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Research Reviews on Middleware Presales Consulting

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Abstract- Middleware becomes a strong research area. The reason is the ability of middleware technologies to solve all the integration problems in an enterprise. This technology combined with other technologies can solve pressing problems for mankind.

Index Terms- Middleware, Integration, PreSales, Request for Information, Request for Proposal.

I. INTRODUCTION

The term Middleware defines " A set of software programs that connects different programs together ". In today's computerized world, there are lot of benefits to mankind. If all computerized systems talk to each other effectively and efficiently there would be lot of benefits to mankind. Presales professionals play a key role in architecting the solution for any enterprise with middleware technologies. The paper focuses on the reviews of presales consultants and their views.

II. IMPORTANCE OF RESEARCH IN MIDDLEWARE

Given the fact that middleware adds a lot of value, there has to be a lot of effort that goes in each architectural framework. The framework need not be technical. Mostly in sales engagement, competencies of middleware professional are key in suggesting and evangelizing the middleware technologies. Every customer has issues and challenges in their IT setup and complexities. It is upto the middleare presales consultants to understand, discuss, elaborate, present and articulate the benefits of middleware.

III. STUDIES AND FINDINGS - REVIEWS

- Patrick Isom, a Technical PreSales consultant says "Pre-sales is all the stuff that happens to develope a sale. As a pre-sales consultant I am closely tied to the sales team but support them in a technical way. I started as a technical person, then went into full on sales and now am back as a technical consultant. Pre-sales consultants are instrumental in technical sales cycles as they are able to analyze the customer requirements and assist in developing a proper solution. Most products these days are not a one size fits all and most successful business are in solution oriented sales. As a pre-sales technical consultant it is my job to make sure the solution fits the customer requirements and will work properly once implemented. You dont have to be a sales person but you do need to understand sales cycles. You do need to be the "expert" in your field and understand how your product works." -February 7, 2012.

- Cristian Dinescu says "In short you have to fill the gap between the functional and business requirements of the Customer and the actual technical implementation of your highly-specialized technical team proposed to do the job. So, you have to speak the "bits-and-bytes-and-MHz" technical language and translate it into common language understandable by a non-technical Customer Manager who needs to know some important information about his business. And present the solution more like benefits, TCO, lowering risk, automation, control, audit trails instead of "We deliver our servers with the fastest Intel processor installed and we have more useful storage compared with our competition." It takes long time to became a true Presales Professional because you need to have technical skills in your domain of expertise, but also Sales skills and preferably also knowledge in PM (Project Management) and BM (Bid Management). It is someone who stops the Salesman to promise to the Customer un-realistic things and also makes sure that a System Engineer doesn't include in the offer 10 man-day just to install an operating system on one server." -February 8, 2012.

- Olga Kuzmina says "It's a very unique set of skills, you have to be technical to understand what would be the best way to design the solution and with perfect customer facing skills at the same time. The most difficult bit it to "translate" customer words into a valid requirement." -February 8, 2012

- Jeff Mason says "Of course the simple answer is any function or task that is performed before the actual contract is signed. But what does that mean in real life? I will try and run through what I have experienced in the pre-sales cycle: Initial visibility in the sales pipeline: Typically you are going to be involved with a pre-sales cycle with a prospect as a result of either the prospect making contract with the company, or the company reaching out to the prospect in one way or another. A good portion of the time, this initial contact, is handled by the salesperson, whether that is inside sales, or out. Most sales people are sensitive to the time and resources that they obtain from within the company and it's at this stage that the sales person will qualify the prospect to ensure that expending company resources on it are worthwhile. However, for a number of valid reasons, the sales person will reach out to you for assistance, education,

involvement, or just to discuss the opportunity with you. This stage is formally managed through the sales pipeline that can take the form of a spreadsheet for small companies, or a software system with processes around it in medium to large companies. It's to your advantage and I would say mandatory that you have some visibility at this stage of the pre-sales cycle so you can understand what can be possible coming your way and to allow you to share and leverage your experience and skills with the sales team. Initial Contact: This can take the form of a sales person contacting the prospect and getting them to agree to a conference call, demo, initial preliminary discussion, or face to face. I have observed that a face-to-face meeting this early on is the exception, but it does happen and more times than you would think. Typically this is a conference call and Webex to discuss the overall solution and most of the time it involves a demo of the product. All of the steps outlined here require everyone to be at the top of their game, but demos are that event that require experienced resources, planning, coordination, and fall back procedures in case something goes wrong. Too many times the demo is lacking because prior planning wasn't taken and the lack of coordination can lead to confusion and the perception or reality that you as a company are disorganized." -February 9, 2012

IV. CONCLUSION

Based on the research reviews, middleware professionals can help customers and product companies to understand, get the requirements and use their competencies to build a framework for suggesting the successful architecture using middleware technologies.

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Research Reviews on Stress among working women in IT field

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Abstract- Today IT workplace stress is becoming a major issue and a matter of concern for the employees and the organizations. It has become a part of life for the women employees, as life today has become so complex at home as well as outside that it is impossible to avoid stress. Selye [1936] defines stress as "a dynamic activity wherein an individual is confronted with an opportunity, constraint or demand"

Index Terms- Stress, IT

I. INTRODUCTION

Indian families are undergoing rapid changes due to the increased pace of urbanization and modernization. Indian women belonging to all classes have entered into paid occupations. At the present time, Indian women's exposure to educational opportunities is substantially higher than it was some decades ago, especially in the urban setting. This has opened new vistas, increased awareness and raised aspirations of personal growth. This, along with economic pressure, has been instrumental in influencing women's decision to enter the work force. Most studies of employed married women in India have reported economic need as being the primary reason given for working.

Women's employment outside the home generally has a positive rather than negative effect on marriage. Campbell*et al.* studied the effects of family life on women's job performance and work attitudes. The result revealed that women with children were significantly lower in occupational commitment relative to women without children; contrary to expectation, women with younger children outperformed women with older children. Makowska studied psychosocial determinants of stress and well-being among working women. The significance of the work-related stressors was evidently greater than that of the stressors associated with the family function, although the relationship between family functioning, stress and well-being was also significant.

II. MULTIPLE ROLES AND PROFESSIONAL WOMEN

Super identified six common life roles. He indicated that the need to balance these different roles simultaneously is a reality for most individuals at various stages throughout their lives. Rather than following a transitional sequence from one role to another, women are required to perform an accumulation of disparate roles simultaneously, each one with its unique pressures. Multiple role-playing has been found to have both positive and negative effects on the mental health and well-being of professional women.

In certain instances, women with multiple roles reported better physical and psychological health than women with less role involvement. In other words, they cherished motivational stimulation, self-esteem, a sense of control, physical stamina, and bursts of energy. However, multiple roles have also been found to cause a variety of adverse effects on women's mental and physical health, including loss of appetite, insomnia, overindulgence, and back pains.

III. IMPORTANCE OF RESEARCH IN STRESS

An increasing number of articles have promoted the importance of work–life balance. This highlights the current concern within society and organizations about the impact of multiple roles on the health and well-being of professional women and its implications regarding work and family performance, and women's role in society. The following variables influencing the experience of work–life balance were identified while reviewing the international literature.

a. The multiple roles performed by women

b. Role strain experienced because of multiple roles, i.e., role conflict and role overload

c. Organization culture and work dynamics: Organizational values supporting work–life balance have positive work and personal well-being consequences

d. Personal resources and social support: Several studies confirmed the positive relationship between personalities, emotional support and well-being

e. Career orientation and career stage in which women careers need to be viewed in the context of their life course and time lines

f. Coping and coping strategies: Women use both emotional and problem-focused coping strategies to deal with role conflict.

IV.   STUDIES AND FINDINGS – REVIEWS

Som Mittal, President, NASSCOM, holds that gender inclusivity is a must for the long-term success of industry. "India will play a key role in future transformation... Women are a key and vital part of our workforce, and industry will continue to work towards creating a conducive environment and attract more women employees and leaders." Workplace diversity in industry gives it a leading edge in the marketplace, and is therefore of even greater importance in these times of economic recession and slowdown. Gender inclusivity is no longer corporate social responsibility but a business imperative.

Cleo Thompson, Gender Advisory Council, Global HC, PriceWaterhouse Coopers, observes that in 2010, 60% of graduates across America, Asia and Europe will be women. Placing this huge pool of talented women in leadership roles will improve the return of investor capital, the quality of the end product, and the corporate bottom line. Harnessing the power of talented women "will pave the way for future generations".

N Krishnakumar, CEO, MindTree Ltd, believes that "building business is not just a man's job. Women helped build up MindTree" as a force to reckon with globally. It is wrong to think that transformation can be effected by men alone. He cites the case of Xerox, where an all-women top management team recently collaborated to transform the company.

Ambitions are changing in today's world. Educated women are now coming in larger numbers from tier II cities and smaller towns across India. These women, with their personal drive, integrity and capacity to manage conflict positively, can build value for stakeholders in a business enterprise. Employing women, in the words of N Krishnakumar, is a "smart business decision". Women should not expect concessions but demand their rights as valuable contributors to enterprise, he feels.

Shankar Annaswamy, Managing Director, IBM India, believes that business innovations will make the key difference in surviving the impending financial tsunami. "We are way behind the rest of the world," says Pramod Bhasin, President and CEO, Genpact. The talent pool of qualified women professionals must be effectively tapped to strengthen industry and the economy. In India, only about 25% of the business leadership is comprised of women. In China, on the other hand, women comprise nearly 60% of the business leadership. "The glass ceiling exists. We have to break it visibly and rock the boat to make things change." Women as innovators bring value to enterprise in a rapidly changing world

This study also found that overall, women ascribe greater importance to True innovation is not about commanding, but getting people to feel comfortable about change," says Sharad Sharma, CEO (R&D) Yahoo India. Today, metaphors for leadership are changing. With more information available than ever before, today's business leaders can no longer claim access to privileged information. Today's business leader is like a masterful coach coaxing the best performance from an average team. The role of an enlightened parent may perhaps be the future metaphor for leadership. The leader should not instruct, but engage the hearts and minds of the team; draw out their passion and leverage their strengths.

Women have a natural adaptability and capacity for change. Today, talent is only a good starting point. You need to make something out of that talent. It takes study and persistence to build skills and then become an expert and adaptive change agent. Women may have this natural ability but they need to be motivated and build a positive self-image, says Sharma. "Faith in oneself is a major turning point for innovation and change."

Nancy Thomas, Vice-President, IBM Global Business Services, holds that diversity of background and ideas are key drivers of innovation. Stereotypes such as the glass ceiling are barriers to innovation. In today's business environment, innovation is of great importance and is much more than a product offering. Today, the rest of the world, and mature markets, are eager to hear about growth countries such as India and of the innovations that drive this growth. Acknowledging the value and potential of women as innovators, IBM encourages more women to earn patents on processes they have formulated.

Women are traditionally stereotyped as collaborative consensus-builders ready to take the backseat. Nancy Thomas urges women to "learn when to stop consensus-building and make decisions for the team. Building credibility and authority is vital for leadership. Cultural factors do restrain women. But the real glass ceiling is the one we put upon ourselves. We women are our own barriers. Women must hone their capacity to handle opportunities and embrace them".

Accenture undertook research for One Step Ahead of 2011: A New Horizon for Working Women to gain a better understanding of how prepared women and men feel to meet the challenges of the multi-polar world, a phenomenon in which traditional centres of economic power are being dispersed more widely around the globe. For this study, 4,100 business professionals from medium to large organisations in 17 countries were surveyed online between December 2007 and January 2008.

The study found some striking differences among individual countries. Professionals of both genders in several key emerging markets were more likely to say they felt equipped than were their counterparts in developed markets. The majority of respondents in India, China and Brazil -- 70%, 68% and 58% respectively -- said they felt equipped to succeed in the global business world of 2011. On the other hand, respondents in the UK and France were least likely and indicate greater readiness for a number of key skill areas than men do. Specifically, they express a heightened propensity to cultivate skills related to inclusion and diversity, social responsibility and global skills. According to the report, technology is the skill that women overall deem most important to success in the future, and the one they are most willing to embrace as an enabler of new business models.

"The current economic crisis shows how interconnected we are," says Rekha M Menon, Executive Vice-President, Accenture

India. "Innovation can come from anywhere. Our study shows that women in emerging markets report better readiness to face the future." Gender diversity influences organisational effectiveness. Corporates with more women in top leadership clearly can face changes and innovate, and therefore perform better. Yet, women are clearly behind in certain key areas of effectiveness at the workplace. Accenture globally encourages women to hold patents for their innovations, Menon adds, as one of the many ways to encourage and nurture the talents of women.

NASSCOM-Mercer study on women in IT and BPO

This six-week study of 40 organisations, with special emphasis on technology shows, in the words of Padma Ravichander, MD, Mercer (India), that "we are travelling beyond inclusivity towards empowerment". The report shows how gender inclusivity has its own rewards for an enterprise. Adequate representation of women in the workforce enhances creativity, productivity and the ability to manage change. The study shows the paradox of more women being recruited at the entry level, but fewer remaining in the workforce and progressing towards the top positions.

There is a talent leakage in middle management levels among women in their thirties. Marriage, family, children, relocation and other personal reasons diminish women's ability to reach the top. Support systems are required for women at work. Current measures such as crÃ¨ches, flexi-time, refresher programmes, orientation on company policies only scratch the surface of the real problems.

However, there is increased awareness of the contribution of women and the need to nurture their talent at the workplace. Leadership paradigms are changing in the 21st century.

V. CONCLUSION

Future directions

It is critical for work and family research to fully understand the conditions under which the married women employees experience conflict between their roles. There is a need to consider working environment, job satisfaction, family support and number of working hours in the future research. Future studies should also continue to refine the methodology used in the area of work–family research. In order to attain in-depth understanding of one's work and family life, researchers who study work–family roles should include multiple perspectives such as job stress, quality of life, mental health, and work demands. In addition, it is necessary to explore multiple waves of data collection over a longer period of time to better understand the changing nature of work family roles over time. Longitudinal studies need to be conducted to examine how the stages of life (e.g., marriage, child birth, and child rearing) affect work and family concerns. It is clear from the current study that married women employees indeed experience WFC while attempting to balance their work and family lives. Thus, organizations need to

formulate guidelines for the management of WFCs since they are related to job satisfaction and performance of the employees.

Like all studies, the current research has limitations. The sample in the present study is quite small; hence, the generalization of the findings is limited. Additional research is needed in other employment settings to explore the relationship between WFC and quality of life among married women employees.

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Stochastic Model to Find the Estrogen Therapy on Gallbladder Disease Using Normal Distribution

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Abstract- Estrogen therapy is thought to promote gallstone formation and cholecystitis but most data derive from observational studies rather than randomized trials. The aim of the study was to determine the effect of estrogen therapy in healthy postmenopausal women on gallbladder disease outcomes.
The second order linear homogeneous differential equation,
$$f_{T_{(1)}}(t;0) = \frac{\lambda^2}{\sqrt{\mu(4\lambda+\mu)}} e^{-(t/2)(2\lambda+\mu)} \left[e^{(t/2)(\sqrt{\mu(4\lambda+\mu)})} - e^{-(t/2)(\sqrt{\mu(4\lambda+\mu)})} \right]$$
which was used to determine the effect of estrogen therapy in healthy postmenopausal women on gallbladder disease outcomes.

Index Terms- Gallbladder, Estrogen Therapy, Normal Distribution.
2010 Mathematics Subject Classification: 60G12, 60H10

I. INTRODUCTION

W omen were excluded if they had any illness that suggested less than a 3 year's survival, had a prior cholecystectomy or gall bladder disease. Women with hysterectomy were eligible for the estrogen alone trial.

Eligible participants were randomized to $0.625 mg/d$ of conjugated equine estrogens (CEE) or placebo. Participants reported hospitalizations for gall bladder diseases and gall bladder related procedures, with events ascertained through medical record review. These data suggest an increase in risk of biliary tract disease among postmenopausal women using estrogen therapy [1] and [10].

In this paper, the model is characterized by the Markov Property of entering and exiting processes, by the service channel and by the system capacity to accommodate one customer at a time [6], [7] and [8]. Here we use the function $f_{T_{(1)}}(t;0)$ satisfies the second order linear homogenous differential equation $\frac{d^2}{dt^2} f_{T_{(1)}}(t;0) = -(2\lambda + \mu)\frac{d}{dt} f_{T_{(1)}}(t;0) - \lambda^2 f_{T_{(1)}}(t;0)$ with the initial conditions $f_{T_{(1)}}(0;0) = 0$ and $\frac{d}{dt} f_{T_{(1)}}(t;0)\big|_{t=0} = \lambda^2$, The explicit value of $f_{T_{(1)}}(t;0)$ is $f_{T_{(1)}}(t;0) = \frac{\lambda^2}{\sqrt{\mu(4\lambda+\mu)}} e^{-(t/2)(2\lambda+\mu)} \left[e^{(t/2)(\sqrt{\mu(4\lambda+\mu)})} - e^{-(t/2)(\sqrt{\mu(4\lambda+\mu)})} \right]$

II. NOTATIONS

$P_m^{(k)}(t)$	-	Conditional Probability
$G_k(s,t)$	-	Generating Probability Functions
$\{T_{(i)}\}_{i \in z^+}$	-	Renewal Process
$f_{T_{(1)}}(t;i)$	-	Conditional Density Function
$v(t)$	-	Number of Customers
$\tau_{(k)}$	-	k^{th} Interarrival time
t_k	-	Moment
S_k	-	Service Time
$l_i(t)$	-	Arrival Order
μ	-	Shape Parameter

λ -   Scale Parameter

t -   Time

λ' -   Interarrival Mean Time

III.   INTERLOSS TIME

Let $P_m^{(k)}(t)$ be the conditional probability to lose m clients in $[0,t)$ with k customers in the system at time $t = 0$:

$$P_m^{(k)}(t) = P\{L(t) = m|k\}, \quad k = 0, 1,$$

the main results found in [5] are the explicit values of the conditional probabilities of no losses in $[0,t)$:

$$P_0^{(1)}(t) = e^{-(t/2)(2\lambda+\mu)}\left[\cosh\frac{t\sqrt{\mu(4\lambda+\mu)}}{2} + \frac{\mu}{\sqrt{\mu(4\lambda+\mu)}}\sinh\frac{t\sqrt{\mu(4\lambda+\mu)}}{2}\right]$$

$$P_0^{(0)}(t) = e^{-(t/2)(2\lambda+\mu)}\left[\cosh\frac{t\sqrt{\mu(4\lambda+\mu)}}{2} + \frac{2\lambda+\mu}{\sqrt{\mu(4\lambda+\mu)}}\sinh\frac{t\sqrt{\mu(4\lambda+\mu)}}{2}\right]$$

and the iterative procedure to determine the distribution of the total number of losses in $[0,t)$. All is obtained by solving the inhomogeneous differential equations

$$P_m^{(k)}(t) = -(2\lambda + \mu)\frac{d}{dt}P_m^{(k)}(t) - \lambda^2 P_m^{(k)}(t) + \lambda\frac{d}{dt}P_{m-1}^{(k)}(t) + \lambda^2 P_{m-1'}^{(k)}(t)$$

Furthermore, the generating probability functions $G_k(s,t)$ of $P_m^{(k)}(t)$ were evaluated and their explicit values are the following:

$$G_1(s,t) = e^{-(t/2)(2\lambda+\mu-\lambda s)}\left[\cosh\frac{t\sqrt{(\lambda s-\mu)^2+4\lambda\mu}}{2} + \frac{\mu+\lambda s}{\sqrt{(\lambda s-\mu)^2+4\lambda\mu}}\sinh\frac{t\sqrt{(\lambda s-\mu)^2+4\lambda\mu}}{2}\right]$$

$$G_0(s,t) = e^{-(t/2)(2\lambda+\mu-\lambda s)}\left[\cosh\frac{t\sqrt{(\lambda s-\mu)^2+4\lambda\mu}}{2} + \frac{2\lambda+\mu-\lambda s}{\sqrt{(\lambda s-\mu)^2+4\lambda\mu}}\sinh\frac{t\sqrt{(\lambda s-\mu)^2+4\lambda\mu}}{2}\right]$$

In order to determine the probability density functions

$$f_{T_{(i)}}(t) = \frac{d}{dt}P\{T_{(i)} < t\} \tag{1}$$

with $i = 1, 2, \dots \dots$ and the related properties.

In effect, the probabilities appearing below have a structure quite similar to the hyperbolic distance of moving particles envisaged in [3].

We establish that the density functions (1) solve the second order linear homogeneous differential equations

$$\frac{d^2}{dt^2}f_{T_{(i)}}(t) = -(2\lambda + \mu)\frac{d}{dt}f_{T_{(i)}}(t) - \lambda^2 f_{T_{(i)}}(t) \tag{2}$$

Let $v(t)$ be the number of customers in the system at the moment t, and let t_{l_i} be the moment with $t_{l_0} = 0$. The initial conditions for (2) depend on $v(t_{l_{i-1}})$, and the renewal process $\{T_{(i)}\}_{i\in z^+}$ has the following property:

$$f_{T_{(1)}}(t) = f_{T_{(i)}}(t), \quad if \ v(0) = 1$$
$$f_{T_{(1)}}(t) \neq f_{T_{(i)}}(t), \quad if \ v(0) = 0 \quad \text{for } i > 1.$$

We also present the derivation of (2) and its solution conditionally by $v(0)$.

Let $f_{T_{(1)}}(t;i)$ be the conditional density function

$$f_{T_{(1)}}(t;i) = \frac{d}{dt}P\{T_{(1)} < t \mid v(0) = i\} \tag{3}$$

The explicit values obtained for (3) are the following:

$$f_{T_{(1)}}(t;1) = \lambda e^{-(t/2)(2\lambda+\mu)}\left[\cosh\frac{t\sqrt{\mu(4\lambda+\mu)}}{2} - \frac{\mu}{\sqrt{\mu(4\lambda+\mu)}}\sinh\frac{t\sqrt{\mu(4\lambda+\mu)}}{2}\right]$$

$$f_{T_{(1)}}(t;0) = \frac{2\lambda^2 e^{-(t/2)(2\lambda+\mu)}}{\sqrt{\mu(4\lambda+\mu)}} \sinh \frac{t\sqrt{\mu(4\lambda+\mu)}}{2}$$

We compute the Laplace transforms of (3)

$$F_{T_{(1)}}^*(s;i) = \int_0^\infty e^{-st} f_{T_{(1)}}(t;i)dt \quad \text{for } i = 0,1, \quad \text{using (2)} \tag{4}$$

The explicit values obtained for (4) are the following;

$$F_{T_{(1)}}^*(s;1) = \frac{\lambda(\lambda+s)}{(\lambda+s)^2+s\mu'}$$

$$F_{T_{(1)}}^*(s;0) = \frac{\lambda^2}{(\lambda+s)^2+s\mu'}$$

Finally, let $\theta_1^{(i)}$ be the conditional means of the 1th interloss time

$$\theta_1^{(i)} = E[T_{(1)} \mid v(0) = i]$$

with $i = 0,1;$ it has been checked that their values are

$$\theta_1^{(1)} = \frac{1}{r'} \qquad \theta_1^{(0)} = \frac{1}{r} + \frac{1}{\lambda'}$$

where r is the Erlong loss rate, and λ' is the interarrival mean time.

Let $v(t)$ be the number of customers in the system at the moment t, let $\tau_{(k)}$ be the kth interarrival time, let t_k be the moment when the kth client enters the system, let S_k be the service time of the kth served customer. Furthermore, let $l_i(t)$ be the arrival order in t, and let t_{l_i} be the moment, with $t_{l_0} = 0$ and $t_{l_i(t)} = t$

If we consider that the system is busy at time $t = 0$, The random variable $T_{(1)}$ can be expressed as follows:

$$T_{(1)} = \sum_{k=1}^{l_1(t)} \tau_{(k)}$$

where $l_1(t)$ represents the arrival order happened in $t_{l_i(t)} = t$, starting from zero.

Now, let $P_n^{(1)}(t)$ be the conditional probability that the arrival order happened in t with $v(0) = 1$ is equal to n:

$$P_n^{(1)}(t) = P\{l_1(t) = n \mid v(0) = 1\}$$

Lemma: (1)

The functions $F_{n,1}^{(s)}(t) = \int_s^t dt_1 \dots \int_{t_{n-1}}^t dt_n e^{-\mu(t-t_n)} \prod_{i=1}^n [1 - e^{-\mu(t_i - t_{i-1})}]$ with $t_0 = s$ do not depend on t but on the time interval $[s,t]$: $F_{n,1}^{(s)}(t) - F_{n,1}^{(0)}(t-s)$ \hfill (5)

Proof:

We proceed by showing that (5) is true for $n = 1$

$$F_{1,1}^{(s)}(t) = \int_s^t dt_1 e^{-\mu(t-t_1)} [1 - e^{-\mu(t_1-s)}]$$

$$= \frac{1-e^{-\mu(t-s)}}{\mu} - (t-s)e^{-\mu(t-s)}$$

$$= F_{1,1}^{(0)}(t-s)$$

Then, we suppose that it is true for $n - 1$, and we obtain that

$$F_{n,1}^{(s)}(t) = \int_s^t dt_1 [1 - e^{-\mu(t_1-s)}] F_{n-1,1}^{(t_1)}(t)$$

$$= \int_s^t dt_1 G_1^{(s)}(t_1) F_{n-1,1}^{(0)}(t - t_1)$$

where $G_1^{(s)}(t_1) = \int_s^t dx\mu e^{-\mu(t_1-x)}$

Finally, by the Markov property of the exponential distribution, the (5) appears

$$F_{n,1}^{(s)}(t) = \int_0^{t-s} dt_1 G_1^{(0)}(t_1) F_{n-1,1}^{(0)}(t - s - t_1)$$

The conditional density function

$$f_{T_{(1)}}(t;1) = \frac{d}{dt}P\{T_{(1)} < t \,|\, v(0) = 1\}$$

can be evaluated as mean of convolution of $l_1(t)$ exponential probability density functions, and thus we have that

$$f_{T_{(1)}}(t;1) = \sum_{n=1}^{\infty} f \sum_{k=1}^{n} \tau_{(k)}(t) P_n^{(1)}(t) = e^{-\lambda t} \sum_{n=0}^{\infty} \lambda^{n+1} F_{n,1}^{(0)}(t) \tag{6}$$

At first, we state the following result concerning the evaluation of the integrals $F_{n,1}^{(0)}(t), n \geq 1$

Lemma: (2)

The functions $F_{n,1}^{(0)}(t) = \int_0^t dt_1 \ldots \int_{t_{n-1}}^t dt_n e^{-\mu(t-t_n)} \prod_{i=1}^{n}[1 - e^{-\mu(t_i - t_{i-1})}]$ satisfy the difference differential equations

$\frac{d^2}{dt^2}F_{n,1}^{(0)}(t) = -\mu \frac{d}{dt}F_{n,1}^{(0)}(t) + \mu F_{n-1,1}^{(0)}(t)$ where $t_0 = 0, t > 0, n \geq 1$

Proof:
We first note that

$$\begin{aligned}
\frac{d}{dt}F_{n,1}^{(0)}(t) &= \frac{d}{dt}\int_0^t dt_1 \ldots \int_{t_{n-1}}^t dt_n e^{-\mu(t-t_n)} \prod_{i=1}^{n}[1 - e^{-\mu(t_i - t_{i-1})}] \\
&= \int_0^t dt_1 \ldots \int_{t_{n-1}}^t dt_{n-1}[1 - e^{-\mu(t-t_{n-1})}]\prod_{i=1}^{n-1}[1 - e^{-\mu(t_i - t_{i-1})}] \\
&\quad -\mu \int_0^t dt_1 \ldots \int_{t_{n-1}}^t dt_n e^{-\mu(t-t_n)} \prod_{i=1}^{n}[1 - e^{-\mu(t_i - t_{i-1})}]
\end{aligned}$$

and therefore,

$$\begin{aligned}
\frac{d^2}{dt^2}F_{n,1}^{(0)}(t) &= \mu \int_0^t dt_1 \ldots \int_{t_{n-2}}^t dt_{n-1} e^{-\mu(t-t_{n-1})} \prod_{i=1}^{n-1}[1 - e^{-\mu(t_i - t_{i-1})}] \\
&\quad -\mu \int_0^t dt_1 \ldots \int_{t_{n-2}}^t dt_{n-1}[1 - e^{-\mu(t-t_{n-1})}]\prod_{i=1}^{n}[1 - e^{-\mu(t_i - t_{i-1})}] \\
&\quad +\mu^2 \int_0^t dt_1 \ldots \int_{t_{n-1}}^t dt_n e^{-\mu(t-t_n)} \prod_{i=1}^{n}[1 - e^{-\mu(t_i - t_{i-1})}] \\
&= -\mu \frac{d}{dt}F_{n,1}^{(0)}(t) + \mu F_{n-1,1}^{(0)}(t) \tag{7}
\end{aligned}$$

In view of lemma (2) we can prove also the following.

Theorem: (1)

The function $f_{T_{(1)}}(t;1)$ satisfies the second order linear homogeneous differential equation

$$\frac{d^2}{dt^2}f_{T_{(1)}}(t;1) = -(2\lambda + \mu)\frac{d}{dt}f_{T_{(1)}}(t;1) - \lambda^2 f_{T_{(1)}}(t;1) \tag{8}$$

With the initial conditions $f_{T_{(1)}}(t;1) = \lambda, \quad \frac{d}{dt}f_{T_{(1)}}(t;1)\big|_{t=0} = -\lambda(\lambda + \mu)$ (9)

The explicit value of $f_{T_{(1)}}(t;1)$ is

$$f_{T_{(1)}}(t;1) = \lambda e^{-(t/2)(2\lambda + \mu)}\left[\frac{\sqrt{\mu(4\lambda + \mu)} - \mu}{2\sqrt{\mu(4\lambda + \mu)}}e^{(t/2)(\sqrt{\mu(4\lambda + \mu)})} + \frac{\sqrt{\mu(4\lambda + \mu)} + \mu}{2\sqrt{\mu(4\lambda + \mu)}}e^{-(t/2)(\sqrt{\mu(4\lambda + \mu)})}\right] \tag{10}$$

Proof:
From (6), it follows that

$$\frac{d}{dt}f_{T_{(1)}}(t;1) = -\lambda f_{T_{(1)}}(t;1) + e^{-\lambda t} \sum_{n=0}^{\infty} \lambda^{n+1} \frac{d}{dt}F_{n,1}^{(0)}(t) \tag{11}$$

And thus, in view of (7) and by letting $F_{-1,1}^{(0)}(t) = 0$, we have that

$$\begin{aligned}
\frac{d^2}{dt^2}f_{T_{(1)}}(t;1) &= -\lambda \frac{d}{dt}f_{T_{(1)}}(t;1) - \lambda e^{-\lambda t}\sum_{n=0}^{\infty}\lambda^{n+1}\frac{d}{dt}F_{n,1}^{(0)}(t) + e^{-\lambda t}\sum_{n=0}^{\infty}\lambda^{n+1}\frac{d^2}{dt^2}F_{n,1}^{(0)}(t) \\
&= -2\lambda \frac{d}{dt}f_{T_{(1)}}(t;1) - \lambda^2 f_{T_{(1)}}(t;1) + \lambda\mu f_{T_{(1)}}(t;1) - \mu\left[\frac{d}{dt}f_{T_{(1)}}(t;1) + \lambda f_{T_{(1)}}(t;1)\right] \\
&= -(2\lambda + \mu)\frac{d}{dt}f_{T_{(1)}}(t;1) - \lambda^2 f_{T_{(1)}}(t;1) \tag{12}
\end{aligned}$$

while the first condition is straight forward to verify, the second one needs some explanations: if we write

$$\frac{d}{dt} f_{T_{(1)}}(t;1)\big|_{t=0} = \lim_{\Delta t \to 0} \frac{f_{T_{(1)}}(\Delta t;1) - f_{T_{(1)}}(0;1)}{\Delta t} \tag{13}$$

and observe that

$$f_{T_{(1)}}(\Delta t;1) = e^{-\lambda \Delta t} \lambda F_{0,1}^{(0)}(\Delta t) = \lambda e^{-(\lambda+\mu)\Delta t} = \lambda[1 - (\lambda + \mu)\Delta t] + o(\Delta t) \tag{14}$$

By substituting (14) in (13) the second condition emerges. The general solution to (12) has the form

$$e^{-(t/2)(2\lambda+\mu)} \left[A e^{(t/2)\sqrt{\mu(4\lambda+\mu)}} + B e^{-(t/2)\sqrt{\mu(4\lambda+\mu)}} \right]$$

By imposing the initial conditions (9) to (8) we obtain (10)

Lemma: (3)

The functions $F_{n,0}^{(0)}(t) = \int_0^t dt_1 \dots \int_{t_{n-1}}^t dt_n e^{-\mu(t-t_n)} \prod_{i=2}^n \left[1 - e^{-\mu(t_i - t_{i-1})} \right]$ Satisfy the differential equations $\frac{d^2}{dt^2} F_{n,0}^{(0)}(t) = -\mu \frac{d}{dt} F_{n,0}^{(0)}(t) + \mu F_{n-1,0}^{(0)}(t)$ where $t > 0, n \geq 1, F_{n,0}^{(0)}(0) = 0$

Proof:

See proof of lemma (2)

Theorem: (2)

The function $f_{T_{(1)}}(t;0)$ satisfies the second order linear homogenous differential equation $\frac{d^2}{dt^2} f_{T_{(1)}}(t;0) = -(2\lambda + \mu)\frac{d}{dt} f_{T_{(1)}}(t;0) - \lambda^2 f_{T_{(1)}}(t;0)$

$$\tag{15}$$

with the initial conditions $f_{T_{(1)}}(0;0) = 0, \quad \frac{d}{dt} f_{T_{(1)}}(t;0)\big|_{t=0} = \lambda^2 \tag{16}$

The explicit value of $f_{T_{(1)}}(t;0)$ is

$$f_{T_{(1)}}(t;0) = \frac{\lambda^2}{\sqrt{\mu(4\lambda+\mu)}} e^{-(t/2)(2\lambda+\mu)} \left[e^{(t/2)(\sqrt{\mu(4\lambda+\mu)})} - e^{-(t/2)(\sqrt{\mu(4\lambda+\mu)})} \right] \tag{17}$$

Proof:

By substituting in (11) and (12) $F_{n,1}^{(0)}(t)$ with $F_{n,0}^{(0)}(t)$, (15) emerges. While the first condition is straight forward to verify, the second one needs some explanations: If we write

$$\frac{d}{dt} f_{T_{(1)}}(t;0)\big|_{t=0} = \lim_{\Delta t \to 0} \frac{f_{T_{(1)}}(\Delta t;0) - f_{T_{(1)}}(0;0)}{\Delta t} \tag{18}$$

and observe that

$$f_{T_{(1)}}(\Delta t;0) = e^{-\lambda \Delta t} \lambda^2 e^{-\mu \Delta t} \int_0^{\Delta t} e^{\mu t_1} dt_1 = \lambda^2 \Delta t + o(\Delta t) \tag{19}$$

By substituting (19) and (18) the second condition emerges.
By imposing the initial conditions (16) to (15) we obtain (17)

EXAMPLE

Two randomized, double blind, placebo – controlled trials conducted at 40 US clinical centers. The volunteer sample was 22579 community – dwelling women aged 50 to 79 years without prior chalecystectomy. Women with hysterectomy were randomized to $0.625 mg/d$ conjugated equine estrogens (CEE) or placebo $(n = 8376)$. The remaining 14203 are in the E+P arm. The proportion of women who were excluded from the analysis based on history of cholecystectomy was higher for the CEE trial compared with the E+P trial $[22\% \, vs \, 14.5\%, P < 0.001]$ the Kaplan Meier estimates of cumulative hazards of any gallbladder procedure, any gallbladder disease event, and the global gallbladder disease or procedure measure showed a divergence starting in the first year randomization, with CEE separating earlier is shown in figure. After 6 months women's became nonadherent to randomization assignment in the sensitivity analysis, the resultant HR for the global gallbladder procedures and diseases outcome was $2.19 \, (nominal \, 95\% \, CI, 1.65 - 2.90; P < 0.001)$ for the CEE trial [2] [4] [9].
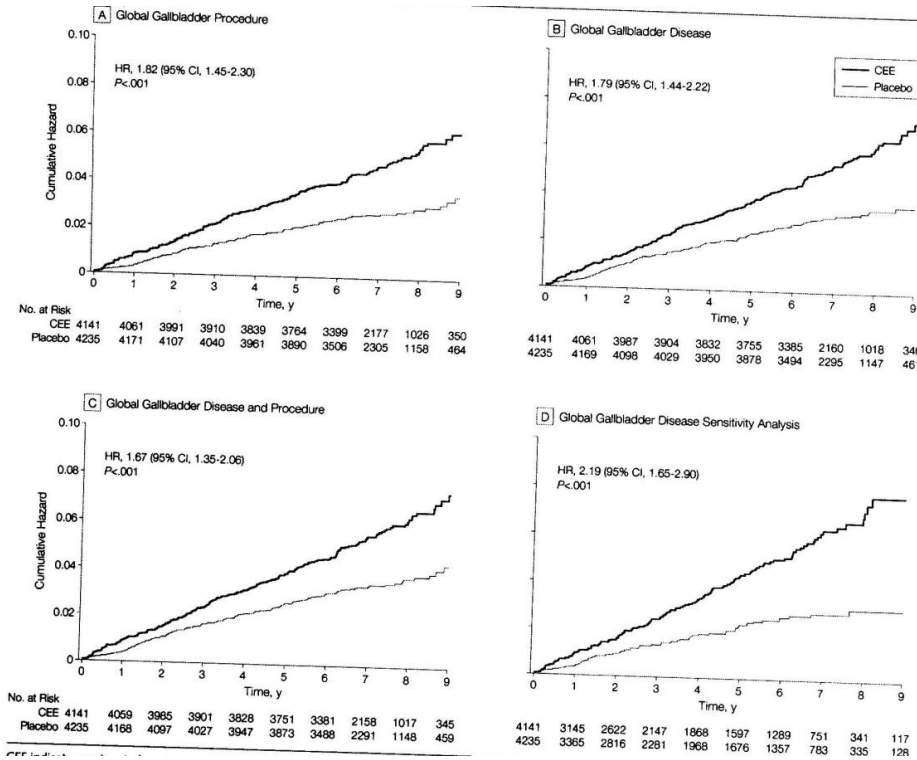
Figure (1): Kaplan Meier estimates of cumulative Hazards for any Gallbladder Outcomes in the Estrogen-Alone Trial
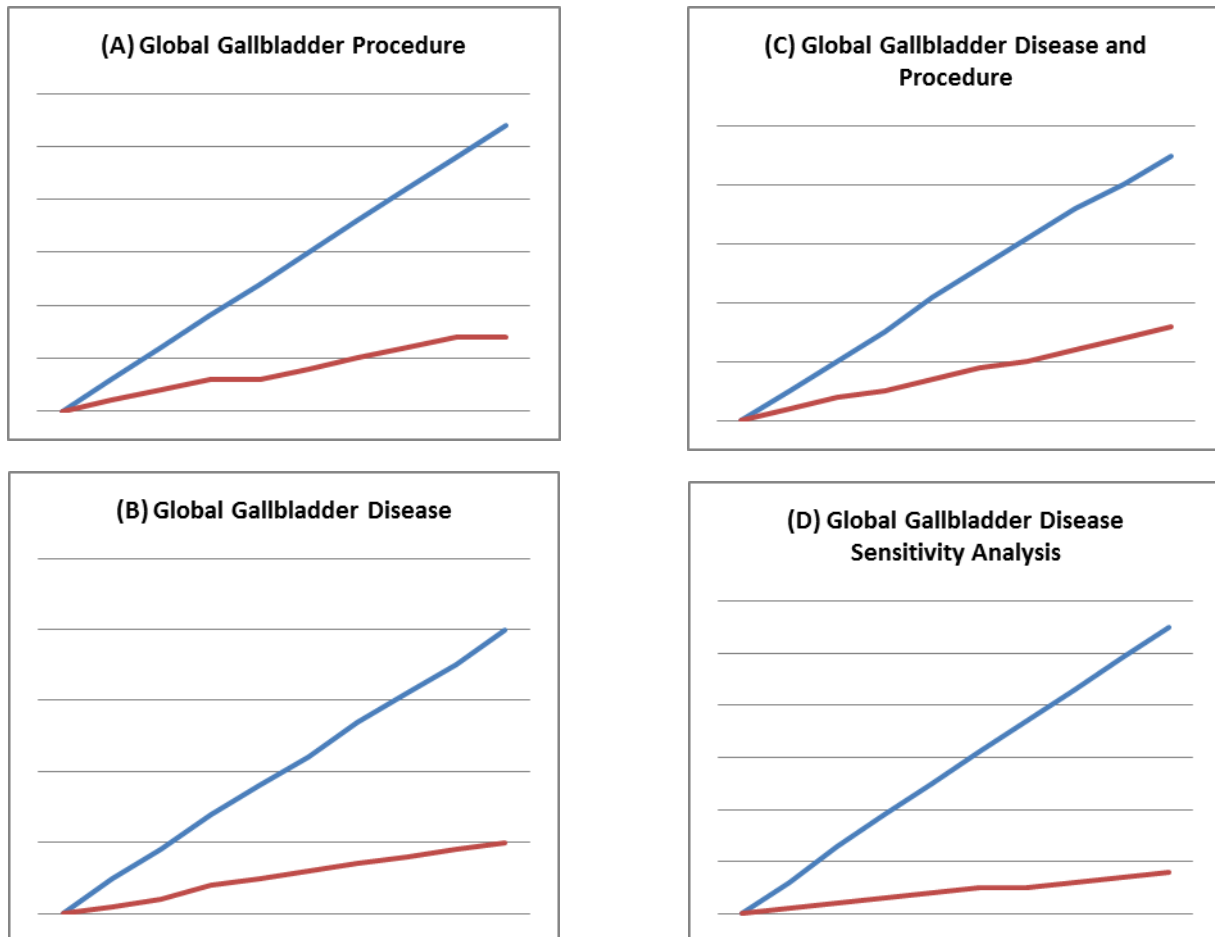
Figure (2)

IV.   CONCLUSION

The medical report suggests an income in risk of biliary tract disease among postmenopausal women using estrogen therapy. The morbidity and cost associated with these outcomes may need to be considered in decisions regarding the use of estrogen therapy. The medical reports {Figure (1)} are beautifully fitted with the mathematical model {Figure (2)}; $(i.e)$ the results coincide with the mathematical and medical report.

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Proximate Analysis, Characterisation and Utilization of Bambara Nut Oil (Mmanu – Okpa)

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Abstract- This work is on Proximate analysis, characterization and utilization of bambara nut oil (Mmanu –Okpa). Bambara groundnut was collected from a local market and analysised. The bambara groundnut has many content, such as carbohydrate, protein ash, water, and oil. The emphasis of this study is on the oil. From the analysis it shows that bambara nut is not an oily seed. As it has high carbohydrate and protein, it is very nutritious and good for human consumption. It can serve as a food supplement. Hence it is good to cultivate the bambara nut in a large quantity to supplement the availability of food in the society.

I. INTRODUCTION

There are many plants that produce their reserve food in form of oil, these plants store their food either in seed or in their fruits. These seeds or fruits may be edible or non-edible. Some of them are useful in many aspects, example: in production of soap, or cosmetics, some are essentially grown for human consumption. The seed that contain oils are called oil seed. Fats and oils have found their ways into almost all the activities of man. The main sources of these fats and oils have always been from animals and plants. While fats are obtained from animals like fishes etc. The oil from plants and animals are collectively called "fixed oils", while the oils from plants are more precisely referred to vegetable oil, and can be isolated from plants like the oil plam, olive, soyabean, cotton, groundnut, coconut, Bambara and host of others. There are also, the essential or ethereal oil which are volatile and found in some plants. Previously, the only oil and fats used by man were those obtained from animals. Experiments to find suitable alternatives to animal oil and fats were made in 19th century when population of Europe was expanding so rapidly that there were insufficient animal oils and fats to meet the growing demand.

Biological seeds contain oil and more research works are carried out on them. Fats and oils are essential for good health. These oils can be utilized as edible fats, for salad, cooking oil, margarine and confectionary purpose.

Presently in Nigeria, Industries depend on palm oil, groundnut oil and beni-seed oil for vegetable cooking oil, soaps, cream and margarine manufacture. There is need to provide other sources of oil for these productions such as from Bambra nut seed. To extract oil from Bambara nut seed, characterize the oil, carry out the proximate analysis and apply it in some of the appropriate industrial uses, is the basis of this work.

II. BRIEF DESCRIPTION OF THE PLANT.

Bambara nut (Voandzeia subterrenea) belongs to the family; leguminosae, sub family, pailionoidae. The crop is first mentioned in the 17th century literature where it is referred to as Mandudi d' Angola. In 1968, Livinaeus described it in species platitinium and named it glycine subterrabean, in accordance with this system of nomenclature. Bambara groundnut is a popular crop in the whole of sub-saharan African. The species is endemic to the Southern Sahelian and Northern Sudania ecozones of Chad, Mali, Niger, North Nigeria, North Cameroun, North Central African Republic, Egypt, Republic of Sudan, East Africa and Madagascar.

Bambara(also spelled Bambarra) groundnut has many common names such as Congo groundnut, Congo goober, Madagascar, Groundnut, Earth pea, Baffin pea, Njugo bean and Under-ground bean. Bambara ground is a herbaceous, intermediate, animal plant with creeping stems at a ground level. Stem branching begins very early about 1 week after germination and as many as 20 branches may be produced. The plant has a well developed taproot with profuse geotropically lateral roots. The flowers are borne on having peduncles which arise from the stems. The flower has a pair of hairy epicalyxes. The calyx consists of five hairy sepals (four on the upper side and one on the lower side).

Apparently, reproductive development is not completely inhibited to light. The pod grows first and reaches its mature size about 30 days after fertilization. The pod usually develop underground and may reach up to 3.9cm, depending on the number of seeds they contain. The pods are indehiscent, often wrinkled, ranging from a yellowish from a reddish dark brown colour. Seeds colour also varies from white to creamy, yellow, brown, purple, and red or black. Various testa patterns are found, including mottled, blotched to stripped, in addition to the predominantly uniformly coloured seed. Mean temperature during the season influences the time taken to achieve physio – logical maturity. Bunch types tend to mature earlier than the spreading types. photoperiod also influences fruit development. Long Photo periods delay or even prevent fruit set in some cultivators.

III. USES OF BAMBARA GROUNDNUT (NMUKPURU OKPA)

Bambara groundnut is essentially grown for household diet and selling as cash crop. The seed makes a complete food as it contains sufficient quantities of protein, carbohydrate and fat.

Despite the relatively low oil content, some tubes in Congo reportedly roasted the seeds and pounded them for oil extraction. The gross energy of Bambara groundnut seed is greater than that of other common pluses such as cowpea, lantil and pigeon pea. Bambara groundnut seeds are consumed in many ways. They can be eaten fresh or grilled while still immature. At maturity, they become very hard and therefore require boiling before any specific preparation. In many west African countries, the fresh pods are boiled with salt and pepper and eaten as a snack. In Cote d' Voire, the seed is used to make flour which makes it more digestible.

In East Africa, the beans are roasted, than pulverized and used to make a soup, with or without condiments. Bread made from Bambara groundnut flour has been reported in Zambia seeds can also be pounded into flour and used to make a stiff porridge. Bambara is used to make a paste out of the dried seeds, which is then used in Nigeria for the preparation of various fried and steamed products such as 'akara', 'moi-moi', and 'okpa'. It is also used to make milk. It is also used as animal feed and the seeds have been used to feed chicks. The leaves were reported to be rich in nitrogen and phosphorous and there fore suitable for animal grazing.

IV. COLLECTION AND PREPARATION OF THE SAMPLE

The Bambara nut (voandeia subteranea) was collected from Eke Awka Market in Awka South Local Government Area of Anambra State. The Bambara used is matured and creamy in colour. The weight of the Bambara nut was 3.8Kg. The seed were first of all ground and spread under the sun for few hours for the elements of water in the powder to evaporate.

V. EXTRACTION OF BAMBARA OIL

There are two methods of extracting oil; mechanical extraction and solvent extraction methods.

Solvent extraction is chosen for this experiment. Soxhlet extractor was used in the extraction of the oils.

The seeds were first of all ground and spread under the sun for few hours for the elements of water in the powder to evaporate. The solvent for the extraction (benzene) was placed in the flat bottomed flask. The ground seed was packed in the thimble and put in a chamber and heat was applied with electric heater. The solvent has boiling point of about $54^{o}C – 60^{o}C$ with the electric heater therefore the temperature is regulated for efficient and gradual extraction. When the solvent was heated to a temperature of about $58^{o}C$ or above, it started to vaporize, moved through the soxhlet arm to the condenser where it condenses and dropped into the soil, this involves reflux action. The solvent coming in contact with the solid (ground seed in the thimble) affects the extraction.

The mixture of the oil and the benzene (solvent) was removed for distillation after several series of extraction. The solution (mixture of benzene and the oil with different boiling point) were separated using distillation methods. The solution was heated in a flask so that the solvent vapourized. The vapour

formed is passed down a condenser which is cooled by circulating water in its outer jacket.

Thus recondenses the vapour (benzene) into a liquid called the distillate, which is then collected in a receiver.

In this case, benzene having a low boiling point compared to those of the oils will evaporate first leaving the oil behind.
The following analyses were carried out on the same.

VI. TREATMENT OF EXTRACTED OIL

Crude fats and oil contain variable amount of non-glycosides impurities. Some such as sterols are relatively inert. Some like tocopherols are desirable but some like free fatty acids, phosphatides, and mucilaginous material or foots and certain pigments are objectionable, tending to make the fat or oil dark coloured, susceptible to foaming and smoking on heating, and liable to precipitation of solid material when the oil is heated during processing operation. Foots refer to those impurities that precipitate during storage and then settle to the bottom of the container.

The objective of refining is to remove the objectionable impurities with minimum damage to the neutral oil (glycerides) and to copherols and minimum loss of oil. These are various degree and methods of refining and the one chosen is dictated by the end uses. Solid contaminates of oil are removed simply by filtration or decantation. The main refining operations are degumming, de – acidification, de – colorizations, deodorizations acid washing and bleaching.

VII. ANALYSIS OF THE SAMPLES

Determination of Saponification value

1g of oil was weighed and placed in a flask. $50cm^3$ of potassium hydroxide KOH solution and a few pieces of porous pot were added. The flask was then fit with a reflux condenser and the solution was boiled for forty-five minutes after which the solution becomes clear.

The solution was titrated against hydrochloric acid (HCL) to find the volume of potassium hydroxide KOH solution which was used.

Saponification value $= 28.01 \times \dfrac{A\text{-}B}{C}$

A = Blank determination value in cm^3
B = Sample titrated in cm^3
C = Sample weight in grams.

VIII. DETERMINATION ACID VALUE

MATERIAL: Oil from the sample, 0.05m potassium hydroxide, Diethyl ether and ethanol.
PROCEDURE:

1.0 gram of the oil was weighed out. 30cm3 of a mixture of ethanol and Diethyl ether was measured out in the ratio of 1:1, and poured into the oil. The solution was titrated with 2 drops of 0.5m of alcoholic phenolphthalein. The solution was titrate while shaking with 0.5m alcoholic potassium hydroxide solution until it remains Just pink. The process was repeated three times using the same oil.

ACID VALUE = 28.01 x $\frac{B}{C}$

B = sample titrated in cm^3

C = garms of the oil used.

IODINE VALUE DETERMINATION

APPARATUS – Burette, $250cm^3$ volumetric flask, chemical balance, $250cm^3$ measuring cylinder, corks, pipette and filter paper stopper bottle.

MATERIAL:

Oil from the sample, iodine solution, carbon tetrachloride, starch indicator, potassium iodide solution

PROCEDURE:

0.25 gram of the extracted oil (Bambara oil) was measured out and put into a dry glass stopper bottle of about 250ml capacity. About 10ml carbon tetrachloride was added to the oil. $25cm^3$ of iodine solution was added with the pipette into the container containing oil and carbon tetrachloride and whole content was allowed to drain for the same time. During this time, excess of iodine will be absorbed and the content was left in dark for about 30 minutes at a room temperature. $0.20cm^3$ of potassium iodide solution and $100cm^3$ of water was then added.

The iodine solution was titrated with 0.1m sodium thiosulphate solution using starch as an indicator. 0.1m sodium thiosulphate was added gradually until yellow colour of the solution has fairly disappeared and 2 drops of starch indicator was added and titration continued until blue colour has entirely disappeared.

At the end, the flask was stopped and the content was shaked vigorously to make sure that any remaining iodine in the carbon tetrachloride solution is taken up by the potassium iodide solution.

Iodine value = 12.6 x $\frac{(B – A) M}{C}$

A = Volume (cm^3) of $Na_2S_2O_3$ solution required for titration of the sample.

B = Volume (cm^3) of $Na_2S_2O_3$ solution required for the titration of the blank

C = Grams of the sample used.

M = Molarity of the $Na_2S_2O_3$ solution

PEROXIDE VALUE DETERMINATION

1g of the oil sample was dissolved in 30ml of the solvent containing 12ml of chloroform and 18ml of glacial acetic acid. 0.5ml of saturated aqueous solution of potassium iodide was added, stopped and allowed to stand for one minute in the dark. 30ml of water was titrated with 0.002N sodium thiosulphate solution until the yellow colour disappeared, 1ml of starch solution was then added disappeared. The same thing was done for a blank solution containing no oil.

Peroxide value = 1000 x $\frac{(S-B) N}{W}$

S = Volume in ml of sodium thiosulphate solution used up by the sample.

B = Volume in ml of sodium thiosulphate used up by the blank.

N = Normality of sodium thiosulphate and

W = Weight in gram of the sample

Free fatty Acid (FFA)

This is calculated thus = $\frac{\text{Acid value}}{2}$

SPECIFIC GRAVITY DETERMINATION

A25ml specific gravity bottle was filled with oil and weighed and the mass of the oil was noted as W_1 similarly, the bottle was filled with water and weighed and the mass of water W_2 was noted specific gravity = $\underline{W_1}$

PROMIMATE ANALYSIS

Determination of Percentage (%) fat.

250ml flask was dried in an oven at 100^oC, allowed to cool in a dessicator and weighed. 2g of Bambara was put inside a thimble and this was plugged with wool, the thimble was placed into extractor for extraction period of 60 minutes afterwards, the thimble was removed. The flask was then disconnected and was placed in an oven at 100^oC for 2 hours after which it was cooled and weighed.

Percentage Oil = $\frac{\text{Increase in mass X 100.}}{\text{Mass of sample used.}}$

Determination of Moisture Content

2 petri dishes were washed and dried in an oven, cooled in a dessicator and weighed. 2g of the sample was added to a separate dish labeled 1 and 2 and transferred to the oven set at100^oC and left for 24 hours – period, they were poured, cooled in the dessicator and reweighed.

Mass of the sample x Dish before drying – Mass of the sample x Dish after drying

= Total Mass of the moisture percentage mass

= $\frac{\text{Total mass of moisture x 100}}{\text{Mass of the sample}}$ $\frac{}{1}$

DETERMINATION OF ASH CONTENT

A Crucible were washed, dried in an oven, cooled in a dessicator and weighed empty and labeled A1. 2g of mashed Bambarar was added into another crucible labeled A2. They were charred in oven for about ten minutes. The crucible and the content were transferred into a furnace for two hours at 600^oC, after which period, the temperature was allowed to return to about 200^oC. The sample was then removed from the furnace with tongs into a dessicator for further cooling. After this, the sample was then reweighed to get the weight of both crucible and ash.

Calculation

Mass of crucible + Ashed sample – Mass of empty crucible = Total mass of ash

Percentage mass of ash = $\frac{\text{Total mass of Ash x 100}}{\text{Mass of sample used.}}$

DETERMINATION OF PROTEIN CONTENT

(a) Digestion : - 2g of the sample each were added into Kjeldahl flask. The following are then added separately into the flasks: half of copper tablet, a pinch of selenium power, 25ml of Conc. H_2S0_4. The flask was placed on an electric coil heater in a fume chamber until blacking occurs. Heating is continued for about one hour after the solution has cleared. When all the black specks have been disappeared indicating complete digestion, the

content was transferred into 25ml volumetric flasks and was then made up to the mark. After cooling, the flasks were then shaken thoroughly.

(b) Distillation: - 5ml of Boric Acid was placed in a 100ml conical flask. The conical flask was placed under the condenser such that the condenser tip is under the liquid. 5ml of the digested sample (ground Bambara) was placed each into the distillation apparatus separately and rinsed down with distilled water. The cup was closed with a rod, and 5ml of 60% NaOH was put into it. This was then let in very carefully leaving behind little to prevent ammonia from escaping. Steam was then let through for 4 to 7 minutes (until the amount of liquid in the conical flask was about twice what it was at the beginning of the distillation.

The boric acid indicator was then titrated with HCL to end point.

$$\text{Percentage protein} = \frac{T \times 0.000140 \times 20 \times 6.25 \times 100}{\text{Sample (w)} \times 1000}$$

Where,
W represents the weight of food stuff,
T represents the titre value.

DETERMINATION OF CARBOHYDRATE CONTENT OF SEED BY DIFFERENCE
Calculation
The carbohydrate content for Bambara seed was calculated from the percentage content of protein, moisture, Ash and fat

% Carbohydrate = 100 − (% Protein + % Ash) + % Moisture + % Fat.

DETERMINATION OF CALORIC VALUE OF THE SEED USING THE CALCULATION METHOD AS GIVEN BELOW, THE Caloric value of Bambara seed is:

Caloric value = (% Protein x 4) + (% Fat x 9) + (% Carbohydrate x 4)

SAPONIFICATION (MAKING SOAP).
1.5M OF NaOH was prepared by dissolving 60g of NaOH in 150ml of water in a beaker. Then, 100ml of my oil was poured into another beaker. The prepared sodium hydroxide solution was in the beaker in the presence of a red litmus paper with vigorous string until the litmus paper turned blue indicating the complete saponification of the seed. A white solid soap was obtained Equation for soap making:

$3NaOH + (C_{17}H_{35}COO)_3\ C_3H_5 \longrightarrow 3C_{17}H_{35}COON + C_3H_5$
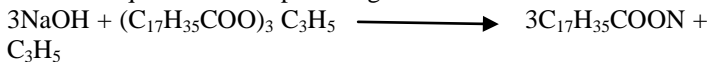
SALTING OUT
The soap produced was redissolved with water and concentrated salt solution was added while heating with vigorous stirring, A pure soap was precipitated while the spent Iye (water, glycerol, and salt) stayed at the bottom. This was separated using a separating funnel. Excess brine was used to wash off the remaining glycerol and dirt thus, making the colour of the soap whiter.

ADDITION OF SAOP ADDICTIVES TO THE PURE SOAP
The pure soap was redissolved and the following was added; 5ml perfume was added to give the soap a fine odour and sodium silicate and sodium phosphate was added as a builder to soap.

Then, the soap was poured into a mold and allowed to stay to solidity; the soap has a rectangular shape.

Table 2.1 Cream produced from Bambara oil

Product Formulation	Composition in g
Bambara oil	3.0
Croada wax	2.4
Stearic acid	1.2
Cetyl alcohol	0.8
Water	10
Glycerol	1.1
Soap Flakes	4.0
Methyl Parabean	3.0

FORMULATION OF CREAM FROM BAMBARA OIL
3g of Bambara oil, soap flakes and water were heated together to a temperature of 70°C.

2.4g of Croada wax, stearic acid, Cetyl alcohol and glycerol were also heated to a temperature of 70°C

The two mixtures were mixed together and stirred continuously until it cooled to 40°C. Methyl parabean was the added as preservatives.

RESULTS OF THE EXPERIMENT
The result of physio-chemical analysis is given on table 3.1 below

TABLE 3.1.1 RESULTS OF EXTRACTION AND ANALYSIS

CHARACTERISTICS	RESULTS IN %
Saponification Value	260.4
Iodine Value	58.97
Acid Value	5.04
Peroxide Value	6.0
Specific gravity	0.89
Free Fatty Acid	2.52

TABLE 3.1.2 PROXIMATE ANALYSIS RESULT

CHARACTERISTICS	RESULTS IN %
Ash Content	2.25
Moisture Content	7.4
Percentage Fat	5.0
Protein	17.51
Carbohydrate	67.84
Caloric Value	386.4

DISCUSSION
The results of the experiment were tabulated above and it is seen that Bambara does not contain much oil (5%).

From table 3.1.1 above, Bambara oil has high saponification value which gives an indication of the average molecular mass of the fatty acid in fat and its higher saponification value indicating that most bonds are saturated at ordinary temperature.

Its Acid value indicates the amount of free acid value which can form soft film after exposure to air and they are good for manufacture of soap. Again, the low Acid value of the oil proved that the oil have a long-shelf life. The oil colour golden yellow and remain liquid at ordinary room temperature. Iodine value serves as the measure of the relative proportion of unsaturated fatty acid. The iodine value result showed that the oil is non-

drying oil and can best be utilized in the manufacture of soap, cream and in confectionary.

Low peroxide value indicates that the oil cannot undergo oxidative deterioration on keeping for a longer period (free from rancidity).

From Table 3.1.2, Ash is incombustible residue left after the complete combustion of any substance. It consists of constituents of inorganic substance. Bambara nut has a higher ash content showing that it contains more inorganic matters.

Finally, Bambara nut contains very high carbohydrate and caloric value showing that it gives energy and is very good for human consumption. Also, that bambara has very low moisture content which is the quantity of water in a saning which shows that they are durable.

IX. CONCLUSION

From the results of the proximate analysis, characterization and utilization of Bambara nut oil, it is obvious that Bambara is not an oily seed.

Bambara has high carbohydrate and protein content showing that it is very nutritious and therefore good for human consumption. It is not an important raw material for our industry for it contains little oil. Because of its proteins and carbohydrate content, it is there suitable for incorporation in livestock feed

Bambara has high nutritive value and after extraction of the oil, the residue cake still has food value which make it the most valuable livestock cakes of commerce.

As benzene was used as solvent in this study, I recommend the use of other solvents for the extraction of the oil in order to determine the nutritive value of Bambara oil.

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Influence of Sesbania Rostrata on Soil Properties and Yield of Onion

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Abstract- The study was carried out in Government Seed farm Vavuniya from June 2012 to September 2012 by Random Completely Block Design (RCBD) with nine treatments and three replicates to study the role of *Sebania rostrata* in relation to soil properties and to evaluate the suitability of Sesbania and inorganic fertilizers on the yield of onion. The green manure (*Sesbania rostrata* and *Crotalaria juncea* (sunhemp)) were incorporated into the soil before 14 days of planting by manually. Onion bulb(Vethalam variety) was planted fourteen days after incorporation of organic material with spacing of 10 cm x 10 cm in a plot size of 1m x 1m. The treatments' T2 – T9 plots were fertilized with urea, *Sesbania rostrata* and sunhemp and it's combinations at the equivalent of 6.21g total N per m^2 (Department Recommendation). Plants were irrigated once in 4 days as farmer practiced. The soil samples were collected for analysis after harvesting to measure the pH, EC, CEC, organic matter content, No3- N and NH4 – N. Total yield per plot were collected. Statistical analysis was carried out using SAS package (version 9.0) and mean separation was done by Dunkan's mean separation. Incorporation of green manure significantly increased soil organic matter content and CEC. Combination of Sesbania and inorganic fertilizer and sunhemp & inorganic fertilizer ensure same yield as inorganic fertilizer along. But sunhemp does not withstand water logging condition and also produce nitrogen lesser than sesbania. Hence incorporation of sesbania as green manure with inorganic fertilizer is good alternative methods to improve soil fertility and obtain good yield. Nitrate leaching to below root zone can be reduced by combination of organic and inorganic N fertilization. This study revealed that the application of inorganic N fertilizer combined with green manure of *Sesbania rostrata* and *Crotalaria juncea* is a viable alternative method to reduce nitrate pollution in ground water and obtain more or less same yield as inorganic fertilizer along. *Sesbania rostrata* can be cultivated in any types of field but *Crotalaria juncea* is not suitable for water logging field.

Index Terms- Sesbania rostrata, soil properties, green manure, inorganic fertilizer

I. INTRODUCTION

Nitrate contamination of ground water has become a serious problem in northern part of Sri Lanka where intensified agriculture is being practiced (Nagarajah et al., 1988). Incorporation of *Sesbania rostrata* is the one ways to improve soil properties and minimize nitrate leachate in soil. My previous leaching column study showed Nitrate losses were less in green manure(Sesbania, Sunhemp & Gliricidia) added soil than inorganic fertilized (urea) soil. The field study could be carried out to confirm the finding to implement the findings in farmers field. *Sesbania rostrata* is a green manure crop, which has nodules both on the stem and root. A green matter yield of 15 to 20 t/ha equivalent to 150-180 kg N/ha is obtained within a period of 8 to 10 weeks. *Sesbania rostrata* is producing nearly double amount of nitrogen per hectare compare to *Crotalaria juncea*. Therefore incorporation of *Sesbania rostrata* is important to improve soil properties and reduce nitrate losses and reduce the cost for inorganic fertilizer and cultivation. Hence, the use of *Sesbania rostrata* is both economically and environmentally friendly. The main objectives of the research were to study the role of *Sesbania rostrata* in relation to soil properties and to evaluate the suitability of green manures and inorganic fertilizers on the yield of onion.

II. MATERIALS AND METHODS

The study was carried out in Government Seed Farm production unit Vavuniya from June 2012 to September 2012 by Random Completely Block Design (RCBD) with nine treatments and three replicates. The green manure *(Sesbania rostrata* and *Crotalaria juncea)* were incorporated into the soil before 14 days of planting by manually (Figure 1.0). Onion bulb(Vethalam variety) was planted fourteen days after incorporation of green manure with spacing of 10 cm x 10 cm in a plot size of 1m x 1m. The treatments' T2 – T9 plots were fertilized with urea, *Sesbania rostrata* and *Crotalaria juncea* and it's combinations at the equivalent of 6.21g total N per m^2 ((Recommendation for onion crop by the Department of Agriculture, Sri Lanka). Plants were irrigated once in 4 days as farmer practiced. The treatments of field experiment were T_1 No N fertilizer application, T2 Urea 50%N (31.5 kg N/ha) T_3 Urea 100%N (62 kgN/ha) T4 Urea 150% N (93.5 kg/N) T5 Urea 50%N + *Ssbania rostrata* 50%N (62 kgN/ha) T6 Urea 50%N + *Crotalaria juncea* 50%N (62 kgN/ha) T7 Urea 50%N + *Sesbania rostrata* 25 %N + *Crotalaria juncea* 25%N(62 kgN/ha) T8 Urea 25%N + *Sesbania rostrata 75%N*(62 kgN/ha) and T9 Urea25%N + *Crotalaria juncea 75 % N* (62 kgN/ha).

After 60 days onion was harvested in the net rows and measured total bulb yield. The soil samples were collected for analysis after harvesting to measure the pH, EC, CEC, organic matter content, No3- N and NH4 – N. NO$_3$-N in soil was determined by sodium salicylate method, NH4 – N was determined by Indophenols blue method and Organic matter content by the dichromate digestion Walkley & Black method,

(Dharmakeerthi *et al*., 2007). CEC of soil was determined by ionic replacement with 1M neutral ammonium acetate, followed by distillation and titration (Chapman, 1965)**.** pH and EC were determined by pH meter and electric conductivity meter respectively. Statistical analysis was carried out using SAS package (version 9.0) and mean separation was done by Dunkan's mean separation.

III.   RESULT AND DISCUSSION

General characteristics of soil

The soil of the experimental site was classified as Reddish Brown Earth. Texture of the soil was sandy clay loam with low nitrogen and organic matter content (Table 1.0).

Properties of soil after incoporation of green manure

pH of soil varied from 7.3 to 7.9 and soil showed slightly alkaline nature and pH of green manure added soil was lesser than inorganic fertilizer alone (Table 2.0) . Incorporation of green manure reduced soil pH (Sangakkara, et. al 2006). Organic matter content of soil varied from 0.83 to 1.70. and incorporation of *Sesbania rostrata* and *Crotalaria juncea* significantly (P <0.001) increased soil organic mater content (Table 3.2). Soil organic matter is important to increase nutrient retain capacity and reduce leaching loss. Organic matter permits better aeration, enhances the absorption and release of nutrients, and makes the soil less susceptible to leaching and erosion (Sekhon and Meelu, 1994). CEC of soil varied from 24.2 to 32.8 and incorporation of *Sesbania rostrata* and *Crotalaria juncea* significantly (P < 0.0001) increased soil CEC. CEC of soil also important   soil properties to increase nutrient capacity of soil and reduce nutrient loss from soil. Inclusion of organic matter is of primary importance in maintaining soil fertility, productivity and sustainability (Dick & Gregorich 2004). Incorporation of *Sesbania rostrata* and *Crotalaria juncea* with in organic fertilizer significantly increased NH4- N and No3 - N retention ability in top soil after onion cultivation than inorganic fertilizer alone. Hence it reduce the nutrient losses by leaching.

Yield of Onion under incorporation of Sesbania rostrata and Crotalaria juncea

Red onion yields of the treatments ranged from 24.7 to 27.9 t/ha (Figure 2.0) and those were higher than the average yield obtained by the farmers of the study area. The control showed a significantly (P<0.001) lower yield compared to the treatments. Yields of inorganic and combination of green manure and inorganic fertilized plots did not show any significant differences (Table 3.0). These results showed that the combined use of green manure and inorganic fertilizer is an effective soil N management strategy that can ensure high yields. Amujoyegbe et. al, (2007) reported that the use of combination of organic and inorganic fertilizer could increase crop yield and reduce the high cost of fertilizer to subsistence farmers in Nigeria. Combination of Sesbania and inorganic fertilizer and sunhemp & inorganic fertilizer ensured same yield as inorganic fertilizer along. But sunhemp does not withstand water logging condition and also produce nitrogen lesser than sesbania. Hence incorporation of sesbania as green manure with inorganic fertilizer is good alternative methods to improve soil fertility and obtain good

yield. Use of green manure has the potential to increase maize yield in Limpopo province, South Africa (Jude 2011)

Nitrate Nitrogen in below root zone under *Sesbania rostrata* and *Crotalaria juncea* incorporation

Nitrate nitrogen content at 15-30 cm soil layer after harvesting of onion was significantly (P<0.0001)high in recommended inorganic N added plots and combination of inorganic N and green manure added plots than control(No N fertilizer application). Hence application of fertilizer increased nitrate nitrogen to the bottom layer (below root zone). But Nitrate nitrogen in below root zone was high in inorganic fertilizer application along than combination of inorganic N and green manure added plots. Highest amount of nitrate nitrogen was observed in T4 where highest amount of inorganic N (1 ½ Urea) added plot (Table 4.0). In thavashikulam area farmers apply fertilizer higher than recommended level of fertilizer. Hence excess amount of fertilizer cause ground water pollution(Loganathan 2011). Nitrate leaching from agricultural field is function of fertilizer rate (Bawatharani et. al, 2004). This study showed that nitrate leaching to below root zone can be reduced by combination of organic and inorganic N fertilization.

IV.   CONCLUSION

This study revealed that the application of inorganic N fertilizer combined with green manure of *Sesbania rostrata* and *Crotalaria juncea* is a viable   alternative method to reduce nitrate pollution in ground water and obtain more or less same yield   as inorganic fertilizer along. *Sesbania rostrata* can be cultivated in any types of field but   *Crotalaria juncea* is not suitable for water logging field.
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Sesbania green manure is added to field

Incorporation of   Sesbania green manure

Onion bulb is in field

Onion crop is in field 3 WAP

Figure 01 Cultivation of onion under green manure application

Table 1.0 General characteristic of soil

Soil property	Content
pH	7.2
EC (ms)	1.1
bulk density(gm^{-3})	1.55
CEC	24.3
Organic matter %	0.88

Total N%	0.11
Soil texture	sandy clay loam
Sand%	70.48
Clay%	21.52
Slit%	8.0

Table 2.0 Chemical properties of soil after harvesting of onion

Treatments	pH	Organic matter %	CEC C mol	NO3- -N (ppm)	NH4+ - N (ppb)
T₁ No N fertilizer application	7.7abc	0.83d	24.2d	0.90c	325d
T2 Urea 50%N	7.8a	1.03d	24.8cd	1.11bc	442dc
T₃ Urea 100 %N	7.8ab	1.17bcd	25.8c	1.09bc	464dc
T4 Urea 150%N	7.9a	1.13cd	25.6c	1.12bc	564bc
T5 Urea 50%N+ *Sesbania rostrata 50%N*	7.5bcd	1.53abc	32a	1.28ab	748ab
T6 Urea 50%N and *Crotalaria juncea 50%N*	7.6abcd	1.67a	32.8a	1.33ab	739ab
T7 Urea50%N + *Sesbania rostrata 25%N+ Crotalaria juncea 25%N*	7.3d	1.70a	32.3a	1.43a	767a
T8 urea 25%N + *Sesbania rostrata 75%N*	7.5bcd	1.57ab	30.4b	1.37ab	671ab
T9 Urea 25%N+ *Crotalaria juncea 75%N*	7.4cd	1.63a	31.5ab	1.31ab	683ab

Note : Means with the same letters are not significantly
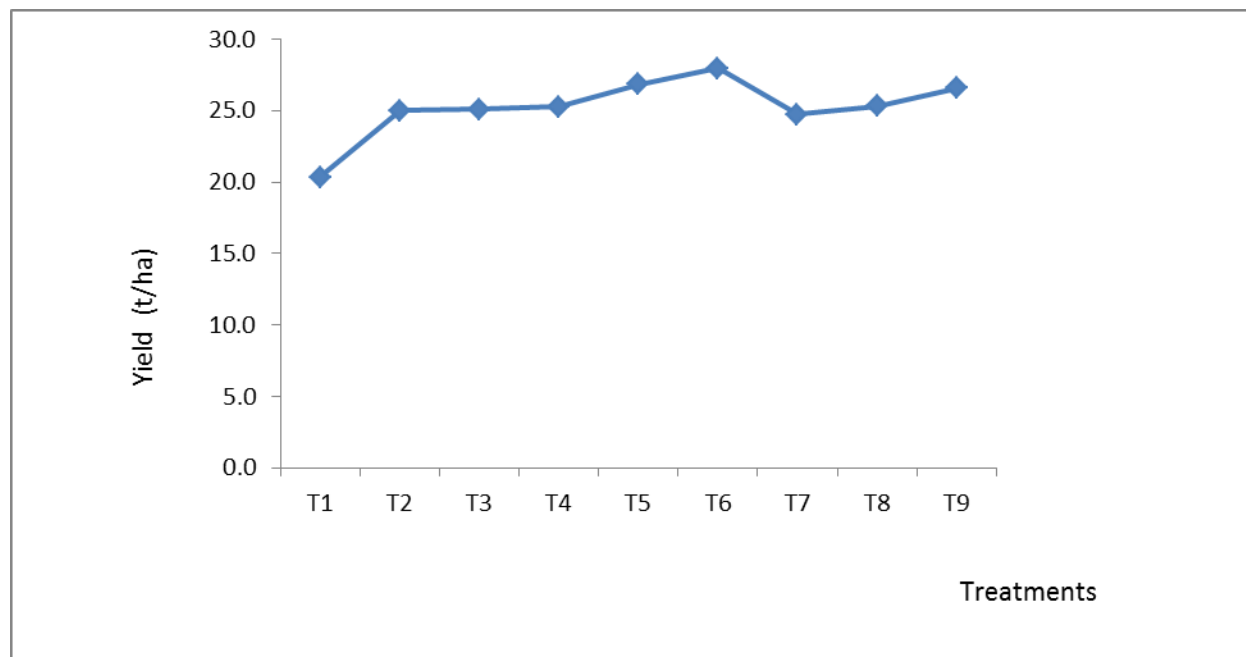
Figure 2.0 Onion Yield under green manure application

Table 3.0 Onion yield under different treatments

Treatments	Yield (t/ha)
T$_1$ No N fertilizer application	20.3c
T2 Urea 50%N	25.0b
T$_3$ Urea 100 %N	25.1b
T4 Urea 150%N	25.2ab
T5 Urea 50%N+ *Sesbania rostrata 50%N*	26.8ab
T6 Urea 50%N and *Crotalaria juncea 50%N*	27.9a
T7 Urea50%N + *Sesbania rostrata 25%N+ Crotalaria juncea 25%N*	24.7b
T8 urea 25%N + *Sesbania rostrata 75%N*	25.3ab
T9 Urea 25%N+ *Crotalaria juncea 75%N*	26.5ab

Note : Means with the same letters are not significantly different.

Table 4.0 Nitrate nitrogen in below root zone

Treatments	NO3- -N (ppm)
T$_1$ No N fertilizer application	0.82^c
T2 Urea 50%N	1.29^{ab}
T$_3$ Urea 100 %N	1.34^{ab}
T4 Urea 150%N	1.43^a

T5 Urea 50%N+ *Sesbania rostrata 50%N*	1.26^b
T6 Urea 50%N and *Crotalaria juncea 50%N*	1.26^b
T7 Urea50%N + *Sesbania rostrata 25%N+ Crotalaria juncea 25%N*	1.22^b
T8 urea 25%N + *Sesbania rostrata 75%N*	1.17^b
T9 Urea 25%N+ *Crotalaria juncea 75%N*	1.29^{ab}

Note : Means with the same letters are not significantly different.

Accessing Information Technology- Social Media in Iraq

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Abstract- In recent years, social media has become one of the most important factors accompanying the development of the Iraqi society. The media industry has experienced tremendous growth and development over the last ten years in Iraq. Prior to 2003, the Iraqi media was restricted and lacked the freedom of speech. After 2003, the media became more liberal and somewhat less restricted. However, the problem is that it still lacks the well-organized strategic plans to get to the hearts of the Iraqi citizens and to make them believe in all what they say either online or on some of the T.V. channels. This study attempts to answer the following research question: what is the state of the Iraqi media pre and post 2003? The aim of this research is to identify the state of the media industry in Iraq pre and post 2003. To examine the research problem, the researchers investigated the state of social media in Iraq and shared the participant's lived experience of the use of media as a means of communication while he was in Iraq. To collect the data, the researchers interviewed an Iraqi man who moved to the U.S. in 2005. The results indicate that the social media in Iraq is more powerful and effective now than it was before 2003 and the number of Internet and social media male and female users increased in the last ten years.

Index Terms- Information Technology, Iraqi Media, Media Industry, Social Media

I. INTRODUCTION

Information Technology (IT) is, in fact, the core business for most industries. IT is the field which pertains to the skills needed to increase, retain, and use information processing systems, software, hardware and networks for the processing and delivery of data (ARMA International, 2007) [2]. The core business refers to main activity of the industry. IT has become the backbone of commerce and supports the industries operations. IT links the business with their customers (Carr, 2003) [4]. Generally speaking, it is good for any industry to get rid of the other inadequate business and to implement new strategies. IT is the core for most industries in the 21st century. The core business is the most important area that any company focuses on in its business operations (Business dictionary, 2012) [3]. IT helps in improving measures of business value such as the revenue and productivity. IT value models have several assumptions like a commodity input and cost efficiency which enable firms to set their strategic plans regarding product quality and consumer value (Thatcher and Pingry, 2007) [18]. The mass media such as newspapers, TV and radio are very important in the modern societies. Media is a very powerful source of influence and innovation. It is the primary means of transmitting essential information.

Over the past decades, advances in information technology have restructured industries and formed huge importance. During the new era, the vast development of communication and information technology has influenced cultures everywhere. The technological innovations changes are an example of what is happening where they turn the world into a small global village. These changes include the emergence of new technologies: satellites, cable television, disks, computer and digital technology, etc. This is clearly the age of information technology where IT brought a revolution in the field of media industry (Carr, 2003) [4].

Social Media industry has witnessed a fast growing pace and the conventional mass media has been updated by the most sophisticated technological tools. Information revolution had made the process of transferring the information or news very easy all over the world (Friedman, 2005) [9]. For example, newspapers were published in a shape, which looks like handwriting. However, in the age of IT, computer is used as the part media industry such as composing, printing, animation, diagrams, audio, video visuals, online newspapers, and magazines publishing (Khattak, 2012) [11].

The increasing of electronic delivery of news on the web came to age in 1995. There were about 20 newspapers published online worldwide such as prodigy and CompuServe. The number of online newspapers increased to thousands in 1994. Based on this increase, the relation between the journalist and the technical means to report the news to people became the new type of communication and it is called "the techno journalist" (Khattak, 2012) [11]. However, electronic delivery of news on the web is new to Iraqis. This electronic delivery launched after 2003.

II. LITERATURE REVIEW

A. Media and Information Age

In the past 50 years, electronic media (radio, TV, computers, satellite, etc.) were the central tools and communication technologies in assisting with transmitting the information to people (McDowell, 2004) [13]. The Information Age brings new challenges since 1950 where people would like to have multimedia sources available for them to use. The term is used to describe a cybernetic society, which depends on the computers and data transmission. The familiar frame of understanding an industrial society relies on the human labor and the machines they use to produce goods. Because of the continual changes over decades, geographic barriers are being dissolved, and relation between the employees and their workplace is changing rapidly. New information technologies and forms of communication have emerged to solve problems and set new directions for issues that have been around for some time. If we take literacy as an example, we will see that people can read,

write, type, print by using computer literacy (Khattak, 2012) [11].

In our society, the nature and function of media has been changed essentially through the use of digital technologies. Although old age practices such as newspapers and magazines still exist, they have been altered by new practices such as the spread of TV, satellite, Internet, online media, etc. These technologies are very important to keep the public informed on matters of public importance (Pavlik, 2008) [14].

IT is the cause of changes for majority of industries. IT is a strategic tool and without information and technologies, changes are not possible. In the 1990s most of the industries all over the world used telecommunicated networks of computers at the center of information systems and communication processes. The innovation of new technologies makes communication more powerful and easier. Technology does not solve the social problems, but it is the essential tool for development and creativity in societies (Castells, 1999) [5]. Schwandt (2007) [15] states that computers assist with data analysis. They can facilitate the management of large volumes of data and enable workers or analysts to locate, labels, and collects different combinations of segments of textual data. Research has shown that IT can aid in improving industry goals where this includes achievement in several different areas for stakeholders in the workplace. For example, peoples' motivation is enhanced when we use technology to assist a person in facilitating a particular plan. In addition, the use of technology in the social media helps to connect people with the outside world. Finally, technology can offer resources and experiences that books are not able to offer.

Journalists in the past are different from the ones today in reporting, thinking, and using technological tools to publish their work. The journalist has to be deeper and diverse in understanding and communication with people. Technology makes editing more easily than before where editors can use computer to make all the editing. Before, editors used hand writing or pen and paper to do the job which used to take a lot of time. This is comparable to previous generations of technology being used such as the typewriter verses modern computer. With computer, people can correct and edit quickly and save the data. Moreover, the use of the pointer, or electronic pen, on screen enables deletions and changes faster than by ball-pen. It also helps in getting a clean copy without the scribbles, which we may have on the hard copy subbing. It is worth mentioning that many newspaper offices use their facilities a little bit once the data editing has been transferred into the computer. This shows how technology saves time, cost, and place to complete the work Schwandt (2007) [15].

B. Country Background

Iraq is one of the Arabic Middle Eastern countries and has an area of 169,234 square miles. It is bordered by Iran from the east, Jordan and Syria from the west, Kuwait and Saudi Arabia from the south, and Turkey from the north. Baghdad is the capital. The oil industry constitutes the majority of Iraq's economy. The Iraqi population consists of several ethnic groups, including Arab Muslim Shiite, Arab Muslim Sunnis, Kurds, Assyrian, Turkoman, Chaldean, Armenian, Yazidi, Sabean, and Jews. Arabic is the spoken language in most provinces and Kurdish is

the official language in Kurdistan (Jacob and Abedalla, 2013) [10]. The following figure illustrates the map of Iraq.
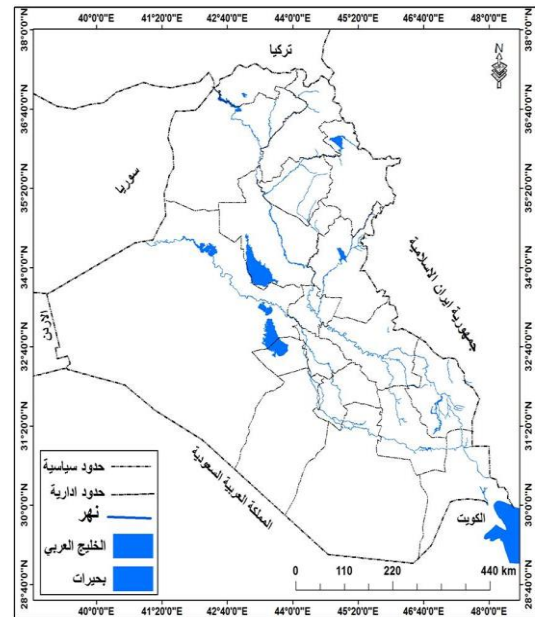
Figure 1. Map of Iraq

C. Internet and Social Media in Iraq

In recent years, the Internet and social media, as a means of communication, users have been growing very quickly. There was no clear number of the Internet users prior to 2003 because there were only few people who had access to the Internet. However, the number of users started to increase after 2003 (Arab IP Centre, 2014) [1]. Currently, the Internet situation and access to social media has improved dramatically, as there are now 26 Internet hosts (CIA, 2014) [6]. The last data collected regarding civilian access to the Internet was in 2009 and at that time approximately 325,900 Iraqis had home Internet access, ranking 126th for Internet access globally (CIA, 2014) [6]. While this is an improvement, people access, small businesses, and government infrastructure continue to cripple Iraq in becoming globally competitive. While the government may not be persecuting Internet users, individuals may risk retaliation from armed militias. Until all sectors of society have their rights to access information, freely exchange information and ideas, and express opinions in compliance with universal human rights, the country will continue to lag behind other nations during the accelerated pace of globalization (United Nations, 2013) [19].

IREX audience research shows that social media and mobile devices play a vital role in the life of the Iraqi citizens on which they depend to gather their new and information about Iraq. However, the TV is still the primary source for news and information for them (Tachovsky, 2011) [16].

Tariq (2011) states that "the U.S. government pump an estimated half a billion dollars into revitalizing Iraq's news media after…2003. It was the first time in three decades that Iraqi citizens had access to a free press, but the current state of news media in the multiparty republic is not what some had hoped for" (para. 1). Moreover, most Iraqis feel that the journalism in Iraq faces the problem of censorship for both local

and foreign journalists. The number of radio listeners is small in comparison with the number of TV viewers. This indicates the low levels of trust in these broadcastings (Whitehouse and Johnson, 2011) [21]. The following figure, which is quoted from IREX research and cited in (Whitehouse and Johnson, 2011) [21], shows the percentage of the viewership trust in the TV challenges. The highest percentage of viewers is Al-Sharqiya TV with 66% and the lower percentage of viewers is Rotana Cinema with 45%.
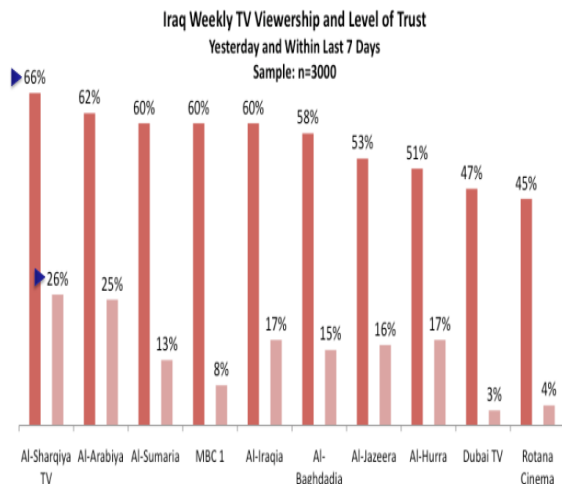
Figure 2. Viewership Trust (Source: Whitehouse and Johnson, 2011, p. 25 [21])

III. METHODOLOGY

This study attempts to answer the following research question: what's the power of the Iraqi media pre and post 2003? The purpose of this research is to identify the effectiveness of the media industry in Iraq pre and post 2003.

A. Data Collection Procedures

A qualitative (QUAL) research approach was used to examine the research problem. The participants were only one Iraqi male who moved to the US after 2003. The researchers interviewed the participant over the phone. The participant agreed to participate in this study on a voluntary basis to share his lived experience and knowledge about the power of media in Iraq pre and post 2003. A short survey was developed by the researchers and was tested in a pilot study for validity and reliability. The survey consisted of 11 closed-ended and open-ended questions (See instrument below). The Open-ended questions gave the participant a chance to respond to questions in different ways without being restricted. Through the questions, his feelings with regard to the research problem were elicited and this provided depth to the problem since a lot of information was provided.

B. Instrument

Although the number of social media users is increasing in Iraq, the problem is that its power and effectiveness still lacks the well-organized strategic plans to get to the hearts of the Iraqi citizens and to make them believe in all what they say either online or on some of TV channels. Therefore, in order to gather data that can be used to solve the problem, the researchers surveyed an Iraqi man to give important insights about the challenges that face the social media in Iraq. The survey questions were as follows:

1- How old are you?
2- When did you move from Iraq to US?
3- What is your level of education?
4- Where have you completed your education, in Iraq or in the US?
5- What social media do you use to communicate with your Iraqi friends and family?
6- How was the Internet and social media pre 2003?
7- How is the Internet and social media after 2003?
8- Do you trust the current news TV channels and Internet websites? Why?
9- Do think that the social media is more powerful and effective now than it was before 2003? Explain
10- What are the specific communication challenges that you would like to address?
11- What do you recommend for the current news TV channels and Internet websites so they can get to the hearts of the Iraqi citizens and to make them believe in all what they say either online or on TV?

C. Social Dimensions Model

Laudon's (1999) [12] model of the five moral dimensions of the information age was adapted for this study. This model explains the relationship between ethical, social, and political issues and information society. This model was quoted as it fits the theme of this case study where all these five moral dimensions are impeded within the Iraqi social media business.

The emergence of new IT has raised ethical, social, and political issues. These issues have five moral dimensions of the information age that include information rights obligations (protect and respect), property rights obligations (property in a digital society), system quality (safety of society), quality of life (prevent violation, cultural values), and accountability and control (system liability). The following figure exemplifies the relationship between ethical, social, and political issues and information society (Laudon, 1999) [12]:
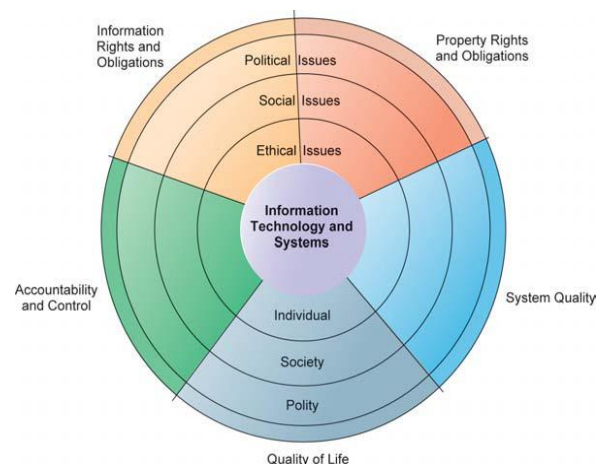
Figure 3. Five Moral Dimensions of the Information Age (Source: Laudon, 1999, [12])

IV. DATA ANALYSIS

To examine the research problem, the researchers used a qualitative (QUAL) research approach to state the results of this case study.

The results indicate that the participant is a 34-year old Iraqi male who emigrated from Iraq to US in 2005. The participant was working as a local interpreter for the US army in the city of Mosul in Iraq. He helped the US troops with interpretation and translation during their 2003 military operation in Iraq. The participant received his bachelor degree in English language and translation from the University of Mosul in Iraq, but he also received a master's degree in Public Administration from the University of Pennsylvania in the US. The participant uses several kinds of social media including mobile phone, Facebook, Twitter, What's up, Viber, Skype, Instagram and WeChat, etc. to communicate with his Iraqi friends and family back home.

The researchers asked the participant about the status of the Internet and social media before 2003. The participant said:
"before 2003, Iraqis did not have online media or Internet. Only graduate students had Internet access and most of the websites were blocked for security purposes. The only social media we had at that time was the land phone that we used to communicate with one another."

Our case participant was asked about how the status of the Internet and social media after 2003 was. Our case participant said:
"The word 'boom' is not enough to describe the change where it was from having nothing to have everything."

Based on the participant's responses to the survey questions, the results also show that Iraqis did not have either TV cable or satellite and the only thing available to them was the national TV with only two local channels to keep the Iraqi population away from the world. However, after 2003, the Internet, online media, satellite, and various other information technologies became available to the public. The number of Internet and social media users has been increased over the time. If we compare the two periods of pre and post 2003, we can see that for years Iraqis used to know about the world news through the Iraqi local printed newspapers. After 2003, publishers were fascinated with the fact of delivering information to people electronically because of its benefits for both the producer and consumer. The participant also added that information in printed publication may reach the readers much more slowly than online. This means that the information can be updated at anytime of the day with the online version, but it takes more time and is more costly with printed publications. It is also easier and quicker to look up the information online other than waiting for the printed newspapers. The participant said:
"during the years I lived in Iraq, the old newspaper publication industry was controlled by the government. There were only two Iraqi channels on TV as local channels and there were only three to four local newspapers and the editors were not allowed to write about anything until the news is cleared. There were many restrictions and no one can go beyond these restrictions and publications requirements."

This means that the Iraqi people had limited sources before 2003. Yet, all these have been changed where so many websites emerged and several new newspapers publications start to appear for public. They have all the tools and technique to publish their news online. They can also edit, post pictures, and update the readers within hours, if not minutes. An additional aspect of this is these online newspapers try to compete each other by trying to reach their readers through focusing on the human needs and their social life and "the Iraqi street thinking."

The participant was asked if he trusts the current news TV channels and Internet websites and why. His response was:
"Some! I do not trust all of them because some of them are loyal to particular political parties and they just focus on what they want their followers to hear. I, myself, like to diversify my sources of news. Most of them are biased to whoever is funding them or to whichever entity sponsoring them. I trust some more than others because they are less biased. I hope in the near future that all news TV channels and Internet websites work together to build the trust of their audience and readers."

The participant was also asked if the social media is more powerful and effective now than it was before 2003. The participant indicated that the current status of media is more powerful and effective in Iraq. He said:
"I think the social media is more powerful and effective now than it was before 2003 because everyone can access the Internet easily and we have mobile phone and more Satellite channels which we did not have in the past. Also, people can use other apps and social media websites such as Facebook and Twitter to stay in touch with their friends and family members."

When the researchers asked the participant to clarify how the social media is more powerful and effective now, the participant explained that by saying that people can post blogs and share events from all over the world so all know what is happening in the world. He also referred to the Arab Spring and how the Egyptians, Syrians, Libyans, etc., used Facebook in their revolutions. He also added that people go to different media sites to look for the truth and source of news. He also added that they did not have all these apps or social media resources prior to 2003 indicating that the media was less powerful and effective at that time.

When the researchers asked the participant about the specific communication challenges that face the social media in Iraq, he explained that most of the sites' owners and organizers lacks the strategic plans and require more organization. The big challenge is to have a trained professional team. The other challenge is the blockage or the bans they face once something related to the country security and instability happened. The problem of not having Internet available is one of the big challenges of continuous communication.

The researchers also asked the participant if he has any recommendations for the current news TV channels and Internet websites so they can get to the hearts of the Iraqi citizens and to make them believe in all what they say either online or on TV. He said:
"First, they have not to be biased. Second, their websites and news have to be up-to-date as I see their websites are not updated quickly as the media sites in the West."

The participant also recommended that news channels and the Internet sites organizers and owners have to have a structured

policy based on the country culture, copyrights policies, privacy and data selling protection, quality and trained employees, and work together for the country benefits. These will make the social media in Iraq more powerful and effective.

In summary, and according to five social dimensions model in figure two above, the people of Iraq were used to buying newspapers from local sellers, but lately the number of buyers of newspapers decreased. Only the older generation and few members of current generation still read hard copies of newspapers because most of the people right now use Internet or satellite to get the news as part of the social life within the Iraqi family. It also created ethical and political issues where politicians use the media IT tools to share the news of other political parties and especially through their election campaigns. Although IT is the core of business, it also creates ethical problems where privacy is not protected. Information privacy rights aim to protect the personal information for individuals. Privacy breaking is the collecting of one's personal information or physical integrity as opposed to privacy protection. There will be an issue if there is no safeguard system quality that protects the safety of individuals and society, and preserves the values of the quality of life in an information society. The nature of the relation between media and society depends on circumstances of time, cost and place with free-market (Weitzner et al, 2008) [20].

V.   CONCLUSIONS

Communication is culture and culture is communication. It is "giving or giving and receiving information signals or messages by talk, gesture, writing, etc" (Debons, 2008) [7]. Information and communication technology within a short time became the main foundation of modern society. IT is one of basic skills to educate people in many different fields. Mass media is one of the fields that focus on technologies nowadays. The industry media in Iraq has changed over the time and especially when technology introduced to be used in media after 2003. The number of news readers and listeners has been increased since 2003 with the emergence of Internet in Iraq, yet the newspapers and magazines has been decreased. Despite the IT is the core business in media industry in many countries since several long years, it is new to Iraq and faces several challenges. It also lacks the trust of all the citizens.

In the age of globalization, the Internet is the primary mode of access to social media and general communications. When Internet access is interrupted, restricted, or heavily censored, nations struggle to remain competitive in the global economy. People who are unable to access information and networks that form the typical communications platform globally find themselves facing both systemic human rights violations and a narrow view of the global village. Iraq has faced certain challenges with regard to Internet access, censorship affecting accessibility, censorship restricting the free sharing of opinions and ideas, and infrastructure stability issues.

The Internet was slow to become integrated into ordinary Iraqi homes due to the cost and restrictions before 2003. During the early years of the Internet in Iraq, problems ranged from domain names to censorship interference and the risk of retaliation in the form of violence against individual users for their Internet activity. While other nations with fewer controls were able to utilize social media networks to organize and create political movements, this was not possible in Iraq to a comparable extent.

In order to have the best practices for the Iraqi media, the researchers recommend that the Iraqi media to implement policies for copyright and data selling protection. They have not to be biased and they have to have well-organized strategies to improve the quality of their work. This will enable them to be more powerful and effective and attract the interest of their readers and audience.

ACKNOWLEDGMENT

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Every *u-v* path of NP-complete Steiner graphs contains exactly 2n-edges

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Abstract- Complexity theory has many facts. Its motivations and goals however, are similar; to determine the computational "difficulty" or complexity of a problem. In this work, we propose an NP- completeness proof for the Steiner tree problem in graphs

Index Terms- Steiner problem in graphs- NP-complete-3-satisfiability- Clause

I. INTRODUCTION

For many decision problems, Steiner Problem in Graphs and satisfiability, no polynomial time algorithm is known. Nevertheless some of these problems have a property which is not inherent to every decision problem, there exists algorithm which, if presented with an instance of the problem.(i.e., a graph G, a terminal set K, and a bound B, respectively a Boolean formula F) and in addition with a potential solution x (i.e., a sub graph T of G, respectively a truth assignment τ for the variables in F) these algorithms verify in polynomial time whether x is a valid solution (i.e. whether T is a Steiner tree for K-terminals contains at most B edges, respectively whether τ satisfies F). The decision problems with this property form the NP. This abbreviation comes from Non deterministic polynomial time. A very important concept in complexity theory is the concept of reducibility. It allows showing that one problem is at least as different as another one.

The Steiner tree problem in graph is called for brevity ST, defined in decisional form as follows
* an undirected graph G = (V, E)
* a subset of the vertices R⊆V, called terminal nodes.
* a number K ∈ N.

There is a subtree of G that includes all the vertices of R (i.e. a spanning tree for R) and that contains at most k edges.

This problem has many applications especially when we have to plan a connecting structure among different terminal points. For example, when we want to find an optional way to build roads and railways to connect, a set of cities or decide routing policies over the internet for multicast traffic, usually from a source to many destinations. Unfortunately, this problem has shown to be intractable in the sense that there exists no polynomial algorithm to Solve it, unless P = NP. The goal of this exercise is to propose an NP − Completeness, proof for the Steiner tree problem.

II. PRELIMINARIES

Definition 2.1: Let a connected graph G= (V, E) and a set K ⊆ V of terminals. Then the Steiner minimum tree for K in G that is a Steiner tree T for K such that
$|E(T)| = \min \{|E(T^I)|/ T^I$ is a steiner tree for K in G$\}$

In the Steiner minimal tree problem, the vertices are divided into two parts, terminals and non terminal vertices.
The terminals are the given vertices which must be included in the solution.

Example 2.1:
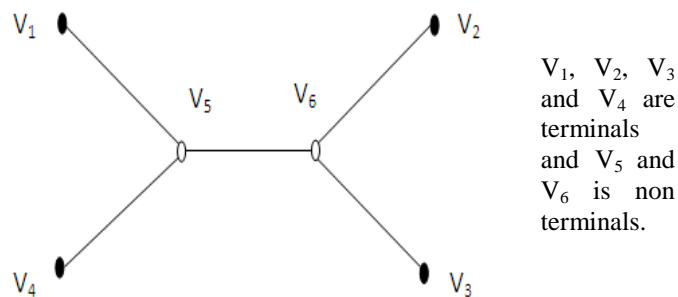
V₁, V₂, V₃ and V₄ are terminals and V₅ and V₆ is non terminals.

Fig.1: Steiner minimal tree

Definition 2.2:
A tree is a connected graph which is acyclic. A forest is an acyclic graph. A tree is connected acyclic graph. A leaf is a vertex of degree.

Example 2.2:

Fig.2: Tree

A tree is a connected forest and every component of a forest is a tree.

Definition 2.3:
   A tree is said to be a spanning tree of a connected graph G, if T is a sub graph of G and T contains all vertices of G.
Example 2.3:
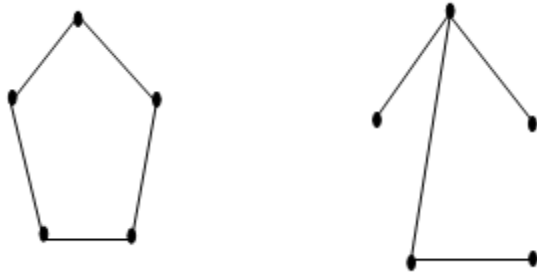
Fig.3: Spanning Tree

Definition 2.4:   .
   Let G be a connected graph each of whose edges is assigned a number called the cost or weight. We denoted the weight of an edge e of G by w(e). Such a graph is called weighted graph. For each sub graph H of G, the weight W of H is defined as the sum of the weight of its edges that is $W(H) = \sum_{e \in E(H)} w(e)$
   We seek a spanning tree of whose weight is minimum among all spanning tree of G. Such a spanning tree is called minimum spanning tree.

Example 2.4:
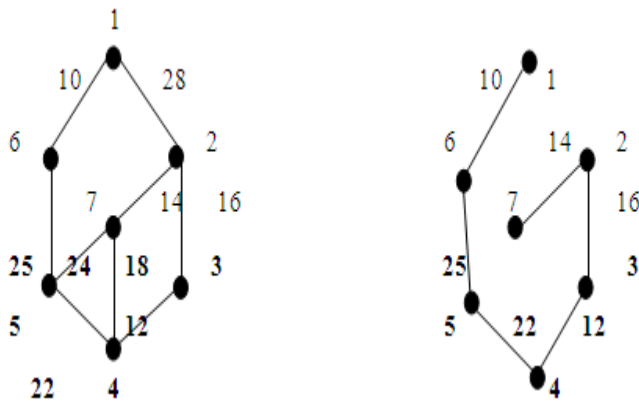
Fig.4: Weighted Graphs

Definition 2.5:
   A Steiner tree is a tree in a distance graph which spans a given subset of vertices (Steiner point with the minimum total distance on its edges)
Example 2.5:
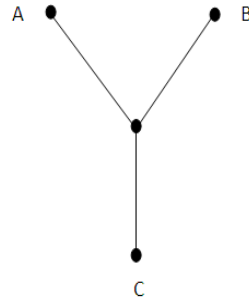
Steiner tree for three points A, B and C [note there is no direct connection between A, B, and C.]
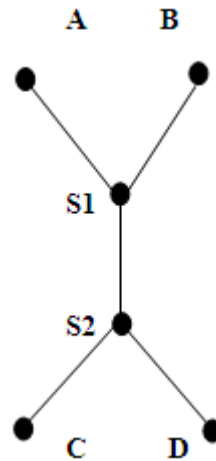
Solution for four points [note that there are two Steiner points s_1 and s_2]

Fig.5: Steiner Tree

Definition 2.6:
   A formula is satisfiable if there is an assignment of truth values to the variables that makes every clause tree.

Definition 2.7:
   A set of logical variables u = {uj} and a set c={ci} of clauses where each clauses consists of three literal being a variable ui or its negations ui.

Definition 2.8:
   The class of problems solvable by non-deterministic polynomial time algorithm is called NP.

Definition 2.9:
A problem is NP-complete if
   1. It is an element of the class NP
   2. Another NP –complete problem is polynomial time reducible to it.

III.   EVERY U-V PATH OF NP-COMPLETE STEINER GRAPH CONTAINS EXACTLY 2N EDGES.

Result: 1
Steiner problems in graph is NP complete

Result: 2

Every u-v path of NP-complete Steiner graph contains exactly 2n edges.

Theorem 3.1:

Every u-v path of NP-complete Steiner graph contains exactly 2n edges, if the Steiner problem in graph is NP-complete

Proof; Let the Steiner problem in graphs is $\in$ NP, it sufficient to show that Steiner problem in graphs is in fact NP-complete.

To see this, we reduce 3 SAT to Steiner problem in graphs.

Let $x_1, x_2, x_3 \text{-------} x_n$ be the variables $c_1, c_2, \text{----} c_m$ the clauses in an arbitrary instance of 3SAT. Our aim is to construct a graph G=(V, E) a terminals set K, and a bound B such that G contains Steiner tree T for k at size at most B if and only if the given 3SAT instance is satisfiable

The graph G is constructed as follows. First we connect two vertices u and v by a variable path as shown in the figure 6. First we consider taking the variable x_1 to x_{10}, and then we connect two vertices u & v by a variable path as shown in figure 6.
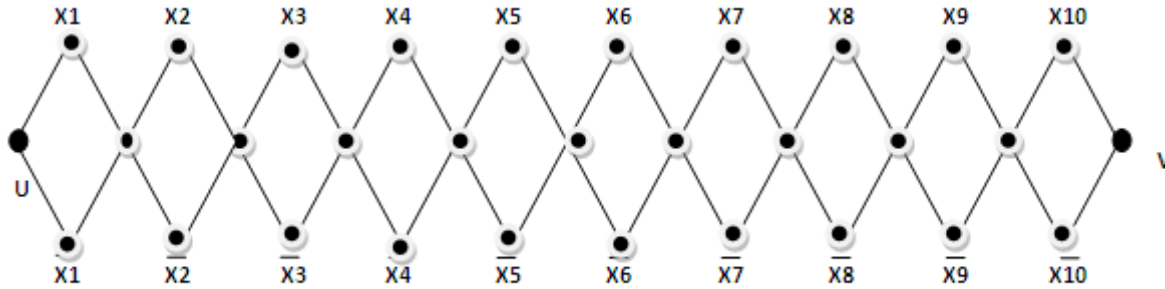
Fig.6: Transforming 3SAT to Steiner problem in graph: the variable path

Clause gadget consisting of a c_i vertex connected to the literals contained in the clause c_i by path of length t=2n+1

As terminal set we choose K= {u, v} U {c_1 ----c_6} and set B = 2n+t.m.
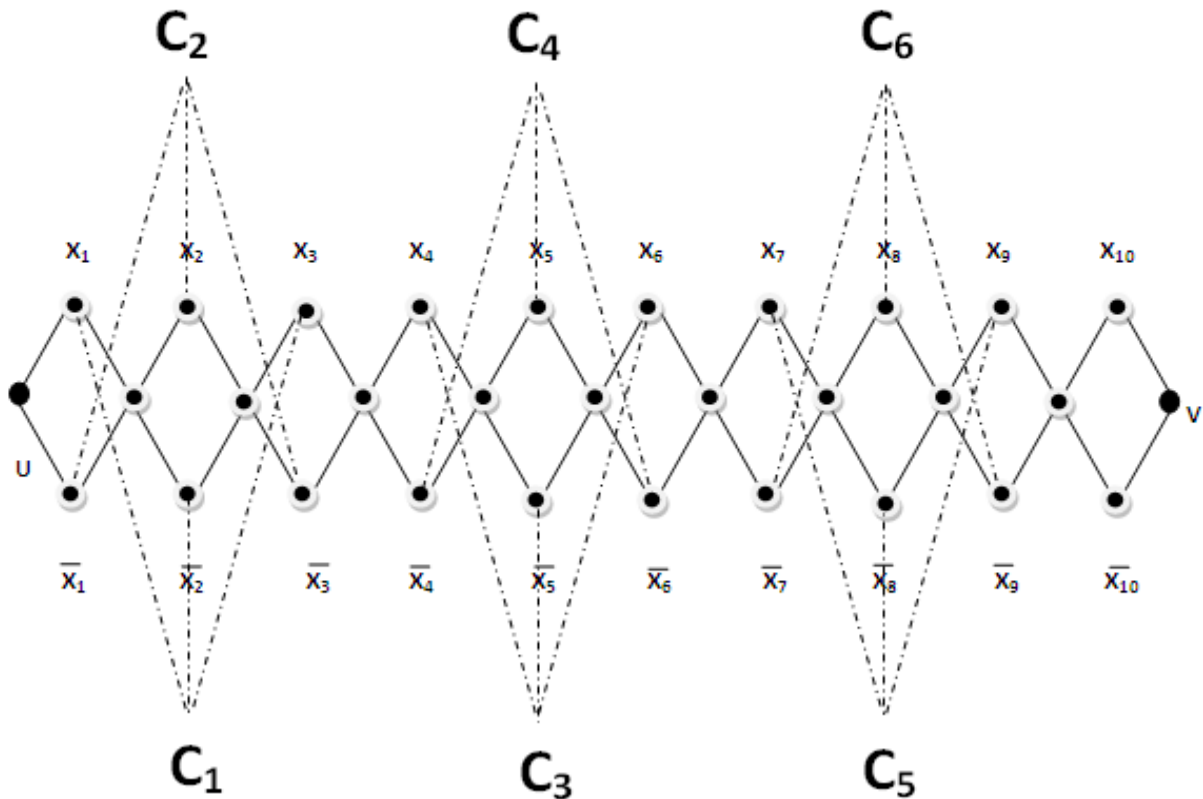
Fig. 7. The clause gadget for the clause $C_i = -x_1 \, V x_2, \, V x_3$. The dashed lines indicate paths of length t=2n+1 from c_i to the appropriate variable path.

Now we take n =10. To form the clauses $\{c_1, c_2, c_3, ----c_6\}$ and the terminals set K = {u, v} ∪ $\{c_1 \ldots c_6\}$ and set B = 2n+t.m

B=2n+t.m

t =2n+1

t =2(10) +1

=21

B=2(10) +21(6)

=20+126

=146

Assume first that the 3SAT instance is satisfiable. To construct a Steiner tree for K. we start with a u-v path p reflecting a satisfying assignment.

We let x_i ∈ p if x_i is set to true in this assignment, x_i ∈ p otherwise. Next observe that for every clause the vertex c_i can be connected to P by a path of length t. In this way we obtain a Steiner tree for K of length 2n+t.m=B.

To see the other direction assume now that T is a Steiner tree for K of length at most B. Trivially, for each clause to the vertex c_i has to be connected to the variable path.

$$\text{Then} \quad |E(t)| \geq (m+1).t > B$$
$$|E(t)| \geq (6+1).21 > B$$
$$\geq 7.21 > 146$$
$$\geq 147 > 146$$

So this can't be. This shows that u and v can only be connected along the variable path, which requires at least 2n edges.

In this graph u-v path contain 20 edges and that each clause gadget is connected to this path using exactly t edges. Thus the u-v path reflects a satisfying assignment.

Result: 1. Steiner problems in graph is NP complete

Result: 2. every u-v path of NP-complete Steiner graph contains exactly 2n edges.

Result: 3. if u & v are two arbitrary verities of a NP-complete graph with n-variables then the u-v path contains exactly 2n edges.

Result: 4. structure of the Steiner minimum tree is simple.

IV. CONCLUSION

By using 3-satisfiability to a NP-complete Steiner graph, it is found that every u-v path of the graph contains exactly 2n edges and that each clause gadget connected to this path exactly contain t edges where t=2n+1.

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An Analysis of Factors Responsible in Making Retailer for Selection of a Cement Brand and Further Expectation from Cement Companies for Competitive Marketing of Cement

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Abstract- In India, there are multiple cement brands available in the market which makes the brands selection a difficult process. The project focuses on studying the major factors retailer consider important compare to other factors in selecting cement for their retail business. This will give an insight into the market and try to identify the major product features and services expected by the retailer from the cement companies. Exploratory research was done initially with sample size 10 which include individual home builder, masons, engineer/architect, contractors, builders and dealer to get an insight into the product features and services they are aware off and the variables that influence the selection of cement. The questionnaire listing various factors affecting their selection process was further modified and administered with a sample of 100 retailers.

Further, the author applied factor analysis to summarize the major factors that influenced decision making process using SPSS software.

Index Terms- Cement, channel, influencers, product features, services, retailer etc.

I. INTRODUCTION

Various cement companies in West Bengal (ACC, Ambuja, Ultratech, Lafarge, Jaypee, Konark, Rashmi) claim to produce cement as per grade of BIS standards which are 33, 43 and 53 grade cement, so there is hardly any scope for differentiation in product of various cement companies and even they market cement and attempt to prove that they are different and better than other cement manufacturer quality wise. The multiple brands available in the market make the brands selection a difficult process.

As majority of customer lack basic understanding regarding technical aspect of cement, it becomes a highly difficult task to convince the customer about the superiority of any particular brand over other brands.

So there is a need to identify and understand the retailer behavior in selecting cement on basis of present product features and services being offered, and their further needs and services expected by them which will help them in offering differentiated product to the end customer.

1.1 Objective of this research

The Study attempts to cover the following areas:

- To explore the cement product features that a retailer looks upon
- To explore the services that a retailer looks upon during selection process of cement.

To factorize various cement product features and services provided as perceived by retailer. Based on those factors suggest suitable measures to improve the penetration rate to various retailer segment through specific promotion campaigns which will help in offering differentiated product.

To summarize the effort, the first and second objectives involve exploring and involve reviewing the literature related to cement selection process and cement product features/services. The third part involves research design, data analysis and major interpretation of the results from a survey questionnaire administered to the respondents. Finally the analysis of the research findings, the marketing implications and inferences and limitation of the study presented and general conclusions are drawn.

II. LITERATURE SURVEY

Doyle P (2002) in his book '' Marketing Management and Strategy'', states that a market consists of customers with similar needs. But customer in market is never homogenous. They differ in the benefits they wanted. Very few products or services can satisfy all the customers in a market. Not all the customers want or are prepared to pay for the same thing.

Jobber, D (2007) states the objective is to identify groups of customers with similar requirements so that they can be served effectively while being of sufficient size for the products or services to be supplied sufficiently.

Jobber, D (2007) explains briefly that creating a differential advantage involves using a marketing mix to create something special for the customer. Jobber presents four keys to successful positioning: a) Clarity: b) Consistency: c) Credibility: d) Competitiveness.

Perceived quality of a Brand is the customer's judgment about a product's overall excellence or superiority that is different from objective quality (Zeithaml 1988, pp. 3 and 4). Objective quality refers to the technical, measurable and verifiable nature of products/services, processes and quality controls. Since it's impossible for consumers to make complete and correct judgments of the objective quality, they use, quality

attributes that they associate Zeithaml 1988, Hence perceived quality is formed to judge the overall quality of a product/service.

The Five stages of the buying decision process were first introduced by John Dewey (1910). The stages are:

1. Problem/Need Recognition
2. Information Search
3. Evaluation of Alternatives
4. Purchase Decision
5. Post-Purchase Behavior

Zeithaml, A, Pasuraman, A., Berry, L. (1990). Delivering Quality Service: Balancing Customer Perceptions and Expectations. New York: The Free Press Division of Macmillan, Inc. Zeithaml, et.al. found that a "Service Performance Gap" occurred when employees were unable or unwilling to perform the service at the desired level.

According to Porter, E Michael. (1998). on competitive advantage: creating and sustaining superior performance a firm can choose a competitive advantage by following one of the three Generic competitive strategies: a) Cost leadership b) Product differentiation c) Focus -Market segmentation.

III.   RESEARCH DESIGN AND DATA ANALYSIS

On what basis retailer select cement? How product features and services are important for retailer during selection of cement. At the first stage, author made an extensive search in review of current literature such as working papers, research, and newspaper and magazine articles with a view to identify the common basic product features of cement and services searched across dealer or retailer segment and examining the strategic importance of their preferences towards certain factors for selection of particular cement.

Exploratory research was done on the basis of a questionnaire with a sample size of 10 which include dealer/retailer, buying process and the variables that influence the selection of cement.

The questionnaire listing various factors affecting their selection process was further modified and administered with a sample size of 100 retailers.

Interestingly in case of cement retailer, they select more than the physical product. Retailer go an augmented product which include easy availability, credit terms, timely delivery, originality of cement bags, site related technical service and complaint handling. So when it is difficult to differentiate physical product, superior augmentation of a cement brand, can add substantial value in the eyes of the retailer.

The study is both exploratory and descriptive in nature based on secondary data as well as primary data. Exploratory research was conducted through pilot interview to identify the major factors responsible for the select decision for the third objective of this research.

Data that will be collected throughout this study is expected to be mainly of a qualitative nature. Two valuable source of evidence are documentation and interview. Documents could be either internal like management reports, market research journal. First data collection from Secondary sources: The secondary data was collected from the company and the company's website. Data collection from primary source includes retail stores to get an insight into the cement industry and current trends in the industry. Face to Face interview and documentation are used as main data collection methods for this study. First systematic random sampling was adopted from a list of dealer/ retailer. To begin with the respondents were asked to rate the product features/ services in a 5-point Likert Scale is used. Where 1-Strongly disagree and 5-Strongly agree. Study attempt to cover 10 districts/districts town of West Bengal namely viz. Kolkata(Cossipore, Kalighat) Howrah(shalimar), Midnapore, Malda, Siliguri, Nadia(Krishnanagar), Murshidabad(Beharampore) Burdwan, Bankura, Birbhum(Sainthia). Fifteen product features and nineteen services were listed for popular cement brands.

3.1 DATA REDUCTION BY FACTOR ANALYSIS

Applying the concept of principal component and the varimax procedure to get an appropriate result of factor analysis.

The construct validity is determined through the factor analysis in which the KMO index of sampling adequacy is above 0.60 and Bartlett's test of sphericity is .000 (sig) which is significant at 5% level. The construct validity proves that questionnaire constructed is valid and can proceed for factor analysis. The author adopted Bartlett's test of Sphericity and KMO measure of sampling adequacy mainly to establish the reliability and scientific validity of the data and technique opted for the purpose of the study for further analysis. Bartlett's test of Sphericity indicates whether correlation matrix under review is an identity matrix, which would indicate that variables chosen for the purpose of the study are unrelated. Values (less than 0.05) indicate that there are probably significant relationships among the chosen variables.

The communality is measured which helps in finding the amount of variance that the variable shares with the other variables, which in turn, gives the proportion of variance explained by the common factors.

3.2 PRODUCT FEATURES

From exploratory survey there are variables namely reasonable price w.r.t to other brands, Good reputation of the brand through word of mouth from other users/ widely used, freshness, fineness, absence of adulteration in cement/good quality, shelf life, strength consideration, colour of cement, packaging, durability, Low setting time, consistency in performance across season, curing time and effort, crack reduction, sales and customer service support which influence the decision making of the cement retailer.

3.2.1 EMPIRICAL RESULT FOR CEMENT RETAILER:

In the reliability test of the variables, the cronbach alpha coefficient is found to be .818 in Table 1, which is accepted.

TABLE 1
Reliability Coefficients

Reliability statistics

Cronbach's Alpha	N of Items
.818	15

In Table 2 Kaisen-Meyer-Olkin measure of sampling adequacy gives the value of .671 which indicates that the factors selected is ideal for factor analysis and Bartlett's test of Sphericity indicates that at 105 degrees of freedom (df) Chi-Square values for the factors derived are highly significant.

TABLE 2: KMO and Bartlett's Test:

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.671
Bartlett's Test of Sphericity	Approx. Chi-Square	720.752
	df	105
	Sig.	.000

Communality, h^2, is the *squared multiple correlation* for the variable as dependent using the factors as predictors. The communality measures the percent of variance in a given variable explained by all the factors jointly and may be interpreted as the *reliability of the indicator*.

TABLE 3:

Communalities

	Initial	Extraction
PRICE	1.000	.792
REPUTAT	1.000	.682
FRESHNES	1.000	.770
FINENESS	1.000	.821
UNADULTE	1.000	.725
LIFE	1.000	.703
STRENGTH	1.000	.680
COLOUR	1.000	.761
PACKAGIN	1.000	.699
DURABILT	1.000	.781
SET.TIME	1.000	.753
CONSIS	1.000	.717
CUTIME	1.000	.636
CRACKRED	1.000	.581
SERVICE	1.000	.544

Extraction Method: Principal Component Analysis.

In this experiment, the extracted factors explain over 82% of preferences for fineness but only 54% for services. In general, communalities show for which measured variables the factor analysis is working best and least well.

As shown in Table 4, the first six components accounted for 78.214 % of the total variance, further does not change after rotation. Further, principal components' extraction, these values will be the same as those reported under initial Eigen values.

TABLE 4: TOTAL VARIANCE EXPLAINED

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.915	32.768	32.768	4.915	32.768	32.768	2.872	19.144	19.144
2	1.904	12.691	45.458	1.904	12.691	45.458	2.618	17.455	36.599
3	1.575	10.500	55.959	1.575	10.500	55.959	1.794	11.962	48.560
4	1.185	7.902	63.861	1.185	7.902	63.861	1.772	11.814	60.375
5	1.066	7.109	70.970	1.066	7.109	70.970	1.589	10.595	70.970
6	.793	5.285	76.255						
7	.778	5.188	81.443						
8	.663	4.420	85.863						
9	.589	3.927	89.791						
10	.538	3.583	93.374						
11	.322	2.147	95.521						
12	.273	1.819	97.341						
13	.207	1.380	98.720						
14	.104	.692	99.413						
15	8.812E-02	.587	100.000						

Extraction Method: Principal Component Analysis.

In this factor analysis, the first 5 components recorded Eigen value above 1 (4.915, 1.904, 1.575, 1.185 and 1.066).

Figure 1: Scree Plot
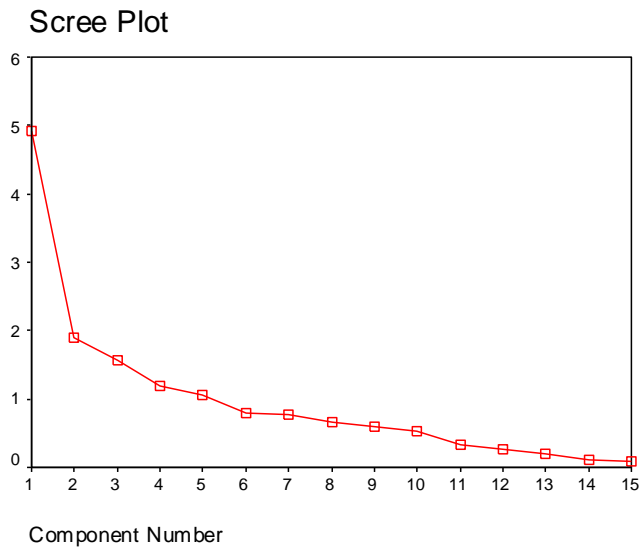
Rotated Component Matrix

Rotation serves to make the output more understandable and is usually necessary to facilitate the interpretation of factors.

The factor solution was derived from the component analysis with VARIMAX rotation of the 15 cement attributes listed for the purpose of the study. The cut – off point for interpretation purpose is +0.55 for the taken sample size.

Factor 1 has four significant loadings; factor 2 has one significant loading while factor 3, 5 has two significant loadings, factor 4 has three significant loadings. For the purpose of naming the factor, factor 1 was designated as most preferred Quality and similarly factor 2 as reputation, factor 3 as curing time, factor 4 packaging, factor 5 prices and effort.

TABLE 5:

Rotated Component Matrix[a]

	Component				
	1	2	3	4	5
PRICE	.122	-.160	2.716E-02	-.120	.858
REPUTAT	.177	.801	7.197E-02	-5.16E-02	4.033E-02
FRESHNES	-4.49E-02	.400	.350	.657	.233
FINENESS	.713	.477	-5.21E-02	.229	.174
UNADULTE	.647	.527	.123	-.103	4.748E-02
LIFE	.318	.559	.408	2.692E-02	.350
STRENGTH	-.138	.387	3.660E-02	-2.00E-02	.714
COLOUR	.172	.836	.177	2.752E-02	-2.90E-02
PACKAGIN	.148	-8.16E-02	.139	.807	-2.37E-02
DURABILT	.857	.166	1.036E-02	.127	5.750E-02
SET.TIME	.779	-1.04E-03	.337	-.145	-.109
CONSIS	.365	.260	.683	-4.32E-02	.220
CUTIME	1.771E-02	9.597E-02	.788	6.988E-02	-3.08E-02
CRACKRED	.500	8.515E-02	.435	.349	-.114
SERVICE	-3.52E-02	-8.41E-02	-.198	.665	-.231

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

a. Rotation converged in 7 iterations.

Component Transformation Matrix: It describes the specific rotation applied to factor solution. This matrix is used to compute the rotated factor matrix from the original (un rotated) factor matrix. It shows the off- diagonal elements which are greater than $\pm$ 0.5; a larger rotation was applied by the following the extraction method of principal component analysis and varimax with Kaiser normalization.It provides the correlations between the factors in the original and in the rotated solutions.

TABLE 6:

Component Transformation Matrix

Component	1	2	3	4	5
1	.636	.602	.414	.146	.199
2	.239	-.282	.065	.727	-.575
3	-.627	.268	.179	.597	.383
4	.102	-.662	.630	-.036	.392
5	.368	-.219	-.629	.304	.574

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

3.3 SERVICES NEEDED

Based on the exploratory/qualitative survey various specific services needed for the customer.

From above exploratory research there a lot of service variables needs to be comply. Service variables namely quick response, exact price rate, pre and post technical service, Pre and post sales feedback and communication, billing and accounting, credit, timely order and delivery process, direct delivery from factory , easily availability, brand faith, recommendation of engineers/mason/ architect, good relationship, advertisement promotion and branding, discount, more company official market visit , handling of grievances and complaints are of equally importance in select decision.

3.3.1 EMPIRICAL RESULT FOR RETAILER: DATA REDUCTION BY FACTOR ANALYSIS

Reliability Coefficients, N of Cases =   100.0, N of Items = 19, Alpha =   .8265

TABLE 7:

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.780
Bartlett's Test of Sphericity	Approx. Chi-Square	535.223
	df	171
	Sig.	.000

TABLE 8:

Communalities

	Initial	Extraction
quick reponse on query	1.000	.641
Exact price rate quote for cement - no ambiguity	1.000	.702
Pre- Sales Technical service	1.000	.628
post- sales technical service	1.000	.759
Pre- Sales communication support/advt/promotions & advt	1.000	.764
post- sales customer feedback	1.000	.654
accounts reconciliation (billing & accounting)	1.000	.524
order processing and confirmation	1.000	.755
delivery process	1.000	.719
credit	1.000	.617
direct deivery from factory	1.000	.584
easily available	1.000	.752
brand faith	1.000	.754
recommendation	1.000	.689
good relationship	1.000	.777
advertisement	1.000	.669
discount	1.000	.532
more company official visit in market	1.000	.589
further improve on handling of greivances and complaints	1.000	.696

Extraction Method: Principal Component Analysis.

From communalities highest preference is for service.

TABLE 9:

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.133	27.014	27.014	5.133	27.014	27.014	2.422	12.745	12.745
2	1.787	9.406	36.420	1.787	9.406	36.420	2.364	12.444	25.189
3	1.371	7.217	43.636	1.371	7.217	43.636	2.147	11.302	36.491
4	1.359	7.155	50.791	1.359	7.155	50.791	1.726	9.082	45.573
5	1.092	5.747	56.539	1.092	5.747	56.539	1.596	8.400	53.973
6	1.055	5.550	62.089	1.055	5.550	62.089	1.355	7.133	61.106
7	1.009	5.312	67.401	1.009	5.312	67.401	1.196	6.295	67.401
8	.903	4.754	72.155						
9	.759	3.994	76.149						
10	.704	3.703	79.852						
11	.637	3.355	83.207						
12	.549	2.890	86.097						
13	.533	2.808	88.905						
14	.448	2.357	91.262						
15	.402	2.118	93.380						
16	.388	2.042	95.422						
17	.336	1.767	97.189						
18	.302	1.591	98.781						
19	.232	1.219	100.000						

Extraction Method: Principal Component Analysis.

Figure 2:

Scree Plot

Component Number
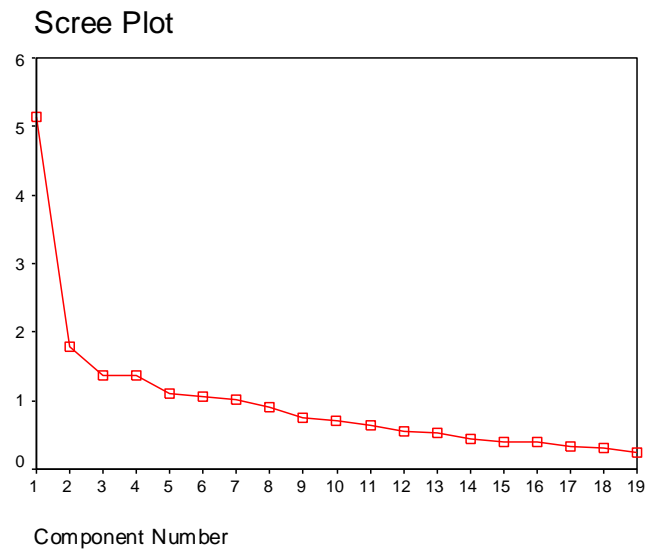
TABLE 10:

Rotated Component Matrix

	Component						
	1	2	3	4	5	6	7
quick reponse on query	.729	.137	.193	-8.88E-02	2.705E-03	.188	.102
Exact price rate quote for cement - no ambiguity	.323	.357	.613	-.245	2.343E-02	6.335E-02	.172
Pre- Sales Technical service	.386	.428	.110	.247	-.158	.325	-.304
post- sales technical service	8.314E-02	4.105E-02	3.130E-02	.121	-2.15E-02	1.464E-02	.857
Pre- Sales communication support/advt/promotions & advt	.106	8.302E-02	5.776E-02	-.122	8.992E-02	.844	-8.05E-02
post- sales customer feedback	-4.18E-02	.163	-8.15E-02	.767	4.582E-02	-4.45E-02	.164
accounts reconciliation (billing & accounting)	8.642E-02	.274	.431	-.123	.468	-.136	-5.12E-02
order processing and confirmation	.145	3.974E-02	.801	.296	2.378E-02	4.237E-02	-2.94E-02
delivery process	.347	.668	.221	.216	.240	-1.01E-02	2.195E-02
credit	-2.87E-02	.623	.306	6.422E-02	.157	.323	4.704E-02
direct deivery from factory	-5.50E-03	8.798E-03	-3.66E-02	.180	-2.33E-02	.582	.460
easily available	1.440E-02	.582	.545	-.244	.198	5.083E-02	.121
brand faith	.240	.820	-3.84E-02	.123	7.488E-02	-4.92E-02	-7.49E-03
recommendation	.148	.139	.449	-3.07E-02	.646	8.759E-02	-.138
good relationship	.207	.119	-8.15E-02	.203	.811	9.450E-02	7.495E-02
advertisement	3.882E-02	1.997E-02	.141	.801	5.707E-02	3.253E-02	1.472E-02
discount	.632	.175	-3.55E-02	-7.62E-02	.279	-8.23E-02	.102
more company official visit in market	.531	8.688E-02	.446	.148	.219	5.256E-02	-.167
further improve on handling of greivances and complaints	.814	8.845E-02	.111	7.911E-02	8.432E-02	1.585E-02	-2.07E-02

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
　a. Rotation converged in 16 iterations.

TABLE 11:

Component Transformation Matrix

Component	1	2	3	4	5	6	7
1	.530	.556	.496	.111	.349	.169	.022
2	-.029	.069	-.265	.895	-.067	.151	.310
3	.789	-.298	-.387	-.140	-.247	.237	.043
4	-.272	.234	.062	-.295	-.325	.713	.408
5	.032	-.163	-.106	-.213	.494	-.237	.785
6	-.035	-.711	.494	.173	.242	.396	-.064
7	-.137	.102	-.524	-.073	.636	.414	-.339

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

For the purpose of naming the factor, factor 1 was designated as most preferred complaint handling and similarly factor 2 as delivery, factor 3 as price, factor 4 Advertisement, factor 5 recommendations, factor 6 sales communication and factor 7 defines as technical services.

IV. SUMMARY OF MAJOR FINDINGS: FACTOR ANALYSIS

There are **major factors derived from factor analysis** that influence the selection decision of retailer, namely

a. **Product features:** The properties of cement like fineness, strength, and curing time play a major role in choosing cement.

b. **Service needed:** the company's sales and marketing actions like availability, advertisement, customer service, pricing, quick response to query, handling of complaints and pre and post sales technical service comes out to be an important factor.

The above defined factors are the highest need features which a company has to take care. It is observed that factor such as service parameter and price are of prime importance to get the product stable and to become market leader.

4.1 MAJOR FINDINGS: RETAILER INSIGHT

Based on the exploratory survey it is found that factor such as quality of service level is very poor compared to other attributes. Quality of service level expected from company official is that complain related to product, exact price rate at various places, settlement of claims, settlement of product complaints and even promptness and accuracy with respect to documents   are not favorable. The company should focus on improving quality of service level based on customer insights.

After data reduction and summarization, strategic options are to comply with the specific service need of the various segment of customer. It is found that there is a necessity of further improvement of services provided.

V.   LIMITATIONS AND SUGGESTION FOR FURTHER RESEARCH

LIMITATIONS OF THIS STUDY:

The quality of information totally dependent on respondent knowledge.

The limitation of this study is that the field research was conducted only in West Bengal. A more extended geographical sample may show greater differences in perceptions. Since there always remains a possibility of changing retailer expectation so to cater and fulfill the need, the service quality standards shall be reviewed and modified periodically to meet the changing retailer expectations. There may be change in view of respondent when comes in terms of Company official.

SUGGESTION FOR FURTHER RESEARCH: More in-depth study is need to be conducted for analysis and derive an advanced design framework is required in respect of marketing strategy.

VI.   CONCLUSION

The factors that appeared to be the most decisive are:

- Quality of the cement: that is approval by the engineers, and sometimes good feedback from the market and the field. It is the first and major criteria to consider the cement.
- Although brands are a major factor for retailer, mass marketing helps them associate brands to an image.
- When the suppliers are already known, the quality of the delivery based on former experience is definitely one of the most decisive factors.

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The Nexus between Productivity and Employment

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Abstract- The paper tried to explore the various studies on the nexus between the productivity growth and the employment through VAR model of Dritsakis(2012) and Blanchand, Solow and Wilson(1995) model and found cointegration and causality but the association went to either direction. In the short run, the nexus was seen negative but not in all countries and in the long run , the association was found both positive and negative in the world economies like Europe, America ,Africa and in Asia. No general conclusion could not be drawn on the nexus because state of technology, employees benefit, wage structure, hours of labour vary from country to country whether it was in USA,France,UK ,India or in EU. Even, the association is different from sectors to sectors. Above all, if the scale of measurement of labour productivity differs, the association between labour productivity and employment may also differ.

Index Terms- Labour productivity , Unemployment

I. INTRODUCTION

Productivity affects unemployment through two different mechanisms: On one hand, an increase in productivity leads to a decrease in the demand for labour for a fixed output level. An increase in unemployment would lead to a decrease in the aggregate demand. On the other hand, an increase in productivity leads to a decrease in the cost of the production and lower product prices. These lower prices could boost the aggregate demand leading to an increase in employment. The popular view is that the relationship between productivity and employment has changed from time to time , sometimes optimistic and sometimes pessimistic. Faster productivity growth is good for employment. The nexus between labour productivity and employment in the real world become inconclusive because no general relationship was found in the economies. In the short run, the positive association was observed in several nations and thereafter it turned into negative relation. The employment scenario in countries are different due to differential economic conditions, the wage structure, labour benefit, hours of labour, the technological progress etc. In the long run, the technology changes, and the productivity changes too. Several VAR model could not drawn any econometric association that is valid as general theory in the light of making any linkage in the long run analysis. However, many studies were done in US and European economies to find out the proper nexus. In this paper, we will try to evaluate some of the researches on the nexus between the labour productivity growth and the employment in general including empirical supports of those studies.

II. MODELS AND OBSERVATIONS

In order to test the causal relationship ,we specify the following multivariate VAR model ,
U = (WR, CPI, LP, UR, GDP)

Where, WR is real wages, CPI is consumer price index, LP is labour productivity,UR is unemployment rate, GDP is gross domestic product and U is a vector.

This VAR model was estimated through Johansen (1988) and Johansen and Juselius (1990) cointegration test technique which suggest that labour productivity and unemployment rate is cointegrated in the order of $(1,1)$ satisfying the trace statistics and it has a strong causal relation as per causality test based on vector error correction modeling. Granger causality tests based on error correction models (ECM) showed that there is a 'strong' Granger causal relation among labour productivity, real wages, rate of unemployment and gross domestic product as well as between real wages and unemployment rate and also among unemployment rate, real wages and gross domestic product. (*Dritsakis*,2012)

We can mention two similar studies. Firstly, Chletsos, Kollias, and Manolas (2000) investigated the relationship between employment, growth rate, labour productivity and wages rate in the case of Greece for the period 1970-93. This period is divided into two sub-periods 1970-1980 and 1981-1993. In the first period they indicate that the employment level is positively related to the growth rate and wages rates are negatively related to the labour productivity. The reverse result is observed in the second period, which is characterized by the restructuring of the Greek economy. Secondly, Hsing (2001), based on the augmented Phillips curve and the autoregressive conditional heteroscedasticity model, studied the impact of the union wage increases to non-union wages and found that the growth of non-union wages is positively associated with the expected inflation productivity growth and negatively correlated with the unemployment rate.

Following Blanchand,Solow and Wilson(1995) model, let us assume,
y=log of current output
e= log of employment
x= log of productivity
*=potential or natural or normal
y*=log of potential output(real GDP)
by definition,x=y-e
then,x*=y*-e*

if there is an exogeneous shock to x* or to its rate of growth, how does that affect the time path of e? In Okun's Law,
$e-e^* = k(y-y^*) + (e_{-1} - e_{-1}^*)$ where k<1,

ie, when output falls below potential in recessions, employment falls proportionately less, so that productivity falls below in normal level.

If g=x-x$_{-1}$ and g*=x*-x*$_{-1}$

Then g= observed rate of productivity growth
g*= rate of growth of underlying supply side determined productivity trend
So,g=m(Δe-Δe*)-b(Δe$_{-1}$-Δe*$_{-1}$)+g* …(1)
Or g=-m(Δu-Δu*)+b(Δu$_{-1}$-Δu*$_{-1}$)+g* ….(2)
Here m=(1-k)/k and b=a/k
Δe= current rate of growth
Δe$_{-1}$=lagged rate of growth

Equation (1) expressed that if we knew the time path of the potential or normal or natural or equilibrium level of employment, we could isolate the supply-determined rate of growth of productivity by estimating (1) and looking at the residuals. We can assume that the equilibrium rate of unemployment u* is approximately constant in the same period ,or else that it follows a random walk with no drift. If (2) can be estimated , the residual from the regression will be fair approximation to g*.

Firstly, estimating (2) we get the time series representation of g* and secondly we can explore the relation between unemployment and calculated autonomous shock to productivity growth .

From the data, there is no random walk with no drift in US and Japan. In European economies, constancy (or stationarity) of u* is a much more dubious proposition. Observed unemployment rate has been much higher in the late 1970s and 1980s than before. The Impulse Response Function calculated from Germany and US economy –the cumulative changes in unemployment rate following a one standard deviation shock to productivity growth. In USA ,g=0.4 % ,or a bit over 1.5% per year. The quarterly standard deviation is 0.8%,so a one standard deviation jolt to productivity change for a quarter would cumulate to 3.2% if prolonged through a year. Remarkably they concluded that in the short run, an increment to productivity growth is likely to be accompanied by a small increase in unemployment but it is temporary. The permanent effect seems to be trivially small. In great depression the key to high employment does not lie in the rate of productivity growth but in a demand for aggregate output that fully uses normal productive capacity.

Jared Bernstein (2011) has studied on the historical relationship between productivity and employment in US during 1947-2010. In the Fig-1, he tried to show that there is a positive, not a negative, correlation between productivity and job growth overtime. But look at the end of the graph. Productivity accelerates while employment growth decelerates. And that ain't no blip either and it suggests the possibility of a structural change in this relationship.

Fig.-1: Productivity and employment during 1947-2010
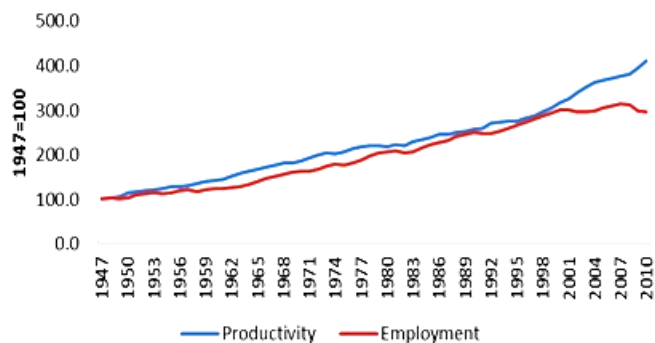
Source-Bernstein,2011

Productivity is a measure of the ability to create goods and services from a given amount of labour, capital, materials, land, knowledge, time, or any combination of these. It is measured, basically, as output per unit of input, where the input could be land, labour, capital, etc.When productivity is growing, living standards tend to rise. However, this is not always the case. Productivity growth can also occur during periods of recession and increased unemployment as businesses cut jobs and seek to become more efficient.

From ILO statistics, it was observed that during 1995-2000,2000-2005,2005-2008 and 2009, world economy did not show any clear positive or negative association between the employment and labour productivity growth. However, from 1995-2000 to 2000-2005 , world labour productivity growth fell but employment change rose which was clearly observed, ie a negative association. On the other hand , in North America during the same period, the relationship was found as positive. In Africa also, the nexus between productivity growth and employment change became positive for long period only. The same conclusion can be drawn in case of India as like as Africa. In Asia Pacific nations, during 1995-2000 and 2000-2005 , the nexus showed positive and in Australia, during 2000-05 and 2005-2008 , the nexus was found direct. In SAARC region during 1995-2000 and 2000-2005, the association was positive (including India) but in ASEAN this was reverse in the same period. In high income economies, the relationship is direct in the same period and then no nexus was clearly seen.(Table-1)

Table-1: Employment and productivity

	Employment change % per year				Labour productivity growth % per year			
	95-00	00-05	05-08	2009	95-00	00-05	05-08	2009
China	1.2	1.2	0.5	0.6	3.4	10.6	10.5	8.4
Japan	-0.1	-0.2	0.2	-2.6	1.4	1.7	0.9	-3.8
India	1.9	2.0	2.2	1.7	4.3	4.4	5.9	5.4
Australia	1.7	2.1	2.0	-0.5	2.1	1.1	1.0	1.2
Asia-Pacific	1.5	1.7	1.5	1.1	2.4	3.9	5.3	1.4
ASEAN	2.2	1.6	2.1	1.6	0.4	3.5	3.4	-0.4
SAARC	2.1	2.7	2.6	2.2	3.3	3.8	4.9	4.8
High	0.3	0.4	0.7	-0.9	1.7	1.9	1.4	-2.3

income economies								
Africa	2.9	3.1	3.2	2.5	0.6	1.5	2.6	-0.2
North America	1.9	0.7	1.0	-	2.3	1.8	0.8	1.1
World	1.7	1.8	1.8	0.7	1.9	1.7	2.5	-1.4

Source-ILO

Research study observed that U.K. productivity growth over the past 30 years has averaged around 2 per cent per annum. Three researches have been done which suggest that this recent productivity growth is faster than in the 80 years from 1870 to 1950, when output per hour grew by 1.25 per cent per annum, but it has been slower than in 1950-73 when it was nearer 3 % . Allowing for this, long-term trend U.K. productivity growth does appear to be around 2 per cent per annum.

Figure 2 shows productivity growth over the period 1993-2003 as measured by both of the ONS measures and both of the Bank of England measures. Annual productivity growth started the period at 3-4 per cent (depending on the measure) before declining sharply to 1-2 per cent by 1995 where broadly it stayed until 1998. There was a slight pick-up (to 2.5-3.0 per cent) in 1999, and then growth fell back again before climbing sharply in 2000, reaching 3-4 per cent again. This was then followed by a sharp fall in 2001, with most measures seeing growth approaching just 0.5-1.0 per cent, and growth has now returned to around 2-3 per cent per annum.

The main difference is between the per person measures and the per hour measures. The per hour measures both peak at a slightly lower rate of growth in 1994 (3.5 per cent compared with the 4.0 per cent growth seen in the per person series) and they both show noticeably stronger growth in 2000. In 2000, the per hour measures shows growth of around 4.0 per cent, compared with around 3.0 per cent on the per person measures. This reflects the fact that while the year to 2000 saw ongoing strong growth in employment levels, there was slower growth in actual hours worked. Indeed, in the year to first quarter 2002, the LFS age 16 and over employment level increased by 1.2 per cent, but total actual weekly hours worked actually fell by 0.4 per cent.

In Fig-2, productivity growth in UK during 1993-2003 is shown in per person and per hour measure which is found cyclical in nature .Also Fig-2 suggests that the different measures show a similar story for the UK, and this is also the case for international comparisons of productivity. For example, it is well documented that there appears to be a productivity gap between the UK and its international competitors, with the UK lagging behind. The extent of the gap varies according to the measure used, but not significantly. On an output per worker basis, the G7 average in 2002 was around 13 per cent higher than the UK figure; on an output per hour basis the gap was around 12 per cent. Moreover, this gap is spread across a wide number of industries: a 2003 Sector Skills Development Agency report showed that out of 30 industries UK productivity was below that in the USA in 26 industries, below France in 25, and below Germany in 21.(*Lindsay*,2004)

Fig-2: Productivity growth in U.K.
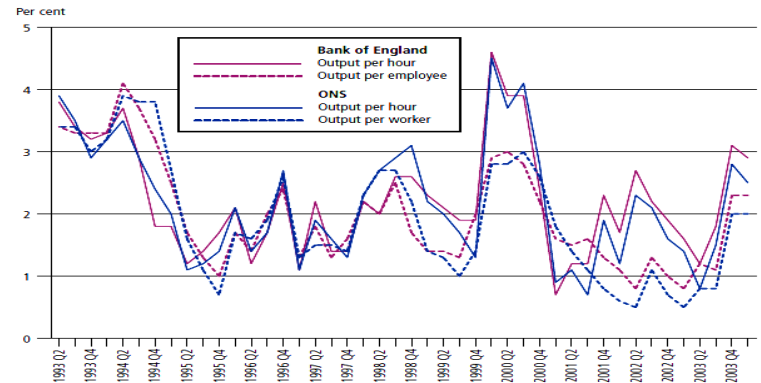
Sources: National Accounts; Labour Force Survey; Bank of England

Table-2:Labour productivity components seasonally adjusted in UK

	Output		Productivity jobs		Productivity hours	
	Change on quarter a year ago	Change on previous quarter	Change on quarter a year ago	Change on previous quarter	Change on quarter a year ago	Change on previous quarter
2009Q3	-3.6	0.3	-1.6	0.0	-2.4	-0.6
Q4	-0.9	0.5	-1.5	-0.1	-0.8	1.4
2010Q1	1.0	0.4	-1.5	-0.4	-1.3	-2.3
Q2	2.1	0.9	0.3	0.8	0.5	2.0
Q3	2.4	0.6	0.9	0.6	1.1	0.0
Q4	1.5	-0.5	0.7	-0.3	0.2	0.5
2011Q1	1.6	0.5	1.7	0.6	2.5	0.0
Q2	0.8	0.1	0.8	-0.1	-0.7	-1.2
Q3	0.7	0.6	-0.3	-0.5	0.1	0.8
Q4	0.9	-0.3	0.1	0.1	-0.2	0.2
2012Q1	0.2	-0.2	0.1	0.6	0.6	0.8
Q2	-0.3	-0.4	0.9	0.7	2.3	0.5
Q3	0.1	0.9	1.6	0.2	2.6	1.1

Source-Office for National Statistics

Several studies have found that UK labour productivity particularly lags the USA, France and Germany in manufacturing and there are also lags in distributive trades, and finance and business services. By comparison, Britain leads the way in mining and extraction productivity.

In France, productivity increased at an average rate of 4.75% per year during 1960-1974 and the unemployment rate averaged about 2% .Between 1974 and 1990,the rate of productivity growth fell to 2.5% a year, and the unemployment rate rose fairly steadily to more than 10% .Other countries, experienced the same conjunction of slower productivity growth and higher unemployment during the later period.

It would be wrong to conclude from this observation that an autonomous increase in productivity or acceleration of productivity growth would be followed by higher employment or faster employment growth. In Table-3, there is no significant long run relationship between productivity growth and unemployment in France. The rank correlation is -0.43. The relationship is very weak . In USA, rapid productivity growth is associated with high unemployment is not always true in the long

run. The rank correlation is -0.73.The over all association is weak.

Table-3: Productivity and unemployment:USA & France

	USA			France	
year	Productivity rate	Unemployment rate	year	Productivity rate	Unemployment rate
1870-1880	2.28	-	1896-1900	2.0	2.93
1880-90	1.86	-	1900-1906	0.1	2.79
1890-1900	1.96	10.4	1906-1913	3.3	2.06
1900-13	1.98	4.7	1913-1919	-3.6	-
1913-29	2.39	4.8	1919-1930	5.5	2.58
1929-1938	0.74	16.8	1930-1939	-0.4	6.71
1938-50	4.03	5.7	1939-1946	-2.5	-
1950-60	2.41	4.5	1946-1958	5.9	2.0
1960-70	2.51	4.7	1958-1968	3.9	2.17
1970-79	1.92	5.9	1968-1974	6.2	3.39
1979-1990	0.80	7.1	1974-1985	3.1	8.35
			1985-1993	-	13.02

Source- Maddison,1982

Developments in euro area productivity growth since the second half of the 1990s have been disappointing. Euro area labour productivity growth (as measured by real GDP per hour worked) declined from an average of 2.1% in the period 1990-1995 to only 1.2% in the period 1996-2005. At the same time, productivity growth in the United States increased strongly from 1.3% in 1990-1995 to 2.1% in 1996-2005.More recently, in the first half of 2006, productivity growth in the euro area has gained some momentum.

Second, the decline in labour productivity growth resulted from both lower capital deepening and lower total factor productivity (TFP) growth. The former can partly be associated with the robust pace of job creation since the mid-1990s, while the latter might be partly explained by higher utilisation of lower skilled workers. The slowdown in both capital deepening and TFP growth appears to be widespread across euro area countries. Third, from a sectoral perspective, industries not producing or using intensively information and communication technology (ICT) would appear mostly responsible for the decline in average labour productivity growth in the euro area since the mid-1990s.

Table-4:Labour productivity growth in Euro Area and the US (annual average percentage change).

	GDP per employed person				GDP per hour worked			
	1981-90	1991-95	1996-00	2001-05	1981-90	1991-95	1996-00	2001-05
US	1.4	1.3	2.3	1.9	1.5	1.1	2.1	2.6
Euro Area	1.8	1.9	1.3	0.5	2.5	2.3	1.7	0.7
Belgium	1.7	1.6	1.4	1.0	1.9	2.3	1.6	1.3
Denmark	1.8	2.6	1.8	0.9	2.7	2.9	2.5	1.2
Germany	0.6	0.7	2.0	2.8	1.1	0.6	2.1	2.9
Spain	2.3	2.2	-0.2	-0.8	3.3	2.3	-0.2	-0.6
France	2.1	1.5	1.5	1.1	2.9	1.7	2.1	1.9
Ireland	3.6	2.6	3.9	2.5	3.8	3.5	5.6	3.0
Italy	1.7	1.8	0.9	-0.6	2.0	2.3	0.9	-0.2
Luxemburg	2.7	1.2	2.8	0.0	3.3	2.1	2.9	1.1
Netherland	0.9	0.6	0.4	0.6	2.0	1.4	0.4	0.8
Austria	1.9	1.1	2.9	1.5	2.4	2.7	3.3	1.9
Portugal	1.5	2.2	2.1	0.3	1.8	2.8	3.4	0.2
Finland	2.6	2.9	2.3	1.4	3.1	2.8	2.6	1.5

Source-ECB

The main developments in euro area productivity growth are summarised as follows (Table 4). While productivity growth was broadly unchanged between the 1980s and the first half of the 1990s, both in the euro area and the US, a substantial change can be observed in the second half of the 1990s. In the euro area, average productivity growth (per hour worked) declined to 1.7% in the period 1996-2000 and further to 0.7% on average in the period 2001-2005. This is clearly lower than the 2.5% and 2.3%

recorded respectively in the 1980s and in the first half of the 1990s. By contrast, in the US, growth in productivity per hour worked rose to an average of 2.1% in the period 1996- 2000 and to 2.6% over the period 2001-2005, a level of growth clearly above that experienced in the past. This rise in the US may partly reflect cyclical factors, but the apparent resilience of productivity growth during the past downturn and the significant further pick-up over the last two years tends to support the widespread view that the mid-1990s marked a structural improvement in US productivity growth. As a consequence, euro area labour productivity growth per hour worked fell in recent years clearly behind that in the US – for the first time in several decades.

In Fig-3 left panel, it is shown that the Euro Area long-run labour productivity growth (measured in terms of real GDP per hour worked) has been subject to a gradual declining trend since

at least 1950 .Thus, from levels close to 6% in the 1950s and 1960s, labour productivity growth in the euro area decreased on average to levels around 4% in the 1970s, 2.5% in the 1980s and 2% in the 1990s. From 2001 to 2005 it was on average just below 1%. Over the whole sample period, US labour productivity growth has fluctuated around an average of 2%. At the same time, some structural changes can also be observed for the North American economy. First, to some extent the US economy also experienced a productivity slowdown from the mid-1970s to the mid-1990s. Second, reflecting the impact of recent advances in information and communication technology associated with the "new economy", from the mid-1990s labour productivity growth in the US rebounded and started to follow an upward trend.(Fig-3, right panel).

Fig- 3: Labour productivity (per hour) growth in Euro Area and the US(%)
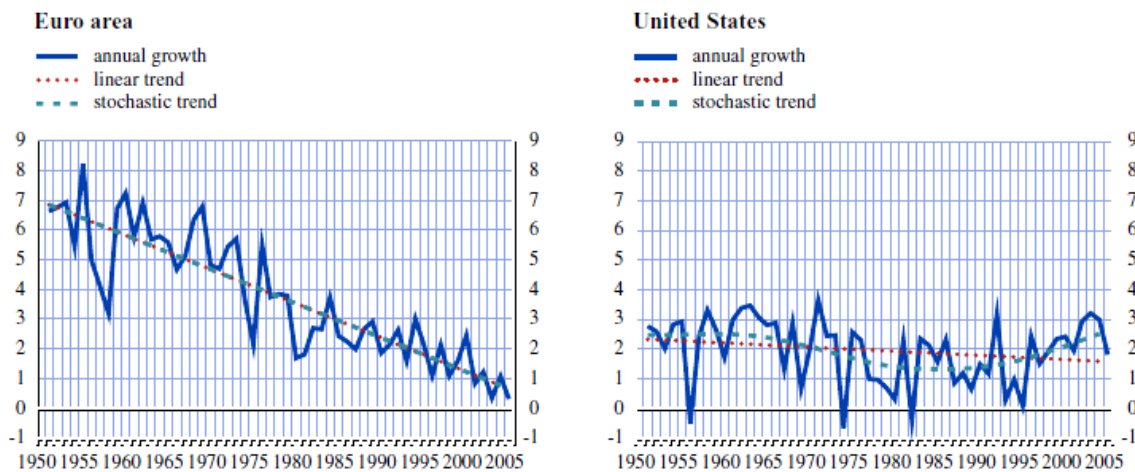
Source-ECB

Fig- 4:Labour productivity(per hour) growth in Euro Area and the US
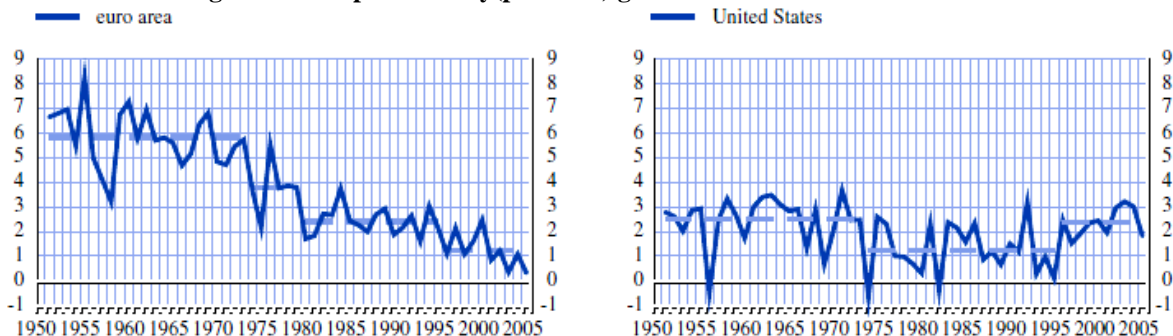
Source-ECB

In Table-5, the structural breaks of labour productivity growth of Euro Area during 1951-2005 were found in 1973,1979, and 1995 respectively which was marked in the Fig-4 left panel. The mean growth rates were also shown whose average was calculated as 3.4% and the trends were broadly constant and decreasing in the respective periods. On the other

hand, the structural breaks in the labour productivity trend during the same period were marked in 1973 and 1995 respectively in USA which was shown in Fig-4 under right panel. The average mean growth rate was observed as 2.02% and the trend patterns were broadly constant.

Table-5: Basic properties of labour productivity (per hour) growth (%) in Euro Area and the US

	Breaks	Mean growth rate	Trend
Euro Area	1973,1979,1995		
Overall 1951-2005		3.8	Broadly constant
1951-1973		5.8	Broadly constant
1974-1979		3.8	Deceasing
1980-1995		2.4	Broadly constant
1996-2005		1.2	Decreasing
USA	1973,1995		
Overall 1951-2005		2.0	Broadly constant
1951-1973		2.5	Broadly constant
1974-1995		1.2	Broadly constant
1996-2005		2.4	Increasing

Source-ECB

Moreover, in non-ICT industries in Euro Area, the nexus between the changes in labour productivity and employment growth was estimated as negative and found statistically significant during 1990-95 and 1996-2002 respectively and it is shown in Fig- 5.

Fig- 5 : Labour productivity change and employment growth (%) in Euro Area
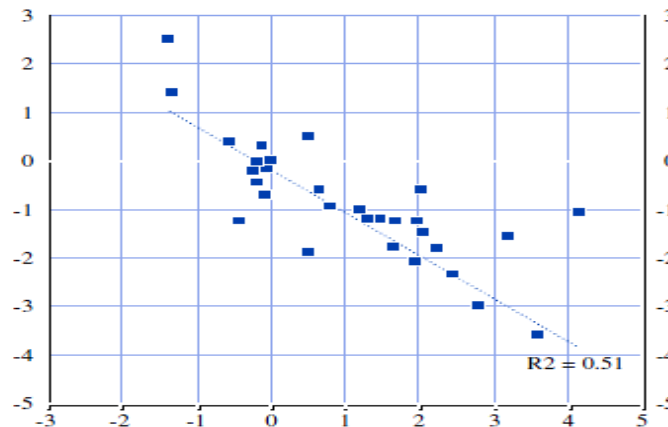
Source-ECB

The significant study on the development of employment and labour productivity in the years 2008-2010 when recession had started in most countries was shown in Fig-6. This figure shows the empirical association of a likely employment/productivity trade-off in the short run. Employment levels fell proportionately less in countries experiencing short-run reductions in labour productivity, in particular in Germany where employment increased by 0.4%, while GDP per hour decreased by 1.2%. Employment losses were greatest in countries with substantial increases in productivity at the same time. Such changes occurred in most of the eastern EU member states, but also in Ireland and Spain (and the US), where unemployment increased substantially because public policies like short-time work compensation did not mitigate the employment impact of the recession. The adjustments in Ireland and Spain both included massive employment losses despite the differences between a liberal and a southern European type of welfare state, reflecting different adjustment process, particularly in Spain, where flexibility was achieved primarily through the reduction of fixed-term employment: unemployment increased to more than 20% of the total labour force in Spain and to 15% in Ireland, while it fell to 6.3% in Germany.

Fig- 6:Employment and productivity during 2008-10

Employment and GDP per hour, 2008-2010 change
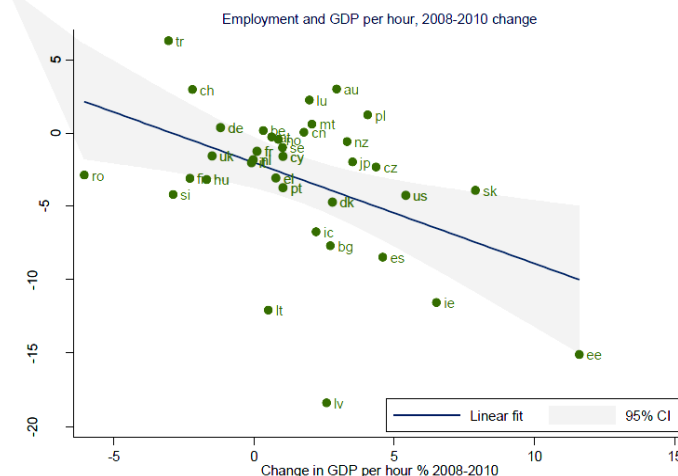
Source-Gomez-Salvador,Musso,Stocker & Turunen,2006

By the end of the recession in most countries in 2010,the differential labour market effect of decline in economic activity can be seen even more clearly (Fig-7).In contrast to the period at the beginning of the recession, productivity increased in 2009-10 in all countries with exception of Ireland, Romania and Greece, but there is also persistent evidence of the employment-productivity trade-off, with countries tending to record either large increase in productivity and employment decline(eg, eastern European EU member states, Ireland)or smaller increases

in productivity and stable or increasing employment (Germany, France and the UK).The only major economy achieving both substantial increases in productivity as well as employment during 2009-10 is Poland, but it is also worth noting that there was also worth noting that there was also a very substantial-and fast-reduction of the foreign value of the Polish currency over this period, resulting in substitution for domestic goods and following the recession, strong export growth.

Fig- 7 : Employment and productivity growth: Emerging from recession,2009-10

Employment and GDP per hour, 2009-2010 change
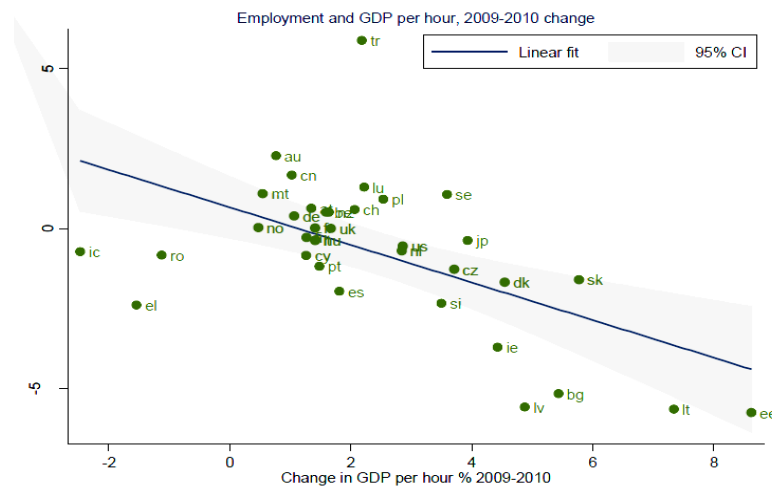
Source- Gomez-Salvador, Musso, Stocker & Turunen,2006

The study of Beaudry and Collard (2002) motivated by a set of cross–country observations on labor productivity growth among industrial countries over the period 1960–1997and showed that over this period, the speed of convergence among industrialized countries has decreased substantially while the negative effect of a country's own employment growth (or labor force growth) on labor productivity has increased dramatically.

Most noteworthy study of George L. Perry (2002) showed that over the postwar period, the average hours worked per year per employee show clear cyclical fluctuations as well as a persistent downward trend. The cyclical fluctuations demonstrate

mainly that employers vary average hours as well as employment in response to changes in their own demand for labor. Higher unemployment rates mean less overtime and an increase in short workweeks of employment. Surprisingly, average hours declined sharply again in the 1965-68 period. Because there are persistent differences in the relative number of average hours worked by different age-sex groups in the labor force, the changing mix of employment contributes to the trend in economy-wide average hours of work. In order to isolate underlying trends in average hours from the effects of the changing employment mix, he eliminated the annual change in hours that was due purely to

changes in the relative mix in employment. The resulting series was then explained by its statistical relationship to the weighted unemployment rate and time trends. According to his estimates, a fall of 1 percentage point in the weighted unemployment rate causes a 0.20 hour rise in average weekly hours worked per employee; or, equivalently, there is a 0.18 hour rise for a fall of 1 percentage point in the official unemployment rate. The time trends indicate that, with a constant weighted unemployment rate, average weekly hours fall by 0.21 hour per year from 1948 to 1955, by 0.14 hour per year from 1955 to 1965, by 0.27hour per year from 1965 to 1968, and by 0.14 hour per year thereafter. The labour productivity growth and employment relationship had differential impacts in various sectors in an economy. The sectoral effects were studied by Nir Klein(2012) in South Africa which showed that in absolute terms, most of the job shedding in the non-agricultural sector occurred in formal employment, particularly in manufacturing, trade, and construction, while in

social services, finance, and utilities, employment increased (cumulative terms, Fig-8). At 2011Q2, informal employment (excl. agriculture) remained slightly below its pre-crisis level, reflecting a significant recovery in 2010, which almost offset the massive decline during 2009.

The sectors' employment and output patterns imply that most of them recorded labor productivity gains since 2008Q4 (Fig- 9). On average, the cumulative increase during this period was 8.25 percent, and the most prominent increase was recorded in construction (22 percent), reflecting the non-trivial decline of 12 percent in employment and a 7 percent cumulative increase in its added value. Productivity in social services and finance remained flat owing to a proportional increase in labor and output. The cumulative decline in labor productivity in the utilities largely reflects the relatively sharp increase in employment since 2008Q4 (9 percent).

Fig-8:Employment change by sectors in South Africa
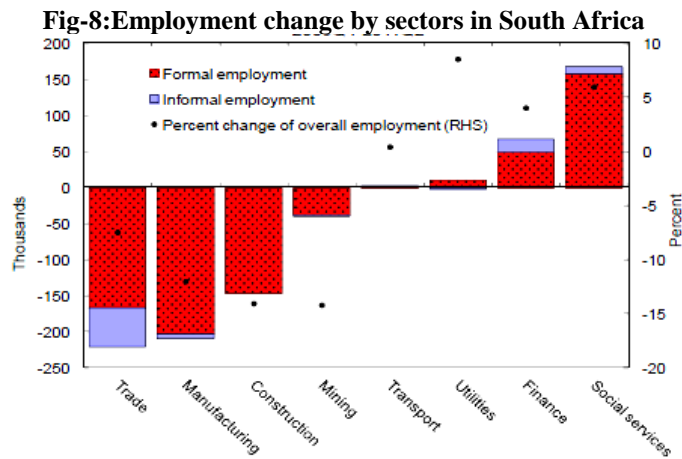
Source-IMF

Fig- 9 : The cumulative growth of labour productivity in South Africa
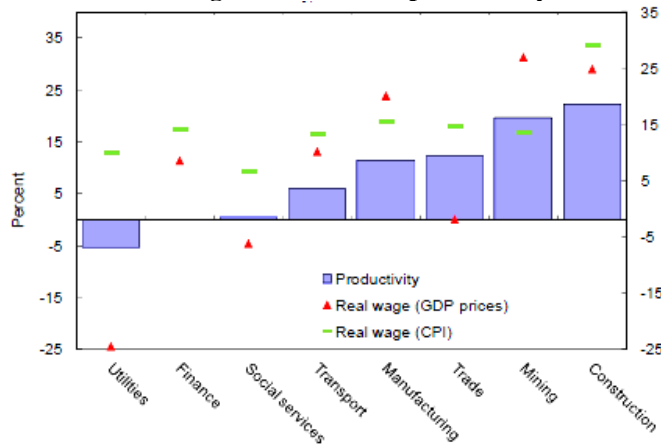
Source-IMF

III.   CONCLUDING REMARKS

But is it really true that productivity growth leads to jobs losses? The McKinsey Global Institute says the answer is no. In a recent report entitled "Growth and Renewal in the United States:

Retooling America's Economic Engine," MGI argues not only that gains in productivity have usually gone hand-in-hand with job growth, but also that greater productivity gains are absolutely crucial to maintaining American growth, and therefore, job creation and prosperity.If we look just at the last two decades and

aim to recapture the 2.8 percent growth in GDP of that period, labor productivity growth needs to increase from 1.7 percent per year to 2.3 percent—an acceleration of 34 percent.

But does that mean jobs will be sacrificed in the quest for productivity gains? MGI says just the opposite is true. Historically, productivity gains and job creation have moved upwards together. Since 1929, every ten-year rolling period except one has recorded increases in both US productivity and employment. And even on a rolling annual basis, 69 percent of periods have delivered both productivity and jobs growth. Why has that been the case? MGI explains:There are three reasons that productivity and job growth can—and often do—complement each other. First, there is the cost savings point. Cost-reducing productivity gains can, on aggregate, lead to higher employment if consumers benefit from those savings in the form of lower prices and spend them. Second, productivity growth is not only about reducing inputs for given output. Importantly, it is also about increasing the quality and value of outputs for any given input. Third, sustaining global competitiveness in many tradable industries requires ongoing productivity gains; strong productivity performance is therefore a necessary condition for attracting and maintaining local jobs.

The "virtuous cycle" between productivity gains, job growth and strong economic performance was on full display as recently as the 1990s, as MGI explains:

The productivity acceleration and rapid GDP growth that the United States enjoyed in the second half of 1990s was enabled by solid gains in both sources of productivity growth. Two sectors— large-employment retail, and very high-productivity semiconductors and electronics—collectively contributed 35 percent to that period's acceleration in productivity growth This helped the private sector boost its productivity growth from 1 percent in 1985 to 1995 to 2.4 percent in 1995 to 1999. At the same time, these two sectors added more than two million new jobs.

The largest productivity gains since 2000 have come from sectors that experienced substantial employment reductions. Computers and related electronics, the rest of manufacturing, and information sectors have contributed around half of overall productivity growth since the turn of the century but reduced employment by almost 4.5 million jobs—more than 85 percent of which occurred before the onset of the recession. The sectors that added the most employment during this period tended to be ones with below-average productivity—notably the health sector.
What the United States needs is to return to the more broadly based productivity growth that the economy enjoyed in the 1990s. During that period, strong demand and a shift to products with a higher value per unit helped to ensure that sector employment expanded at the same time that productivity was growing—reigniting the virtuous cycle of growth in which productivity gains spur increased demand, in turn leading to higher economic growth.

We can raise productivity (output per worker) by either cutting workers (ie, reduce the denominator) or increasing the value of output per worker (increase the numerator). In the 1990s, many sectors were able to innovate and raise the value of output per worker. This can happen by increasing the performance of products (think computers), shifting to higher-value goods (think retail), or redesigning processes to enable

workers to do more (think Walmart). In the 2000′s, some of the highly productive sectors used technology and automation to instead replace labor (think manufacturing) innovation is the key — developing new and better products that will spur demand.

We also find a strongly robust negative correlation between growth in labour productivity and growth in employment per capita across all of Europe, not just in Italy and Spain. We identify this effect using the following strategy. While it is obviously the case that there is two-way causation between productivity and the employment rate (since productivity drives wages), changes in labour taxes should have no direct effect on productivity. Rather, the tax effects should be mediated through employment. Using labour taxes as an instrument, we find a strong and robust negative relationship between productivity and employment. This same relationship has also been noted by Beaudry and Collard (2002), as well as Pichelmann and Roeger (2008). We go beyond their work by relating this trade-off to the post-1995 productivity slowdown. European reform agenda may raise employment per capita but may also reduce productivity. We find that some reforms, such as lowering labour taxes, may only have small short-run effects on output per capita after their effects on productivity are taken into account.

We find that the revival of European employment growth can help explain why European productivity slowed. But we do not explain why European productivity growth did not accelerate as occurred in the US. US productivity took off after 1995, growing at 0.7 percent faster per year.

Policymakers who want a quick fix that will rapidly raise both employment and productivity should find a tool other than labour market liberalisation. Liberalisation should be expected to provide long-run benefits, but there will be noticeable short-run costs. We hope that politicians in Europe and elsewhere have the fortitude to propose these policies even if the benefits may take years to fully accrue.

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Influences of Intrauterine Exposures Propelling Low Birth Weight: The Chagrin of Babies in the Developing World

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Abstract- Low birth weight (LBW) is one of the major challenges in achievement of the Millennium Development Goals particularly in low and middle-income countries, the incidence in India being reported to be around 28 percent. The risk of a poor outcome in the LBW infants is increased in a background of poor nutrition, both of the mother and the infant. Recent estimates suggest that stunting, wasting, and intrauterine growth restriction are responsible for 2.2 million deaths and 21% of disability-adjusted life years lost among children younger than 5 years [1]. The LBW infant is faced with rapid rate of anabolic processes and brain growth but has poor reserves. Thus the infant's need for optimal nutrition and special care is critical. Deficient nutrition and improper care lead to fatal outcome. LBW is universally the single most important determinant of the chance of newborn to survive and experience healthy growth and development. LBW as a health indicator is very sensitive to socio-economic factors, in particular to adverse conditions such as hunger, draught, infections and physical stress which specifically affect the poorest segment of population. Determinants of LBW need to be studied in order to identify potentially modifiable risk factors. This brief review explores the available epidemiologic data to investigate the questions of what are the causes and consequences of LBW.

Index Terms- Low birth weight, intrauterine growth retardation, nutrition, causes, consequences

I. INTRODUCTION

Low birth weight (LBW) has been defined by the World Health Organization [2] as weight at birth, irrespective of gestation age, of less than 2500 grams. During the period of 2000-2009, the incidence of LBW was reported to be 15 percent globally, 24 percent in the South East Asia region and 28 percent in India [3]. Recent research on child and maternal undernutrition emphasizes a 1000-day window of opportunity from gestation to 24 months of age, as a period of rapid growth [4]. It has been reiterated that damage during this period can potentially be permanent and impacts not only child growth and nutrition, but also cognitive development [5]. However, controversy abounds regarding the potential for LBW infants to catch-up to the typical growth pattern of the normal birth weight term infants of the same age. LBW is an important contributor to a range of poor health outcomes and is also an important predictor of clinical complications during this crucial age.

II. METHODS

The MEDLINE and EMBASE databases were searched for English-language papers published between 1990 and 2014 using a search expression including "low birth weight", "intra uterine growth retardation", "neonatal nutrition" etc. Apart from this journals were accessed at National Medical Library, Delhi. There were 354 papers located in the initial search of which 51 were selected which clearly related to the area of study.

Desk review of research publications in several national and international journals was undertaken. Journals referred to included Journal of Nutrition, European Journal of Clinical Nutrition, Food and Nutrition Bulletin, Lancet, International Journal of Public Health, Public Health Nutrition, Indian Pediatrics etc. Guidelines and reports from various international organizations including World Health Organization, UNICEF and Indian Academy of Pediatrics were reviewed.

Selected articles were reviewed to synthesize evidence from developing countries about the causes and consequences of low birth weight generated from various primary and secondary research.

III. FINDINGS

1. Dynamics involved in determining LBW

LBW, resulting from restricted fetal growth, preterm birth, or both, is a persistent problem in disadvantaged populations of developing countries like India. Intertwined arrays of factors are involved in predicting LBW deliveries during the intrauterine period. Poor nutrition is a known cause of LBW, especially in developing countries.

Table 1: Global and Regional Estimate of LBW (52)

	% LBW infants	Number of LBW infants (1000s)
World	15.5	20, 629
More developed	7.0	916
Less developed	16.5	19, 713
Least developed countries	18.6	4, 968
Africa	14.3	4, 320
Asia	18.3	14, 195
Europe	6.4	460
Latin America & Caribbean	10.0	1, 171
North America	7.7	343
Oceania	10.5	27

1.1 Socioeconomic status: The relative risk for LBW is significantly higher for lower socioeconomic status and primiparity [6]. Subramanyam et al reported that children are less likely to be born with LBW if they have mothers with a higher education (>12 years) compared to low educational levels (1-5 years) [7]. Poor access to good quality antenatal care is a significant risk factor for LBW deliveries [11].

1.2 Age at conception, parity, inter-pregnancy interval and gestational age: According to Raj et al, undernourished girls in developing countries who become pregnant in the growing adolescent phase are at much higher risk of delivering LBW infants [8]. Lenders et al noted that among adolescents, LBW deliveries were found to be more than twice as common as in adult pregnancies and the neonatal mortality rate was almost 3 times higher [9]. The proportion of such women who begin child bearing below 18 years was as high as 16 percent in India as determined by the third National Family Health Survey [10].Conversely, primus, elderly mothers were found to be at risk of delivering LBW babies [11]. Zhu et al observed that women with an inter-pregnancy interval of less than 6 months are 50% percent were more likely to have an LBW infant [12]. Short gestational age is has also been identified a strong risk factor for LBW [13].

1.3 Maternal Nutritional Status: Maternal height and weight are significant indicators of LBW. Women with low pre-pregnancy BMI, have substantial attributable risk for LBW deliveries [14]. A study among south Indian population identified pre-pregnancy maternal weight less than 45 kg and, anemia during pregnancy as significant risk factors for LBW among term babies [6]. Maternal height has an influence on birth weight, with a height below 145 cm increasing the incidence of LBW [15]. Poor gestational weight gain is also associated with the risk of LBW [14, 16]. Total weight gain of less than 8kg significantly increases the risk of LBW and SGA infants [17, 18].

1.4 Maternal Nutritional Intake: Poor nutrition is a known cause of LBW, especially in developing countries. The diet of women in the pre-conception period and throughout most of pregnancy has a significant effect on birth weight. Intrauterine growth restriction is also associated with poor food availability during pregnancy [1, 20]. In many developing countries, pregnant women often eat less for the fear of the baby becoming too big and causing problems during labour thus giving birth to a LBW baby. Pregnant women are denied good food due to false beliefs. Papaya, a rich source of β-carotene (vitamin A) is considered to be an abortificient and is banned. Banana eating is believed to produce single child infertility, since the banana tree fruits only once [19].

Intrauterine growth restriction is also associated with poor food availability during pregnancy [1, 20]. Intake of macronutrients such as energy [1, 21] and protein [22], before and during pregnancy, have the greatest positive influence. Also, higher fat intake during second trimester of pregnancy is associated with improved neonatal length, birth weight and tricep skinfold thickness [23]. Sabour et al found significant correlations

between adequate maternal calcium and vitamin D intake and birth weight [24]. Ramakrishnan et al reported that pre-natal docosahexanoic acid (DHA) supplementation of primigravid women resulted in increased birth size in a population where dietary DHA intakes are very low [25]. Birth size has also been strongly associated with the consumption of milk during the second trimester, and green leafy vegetables and fruits during the last trimester of pregnancy [23].

Strong evidence exists for an association between maternal hemoglobin concentration and birth weight with minimal values for LBW occurring at maternal hemoglobin concentrations below the current cut-off value for anemia during pregnancy [26]. At delivery, malarial infection has been associated with severe anemia and a reduction in mean birth weight [27]. Palma et al reported iron supplementation during pregnancy to be effective in reducing the risk of all kinds of LBW babies [28]. Inadequate maternal folate status has been linked to LBW by Molloy et al [29]. Birth size is also strongly associated with the consumption of milk during the second trimester, and green leafy vegetables and fruits during the last trimester of pregnancy [23]. Addressing multiple micronutrient deficiencies during pregnancy in mothers has been found to increase birth weight [30, 31]. Poor access to good quality antenatal care is a significant risk factor for LBW deliveries [11].

1.5 Smoking: Smoking has been observed to be the strongest lifestyle related predictor of LBW. Evidence exists for the influence of environmental tobacco smoke exposure and risk for LBW babies [33]. Direct dose response relationship exists between the number of cigarettes smoked and the risk of fetal growth retardation. Women whose partners' smoke are also at a higher risk of having a child with growth retardation. The effect of maternal smoking on LBW seems to be attributable to IUGR rather than preterm delivery [34]. In a cohort study, maternal smoking during early pregnancy was found to be a risk factor for LBW with small for gestational age (SGA) outcome and for LBW with full term birth [35].

1.6 Stress: In a few studies, poor maternal mental health has mediated the link between domestic violence and LBW [36]. Increased physical stress due to increased workload during harvest seasons has been associated with worsening in maternal nutrition status and LBW in a study from India [37].

1.7 Seasonality: Several studies have documented seasonal variation in birth weight, but results are far from homogeneous. In most epidemiological studies, summer has been associated with relatively lower birth weight, possibly because of exposure to cold temperature during early or mid-pregnancy, and babies born in fall or winter have relatively higher birth weights [38].

2. Implications of LBW
Over 18 million babies are estimated to be born with LBWs every year of which half are in south Asia [39]. Many of these neonates tend to suffer from increased risk of adverse outcomes during infancy such as increased morbidity and mortality, physical growth retardation and cognitive impairment, along with an increased risk of adult chronic diseases.

2.1 Infant mortality and morbidity: Infants born with LBW at term weighing 1500-1999 grams are 8.1 times more likely to die and those weighing 2000-2099 are 2.8 times more likely to die from all causes during the neonatal period than are those weighing 2499 gram at birth.

Globally, a neonatal mortality rate (NMR) of 24 per 1000 live births has been reported. In India, more than two-thirds of infant deaths happen in the first 28 days of life [3] of which nearly 82 percent occur among LBW infants, which is the highest in the world [40]. It has been shown that LBW plays an important role in almost 60 percent of neonatal deaths occurring due to birth asphyxia and infections [1, 41].

The scenario in India is detrimental. The infant mortality rate (IMR) in India continues to remain high at 50 per 1000 live births. The total number of deaths of children under five years, fell from 12.4 million in 1990 to 8.1 million in 2009 worldwide [3]. However, with an under five mortality rate of 66, India's position is detrimental in comparison to even the South East Asia region average of 59. Prematurity and LBW (14%), diarrhea (13%) and pneumonia (20%) have emerged out as the major causes of death in the under-five age group in India [42].

Reduced weight, poor immunity and a poor insulation because of lack of fat as the source of energy makes LBW babies susceptible to the risk of frequent infection, hypothermia, and poor growth, impact of which is maximum during the neonatal period. LBW is also implicated as a contributor to impaired immune function, which may be sustained throughout childhood [43].

in India have wasting and a fifth are stunted at birth and within the first 6 months of life [10]. High prevalence of postnatal malnutrition in LBW infants has been linked to lower gestation, poor intrauterine growth, lower birth weight, infant sickness and poor post-discharge weight gain [45].

The growth pattern for weight and length show good catch-up growth in babies with birth weight of more than 1.25 kg, reaching almost the same level as infants born with weight appropriate for gestational age by 1 year of age. Babies with birth weight less than 1.25 kg show late and poor catch-up growth, with considerable lag persisting at 1 year of age [46].

2.3 Psychomotor and Cognitive Development: Term LBW is associated with cognitive and behavioral deficits in children and adults [47]. There are few studies of the development of term LBW infants in developing countries in which LBW is usually associated with poverty and inadequate stimulation in the home as well as poor postnatal growth. These disadvantages may increase the children's risk of poor development [48].

Neonatal complications may have a larger detrimental effect on long term cognitive development of LBW infants [49]. A study by Latan Hajnal et al among LBW infants [50] found that at two years of age, children who did not catch-up in growth had lower psychomotor development than those who experienced catch-up growth.

Figure 1: Association of LBW and nutritional status of children < 2 years [44]

IV. CONCLUSION

The National Plan of Action for Children 2005 [51] committed India to reducing LBW and malnutrition and LBW in children (age <5 years) by half from 2005 to 2010. Needless to say, this still remains a formidable challenge due to high incidence of LBW and poor care of this disadvantaged population thereafter. In the last few decades, increasing numbers of smaller babies

2.2 Undernutrition as a silent killer: Infants born with LBW suffer from underweight, stunting or wasting beginning in the neonatal period through childhood. The proportion of children who are moderately underweight or moderately stunted is higher in LBW babies [44]. As per NFHS-3, a third of the LBW infants

have survived due to technological advances and exhibit much more health, growth and developmental disabilities than normal birth weight babies.

Globally many studies have been carried out to assess the magnitude and determinants of LBW. It is now acknowledged that many factors can influence the occurrence of LBW including some important ones like maternal nutritional status both at the time of conception and during pregnancy; socio demographic variables such as age, education and occupation of mother; and access to health care. There is still considerable confusion and controversy about the factors that have independent effects on LBW as well as the quantitative importance of these effects. One of the reasons is that many of the potential determinants are highly associated and their effects are thus mutually confounded. The study of LBW is all the more important since sub-optimal birth weight may have consequences in the perinatal period, during infancy, and even in adulthood. In the first place, perinatal morbidity and mortality are more frequent in LBW infants than in normal infants. Infants who survive suffer from impaired physical growth and psychomotor development. Finally, several epidemiological studies have suggested that infants born with IUGR have a higher risk of developing metabolic syndrome in adulthood.

ACKNOWLEDGMENT

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Up To Date in Rhabdomyolysis: Concepts and Protocol Evaluation

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Abstract- Introduction: Rhabdomyolysis is the consequence of some diseases commonly seen in the emergency services, with several complications. In addition, there are lots of Rhabdomyolysis protocols in different countries and also in Brazil, with many points of agreement and others with divergent opinions, like the time of drugs administration and their posology. There are many variations and little evidences in the few studies and researches on humans.. *Objectives*: This paper aims to discuss the various protocols and reviews existing literature in order to adapt them to our institutional reality and the best treatment protocol. *Methods*: This study analysed protocols and updated concepts on Rhabdomyolysis. An non systematic review of protocols of all over the countries was performed. *Results*: All protocols focus on hydration and in a earlier diagnosis. Support treatments differs from service to service. *Discussion and Final Comments*: We hope that this study and research standardise the current treatment of the Rhabdomyolysis, based on evidences and clinical findings of various countries and thereby decrease the risk of it's most important complication: acute renal failure.

Index Terms- *Rhabdomyolysis; myoglobinuria; creatine phosphokinase; protocol evaluation.*

I. Introduction

Rhabdomyolysis is an acute syndrome and potentially lethal, which manifests clinically and through laboratory testing, and results from the lysis of skeletal striated muscle cells causing the release of intracellular substances into the systemic circulation, thus causing mostly damages and disturbances of renal tissue [1.2].

Approximately 26,000 cases of hospitalisation associated with rhabdomyolysis are reported every year in the United States. Rhabdomyolysis causes acute kidney injury in 13-67% of affected individuals, accounting for 5 - 10% of ARI cases in the U.S. [1]

Rhabdomyolysis aetiology is a complex and multifactorial syndrome with inherited (metabolic myopathies and muscular dystrophy) and acquired causes. Hereditary causes are uncommon and may appear in patients with recurrent episodes of muscular pain and family-related epidemiology [3].

The most common acquired causes can be divided into 3 major groups: traumatic and nontraumatic joint, the latter being a combination of causes [4].

The most frequent acquired causes are alcohol consumption, intense physical exercise, traumatic muscular compression and the use of certain pharmaceuticals and drugs [1].

Traumatic causes are related to compressive traumas (automobile accidents, earthquakes), burns and electrical injuries [4].

Non-traumatic causes are currently considered 5 times more frequent [5]. A 1982 study showed that 59% of the 87 patients presented one of the risk factors among alcohol intake, compression of soft tissues, seizures, and trauma history [3]. Another study published in 1984, identified other predisposing factors, 60% of which corresponding to trauma, ischemia and polymyositis, the remainder was associated with overdose, exercise, seizures, burns, sepsis, hereditary diseases and viruses.

A wide variety of drugs and toxins are present in approximately 80% of cases of rhabdomyolysis. Ethanol consumption, illegal drugs and statins are the most common ones [5].

Among the causes of rhabdomyolysis due to poisoning, the most common illegal drug is the use of heroin or cocaine, with about 20% cocaine overdoses being complicated with rhabdomyolysis. Statins can cause muscular pain in 10% of patients using it regularly, but cases of rhabdomyolysis reach only 0.1 to 0.2 cases per 1,000 persons / year [6,7].

The exercise-induced rhabdomyolysis is also a worrying issue. It may be due to excessive muscular exhaustion, prolonged exposure to heat, coexisting sickle-cell trait, use of dietary supplements (e.g, ephedra). In a series reported in the U.S., 57% of an ultra-marathon participants showed myoglobulinemia, but none developed ARI. In another medium studied (the military) it was demonstrated that it occurs in 2-40% of recruits during basic training.

As expected, risk factors include lack of physical conditioning and early introduction of repetitive exercises. Most cases are self-limited, there being no evidence of renal or muscular damage in the long run. It is worth noting that 25% of all cases of AMI in American military circles between 1980 and 2000 were associated with rhabdomyolysis, leading to ARF in 33% of cases [6,8].

The mechanisms involved in the pathogenesis of rhabdomyolysis are directly related to muscular cells injury. The injury causes a shift in the balance of calcium homeostasis and

the fall of Adenosine triphosphate (ATP). The decrease of ATP impairs the operation of pumps involving suitable calcium transport, thus resulting in increased sarcoplasmic calcium [6].

The excess calcium results in persistent contraction of muscle fibbers, depleting energy reserves, producing free radicals, activating vasoactive molecules, releasing proteases and ultimately cell death. After the reestablishment of perfusion to the injured tissue, leukocyte migration occurs and oxygen is consumed, creating more free radicals.. This mechanism establishes an inflammatory reaction that is self-perpetuating, leading to more muscular lysis and release of intracellular toxins into the systemic circulation [1,9].

The major components of the cellular content acting in the pathophysiology of renal injury are myoglobin, potassium, lactic acid, purines and phosphate. At present there are accepted three main mechanisms in kidney injury: a tubular obstruction, renal ischemia, and direct tubular injury through the toxicity of iron. Obstruction by myoglobin occurs mainly in the distal tubules. Direct injury through cytotoxicity occurs mainly in the proximal tubules, and is caused by the toxic effect of iron, which stimulates lipid peroxidation [6].

They contribute to the precipitation of myoglobin, the release of lactic acid, and nucleotides, which are metabolised in uric acid, creating an acidic environment, which facilitates the precipitation of myoglobin in renal tubules. Another mechanism of injury is renal ischemia due to imbalance between mediators of vasoconstriction and vasodilatation, especially nitric oxide and its *scavenger* effect, thus prevailing vasoconstriction and drastically decreasing renal blood flow [8,9].

The clinical presentation of rhabdomyolysis is often nonspecific and patient outcome depends on its precipitating factor. [2] Its signs and muscular symptoms are present in only 50% of cases [8], presenting muscular pain, tenderness, weakness, stiffness and fasciculations. Also, the patient present malaise, vomiting, nausea, fever and palpitations, whose most important signals are decreased urinary output and change in urine color (darker, reddish-brown) [1].

The diagnosis is made by high degree of suspicion against the clinical presentation. Therefore, considering the predisposing factors for rhabdomyolysis may help in diagnosis [2].

The change in urinary coloration is generally the first clue for the diagnosis of rhabdomyolysis, which has the heme fraction in urine [2].

The definitive diagnosis is made from laboratory tests. There is no consensus about the cutoff value of CPK (muscle creatine phosphokinase), but some considerer very probable diagnosis when higher than 1000 U/L. Is is important to note that myoglobinuria is a very important factor in diagnosis, however, has a short half life and is almost never measured and identified in laboratory tests [10].

Orthotolidine of Urine Test I: Urine dipstick test for detection of heme fraction (occurring in myoglobin), but their absence does not rule out rhabdomyolysis, due to its short half-life and the need for high serum concentration [2]. Urine I usually shows absence of hematuria.

Serum creatine phosphokinase (CPK) is released into the systemic circulation after the death of striated muscle cells, constituting an unspecific marker for rhabdomyolysis. However, persistent elevations of CPK indicate continuous muscle injuries

that may aid in diagnosis, the presence of compartment syndrome being excluded [1].

Serum and urine myoglobin: has rapid hepatic metabolism and renal excretion, thus being little sensitive. Therefore, the serum concentration of myoglobin returns to normal levels in around 1-6 hours. In plasma concentrations above 300ng/mL, it becomes detectable in urine, and its color changes in urinary concentrations above 10 0mg/dL [1].

The muscle damage causes release of phosphorus into the blood stream, changing the calcium-phosphorus ratio. Therefore, hypocalcemia and hyperphosphatemia may occur, which are generally asymptomatic and do not require treatment [2].

With progression to renal failure in these patients, creatinine rises disproportionately in relation to urea due to its release by muscle injury. Therefore, there is disproportionate elevation of urea due to catabolism of muscle proteins [2].

Other tests are also important: blood count, serum calcium, potassium, phosphorus, blood gases, coagulation, and albumin, so as to avoid complications and correct the evolutionary framework of the aforementioned rhabdomyolysis [6].

The differential diagnosis vis-à-vis the clinical presentation, includes hemoglobinuria, hematuria diseases (trauma, tumors, gallstones), acute intermittent porphyria, liver disease with dark urine and severe infections [2].

Treatment of rhabdomyolysis is still controversial, since there are few randomized controlled studies conducted in humans, making it difficult to establish a standard treatment with a high degree of evidence.

However, there is a consensus in the treatment of disease, which is based on factors that enhance prevention of acute renal insufficiency. It is important to recognise this condition early, as the correct and early treatment can prevent possible complications and allows clinical improvement. [1] Even in patients using dialysis techniques, renal function is recovered in most cases [1,2,11].

The most commonly occurring complications of rhabdomyolysis are hypocalcemia, hyperphosphatemia, hyperkalemia, hyperuricemia, compartment syndrome, peripheral neuropathy, disseminated intravascular coagulation, and renal failure. [2]

This paper aims to discuss the various protocols and reviews existing literature in order to adapt them to our institutional reality and the best treatment protocol.

II. REASEARCH ELABORATIONS (METHODS)

An non-systematic review of the medical scientific literature was performed using the database of PubMed, Lilacs, SCOPUS and by the analysis of national and international centers protocols.

Articles were researched in the english, spanish and portuguese languages, using the word "rhabdomyolysis", with no limits in the research concerning to age, date or gender, at PubMed / MEDLINE, LILACS, Scopus and SCIELO databases. Two authors were responsible for selecting all items; all abstracts were read and from the information contained therein, if they were rhabdomyolysis articles, these were read in full way.

The articles read in full were included covering the information about aetiology, diagnosis, clinical presentation,

laboratorial tests, treatment and it is related to details, complications and other relevant points.

Both authors reviewed the inclusion of articles in the review. Review articles with no clinical informations cited above were excluded, and also those who not concern to those topics.

An statistical analysis was performed to compare groups using the Sigma XLversion 6.22 software.

The study was approved by the research ethics committee of the institution.

III. RESULTS

Through literature search it were identified 7383 articles about rhabdomyolysis, and 1023 were review articles, 139 are clinical trial, 15 controlled clinical trial, 3 guidelines, 3844 case reports, 64 editorials, 11 classical and historical articles, 114 systematic reviews and 29 meta-analysis.

The protocols of some institutions around the world are presented below and detailed for better discussion.

USP Protocol (São Paulo University , Brazil) [12].

[0]   Treatment

The goal of the treatment is to prevent rhabdomyolysis and acute renal injury by treating predisposing conditions such as volume depletion, tubular obstruction, aciduria and the release of free radicals. The treatment can be divided into:

I. Hydration

The most important treatment is to maintain an vigorous hydration with fast IV infusion, 0.5-1L bolus of saline, maintaining this system of hyper-hydration for 48-72 hours. Leading to a urinary output of at least 2mL/Kg/h (200 - 300 mL / h).

[1]   Alkalinization

Another important topic is urine alkalinization, which must be prescribed 140mEq sodium bicarbonate in 1L of dextrose, and this infusion will depend on urinary pH, which should be kept to a value greater than 6.5. A 1mEq/kg bolus of sodium bicarbonate should also be prescribed, being careful with the alkalinization risks and especially worsening hypocalcemia.

. Mannitol

When the patient reaches a good urinary output, it must be prescribed 10% mannitol, 15 to 45ml per hour (about 5g / h).

[0]   Dialysis

If the treatment fails, the patient should be undergo dialysis, otherwise the clinical support should be maintained and the complications should be treated (causes of rhabdomyolysis), performing a periodic monitorization of electrolytes levels, renal function and treat the hyperkalemia.

[0]   Complications

Hyperkalemia is common and may require aggressive treatment. Hypocalcemia in the early treatment rarely needs replacement. Other complications associated with

rhabdomyolysis are: disseminated intravascular coagulation; hypocalcemia; hyperphosphatemia (hypophosphatemia may occur lately); hyperkalemia; hyperuricemia; peripheral neurophaty and compartment syndrome.

USA Protocol [13].

The initial management of patients with established diagnosis of rhabdomyolysis has as main objective the prevention of acute kidney injury induced by myoglobin, minimising not only the hypnotic effects of low flow but also induced injury by the generation of cylinders in renal tubules. [12, 13] Thus, it is recommended that the patient should be admitted to ICU or emergency bed, properly monitored and with a well established venous access.

In the acute phase of treatment, the preservation of renal function and correction of metabolic disturbances are the main goals to be achieved. [14]

[0]   Hydration

Vigorous fluid replacement should be performed as early as possible, always with 0.9% NaCl, avoiding solutions containing potassium so there is no worsening of hyperkalemia associated with the disease. The infusion rate should be 1.5 L / h in order to maintain urinary flow rate rate of 200-300ml / h. This overhydration plan should be maintained until it achieves serum CK levels lower than 1000IU / l. At this time, it is important that the patient is constantly evaluated for the development of heart failure or pulmonary edema, mainly.

[0]   Alkalinization

Patients with severe cases of rabdomyolysis (CK> 5000 IU / l) or showing increasing levels of CK despite adequate hydration volume, benefit from this approach. In addition, for the use of bicarbonate, three conditions must be met: hypocalcemia should not be present; arterial blood pH should be less than 7.5; serum bicarbonate should be less than 30mEq / L. The initial infusion should be at 130 mEq / L, with an infusion rate of 200 mL / h for urinary pH exceeds 6.5. In patients receiving bicarbonate, serum calcium levels should be measured every two hours, as well as the arterial blood pH. If the patient does not alcalinize their urine after 4 hours, develop symptomatic hypocalcemia, present arterial blood pH higher than 7.5 or bicarbonate higher than 30mEq / L, one should stop the bicarbonate infusion and maintain the saline infusion.

[0]   Mannitol

Due to the induced osmotic diuresis, mannitol is used in cases of rhabdomyolysis. [12] In severe cases, with serum CK reaching values greater than 30,000, one can consider using a dose of 1 to 2g/kg with infusion speed of 5 g / hr. This medication should be used only in patients who already have adequate urine output (> 20 mL / h) and the plasma osmolal gap and serum osmolality should be calculated. Discontinuation of the drug should be taken if diuresis suffers reduction or the osmolal gap reaches values exceeding 55mOsm/kg.

[0]   Complications

If the measures do not show effect and the patient has excess plasma volume, hyperkalemia greater than 6.5 mEq / L, metabolic acidosis with arterial blood pH below 7.1 or signs of uremia, the hemodialysis is indicated.

Spain Protocol [9].

. Treatment and prevention

Start volume replacement with saline at a rate of 400 mL / h (200-1000ml / h depending on the case and severity), with monitoring of central venous pressure.

Have a target diuresis of approximately 3mL/kg/h (200mL / h)

Correct hypocalcemia only in symptomatic patients (tetany or convulsions) or if the patient presents severe hyperkalemia.

Check urinary pH. If it is below 6.5, alternate each liter of saline with a liter of dextrose 5%, plus 100mmol bicarbonate. Avoid solutions containing lactate and potassium.

Consider treatment with mannitol (Up to 200g per day and up to a cumulative 800g). Check plasma osmolality and its variation. Discontinue if diuresis is not established (or <20 mL / h).

Keep volume replacement until no more myoglobinuria (evidenced by the clear urine or absence of blood in urine test) Consider dialysis if refractory hypercalemia above 6.5 mmol / L, symptomatic (evidenced in ECG), rapid elevation of serum potassium, oliguria (<0.5 mL / kg / h per 12h), anuria, volume overload or refractory metabolic acidosis (pH <7.1). [17]

The Table 1 summarises the main points of the protocols evaluated.

Table 1: Details of the evaluated protocols (4,9,12,13).

	USP	SANTA CASA	USA	SPAIN
Diagnosis	Clinical and Lab	Clinical and Lab	Clinical and Lab	Clinical and Lab
Hydration	0,5-1L bolus	1,0-1,5L bolus (10-12L/24h)	1,5L/h	200-1000 mL/h
Alkalinization	1mEq/kg bolus 140mEq BIC into 1L dextrose 5%	100ml of BIC 8,4% + 100ml manitol 25% + 800 ml dextrose solution 5% at 1L/4h.	130mEq/L 200ml/h	- 100mmol BIC + 1L dextrose 5%
Manitol	10% mannitol 15 to 45ml/h 5g / h.	100ml of BIC 8,4% + 100ml manitol 25% + 800 ml dextrose solution 5% at 1L/4h.	1 to 2g/kg - 5g/h	200g/24h – Max 800g
Dalisys	K > 6.5 mmol/L rapid elevation of serum K oliguria anuria volume overload pH <7.1	K > 6.5 mmol/L rapid elevation of serum K oliguria anuria volume overload pH <7.1	Volume overload K > 6.5 mEq/L pH < 7.1 signs of uremia	K > 6.5 mmol/L rapid elevation of serum K oliguria anuria volume overload pH <7.1
Complications	Hypocalcemia Hypercalemia Volume overload	Hypocalcemia Hypercalemia Volume overload	Hypocalcemia Hypercalemia Volume overload	Hypocalcemia Hypercalemia Volume overload

Below we suggest an protocol for early identification and treatment of rhabdomyolysis (chart 1).

Chart 1: Suggested Protocol.

Early 0.9% NaCl − 1.5L/h
- Urinary Debit 200-300mL/h
- Up to CK < 1000UIL (48 to 72h)

↓

-Clinic support and Periodic evaluation

- Correction of electrolyte disturbances and complications

Failure in clinical treatment:
- hyperkalemia
- pH < 7.1
- signs of uremia
- oligoanuria

→ Dialysis

Metabolic Acidosis or urinary pH < 6.5

→ Bicarbonate

If urinary flow rate between 20 and 300mL/h

→ 20% Mannitol - 1-2g/kg

IV. DISCUSSION

The main objective is to prevent acute renal injury and secondarily correct electrolytes disturbances and treat the cause of rhabdomyolysis [12].

The patient with this disease must be hospitalized in an emergency bad or ICU with monitoring and a well established venous access [14,15].

Preserving renal function is crucial in the acute phase of treatment, as well as reestablishing the metabolic functions of the body. In the 2013 review of Prof. Elizabeth J Scharman *et al*, is recommended an early volume replacement (within 6 hours). Hydration should be performed with 0.9% NaCl solution infused at a rate of 1.5 L / h, targeting a diuresis between 200 and 300 ml/h [16].

Such values of diuresis must be achieved in about at least 24 hours for a better prognosis. According to American literature, this hydration should be maintained until the values of CPK fell to below 1000 IU / L and according to Hospital Santa Casa de São Paulo and Hospital das Clínicas of USP university guidelines, it is recommended 48 to 72 hours hydration depending on clinical improvement and continuous decreases in CPK. If the CPK levels are not falling and the patient did not show any clinical improvement within 72 hours we considered in our protocol to maintain hydration until CPK levels are below 1000 IU / L [13,14, 15, 17].

The patient should be reassessed periodically in controlling complications of rhabdomyolysis and fluid replacement. Treatment should be individualised according to comorbidities, age and needs of each patient [4,9,10,16-18].
One way to optimize renal blood flow, mobilize interstitial fluid and reduce muscle edema is the use of mannitol. Mannitol is a diuretic with proximal tubes action and it's therapeutic use is controversial in rhabdomyolysis. There are no randomized studies with control groups made in humans, demonstrating their benefit [13,16,17].

However, nefroprotector mechanisms are described in the literature, such as decreased formation of tubular cylinder by the excretion of heme protein; renal vasodilatation properties; reduction of oxidative stress because it is a free radical scavenger and acts as an osmotic agent in the transfer of fluid into the intravascular compartment, interstitial edema, and decreasing the risk of compartment syndrome. [4.22]

But at Brown et al's work, 2004, no statistically significant difference in preventing mortality, renal failure or the need for dialysis was found. This study analyzed 2083 patients over 5 years, victims of trauma, who had rhabdomyolysis, comparing treatment with hydration against treatment with hydration plus alkalinization of urine and mannitol [4, 9,20].

The use of mannitol is considered beneficial in cases where the urinary flow is under 300 ml / h, by increasing or maintaining this flow rate. This medication should be administered into a 20% solution for about 1 to 2 g per kg. Mannitol may be used only in patients who have adequate urine output, in other words, above 20 mL / h. During the infusion of mannitol it is important to be aware of it's use complications as hypernatremia, thrombophlebitis, pulmonary edema and cardiac overload (especially in overdose). There is no consensus on the timing of discontinuation of the administration of mannitol, however this can be done through the establishment of greater than 300 mL/h associated with decreased muscle edema (if any) and clinical improvement in the patient's urine output overall [4,13,16].

In Scharman et al and Brown et al, the benefits of urine alkalinization are unproven, but also did not become apparent harm and is considered positive by many experts (level of evidence D). The use of bicarbonate is based on alkalinization of urine, thereby reducing the renal capillary vasoconstriction, improving renal filtration and by consequence the clearance, reducing kidney injury by decreasing the precipitation of myoglobin in the tubules therefore reducing the risk of hyperkalemia. The administration of sodium bicarbonate is intended to maintain a urine pH above 6.5 [16,19,21].

Alkalinization may exacerbate early symptoms of rhabdomyolysis hypocalcemia. Administration can be accomplished in several ways. The book Emergências Clinicas of Santa Casa de São Paulo recommends a solution containing 100 mL of 8.4% sodium bicarbonate, 100 ml mannitol 25% and 800mL of glucose solution 5% infused 1 liter into 4 hours. One

bolus of 100 mL of 8.4% sodium bicarbonate can be utilized if the urine pH is below 6.5 (4,13).

However, we will follow international pipelines, in which it is recommended 140mEq infusion of sodium bicarbonate in 1 liter of glucose solution and an attack bolus of 100mEq of bicarbonate 8.4%. This process will continue until maintaining the urinary pH range above 6.5. Keeping alert for signs of hypocalcemia as convulsions and tetany. Measure serum potassium every 3-4 hours because there is a risk of hyperkalemia during bicarbonate infusion. The suspension should be made if in 4-6 hours of treatment initiation the urinary pH increase is not evidenced. [4,13,16,19,22]

In the failure of clinical treatment, the patient may progress to severe renal failure. This means maintenance of hyperkalemia (K greater than 6.5) metabolic acidosis (pH less than 7.1 blood), signs of uremia, oliguria or anuria; the patient should undergo hemodialysis or hemofiltration [13,23,24].

After this review of medical literature, it was observed that there is a consensus about the use of early hydration as the main form of preservation of renal function during the management of rhabdomyolysis.

Despite existing conflicts in the literature, most revisions suggest the use of mannitol and sodium bicarbonate only if there is an adequate indication and should be considered as supportive therapy.

Randomized controlled trials would be interesting, since definitions of diagnostic and therapeutic purposes.

V. CONCLUSION

After analyzing all the articles and reviews, it was observed that there is widespread use of early hydration as the primary form of preservation of renal function on the management of rhabdomyolysis. Although there are conflicts in the literature, most revisions suggests the use of mannitol and sodium bicarbonate only if an appropriate indication exists. So to conclude a definitive protocol and resolution of conflicts between different protocols, more randomized controlled studies are necesary.

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Effect of Hardness of Water on Fixation and Total Wash off Percentage of Reactive Dyes When Applied to Cellulosic Fiber

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Abstract- Dye-house water quality is the most important parameter to be confirmed before dyeing; precisely the presence of metal content i.e. Hardness. This research will investigate & analyses the impact of separate hardness (i.e. Calcium, Magnesium & Iron) on particular 'Turquoise' (C.I. Reactive Blue 21) & a 'High Exhaustion' class (C.I. HE Red 120, C.I. HE Yellow 84) of Reactive dye on cotton knitted-fabric. From evaluation of dyed fabric the range of metal content is sorted out where the quality starts to fluctuate as distinctive visible & spectral change of shade & fixation rate of the dye molecules has been found. The result of the work will help for further projection about water quality degradation in upcoming years & its effect on dyeing behavior, also the sustainability of present dyeing process to cope with the ever degrading quality of water.

Index Terms- Water hardness, Reactive dyes, Cellulosic fiber, Fixation & Wash off percentage

I. INTRODUCTION

In textile wet process, the most substantial & influential role is played by water. Although several alternatives are getting into consideration, water is undoubtedly the most suitable as dyeing medium. So the quality of coloration is vastly dependent on quality of water. Throughout the time there have been lots of studies & works to evaluate & standardize dye house quality, however chronologically the water quality is degrading so alarmingly that dye houses are required to be more conscious about this. 'Right first time' dyeing hugely depended on the quality of water; quality of water is vast idea, the most important are the presence of metal ions (i.e. Hardness), alkalinity, turbidity etc. So before dyeing these parameters should be in control. This experimental work is to investigate the effect of Hardness in reactive dyeing, precisely the dyeing properties, build-up, strength & fastness etc. Hardness is generally referred to presence of calcium & magnesium in water. In this research dyeing with reactive dyes in different amount of hardness, artificially created in water, is done to investigate the dyeing behavior & other qualities which might be affected by Hardness. Dye-house water-hardness is defined as the presence of soluble calcium and magnesium salts in the water and is expressed as the $CaCO_3$ equivalent [1]. The presence of hardness in the water can cause dye precipitation, and the precipitates can further promote dye aggregations, which results in color specks and loss of depth [2].

The objectives of this study is as to investigate different aspects of increased hardness as change in wash off and fixation percentage Usually the dyeing with reactive dye is commenced in neutral solution in presence of electrolyte. Here electrolyte acts to promote the exhaustion of the dye. Electrolyte neutralizes the negative charge formed in the fiber surface & puts extra energy to increase absorption. During this period dye just only migrate into the fiber surface but do not react with the fiber. Usually the higher shade percentage is ensured by higher electrolyte percentage and higher temperature. In dye Fixation stage, by the reaction of the reactive group of the dye and the fiber, dye-fiber covalent bond is formed. And running the exhaustion stage for few minutes an appropriate alkali is added to increase its P^H (>10). The hydroxyl group of the cellulose is slightly acidic and due to the hydroxyl ion of the alkali, there causes some disassociation, forming cellulose ion.

$$Cell\text{-}OH + {}^-OH \longrightarrow Cell\text{-}O^- + H_2O$$
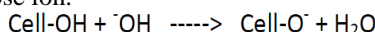
And this cellulosate ion performs fixation by two distinct ways- (a) Nucleophilic Substitution & (b) Nucleophilic Addition [3].
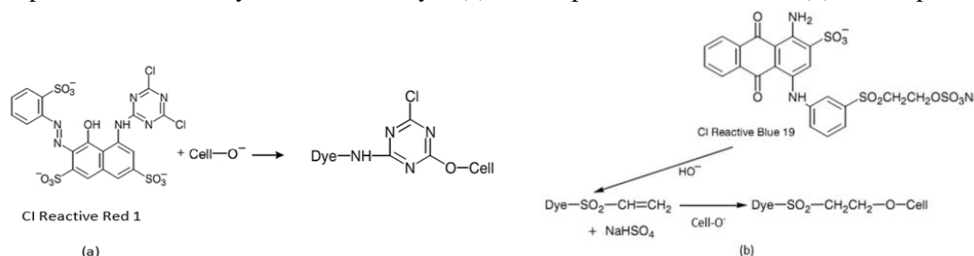
Fig: 1 Nucleophilic substitution (a) and addition reactions (b) of reactive dyes with cellulosate ion

Unfortunately under the alkaline condition, necessary for dyeing cellulose, some reactive dye hydrolyzed by the act of OH- of water as nucleophile. After dyeing unreacted and hydrolyzed dyes present in the cellulose must be removed by washing [4].

II. MATERIALS AND METHODS

A. Materials

By creating hardness artificially in water, investigations are done on dyeing. Following soluble salts has been used for this purpose- Calcium Chloride (CaCl$_2$), Magnesium Chloride (MgCl$_2$), Ferric chloride (FeCl$_3$). Following reactive dyes are chosen for this experiment

C.I. Reactive Blue-21. (Turquoise)
C.I. Reactive Red-120. (High-exhaust)
C.I. Reactive Yellow-84. (High-exhaust)

B. Water Hardness determination

The presence of calcium, magnesium and ferric salt in water is determined by the titration of sample water against a standardized solution (0.01M) of the di-sodium salt of Ethylene Di-amine Tetra Acetic acid (EDTA) solution [5].

C. Dyeing of fabric adding different hardness

Fabric is dyed adding different hardness in the dye bath in LABTEC dyeing machine following mentioned recipe on Table 1.1
Name of the machine: LABTEC Dyeing m/c
Bath: Glycerin bath
Maximum Temp: 150°C
Machine Type: Sample dyeing m/c

D. Dye liquor transmittance measurement by Minolta CM-2500D Spectrophotometer

Designed for versatility in various applications, the CM-2500d is a portable integrating sphere spectrophotometer incorporating Numerical Gloss Control. The CM-2500D is a high performance, low cost, portable spectrophotometer ideal for measuring the transmittance of dye liquor [6].

The Beer-Lambert law relates light absorption in a transparent material to concentration of colorant in the material and thickness of the material. The law is actually a combination of two separates laws- Beer's law relates absorbency of light by a colored solution to the absorbance of light by a colored solution to the thickness of the absorbing substance. This law is usually valid only when monochromic light is used. On the other hands, dye solution having high concentration or where dye is an aggregated state in the solution, Beer-Lambert law cannot be applied. That's why before applying this law in spectrophotometer; the solution has to be diluted around hundred times for the specific dyes to lower the concentration of the dye liquor [7].

E. Dyeing Procedure

The following sequence has been used in the dyeing of the fabric samples-
1. Bath set in room temperature.
2. Additional water, hard water, salt, sample fabric, dye solution added.
3. Temperature raised to 80°C at 2°C/sec.
4. Run the bath for 30 min.
5. Soda added at 80°C & then run for 1 hour.
6. Bath drop

Table 1.1: Recipe for dyeing with CaCl$_2$, MgCl$_2$ and FeCl$_3$

Recipe for dyeing with CaCl$_2$	Recipe for dyeing with MgCl$_2$	Recipe for dyeing with FeCl$_3$
Turquoise Blue G – 2% Salt – 45 g/l Soda – 15 g/l M: L – 1:8 Hard water-as per following amount Temp. & Time – Soda at 80°C (30 min) & Run for 1 hr. at 80°C	Sola HE Red 3B – 2% Salt – 65 g/l Soda – 25 g/l M: L – 1:8 Hard water-as per following amount Temp. & Time – Soda at 85°C (30 min) & Run for 1 hr. at 80°C	Sola Yellow 4RN – 2% Salt – 65 g/l Soda – 25 g/l M: L – 1:8 Hard water-as per following amount Temp. & Time – Soda at 85°C (30 min) & Run for 1 hr. at 80°C

F. After treatment

At first cold wash 1 and 2 were done in open bath without any reagent at room temperature on neutral condition for five minutes on a liquor ratio 1:5. Acid wash was done in open bath with green acid of 2g/l at room temperature for five minutes on same liquor ratio. Then hot wash in closed bath without any reagent at 70^0C for 5 minutes. Soap wash with standard soap of 2g/l at 90^0C for 5 minutes in closed bath. Then hot and soap wash again with previous condition.

III.   RESULTS OF FINDING

In all cases it has been observed that with the increase of hardness, total wash off % is increased. During dyeing, aggregated dye molecules deposited on fabric surface. As these dyes are not fixed with the fiber, in washing stage they are very easily washed off. That is why, higher water hardness shows higher wash off %.

With the increase of hardness, fixation % is gradually decreased. As the pick-up % were not very significantly with hardness, but wash off % increased, so total fixation is decreased with increase of hardness.

A. Effect of CaCl₂

Table 1.2: Fixation % and Total wash off % of Turquoise Blue G with hard water containing Calcium Chloride ($CaCl_2$)

Beaker No	Before Dyeing (Std.) %	After Dyeing %	1st Cold Wash-off %	2nd Cold Wash-off %	Acid Wash-off %	Hot (70°C) wash-off %	Soap (90°C) wash-off %	Final Hot (70°C) wash-off %	Final Cold wash-off %	Total wash off %	Pick up %	Fixation %
1	100	15.098	12.356	8.729	1.349	10.223	9.585	4.553	1.517	48.312	84.902	38.455
2	100	16.523	10.785	10.666	1.312	12.422	11.394	3.676	1.811	49.012	83.477	36.052
3	100	14.836	10.665	9.715	1.09	5.887	14.471	4.313	1.77	51.097	84.164	33.067
4	100	15.042	13.107	9.536	5.455	14.246	8.166	5.303	1.742	52.964	84.958	30.034
5	100	16.154	12.142	11.766	1.057	4.119	18.186	3.071	1.679	53.459	83.846	30.387
6	100	15.071	10.433	8.161	1.56	11.379	12.334	5.41	2.12	54.612	84.929	30.317
7	100	15.329	11.608	9.053	1.282	11.163	11.186	5.365	2.078	54.958	84.671	29.713
8	100	13.378	8.941	7.986	1.757	10.865	11.148	5.413	2.057	55.012	83.622	28.61

B. Effect of MgCl₂

Table 1.3: Fixation % and Total wash off % of Sola Yellow 4RN with hard water containing Magnesium Chloride ($MgCl_2$)

Beaker No.	Before Dyeing (Std.) %	After Dyeing %	1st Cold Wash-off %	2nd Cold Wash-off %	Acid Wash-off %	Hot (70°C) wash-off %	Soap (90°C) wash-off %	Final Hot (70°C) wash-off %	Final Cold wash-off %	Total wash off %	Pick up %	Fixation %
1	100	8.645	4.231	2.015	1.025	3.079	6.953	3.025	1.009	21.34	91.36	70.018
2	100	8.64	4.958	2.125	1.195	3.856	6.852	3.715	1.252	23.95	92.07	68.117
3	100	8.39	5.025	2.659	2.032	3.965	7.025	3.698	2.095	26.5	91.61	65.111
4	100	7.769	5.869	2.891	2.791	4.015	7.893	3.967	2.125	29.55	92.23	62.68
5	100	7.684	5.024	3.265	1.925	7.065	11.015	3.852	0.125	32.27	92.32	60.045
6	100	7.195	5.534	3.958	1.015	7.025	11.625	3.265	1.025	33.45	92.81	59.358

B. Effect of FeCl$_3$

Table 1.4: Fixation % and Total wash off % of Sola Yellow 4RN with hard water containing Ferric Chloride (FeCl$_3$)

Bea-ker No.	Before Dyeing (Std.) %	After Dyeing %	1st Cold Wash-off %	2nd Cold Wash-off %	Acid Wash-off %	Hot (70°C) wash-off %	Soap (90°C) wash-off %	Final Hot (70°C) wash-off %	Final Cold wash-off %	Total wash off %	Pick-up %	Fixation %
1	100	10.23	4.231	2.015	1.025	3.079	6.953	3.025	1.009	21.34	89.8	68.433
2	100	10.97	4.958	2.125	1.195	3.856	6.852	3.715	1.252	23.95	89	65.077
3	100	9.64	5.025	2.659	2.032	3.965	7.025	3.698	2.095	26.5	90.4	63.861
4	100	10.15	5.869	2.891	2.791	4.015	7.893	3.967	2.125	29.55	89.9	60.299
5	100	9.25	5.024	3.265	1.925	7.065	11.015	3.852	0.125	32.27	90.8	58.479
6	100	9.61	5.534	3.958	1.015	7.025	11.625	3.265	1.025	33.45	90.4	56.943

IV. CONCLUSION

The change of fixation and total wash off percentage of high exhaust and turquoise reactive dyes on cellulosic fiber under changing of presence of metal ion is presented in this paper. Fixation is gradually decreases while wash off gradually increases for any kinds of metallic salt present in water. It is important to use a sequestering agent or water softening agent that is compatible to chemicals and auxiliaries used in this dyeing also cost effective and available. It is the best way to utilize natural soft water which eliminates water softening processing costs as well as achieving the desired result.

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Tea (Camellia Sinensis) Breeding in Nigeria: Past and Present Status

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Abstract- The understanding of the genetic resource status of an economic and medicinal crop such as tea (*Camellia simensis*) is a very relevant prerequisite for its improvement and advancing its research attention. This review summarises the available information on tea breeding in Nigeria. Tea cultivation in Nigeria contributes significantly to the economic development of the tea growing communities especially women who are about 75% in the tea industry. The available information showed that 2045 tonnes, 2914 tonnes made tea were produced in 2006 and 2007 respectively. The major breeding achievement was the adaptability of three tea clones to the lowland regions in Nigeria, standardization of pluck quality, the grouping of tea clones into three distinct groups for further hybridization studies. Induction of callus from tea stem cuttings, shoot apices and flower buds were not left out. Germplasm collection, introduction, hybridization and introduction of biotechnology techniques become urgent steps for tea improvement in Nigeria.

Index Terms- Tea breading, hybridization, plant biotechnology

V. INTRODUCTION

Tea *(Camellia sinensis)* is one of the most popular beverages and an important revenue source for the tea producing countries in the world. Tea is an evergreen, perennial, cross pollinated plant and grow naturally as tall as 15m but 60-100cm under cultivation with life span of more than 100 years. It is widely cultivated in countries of Asia (India, China, Sri lanka, Japan, Vietnam and Indonesia) and Africa (Kenya, Nigeria, Uganda and Malawi). Tea is the most popular drinks in the world in terms of consumption. Its consumption equals all other manufactured drinks in the world including coffee, chocolate, soft drinks and alcohol put together.

The amount of tea valuable chemicals found in tea is over 700 and most of them that are germane to with human health are flavanoides, amino acids, vitamins (C, E and K), caffeine and polysaccharides Mondel *et al*., (2007). However, green tea has been known for its effectiveness on diseases such as high blood pressure and high blood sugar. The antioxidants present in the tea together with other health related properties help in boosting memory, lowering body weight and preventing stroke. Punch July 6, (2013). Tea is good for cell-mediated immune function of the body. The beneficial role of tea to intestinal microflora is well proven and it provides immunity against intestinal disorders. It protects cell membranes from oxidative damage. Tea is well known for it effectiveness in preventing dental caries due to the presence of fluorine. Tea also contains germicidal and germistatic properties against various gram-positive and gram negative human pathogenic bacteria. Both green and black tea infusions contain numerous of antioxidants, viz-avis catechins that have anti-carcinogenic, anti-mutagenic and anti-tumoric properties. Mondel *et al*., (2007). In 2010, researchers found that people who consumed tea had significantly less cognitive decline than non-tea drinkers. The study used data on more than 4,800 men and women aged 65 and older to examine change in cognitive function over time. Study participants were followed for up to 14 years for naturally-occurring cognitive decline. Alzhemer's association (2010). The three major cultivars of tea throughout the world that have contributed to tea genetic pool are: China [*Camellia sinensis* (L.) O. Kuntze], Assam [*Camellia assamica* (Masters)] and Cambod [*Camellia assamica* sp. *lasiocalyx* (Planch. MS)] (Wight, 1962). Phenotypic diversity in tea is significantly high. The variation in the morphological, physiological and biochemical characteristics of the crop can be explained by the out-crossing nature of tea breeding method. Clonal selection is a good and widely developed method of tea plant improvement as a result of wide variation in the existing seedling population. (Barua, 2008). In 2003, the world tea production was estimated as 3.21 million tonnes annually while in 2008 the production of tea increased to 4.73 million tonnes. China, India, Kenya and Sri Lanka are the largest tea producers in the world respectively (FAO 2010).

VI. TEA PRODUCTION IN NIGERIA

Tea *Camellia sinensis* (L.) O. Kuntze was introduced to Nigeria from Kenya in 1972 by Nigerian Beverage Production Company (NBPC). Ten years later tea breeding started with acquisition of 33 clones by Cocoa Research Institute of Nigeria from NBPC. Currently, tea is only growing in Mambilla plateau on an average of 950 ha. Efforts have so far been made to adapt tea to lowland areas of Nigeria viz-avis Ibadan (Oyo State), Ikom (Cross River Estate), Ikorodu (Lagos State) and Mayo-Selbe in (Taraba State) where clones 143, 318, 236 and 357 are promising. Generation of tea planting materials in-vitro through tissue culture was seriously explored. Information regarding the hybridization of tea is limited. However, vegetative means of propagating tea and selection pressure for high yielding clones have posed serious problem for genetic erosion which may lead to loss of valuable genetic traits. There is no information whatsoever, on the improvement of tea at DNA level in Nigerian tea germplasm. Therefore, there is urgent need for germplasm collection both local and world leading tea clones, hybridization and tea improvement at molecular level in Nigeria.

Tea is important in the national economies of some African countries such as Cameroon, Kenya, Malawi and Tanzania (Omolaja S.S. and Esan E.B. (2005). Conversely in Nigeria the production has not been sufficient to meet up the demand from processing companies in Nigeria. However, tea production can contribute immensely to food security and poverty alleviation in Nigeria if much attention is given to improvement.

Fig: 1 Map of Nigeria showed Mambilla plateau in Taraba state were tea is growing

Table 1: Trend of tea production between 2006 to 2008 among 3 tea leading producing countries and Nigeria in tonnes

Country	2006	2007	2008
China	1,047,345	1,183,002	1,257,384
India	9,280,000	949,220	805,180
Kenya	310,580	369,600	345,800
Nigeria	2,045	2,914	-

Table 2: List of the tea clones in the germplasm

Serial number	Clone number
1	357
2	25
3	138
4	368
5	353
6	143
7	14
8	238
9	359
10	33
11	108
12	370
13	19
14	74
15	363
16	369
17	228
18	354
19	35
20	367
21	68
22	236
23	237

Table 1 above showed the results of tea production in three consecutive years among four tea producing countries of the world. China was the highest tea producer in all the years considered followed by India. Kenya becomes the highest producer of tea in Africa. However, the amount of tea produced in Nigeria is of no significance in the International market but there are potentials for Nigeria to improve her productivities. Tea is only grown commercially on the top of Mambilla plateau covering less than 1% of Nigerian land mass. Figure 1 above shows the area were tea is currently produced in Nigeria.

VII. CLONES

Clones are genetically uniform and give uniform yield and quality. The drawbacks of mass vegetative multiplication are yield variability under stress conditions and relative proneness to pathogens, whereas seed populations which have high genetic variability are less prone to stress condition and of average quality (Bandyopadhyay and Das, 2008). However, reliance on a limited number of clones may lead to a loss of valuable genetic resources (diversity) and an increase in potential risks of natural hazards like pests and diseases. So, wide genetic variability is desirable because it provides a buffer against co-evolving factors of natural hazards like diseases, pests and changing environment (Barua, 1963; Wachira *et al.*, 1995). Investigation of genetic diversity of natural, old seedling tea populations in Nigeria is required to preserve these diverse populations as *in situ* conservation sites, prior to replace them with genetically more similar modern tea cultivars. Genetic variability with trait related molecular markers, genetic linkage maps with association mapping is urgently necessary to improve tea production in Nigeria.

VIII. BREEDING EFFORTS ON TEA IN NIGERIA

The scope of Cocoa Research Institute of Nigeria was expanded in 1975 by the Agricultural research Institutes establishment order No 107 under Agricultural research decree No 37 of 1973 to include tea with one of the objectives to improve the genetic potential, agronomic and husbandry practices including processes and storage of tea. However, adaptability of tea to the hotter and lowland ecologies of Nigeria begins as a result of inadequate of farm land on the plateau were tea is domiciled, competition among cattle grazing, tea farmers, industries and settlements. Table 3 below showed the adapted clones to the hotter and lowland ecology of Nigeria and their average yield in kg.

Table 3: Yield of adapted clones to the lowland area of Nigeria.

Clones	Yield/ha/yr(kg)
143	790.14
318	510.8
236	380.97
357	797.6

The available clones in the germplasm were evaluated under four different light/shade intensities and quality. No shade (100 % intensity) control, green plastic netting 85 % intensity, palm fronds 50 % and palm frond spread on green plastic netting 20%. Clones 318, 143 and 236 found suitable for lowland ecologies of Nigeria. Esan E.B.1984

In another studies to identify and to group clones under natural condition for hybridization, the following traits were observed, leaf size, shape, margin, colour and stem inter-nodes, flowering and fruit traits. The result led to 3 distinct groups vis-à-vis (1) Non flowering and Non fruiting clones these are clones (1) 14,25,35,74,108,143,318,353,357,359,363,367,368,369 and 370. (2) Regular flower and regular fruiting clones. These are 33, 68, 237,238 and 344. (3) This group is seasonally fruiting and seasonal flowering clones. Only 19 fall in this category. Esan E.B 1985. Rooting ability of tea is a great challenge to tea propagation especially in the nursery stage of tea production. However, the development of the appropriate technology for rooting selected clones was a great asset in commercial production of the crop. Two rooting promoting chemicals namely Beta –IBA at 100ppm, Boric acid at 40ppm as recommended by Esan E.B.(1984). The rooting promoting chemicals were evaluated in an improved humidity chamber at Onigambari, Ibadan. The results showed that more leaf flushes were observed in 6 weeks after treatment. In another related experiment, accession 318, 143 and OP236 were raised in the nursery under four different light/shade intensities and quality, 85%, 50%, 20% and control no shade (100% intensity) were used. The result showed that highest number of leaves was recorded for OP 236 (58) while 318 had the lease number of leaves (21). The highest number of branches recorded Op236 having 22.4 branches and clone 318 had the lease number of branches (11.3). The clone with longest shoot length (cm) and girth (cm) was 143 while the lease was 318, (Esan E.B. 1984). Omolaja and Esan (2005) in his studies titled Evaluation of High Altitude tea (*Camellia sinensis* (L) for adaptability of tea in lowland ecologies of Nigeria discovered that clone 143 showed the highest stability performance under ranging locations. He further stressed that since the contribution of the linear components in the genotype x environment interaction was significant. It suggested that the yield of tea clones studied in a given location is capable of being predicted with a reasonable level of accuracy. Therefore, clone 143 can be used in further breeding programmes. Esan E.B. (1989). In his efforts to characterize the clonal materials in Mambilla germplasm grouped the 29 clones into 6 distinct homogeneous classes. He discovered that the use of Principal Component Analysis (PCA) and Canonical Discriminant Function Analysis (CDA) were very effective for germplasm identification, conservation, hybrid indexing and information retrieval. Tea clones in the germplasm were characterized into eight groups using leaf traits. Esan E.B. 1990.

IX. TISSUE CULTURE IN TEA BREEDING

The newest non-conventional method of improving tea is through the application of plant tissue, cell and organ culture. Forest (1969) was the first to apply the technique to *in vitro* studies of tea. Having induced callus from tea stem cuttings, shoot apices and flower buds, he used this system to investigate biochemical processes of secondary natural products in the tea tissue. Recently, Esan E.B. (1989) reported for the first time the

direct induction of somatic embryo and natural size cotyledon regeneration *in vitro*. Host of other organs, structures and plantlets were also developed *in vitro.* Effective establishment of this technique will be helpful in *in vitro* hybridization and genetic manipulation on tea.

The quest to improvise for tissue culture substances locally in preparing nutrient media from pure natural components was promising. Trona and salt water were used as a substitute for the salt fraction in Skoog and Murashige which allowed for the germination of embryo axis and caused somatic embryogenesis. Esan. E.B. 1990

X. TEA GENETIC EROSION

Selection pressure imposed during early domestication of tea in Nigeria and modern breeding activities result in cultivated varieties, which carry only a fraction of the variation present in the gene pool. At any point in time, the level and distribution of genetic diversity in a crop species depends on three variables: (1) the biological characteristics of the species, including its reproductive system, ploidy level and other genetic characteristics, (2) the biotic and abiotic factors and (3) the human environment (Gepts, 2004). The existence of human environment sets apart crop evolution from natural evolution. The amount of variability in a crop also varies depending on the type of genetic resource dealing with, e.g., whether it is present from wild genetic stock or whether it is a selected material from a breeding programme. In another study by Oloyede *et al.,* (2004) it was noted that tea is predominantly planted through stem cuttings, this may further narrow down the genetic base of the crop because individual genotype is being replicated. Therefore, there is need for mass germplasm collection in all tea growing regions in Nigeria to enrich tea gene pool in Nigeria.

XI. FUTURE FACTORS FOR TEA IMPROVEMENT IN NIGERIA

To improve tea economic status in Nigeria, there is need for improvement in such important factors as pest and disease incidence, abiotic factors especially climate change and other factors influencing tea production directly and indirectly. There is need for mass germplasm collection in all local government areas of Taraba State where tea is currently growing to improve tea germplasm with the aim of broadening the genetic base of available germplasm at experimental stations. However, based on the efforts of previous scientist to improve tea (*Camellia sinensis),* there is need to be- up to-date with the recent trends in scientific investigations, so as to arrive at precise and overwhelming results. The role of biotechnology becomes important for meaningful progress to be achieved in this, since scientists have extensively explored morphological characterization. According to Adenuga *et al.*, (2012), it is sufficient to consider the use of further molecular markers to investigate tea germplasm and tea collection in Nigeria.

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The role of Metropolitan Iakovos in Albanian-Greek relations (1919-1921)

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Abstract- This paper examines the role that Greek Metropolitan Iakovos played in Albanian-Greek relations from the end of World War I to the establishment of a national Autocephalous Orthodox Albanian Church in 1922. As a result of the political and social structure that was in place during the Ottoman Empire, religion played a significant role in post-Ottoman politics. This was amplified in countries like Albania, where no national religious institutions existed. At the end of World War I, Greece used its influence towards the Patriarchate of Constantinople to increase its opportunity to annex the *terra irredenta* of Korçë and Gjirokastër, while Albania tried and managed to *nationalize* religious communities that existed in its territory. The mainly Orthodox, Albanian-speaking Area/Region/Diocese of Korça where religion became the outmost battlefield between Albania and Greece is the area of research for this paper. The way politics used religious communities on one hand, and the way religious communities used their influence towards politics on the other hand, constitute the core analyses of this paper. The theoretical approach of religion as a soft power in International Relations distinguishes two main levels of the religious communities, firstly its role as a *political* structure (bishops, priests) that can be influenced by state organization and secondly its *divine* authority, which constitutes its inner strength and can be used to influence the faithful population toward a national or social idea. As such, the paper focuses on Albanian-Greek diplomatic battle as well as on the religious battle between the Albanian-speaking Orthodox populations the Greek religious hierarchy. The results that are acquired from this paper can be used in other similar situations throughout the territories that once were part of the Ottoman Empire, as they have as their basic premise the *Millet System* based on which the Sultans governed their empire.

Index Terms- Diplomacy, Religion, Soft-power

I. INTRODUCTION

The Great Powers recognized Albanian sovereignty on July 1913, after Albania's independence on November, 28th 1912. Albania was the only nation with no national religious institutions, while Albanians were the only multi-religious ethnic group (Muslims 52%; Orthodox 20%; Bektashi 18%; Catholic 10%) in the Balkans. Korçë and Gjirokastër were claimed by Greece since 1913 as "Northern Epirus". Both areas were included in Albania in the Protocol of Florence. A number of Greek-speaking villages were located south of Gjirokastër. However, its vast majority as well as the entire population of Korça was Albanian-speaking, half-Orthodox. Greece claimed that every Orthodox Albanian was Greek, as being under the Ecumenical Patriarchate spiritual leadership, which since 1860s acted as a Greek foreign relations instrument. It unilaterally annexed those territories in 1915. However, the national schism between the pro-Entente Government of Eleutherios Venizelos and pro-Central Powers King resulted in Korça's and Gjirokastër's occupation by France and Italy respectively. The rest of Albania was controlled by Austro-Hungary. Since Great Powers' chosen Prince Wied left the country in 1914, Albania had no national authorities. Later Bishop Theophan Noli had established an Albanian Church in America, in an attempt to 'nationalize' every church in Albania. The people of Korça, a stronghold of Albanian nationalism, managed to convince French authorities to create a local administration, unofficially called the "Albanian Republic of Korça". Local councils, elected by the priests, ran churches and schools. They introduced Albanian in schools and Church liturgy; seriously undermining the Greek claim on Orthodox Albanians. Bishops were expelled during the war for their anti-Albanian stance, including the Metropolitan of Durrës Iakovos Ngigilias, a Greek from Asia Minor. On July 1919, Italy and Greece signed the Venizelos-Titoni Agreement, which set the mutual support of each-others claims towards Albania. France and Great Britain agreed to the Venizelos demands, disestablishing the "Republic of Korça" and executing its leader, Themistokli Gërmenji. Albania's borders were to be set in the Paris Peace Conference. On January 1920, an independent Albanian Government was created seeking the reestablishment of 1913 borders. Korça became the outmost battlefield between Albania and Greece and the Orthodox Church would play an important role to the developments.

II. REINSTATING GREEK INFLUENCE

On August 11th 1919, Venizelos asked the Ecumenical Patriarchate to send Iakovos as Exarch to Korça, instead of Ioakeim, who had been selected. (Kondis, 1995) The Patriarchate ordered Iakovos to go to Athens and get under Greek Government orders. He was to be sent to Korça along with the Greek occupation Army. Greek diplomat Kalevras was to be appointed governor "in order to cover the true role of the Greek Hierarch."[1]

Just a few kilometers before getting to Korça, they were informed that Greece would not advance. The French Colonel who ran the town had asked for a postponement, because of massive Albanian protests. Venizelos, being aware of the

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[1] This is accepted by Iakovos in his authorized biography: Stratigakis, 1956, p. 100.

Albanian national sensitivity in Korça, instructed his representatives to "explain [to the people] the high role that Albanians[2] in Greece have". He would accept Albanian schools and an extensive autonomy. (Kondis, 1995)

Kalevras was appointed General Governor of Epirus, while the army stepped back. The only one who entered Korça was Metropolitan Iakovos. His mission was political: to prepare the population for the Greek occupation. (Stratigakis, 1956) But the situation in Korça was tense, as Iakovos was informed: Albanians would forcefully react in case of a Greek intervention. His first achievement would be reinstating Greek language in Churches, just like during the Ottoman rule, which had been replaced by Albanian language since 1914. (Kondis, 1995)

The new French Commander of Korça, Colonel Cretin was instructed by his Government to cooperate with and back up Iakovos requests. The main focus of Iakovos was the opening of Greek schools for Orthodox Albanians. Those schools would create a propaganda tool, as well as extend the network of his collaborators.

In November 1919, Cretin allowed the opening of four Greek schools, a decision that according to him "immediately provoked an outright concern of the Albanian circles, which naturally, see this as a proof of a Greek propaganda." (Çami & Pollo, 1969)

Iakovos allowed a two-hour per week teaching of Albanian, considering this to be enough, since "everyone knew the language". The rest of the teaching was done in Greek, a language not spoken by the population. He managed to open more than 21 schools, extending his network to tens of teachers and hundreds of pupils, who under the French rule had limited options. (Kondis, 1995)

The reaction towards his propaganda made Iakovos afraid, asking Cretin for more guards assigned to protect him. Cretin reported that "his role has made people see him as an agent of Greek propaganda" and this would not happen if Iakovos "would keep the balanced stance he is supposed to".

Cretin felt Iakovos was an obstacle even to Greece's goal. He reported that his presence could be justified at first as "a mission of peace... to secure the population of Greek Government's good will". However, two months later, in December, his exaggerated requests and attitude became "a serious obstacle to the implementation of the Grecophile policy, which I am implementing, according to your instruction".

According to Cretin, "there is no question that the masses would react by force to the entrance of the Greeks", while the "Grecophiles, although too little in number, are still moving... with their main tool the opening of Greek schools, whose creation is allegedly for humanitarian purposes, but in reality for political ones." (Çami & Pollo, 1969)

III. KAPSHTICA PROTOCOL

The occupation was not eminent, as the vast majority of the Greek Army was in Thrace and Asia Minor. The VIII Army Division was located in Epirus. This was a medium unit that lacked equipment and soldiers. On March 7, 1920 the division reported that it would not be able to react in case of an Albanian

rebellion, because of the movements towards Thrace. Therefore, it asked for soldiers and equipment and later on an order to occupy Korça. (Kondis, 1995)

Because of lack of personnel, the Greek Government ordered to replace the soldiers of the division with "Albanians[3] in order to create a positive reaction of the population". But, a massive movement was impossible and the plan was abandoned. (Kondis, 1995)

Therefore, Greece was bluffing. On one hand, Greece was declaring that the Greek army would replace the French as international troops, discouraging Albanians. On the other hand, it was asking France to postpone its disengagement. After two delays on Greece's request, at the end of May France decided to withdraw.

On May 21st, Iakovos was informed of this decision and declared to Cretin that Greece would respect the population, as well as Albanian schools. Cretin asked him to keep quiet, in order to avoid panic. On the contrary, the Metropolitan spread the word; a maneuver to discourage Albanians, while reinstating that the Greek troops would stay as international troops, until the Peace Conference decisions were made. Greece, through Iakovos was relying on those arguments in order to achieve occupation without rebellion. The elected representatives of the town: Mayor Koço Kotta and Council Chairman, Jorgji Raci, both Orthodox, asked Cretin to expel Iakovos. They also decided to unite Korça with the Albanian Government of Tirana and started to prepare for war. (Duka, 2007)

On 22 May, Venizelos ordered a division from Asia Minor to be sent to Korça, arguing that "we endanger to lose [it] forever". But the army could not arrive in such a short notice. According to Iliakis, the Governor of Kozani, who acted as liaison to Iakovos, if France would have agreed on delaying its disengagement for a single day as asked, Greece would have been able to occupy Korça. (Kondis, 1995)

Venizelos justified that Greece did not intervene because "the English advised [so] fearing an Albanian reaction". But, the real cause was that "no thought for occupation of Northern Epirus could be at this moment, because of our lack from the occupation of Eastern Thrace". (Kondis, 1995)

Strategically, Venizelos had to defeat the Turkish troops, before Turkey would rise from Ottoman Empire's ashes. Albania could be easily won in a future war. Consequently, he had to accept the will of Korça's population to unite with Albania. However, in order to achieve its goal, Greece needed to keep Iakovos' network of information, as well as the 'Greekness' of schools and churches. Furthermore, by not contacting the Albanians, Greek military absence in the region would become obvious, creating a bad momentum for Iakovos and his entourage.

Therefore, a day after Korça was reunited, Venizelos instructed Iakovos for an unexpected move: "to take over to Albanians to convince us not to continue with the occupation of Korça, waiting for the Conference, with the condition to respect our institutions and people in Korça". (Kondis, 1995)

The people were convinced that the Greek occupation was a matter of time. Therefore, they were preparing for war. Raci and Kotta had handed Korça over to Government representatives: Eshref Frashëri and Pandeli Cale. Nikollaq Zoi was appointed

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[2] Albanians of Attica, Beoeotia, Eubeoa, Peloponesus and the islands, who later would be called Arvanites.

[3] See note 3

prefect. Iakovos met with them and reassured that the occupation was eminent. Nevertheless, since he did not want bloodshed, he offered to use his influence to the Greek troops so they would not advance. The Delegation, being certain that Korça would be occupied, agreed. (Stratigakis, 1956)

Iakovos told them to meet the Head of the Occupying Army, Trikoupis, who referred them to Governor Iliakis. Iliakis reaffirmed that the decision was definitive, but for Metropolitan's sake he would discuss it with Venizelos. The theatrical act resulted in Venizelos answer "to halt the occupation" and achieve an agreement, which took the Delegation by surprise. (Kondis, 1995)

The next day, the agreement, branded as Kapshtica Protocol, was signed based on the draft written by Metropolitan Iakovos. It sanctioned that the Greek Army would halt and Korça would be united with Albania, until the Conference's decision. Albania would respect the Greeks of Korça and schools and churches would continue to be in Greek. Some villages east of the town would remain under the Greek occupation.

The Protocol was important for Greece. For the first and only time, Albania recognized that a Greek population existed in the entirely Albanian-speaking Korça. Greece used this agreement as a "strong diplomatic title" that Orthodox Albanians of Korça were actually Greek. This was an enormous success, especially, as it was an outcome of a bluff.

On the other hand, it also gave Albania a political momentum. It ended a problem in the Southeast, allowing the government to focus on the Italian-occupied Southwest Vlora region.

There were two developments that made the Protocol void. First, within a year, Greece faced the biggest modern history military disaster by Turkey. Second, Italy denounced the Venizelos-Titoni Treaty. The fact that the Protocol allowed Albanians to win the war in Vlora was a major cause for the denunciation.[4]

IV. IAKOVOS ROLE IN KORÇA

Iakovos' role was limited only on those matters sanctioned by Kapshtica Protocol; along with the power acquired from his network of information. This network was composed of Greek schools' teachers and a minority of priests. The information gathered was sent to Athens, in a diplomatic narrative. Every document was made in two copies; one copy was sent to the receiver, and the other to the Greek Ministry of Foreign Affairs.[5]

If persons of interest for Greece were in Korça, Iakovos' network would follow and monitor them, as he reported during a visit of a Turkish colonel in the town. Moreover, he acted as a Greek official in front of Albanian high authorities. (Kondis, 1995)

In November 1920, Venizelos lost during the General Elections, and left Greece. A new government was created, promising a disengagement from Asia Minor and restitution of Monarchy. As a result the majority of the pre-1913 Greece, including Albanians, as well as the majority of the minority votes in the New Lands was casted for the Demetrios Gounaris' led "United Opposition". Iakovos did not lose just his political mentor, but Gounaris' winning created a patriotic movement on countries, under Greek threat. (Stratigakis, 1956)

On March 1921, Albania was set to organize its first elections. Iakovos asked the new government, whether he should act. "If the participation of our men ... will harm the international opinion on the issue of Korça and Northern Epirus, then a boycott should be organized" – he proposed. (Kondis, 1995) The Greek Government asked Albania to halt the elections, implying that Korça and Gjirokastër were not recognized as part of its territory. Albania did not accept this proposal, based on the Protocol of Florence. Greece instructed a boycott, while rumors that elections would be a *casus belli* and that the Greek Armed Forces were on the border were spreading throughout Albania. (S.M.T., 1921)

It resulted in unexpected win for the Greek policy. On 13 February 1920, a group of Korça Orthodox Albanian nationalist elite signed a memorandum asking the Albanian Government for a separate administration of the South, with a Christian Governor, a Parliament and a Gendarmerie made of 2/3 Christians, fiscal autonomy and military neutrality. (Zoi, 13/2/1921)

The fact that this memorandum was organized by an Orthodox Albanian nationalist group came as a surprise to the Government of Tirana and Athens. Their argument was that the Greek claim that "a Muslim government" was discriminating a Christian population would be void. Being an Albanian nationalist memorandum, signed by Orthodox Albanians, it would make those who professed obedience to Iakovos act as Albanians in opposition and not as Greek agents. Finally, when the Peace Conference would reinstate the Protocol of Florence, these arrangements could easily be overturned. The Metropolis instructed its followers to sign the memorandum. (Zoi, 16/2/1921) Unable to a military intervention, its implementation would be a good scenario for Greece; a fact that Albanian nationalist were unaware of.

Albanian Government refused the memorandum, arguing that it should be discussed in the Parliament, (Ministry of Interior, 17/2/1921) while every town in the South organized protests against it.[6] In Korça influential Orthodox Albanians opposed the memorandum. (Ministry of Interior, 5/3/1921) Prefect Zoi tried to divide the organizers, through the influence of their fellow Albanian nationalist Bishop Noli. (Zoi, 25/3/1921)

Elections were held on March 5th. Many Orthodox in the town boycotted, while the memorandum had no impact in the villages, where everyone voted. (Turtulli, 1921) As a result, Orthodox Albanian nationalists managed to get elected in the parliament. (Dervishi, 2006)

The situation triggered an investigation. Korça Police Director, Nik Dishnica reported on April that Iakovos was acting against the Albanian interests and that he had advised his followers for a boycott, enforcing the memorandum. Furthermore, Greece was informed on every development because of Iakovos "network of spies". Finally, he proposed the expulsion of the Metropolitan from Albania. (Dishnica, 1921)

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[4] The denunciation was firstly reported on June 1920. Kondis, 1995, p. 255.

[5] Those documets are in folder B/35, year 1925 in the Greek Ministry of Foreign Affairs and are partly published in: Glavinas, 1986

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[6] The protests are archived on folder 45 of the Collection "Ministry of Interior" in Albanian Central Archives.

Although he had a second-hand role in the memorandum issue, Iakovos "managed to create a division in the Albanian movement, creating a shadow between Christian and Muslim Albanians"; divide and conquer. (Stratigakis, 1956)

V. FALL AND EXPULSION

Korça, which had been the frontrunner of Albanian-language Church, had become one of the last Albanian regions were liturgy was held in Greek. Those who unwillingly helped Iakovos through the memorandum, along with the rest of Orthodox elite on April 24th did the opposite. They asked the Government to allow Albanian in liturgy, threatening that "either peacefully and prudently or unwillingly and in a blur, the desire of Albanian Christians, to mass those saint days of Easter" in Albanian would be fulfilled.

The Government decided to maintain the status quo: the Prefect ordered the population to keep calm, but the military structure upraised. Under the lead of the Third Company Commander, Spiro Kosova, Orthodox Albanian soldiers forcibly took the keys of Saint George Church and invited Bishop Noli's aides, Fathers Vasil Marku and Vangjel Çamçe to hold the Great Thursday Liturgy in Albanian. (Verli, 2008)

Prefect Zoi sent police officers to stop the people from entering the church and called the Interior Ministry. As Zoi was on the phone, Nik Dishnica forces could not stop the population; while a clash with the Army, was out of the question. (Zoi, 28/4/1921) Consequently, thousands of Christian Albanians took part in the liturgy, a year after Albanian was banned from the Church. Metropolitan Iakovos massed in another Church, with a few of his followers.

The Government ordered the army to halt its actions and turn the Church to the Metropolis. On April, 30th, Zoi expressed Iakovos "his regret for non-preventing the coup d'état", ensuring that after Easter the Church would be turned over. (Kondis, 1995)

This situation was presented exaggerated in Athens. False reports of casualties and uncertainty of Iakovos fate alarmed the Greek Government, which immediately closed the borders with Albania. On May, 6th Governor Iliakis gave an ultimatum to Zoi. If the Church would not turn to the Metropolis, Greece was "ready with every force, to do what the [Albanian] government could not do in order to protect [Greek] national dignity." Greece was outraged by the fact that orthodox officers initiated the uprising. Therefore, it requested Orthodox Albanian's exclusion from the army, as long as there was no decision by the Peace Conference. Iliakis told Zoi (an Orthodox Albanian) that Churches kept the Greek nation alive and religious concessions to Albania were not possible. (Kondis, 1995)

Saint George Church was becoming *casus belli* for Greece, based on Kapshtica Protocol, as Tirana feared. Immediately, Albania replied that the religious status quo would be maintained "until relations of Albanian Orthodox and the Patriarchate would be set", while the call of Orthodox Albanians in the army was an internal issue. (Ministry of Interior, 6/5/1921)

Moreover, officers and local personalities gathered the next day to prepare for war. "Albanians are pitiful; divided they are insulting each-other" – reported Iakovos to Greek Ministry of Foreign Affairs, regarding some requests to turn the Church back, in order to avoid war. (Kondis, 1995)

A Governmental appeal was displayed in Korça on May 14th. It declared that Albania "has no intention to strike any of its neighbors, on the contrary it desires total friendship. Besides hope, in case that any of our neighbor passes our borders, in order to defend our Fatherland, together with the People, we will fulfill our duty. We request calm and cold blood." (Ministry of Interior, 14/5/1921)

Local authorities were stuck between two fires: if they turned the Church back, they would provoke a popular uprising, as it would be treated as treason. If they let the Church to mass in Albanian, it could provoke war. Therefore, Zoi kept the keys and the Church was closed. Meanwhile, the vast majority of Orthodox Korça inhabitants, more than 7000 people signed a protest asking for "the right of preaching of Orthodox faith in our Churches in our language."[7]

However, the Greek threat became insignificant in a few weeks. Gounaris' Government had reinstalled pro-Central Powers King, creating a friction with the Allies. Furthermore, Greece started its biggest offensive in Turkey on August 1921, shifting its army and attention far away. This time, Greek absence in the Albanian borders was obvious. Therefore, the Church's keys were handed to the people on August 22nd. (Zoi, 22/8/1921)

Greek inactivity made obvious that military action was out of question, because of its involvement in Asia Minor. Iakovos felt threatened in Korça. The last months he was isolated in the Metropolis and was constantly guarded, as his action had provoked irritation among the population.

Albanian authorities sequestrated a number of letters that proved that he acted as a Consul, resulting in the termination of his secret communication with Greece. (Zoi, 21/8/1921) The schools, his last stronghold, gathered an insignificant number of registrations, since Albanian State schools were opened and the fear of occupation was missing. (Stratigakis, 1956)

The three newspapers in Korça had voiced requests for Iakovos expulsion. Since September Orthodox Communities of the town and villages officially requested his expulsion. (Zoi, 10/9/1921) The local authorities, proposed this action to take effect as soon as possible. On November 9th 1921, the Peace Conference had decided to reinstate the Protocol of Florence, acknowledging Korça as Albanian territory. This triggered the final governmental decision ten days later. It underlined that under Ottoman law, still in force in Albania, the metropolitan should be a local citizen, a capacity which Iakovos lacked. Furthermore, his action against the national interest and the internal peace forced the Government to expel him. (Ministry of Interior, 19/11/1921) He was driven through Vlora and Corfu to Greece. (Council of Ministers, 19/11/1921)

For his contribution, Iakovos was awarded the Greek Military Cross of the First Order, becoming one of the few prelates to have military decorations. (Stratigakis, 1956)

The priests in Korça elected a new council, made of well-known patriotic figures. Its first decision was to sanction Albanian as the sole language in the Metropolis. (Posta e Korçës, 1921) A few months later, a Cleric-Laic Assembly decided to declare the Church of Albania Autocephalous, under the leadership of Albanian clerics and with Albanian as the language of worship.

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[7] The original protest, including the signatues, is located in the Albanian Archives: Ministry of Interior, 16/5/1921.

As an irony to the idea that Iakovos was fighting a "Muslim" state, the borders' decision that triggered his expulsion resulted from the diplomatic surge of Bishop Theophan Noli. His expulsion was decided by Prime Minister Pandeli Evangjeli, on proposal of Prefect Zoi and implemented by Police Director Dishnica, all of them Orthodox from Korça.

VI. CONCLUSION

Greece used its influence to the Ecumenical Patriarchate to send Metropolitan Iakovos in Korça, in order to act as its political representative. Iakovos managed to reinstate Greek in Church and schools, as well as to create a network of information, acting as an intelligence agency and consulate of Greece. Moreover, through preaching, he tried to prepare the terrain for Greek occupation. Greece could not occupy Korça due to the large military presence in Thrace and Asia Minor, an unknown fact to Albanians. Therefore, Venizelos, through Iakovos, managed to achieve the signing of Kapshtica Protocol, which recognized the existence of Greeks in the entirely Albanian-speaking Korça area, as well as the exclusive use of Greek in liturgy and schools until the final border decision. Through his role as the presumable spiritual head of the majority of Korça's population, Iakovos managed to create a climate of distrust; a role that was manifested in the Orthodox Albanians' Memorandum. The distrust resulted in an ecclesiastical uprising, where the population and Orthodox soldiers managed to hold an Albanian liturgy. Greece treated this act as *casus belli*. As its enormous military presence in Asia Minor became obvious, another military front was improbable for Greece. Consequently, the church was allowed to preach in Albanian and Iakovos was isolated. As the Albanian borders were set, Iakovos was expelled and local ecclesiastical authorities reintroduced Albanian. Albania was the only nation in the Balkans with no national religion or religious institutions. The *political structure* of those institutions (Metropolitan Iakovos and his entourage) were used as a political tool by a foreign country, while through its *moral authority* the Church hierarchy tried to create a climate that upheld the Greek demands. This resulted in a diplomatic battle, creating confrontations and agreements, as well as a religious battle between the Greek hierarchy and Albanian population and priests, as an indirect consequence of the Ottoman Empire's *Millet System*.

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Diagnosis and management of three rooted permanent mandibular molar: An Endodontic challenge

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Abstract- Variations in root and root canal is always a challenge and failure to recognize these variations can result in unsuccessful endodontic treatment. Mandibular molars can sometimes present a variation called radix entomolaris, wherein the tooth has an extra root attached to its lingual aspect. This additional root may complicate the endodontic management of the tooth if it is misdiagnosed or maltreated. The case reports in the present article focus on the radiographic identification and endodontic management of Radix Entomolaris in permanent mandibular first molars.

Index Terms- Anatomical Variations, Endodontic Treatment, Mandibular Molar, Radix Entomolaris

I. INTRODUCTION

A thorough knowledge of root canal anatomy is required for achieving high level of success in endodontic treatment. Failure to recognize variations in root canal anatomy may result in unsuccessful endodontic treatment. Hence, it is of utmost importance that the clinician must be familiar with all the possible variations. The permanent mandibular first molars are usually two-rooted with a mesial and a distal root [1]. The major variant in this tooth type is the presence of an additional third root, a supernumerary root found lingually (referred as distolingual root). This macrostructure, which was first mentioned in the literature by Carabelli [2], is called Radix Entomolaris (RE) [3]. Bolk reported the occurrence of a buccally located additional root: the Radix Paramolaris (RP) [4]. This macrostructure is rare and occurs less frequently than the Radix Entomolaris [5].

The prevalence of these three-rooted mandibular first molars appears to be less than 3% in African populations, not to exceed 4.2% in Caucasians, to be less than 5% in Eurasian and Asian populations, and to be higher than 5% (even up to 40%) in populations with Mongolian traits [4] and 5.97% in Indian population [6].

Achieving success and predictability in endodontics necessitates the proper identification and management of these not so common structures as failure to identify such variations will certainly increase the chances of failure.

In the present case reports, clinical approach to diagnosis and endodontic treatment of Radix Entomolaris are presented.

II. CASE REPORT 1

A 42-year-old male patient reported with a chief complaint of pain in his lower left back tooth region since two weeks. Patient gave a history of previous restoration done in the lower left

second premolar, first molar and second molar. Medical history of the patient was noncontributory. On examination, the left mandibular second premolar and first molar were found to be restored with temporary restoration with tenderness on percussion in both the teeth. Electric pulp testing revealed aggravated response when compared with control teeth. Diagnostic radiograph of mandibular second premolar and first molar revealed radiopaque restoration in close proximity to pulp and widening of the periodontal ligament space (Fig 1a). Further soft and hard tissue examination revealed no other abnormality.

Close inspection of the radiograph also revealed the presence of an additional periodontal ligament space crossing the distal root leading to an impression of double periodontal ligament space on the distal aspect of mandibular first molar. This led to the suspicion of additional or extra root entity. Two radiographs with different horizontal angulations were made which confirmed that the additional root was present distolingual to the mesial root in mandibular first molar. Based on the literature evidence this supernumerary distolingual root was diagnosed as Radix Entomolaris. A diagnosis of chronic irreversible pulpitis with apical periodontitis [7] was made for both left mandibular second premolar and first molar and endodontic treatment was planned.

The teeth were anaesthetized with local anaesthesia (Lidocaine HCL Injection BP, Zymeth Wellness, Ahmedabad, Gujarat, India) and then isolated under rubber dam (Hygenic Rubber Dam Kit, Pearson Dental Supplies). The restoration was removed with round bur (Round Long Diamond Bur 801L, Jota rotary instruments, Switzerland) and access cavity was refined using an Endo Z bur (DENTSPLY Maillefer, Birmingham). A single canal orifice was located in case of premolar .One distal and two mesial canal orifices were located using an endodontic explorer (DG16 D/E Endodontic Explorer, Pin Tech Instruments, Pakistan) in left mandibular molar but upon close inspection a dark line was observed between the distal canal orifice and the distolingual corner of the pulp chamber floor. At this location overlying dentin was removed and a second distal canal orifice was located. Working length was determined using an apex locator with file no. # 15 in each canal (J.Morita Root ZX II, Scott's Dental Supply, WA) and was verified using radiographic method (Fig. 1b).

Biomechanical preparation was performed using hand protaper instruments (Dentsply Maillefer, Birmingham) upto file F2 in all the four canals of first molar and single canal of second premolar as per manufacturer's recommendation. Irrigation between each instrument was done using 2.5% sodium hypochlorite (NaOCl, Cole-Parmer, Mumbai, India). The master cone x-ray was taken using F2 protaper gutta percha points (Dentsply Maillefer, Birmingham) (Fig. 1c). The canals were obturated with F2 protaper gutta-percha and AH plus sealer (De

Trey Dentsply,Konstanz, Germany) by a lateral compaction method. Post obturation restoration was done and a post-obturation radiograph was taken (Fig. 1d). Patient was recalled after a month for follow up examination and was found to be asymptomatic.
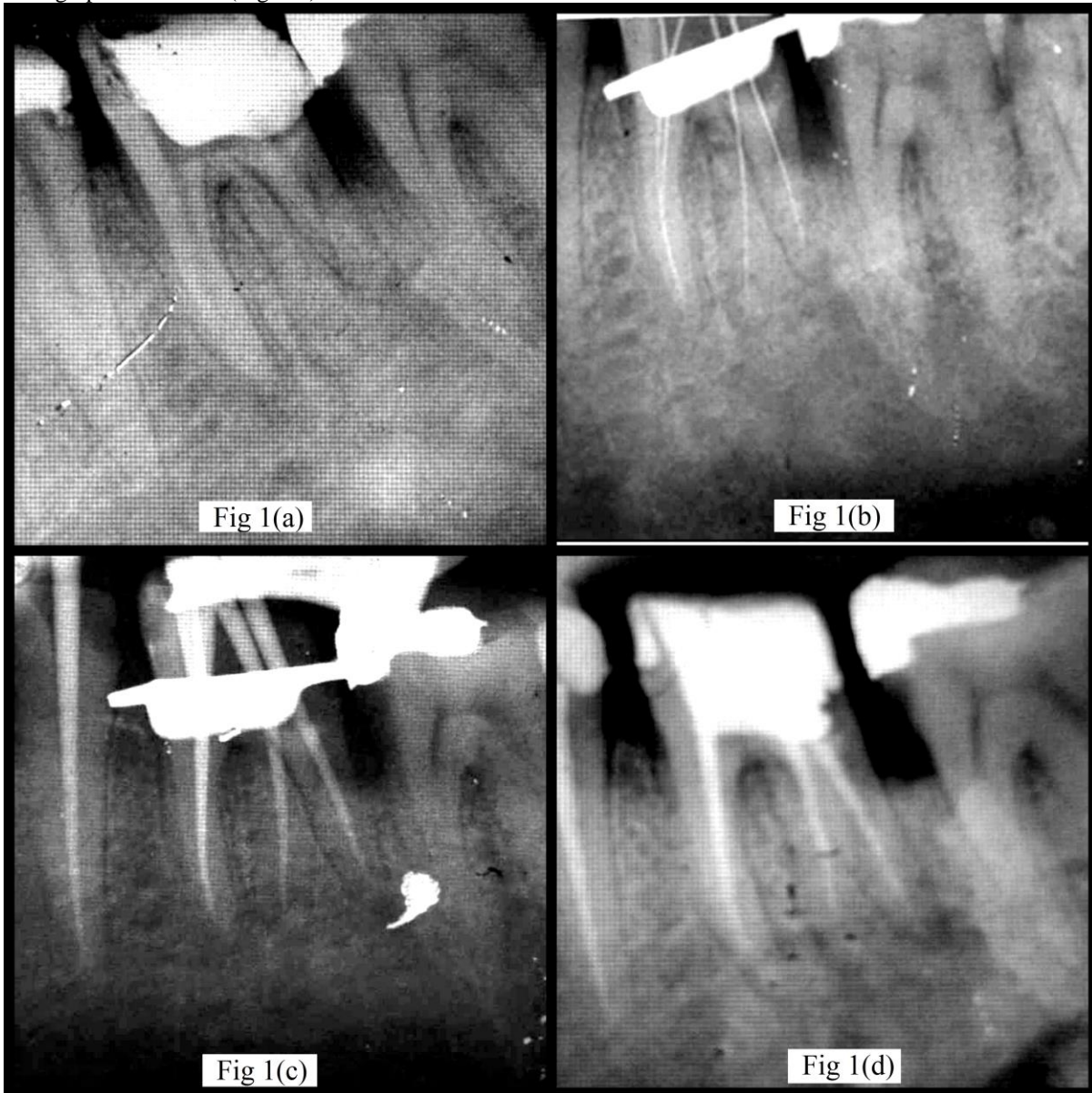
Fig 1 (a): Pre-operative radiograph. Fig 1 (b): Working length determination. Fig 1 (c): Master cone IOPA
Fig 1 (d): Post-obturation radiograph.

III. CASE REPORT 2

A 15-year-old male patient reported with a chief complaint of pain in his lower left back tooth region since one week. Patient gave a history of previous dental intervention wherein a restoration was done in the lower left first molar. Pre-operative radiograph of mandibular first molar revealed a radiopaque restoration in close proximity to the pulp with a faint outline of an additional root present between the mesial and distal roots (Fig. 2a). A radiograph with mesial shift confirmed that the additional root was present distolingual to the mesial root in lower left first molar. This supernumerary distolingual root was diagnosed as Radix Entomolaris. Clinical examination showed

restoration in lower left first molar with tenderness on percussion in lower left first molar and electric pulp testing revealed aggravated response in respect to left mandibular first molar when compared to control teeth. Further soft and hard tissue examination revealed no other abnormality. A diagnosis of chronic irreversible pulpitis with apical periodontitis [7] was made for lower left first molar.

The tooth was anaesthetised (Lidocaine HCL Injection BP, Zymeth Wellness, Ahmedabad, Gujarat, India) and isolated under rubber dam (Hygienic Rubber Dam Kit, Pearson Dental Suppliers). The restoration was removed with round bur (Round Long Diamond Bur 801L, jota rotary instruments, Switzerland) and access cavity was refined using an Endo Z bur (DENTSPLY Maillefer, Birmingham). The first distal canal was found slightly

away from the centre (buccally), and thus indicating that the other canal would be on the lingual side. The access cavity preparation was modified from a triangular shape to a trapezoidal form and the fourth canal was located. The root canals were located with an endodontic explorer (DG16 D/E Endodontic Explorer, Pin Tech Instruments, Pakistan) and patency of canals was established with K-file ISO#15. Working length was determined using apex locator with file no.# 15 in each canal (J.Morita Root ZX II, Scott's Dental Supply, WA) and was verified radiographically (Fig. 2b).

Biomechanical preparation was done with hand ProTaper instruments (Dentsply Maillefer) upto file F2 in all the four canals of first molar as per manufacturer's recommendation. Irrigation between each instrument was done using 2.5% sodium hypochlorite (NaOCl, Cole-Parmer, Mumbai, India) and normal saline. The master cone IOPA was taken using F2 protaper gutta percha points (Dentsply Maillefer, Birmingham) (Fig. 2c). The canals were obturated using F2 protaper gutta-percha points and AH plus sealer (De Trey Dentsply,Konstanz, Germany) by a lateral compaction method. Post obturation restoration was done and a post-obturation radiograph was taken (Fig. 2d). Patient was recalled after one month for follow up examination and was found to be asymptomatic.
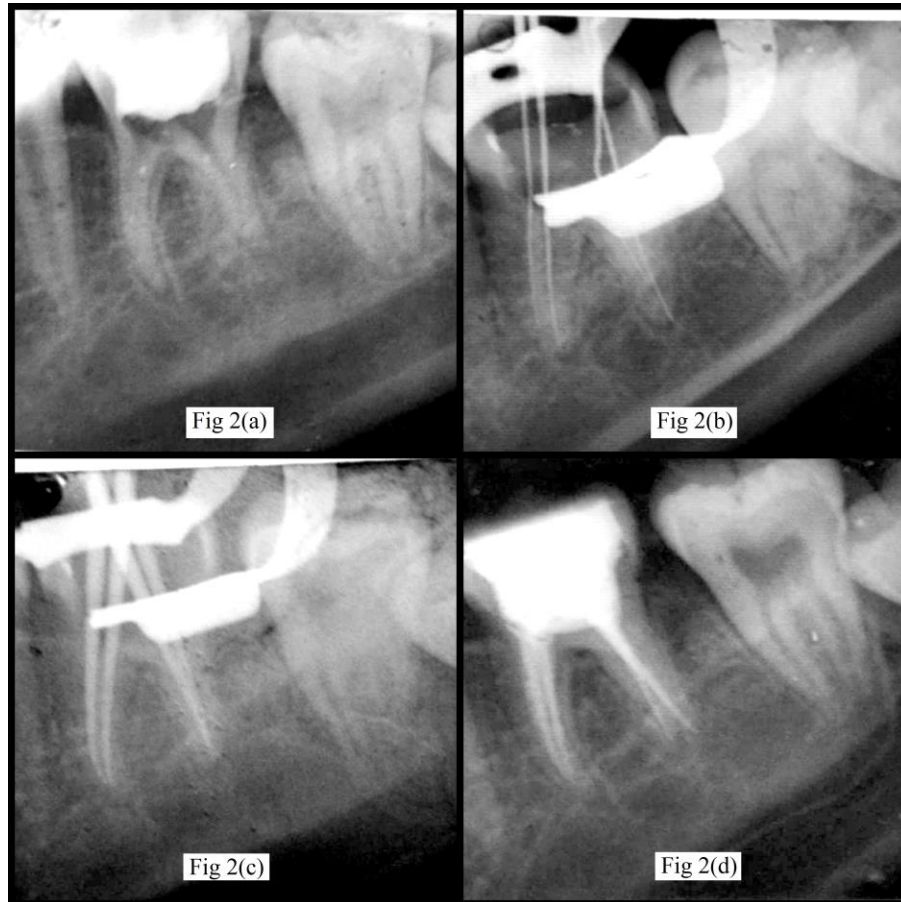
Fig 1 (a): Pre-operative radiograph. Fig 1 (b): Working length determination. Fig 1 (c): Master cone IOPA
Fig 1 (d): Post-obturation radiograph.

IV. DISCUSSION

Root canal treatment should result in a thorough mechanical and chemical debridement of the entire pulp chamber and root canal, followed by complete obturation with a three dimensional seal. Radix Entomolaris poses a great endodontic challenge and inability to diagnose it can result in treatment failure. Dentists should be familiar with morphological variations to avoid missed canals. The presence of an additional distolingual root in the cases described above was detected in the preoperative radiograph itself. This signifies the importance of preoperative radiograph in the endodontic treatment [8,9]. To reveal the Radix Entomolaris, a second radiograph should be taken from a more mesial or distal angle (30 degrees) [5]. In the cases described, all the radiographs taken during the root canal procedure were clearly suggestive of Radix Entomolaris and did not warrant the need for further investigations like cone-beam computed tomography and 3-dimensional reconstruction [10].

Clinically, the possibilities of detecting and managing Radix Entomolaris can be enhanced by obtaining straight line access and modifying typical triangular shape of access preparation to a trapezoidal form. Visual aids such as a loupes, intra-oral camera or dental microscope can, in this respect, be useful. A dark line on the pulp chamber floor can indicate the precise location of the RE canal orifice. The distal and lingual pulp chamber wall can be explored with an angled probe to reveal the overlying dentin or pulp roof remnants masking the root canal entrance. However, to

avoid perforation or stripping in the coronal third of a severe curved root, care should be taken not to remove an excessive amount of dentin on the lingual side of the cavity and orifice of the RE. Thus, a good knowledge of law of symmetry and law of orifices, various methods like, visualizing the dentinal map and canal bleeding points, using DG-16 explorer, micro-opener, troughing of the grooves with ultrasonic tips, staining the chamber floor with 1% methylene blue dye, champagne bubble test and micro computed tomography will be useful to locate the canals [11] .

A classification by Carlsen and Alexandersen [12] describes four different types of RE according to the location of the cervical part of the RE: types A, B, C and AC. Types A and B refer to a distally located cervical part of the RE with two normal and one normal distal root components, respectively. Type C refers to a mesially located cervical part, while type AC refers to a central location, between the distal and mesial root components. This classification allows for the identification of separate and nonseparate RE. In the apical two thirds of the RE, a moderate to severe mesially or distally orientated inclination can be present. In addition to this inclination, the root can be straight or curved to the lingual.

According to the classification of De Moor et al [4], based on the curvature of the separate RE variants in bucco-lingual orientation, three types can be identified. Type I refers to a straight root/root canal, while type II refers to an initially curved entrance which continues as a straight root/root canal. Type III refers to an initial curve in the coronal third of the root canal and a second curve beginning in the middle and continuing to the apical third.

Other clinical difficulties envisaged with Radix Entomolaris would relate to extraction and orthodontic procedures, where the extra root would render extraction difficult with possible fracture of the distolingual root, because of its curvature and movement difficulty [13].

V. CONCLUSION

Clinicians should be aware of the unusual root morphologies in the mandibular molars. The initial diagnosis of Radix Entomolaris is important to facilitate successful endodontic treatment.

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A Study on factors influencing consumer buying behavior in cosmetic Products

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Abstract- The purpose of this study is to investigate internal and external influences on consumers purchasing decisions on cosmetic products in Tamilnadu and Kerala. The questionnaires were given to 500 consumers who are all using cosmetics. Out of 500 consumers contacted, 412 questionnaires were received with required coverage and details. The instruments of this study involved two parts: the first section of the instrument consisted of forced-choice questions about demographic characteristics: gender, marital status, age, occupation, monthly income level. The second section variables chosen for this study in order to measure the influence of consumer buying behaviour in cosmetics products. The Statistical Package for the Social Science (SPSS) for Microsoft Windows 20.00 was used to complete the analysis of the collected data. Descriptive statistics, including means, standard deviations were implemented in order to investigate the demographic data, one-way analysis of variance (ANOVA) were used to determine whether any significant relationships exist among respondents. In addition, the .05 level of statistical significance was set at all statistical tests in the present study. The findings of the study were generalized as follows: Statistically significant differences were found in Income level by the different brand dimensions like social, culture and there is no statistically significant difference in dimension of Personal and psychological. In the end of the study implications and conclusion were provided.

Index Terms- buying, social, personal, cultural, psychological

I. INTRODUCTION

Understanding behavior of consumers is a key to the success of business organizations. Marketing personnel are constantly analyzing the patterns of buying behavior and purchase decisions to predict the future trends. Consumer behavior can be explained as the analysis of how, when, what and why people buy. Consumer behavior can be understood as: "The decision process and physical activity individuals engage in when evaluating, acquiring, using, or disposing of goods and services." (Loudon and Della Bitta, 1980). Nowadays, this phenomenon, can also be illustrated in the following way: "activities people undertake when obtaining, consuming, and disposing of products and services" (Blakwell, Minard and Engel, 2001).A study by **Voss and Parasuraman (2003)** suggests that the purchase preference is primarily determined by price than quality during pre-purchase evaluation. Given explicit quality information, price had no effect on pre-purchase or post-

consumption quality perceptions. Instead, post consumption quality evaluations had a favorable impact on price evaluations. Another study by **Chernev (1997)** analyzed the effect of common features on brand choice and the moderating role of attribute importance. It is argued that when brand attributes differ in importance, with the best value on the most important attribute, thus further polarizing brands' choice shares. In contrast, when attributes are similar in their importance, common features are likely to have an opposite effect, equalizing brands share.

Russo and France (1994), studied the nature of the choice process for commonly purchased nondurables by tracking eye fixations in a laboratory simulation of supermarket shelves. The findings are fully compatible with the general view that the choice process is constructed to adapt to the immediate purchase environment. While describing about shopping orientation, **Sinha (2003)** reports that Indian Shoppers seek emotional value more than the functional value of shopping. Their orientation is based more on the entertainment value than on the functional value. The orientation is found to be affected primarily by the type of store, the frequency of buying and to some extent by the socio-economic classification. The retailers need to experiment with a format that attracts both types of shoppers. Research suggests that beauty consciousness among people in general is changing.

Vigneron and Johnson (1999) reported that people's needs for appearances and materialism were increasing. That is human beings wanted to satisfy the need to look and feel good. This created a boom in the cosmetic and toiletries sector across the world. Chambers Encyclopedia defines cosmetics as (a) articles intended to be rubbed, poured, sprinkled or sprayed on, introduced into or otherwise applied to the human body or any part thereof for cleaning, beautifying, promoting attractiveness or altering the appearance and (b) articles intended for use as a component of such articles. Now a variety of cosmetic and toiletries ranging from natural to sophisticated items are available in the market. The pattern and preference of use of these items vary according to different segments of gender, age and socio economic class. When we review the literature on the cosmetic and toiletry industry, not many studies are available especially about Indian scenario. The present study is an attempt to analyse the purchasing pattern of cosmetic consumers in Kerala.

Manufacturers and marketers need to gain a deeper understanding of consumer and shopper behavior (going beyond traditional consumer/market research), and then work out the appropriate value proposition and delivery channels for their basket of goods and services (Business world Marketing

Whitebook 2012-13). It is well known fact that the success of any business organization stems from company's ability to understand and influence consumer behavior. This study is needed to consider when designing and implementing marketing programs. Failure to understand the dynamic buyer behavior and improper allocation and coordination of resources will lead the organization to great losses. The better marketers are at understanding consumer behavior, the more successful they will be at influencing consumers' purchase behavior (Kurti Shah 2009). There are three sections of consumer behavior that need to be addressed carefully: psychological influences, socio-cultural influences and situational influences. The marketers have to go through a number of challenges in selling products like „cosmetics" as they have to be applied directly on human skins, body and other parts. There is a perceived risk of dissatisfaction in the consumers as far as its benefits are concerned. It is necessary to study the consumer buying decision process in this regard.

II. LITERATURE REVIEW

In order to develop a framework for the study consumer behaviour it is helpful to begin by considering the evolution of the field of consumer research and the different paradigms of thought that have influenced the discipline. As described in this article, a set of dimensions can be identified in the literature, which can be used to characterize and differentiate, the various perspectives on consumer research. It is argued that consumer behaviour itself emerged as a distinct field of study during the 1960s; and is characterized by two broad paradigms, the positivist and the non-positivist. The positivist paradigm encompasses the economic, behavioural, cognitive, motivational/trait/attitudinal, and situational perspectives; these perspectives are referred to as the traditional perspectives as they pre-date the development of the non-positivist paradigm. The positivist paradigm, which is still the dominant paradigm, emphasizes the supremacy of human reason and that there is a single, objective truth that can be discovered by science. This paradigm regards the world as a rational and ordered place with a clearly defined past, present, and future. The assumption of rationalism is therefore fundamental to the traditional perspective. The opposing, non-positivist paradigm, envelops the interpretive and postmodern perspectives, which have emerged more recently during the period post-1980 to date. The proponents of this emerging perspective argue that positivism overemphasizes the rational view and the ideology of a homogenous social culture and thereby denies the complex social and cultural world in which consumers live. This paradigm instead stresses, the importance of symbolic and subjective experience and the idea that consumers construct meanings based on unique and shared cultural experiences, and thus there can be no single unified world view. Unsurprisingly, the two paradigms differ in their views on the benefits derived from consumption and the objectives that underscore consumer research. The traditional, positivist perspective takes a very utilitarian approach to the benefits from consumption. While the non-positivist perspectives place much greater emphasis on the symbolic dimensions of choice. The objective of non-positivist research endeavour is to achieve a better understanding of consumer behaviour with no specific intent to influence consumer processes. Conversely, outcomes of positivist research are directed toward advancing the goals of marketing practice. By identifying the paradigmatic shifts within the field, this article aims to identify different streams of thought that could guide future consumer research.

Consumer is the study "of the processes involved when individuals or groups select, purchase, use, or dispose of products, services, ideas, or experiences to satisfy needs and desires" (Solomon 1995, 7). In the marketing context, the term 'consumer ' refers not only to the act of purchase itself, but also to patterns of aggregate buying which include pre-purchase and post-purchase activities. Pre-purchase activity might consist of the growing awareness of a need or want, and a search for and evaluation of information about the products and brands that might satisfy it. Post-purchase activities include the evaluation of the purchased item in use and the reduction of any anxiety which accompanies the purchase of expensive and infrequently-bought items. Each of these has implications for purchase and repurchase and they are amenable in differing degrees to marketer influence (Foxall 1987). Engel, et al. (1986, 5) define consumer behavior as "those acts of individuals directly involved in obtaining, using, and disposing of economic goods and services, including the decision processes that precede and determine these acts". Simple observation provides limited insight into the complex nature of consumer choice and researchers have increasingly sought the more sophisticated concepts and methods of investigation provided by behavioral sciences in order to understand, predict, and possibly control consumer behavior more effectively. Psychology, social psychology, and sociology are the disciplines most widely employed in this endeavor which has become a substantial academic industry in its own right. In order to develop a framework for the study of consumer behavior it is helpful to begin by considering the evolution of the field of consumer research and the different paradigms of thought that have influenced the discipline (Marsden and Littler, 1998). Paradigms in consumer research can be broadly classified as a set of fundamental assumptions that researchers make about what they are studying and how they study it (Kuhn, 1962). As described below, a set of dimensions can be identified in the literature, which can be used to characterize and differentiate the various perspectives on consumer behavior. Consumer behavior itself emerged as a distinct field of study in the 1960s. A major catalytic influence in its emergence was the formation of the Association for Consumer Research in 1969. Membership now exceeds 1700 (www.acrweb.org), and the growing maturity of the field is reflected in its annual conference proceedings, entitled Advances in Consumer Research. The literature has grown sharply, with the Journal of Consumer Research (first published in 1974) standing as a premier source. More recently, the Journal of Consumer Psychology was launched in 1992.

3.1 Objectives of the Study

The purpose of this study is to investigate internal and external influences on consumers purchasing decisions on cosmetic products in Tamilnadu and Kerala.

1. To Find how consumer buying behavior factors influence Consumers when purchasing cosmetic products.

2. To study the influence of Income Level of the respondents on consumer buying behavior dimensions

3.2 Hypothesis of the study
   H1: Social dimension has influence on respondents Income
   H2:Cultural dimension has influence on respondents Income
   H3:Personal dimension has influence on respondents Income
   H4:Psychological dimension has influence on respondents Income

3.3 Sample & Instrumentation
   The questionnaires were given to 500 consumers who are all using cosmetics. Out of 500 consumers contacted, 412 questionnaires were received with required coverage and details. The instruments of this study involved two parts: the first section of the instrument consisted of forced-choice questions about demographic characteristics: gender, marital status, age, occupation, monthly income level. The second section variables chosen for this study in order to measure the influence of consumer buying behaviour in cosmetics products dimension contains of 39 items and characterized into four sub scales : (a) Social(items 1 to 7), (b) culture(items 8 to 13), (c) Personal (items 14 to 18) ,(d) Psychological(items 19 to 39)The dimension 39 items are evaluated on a five-point Likert scale ranging from 1 to 5 ,using the anchors "5=stronglyagree,4=agree,3=Neutral,2=Disagree ,1= Strongly disagree".

   Cronbach, s alpha is a coefficient (a number between 0 and 1) that is used to rate the internal consistency (homogeneity) or the correlation of items in a test. If the test has a strong internal consistency most measurement experts agree that it should show only moderate correlation among items (0.70 to 0.90).The

reliability coefficients for the variables chosen for the study should have to be more than 0.70, to consider it as an acceptable value (Nunally, 1978). In this study the Reliability analysis shows that all the factors have shown alpha value greater than 0.7, indicating the evidence of reliability and the overall reliability of the instrument is 0.92. So, the items constituting each variable under study have reasonable internal consistency and shows that all the dimensions of consumers buying behaviour have a positive reliability. The factors and dimensions included for analysis carry a good degree of reliability to support the objectives formulated. All dimensions have got significant relationship to make the real representation of the study. Hence it is concluded that the data collected in this study is highly reliable.

3.4. Data Analysis
   The Statistical Package for the Social Science (SPSS) for Microsoft Windows 20.00 was used to complete the analysis of the collected data. Descriptive statistics , including means, standard deviations were implemented in order to investigate the demographic data, one-way analysis of variance (ANOVA) were used to determine whether any significant relationships exist among respondents. In addition, the .05 level of statistical significance was set at all statistical tests in the present study.

3.5 Result of Data Analysis
   The descriptive table(see below) provides some very useful descriptive statistics the mean, standard deviation for the dependent variables for all the groups and when all groups are combined (Total). The F-value and also the significant value

Table-1 Analysis of variance (ANOVA)

Income Level	Mean				Standard Deviation					
	G1	G2	G3	Total	G1	G2	G3	Total	F	Sig
Social	3.04	2.84	3.36	3.30	0.77	0.78	0.85	0.85	5.99	0.03
Culture	3.29	3.36	3.58	3.54	0.51	0.64	0.67	0.66	3.84	0.02
Personal	3.05	3.23	3.28	3.26	0.70	0.69	0.79	0.78	1.26	0.282
Psychological	3.25	3.21	3.45	3.42	0.70	0.69	0.73	0.73	2.22	0.110

Note: G1-Less than Rs .30, 000, G2-More than Rs.30, 000, G3-Dependent,.

we can see that in this the significance level of Social is $0.03(P = .03)$, which is below 0.05 and, therefore, there is statistically significant difference between social dimension by Income level of respondents, the significance level of cultural is $0.02(P = .02)$, which is below 0.05 and, therefore, there is statistically significant difference between cultural dimension by Income level of respondents, the significance level of Personal is $0.28(P = .28)$, which is above 0.05 and, therefore, there is no statistically significant difference between personal dimension by Income level of respondents, the significance level of Psychological is $0.11(P = .11)$, which is above 0.05 and, therefore, there is no statistically significant difference between Psychological dimension by Income level of respondents,

3.5.1 Homogeneity of Variances

Test of Homogeneity of Variances shows the result of Levene's Test of Homogeneity of Variance, which tests for similar variances. If the significance value is greater than 0.05 then we have homogeneity of variances.

We can see from this that Levene's F Statistic has a significance value of Social is 0.396, culture is 0.100, Personal is 0.355, Psychological is 0.623 and, therefore, the assumption of homogeneity of variance is met.

3.5.2 Post hoc test
   Since we rejected the null hypothesis in Imagery dimension (we found differences in the means), we should perform a Turkey's W multiple comparison to determine which means are different. Using the previous output, here is how such an analysis might appear.

Multiple Comparisons
Dependent Variable: Social
 Tukey HSD

(I) INCOME	(J) INCOME	(I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Less than Rs.30,000	Morethan Rs.30,000	.20660	.22795	.637	-.3296	.7428
	Dependent	-.31689	.15579	.105	-.6834	.0496
Morethan Rs.30,000	Less than Rs.30,000	-.20660	.22795	.637	-.7428	.3296
	Dependent	-.52349*	.17803	.010	-.9423	-.1047
Dependent	Less than Rs.30,000	.31689	.15579	.105	-.0496	.6834
	Morethan Rs.30,000	.52349*	.17803	.010	.1047	.9423

*. The mean difference is significant at the 0.05 level.

The above indicates that significant differences existed among social dimension and Income level of the respondents. According to the results of the Turkey's W multiple comparison analysis, significant differences existed among the groups of Less than Rs.30, 000, More than Rs.30, 000 and Dependent. This shows that dependents are more influenced by the social factor. However they are influenced by the reference group these groups include aspiration groups ,groups that a person desires to belong to a fans and the friends they motive to buy cosmetics in different brands .when they are moving to shops salesperson plays a major role in buying decision they may be very active to show attractive brands with different colors and the advertisement which the young people see from different medias once they are seeing from different media they also attracted to be like that same in using different cosmetics ,these have strong influence in buying decision. advertising is another factor that plays a major role in influencing the purchase decision of the female teenagers. It has been found that television is the most popular media among the teenagers and thus it is important for the cosmetic producers to use this media in order to attract the consumers. Moreover, it has been also found that stylish design and packaging of the cosmetic products are also important factor for the female teenagers when choosing cosmetic products. Thus cosmetic producers should give emphasis in these factors in order to gain attention from this segment.

III.   MULTIPLE COMPARISONS

Dependent Variable: culture
 Tukey HSD

(I) INCOME	(J) INCOME	(I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Less than Rs.30,000	Morethan Rs.30,000	-.06845	.17888	.922	-.4892	.3523
	Dependent	-.29083*	.12225	.047	-.5784	-.0033
Morethan Rs.30,000	Less than Rs.30,000	.06845	.17888	.922	-.3523	.4892
	Dependent	-.22238	.13970	.250	-.5510	.1062
Dependent	Less than Rs.30,000	.29083*	.12225	.047	.0033	.5784
	Morethan Rs.30,000	.22238	.13970	.250	-.1062	.5510

*. The mean difference is significant at the 0.05 level.

The above indicates that significant differences existed among imagery dimension and Income level of the respondents. According to the results of the Turkey's W multiple comparison analysis, significant differences existed among the groups of Less than Rs.30, 000, More than Rs.30, 000 and Dependent. This shows that dependents are highly influenced by the cultural factors because youngster move around everywhere for educational purpose or Job.They may see different culture of people everywhere .They would like to change themselves whenever they wish too. so if they are attracted by different culture of people their buying decision will change accordingly. Culture is the complex of values ,ideas, attitudes and other meaningful symbols that allows humans to communicate ,interpret ad evaluate as members. Finally teenagers' also get influenced by aspiration groups such as celebrities. Because of the high referent power of this group, female teenagers easily get influenced by the celebrities.

IV.   FINDINGS AND DISCUSSION

Significant differences existed among social dimension and Income level of the respondents. According to the results of the Turkey's W multiple comparison analysis, significant differences existed among the groups of Less than Rs.30, 000, More than Rs.30, 000 and Dependent. This shows that dependents are more influenced by the social factor. However they are influenced by the reference group these groups include aspiration groups

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V. CONCLUSION

After analysis we found that small differences exist in the income level that implies the different groups prefer or opinion differs on consumer buying behavior. It created a curiosity to us to find out which group really differing on the opinions. By the help of Post hoc we found out that the dependent differ the opinion among other class. It may be due to the decisions taken by youngsters. Every person plays multiple roles in their daily life, professional role or social role. Each of these roles has a certain effect on consumers buying behavior. Each role has a particular status in society and consumer behavior is considerably depended on the status factor .If the marketers easily understand the factors that mainly influence in buying decision the sales can be increased a lot. The study offers an assessment of the symbolic devices that celebrity and peers adopts to persuade the audience. The visual expression model is supported in that the study suggests why advertisers use celebrities of different gender and age groups and expertise areas in commercials for certain products and cultural values

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Frequency and Clinical Significance of Conus Artery and Its Variant Third Coronary Artery (TCA) in North Indian Population: A 64-Slice CT Angiographic Study

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Abstract- In most of the cases two coronary arteries supply oxygenated blood to the heart, the right coronary artery (RCA) and the left coronary artery (LCA). One of the important branches of RCA is the conus artery (CA) which supplies the infundibulum of the right ventricle or pulmonary conus.

In the present study Computed Tomographic (CT) coronary angiograms of 50 subjects of north Indian population were analyzed prospectively to see the pattern of origin and number of conus artery. One of the most important variant of origin of conus artery is the *third coronary artery* (TCA). The incidence of TCA was also assessed.

All the subjects were undergone multidetector CT coronary angiography in the department of Radiodiagnosis KGMU, U.P, Lucknow.

One conus artery was seen in *47* (*94%*) subjects. Out of these 47 subjects, conus artery arose from the RCA in *38 (76%)* cases and from the anterior aortic sinus (AAS) of ascending aorta in *9* (*18%*) cases. In these 9 cases, conus artery acts as *third coronary artery*. In some cases RCA and conus artery have separate orifice in the AAS and some cases have common orifice for RCA and conus artery. Two conus arteries were observed in *1* (2%) case. In this case one artery arose from AAS (*third coronary artery)* and second from RCA. In 2 (4%) cases conus artery was not visualized. In this way *third coronary artery* was seen in *10 (20%)* cases.

The *third coronary artery* represents a significant path of collateral coronary circulation as it often anastomoses with left anterior descending (LAD) branch of LCA.

Index Terms- Computed Tomography (CT), Conus Artery (CA), Coronary Angiogram, Third Coronary Artery (TCA).

I. INTRODUCTION

An in-depth knowledge of the anatomy of coronary arteries is a pre-requisite for a detailed understanding of the coronary artery disease (CAD) and for planning of cardiovascular surgery. In most of the cases the heart is supplied by two coronary arteries right and left. Sometimes *third coronary artery* is present. Normally the conus artery is a branch of RCA. According to *Schlesinger* TCA is the conus artery arising directly from the anterior aortic sinus (AAS) [21]. This *third coronary artery* may be a boon for the person having it. This artery when present may help in the establishment of partial identity of an individual, if ante mortem records of coronary angiograms are available [4].

Occurrence and distribution of *third coronary artery* is important for accurate understanding of coronary angiograms, assessment of severity and effect of coronary insufficiency and appropriate preparation for timely revascularization of ischemic myocardium.

Usually the conus artery is the first right ventricular branch of the RCA which originates from the *first part of RCA* (extending from origin to the junction of right and inferior borders of the heart). The conus artery supplies the pulmonary conus or outflow portion of the right ventricle. Several authors had suggested that conus artery is a collateral arterial channel between the right and left coronary arteries.

This study was done with an aim to assess the variations in the origin and number of conus artery and the frequency of *third coronary artery* in North Indian population. The findings of this study would be of great significance in the interpretation of coronary angiograms and for surgical revascularization of ischemic myocardium.

This was a prospective study in which 64-slice computed tomographic (CT) coronary angiograms of 50 subjects were visualized. *Third coronary artery* was seen in *10 (20%)* subjects. The *third coronary artery* plays a significant role in collateral circulation of the heart because it anastomoses with a branch of left anterior descending (LAD) artery. The results of this study provide an extensive knowledge of the origin of conus artery which is required for the diagnostic and therapeutic interventional procedures done on coronary arteries.

II. MATERIAL AND METHODS

CT coronary angiograms of 50 subjects of both sex and different age groups [32 males (14-75 years), 18 females (12-70 years); mean age 51.36 ± 14.07 years, age range 12-75 years] were analyzed.

Scan protocol and image reconstruction

Coronary Angiography (CA) was performed in all subjects using a 64-Slice Multidetector Computed Tomographic (MDCT) scanner (BRILLIANS[TM]CT, Version 2.45.22042, Philips) installed in the department of Radiodiagnosis, King George Medical University (KGMU), Lucknow, Uttar Pradesh (U.P.), India. Retrospective Electrocardiographically (ECG) gated imaging was performed.

The scan field extended from the carina to the diaphragm. The imaging parameters were: **slices/detector collimation** of 64×0.625 mm, **effective temporal resolution** (with 180°algorithm) of 165 ms, **tube voltage** of 120 kV, **tube current** of 800 mA, **gantry rotation time** was 400 ms, **pitch** of 0.2, **slice thickness** of 0.90 mm and 0.45mm **reconstruction interval**, **Field of view** (FOV) was 220mm, **Isotropic voxel resolution** of $0.4 \times 0.4 \times 0.4$ mm. A single inspiratory breath-hold of approximately10-12 seconds **(scanning time)** completed the examination.

Pre-procedure precautions

- The subjects were enquired, to rule out the presence of any drug allergy to avoid the occurrence of any untoward anaphylactic reaction during the procedure.
- The subjects were advised to avoid the intake of fatty food two days prior to the procedure.
- They were advised to drink only water just prior to the procedure.
- Blood urea and creatinine levels were evaluated.

Procedure

The subjects were laid supine. Their heart rate was stabilized with an oral dose of 50-100 mg Metoprolol one hour before the scan. If heart rate was not stabilized with an oral dose, then intravenous (IV) Metoprolol was given. Electrocardiogram (ECG) and pulse rate were monitored half an hour prior to the procedure. The subjects were counseled to reduce their anxiety.

The subjects were connected to a cardiac monitor. For venous access, an upper extremity vein (antecubital vein) and a 20-gauge intravenous canula was used. 80-85 ml of non-ionic contrast Iohexol (Omnipaque, GE, GE Healthcare Ireland, Cork) containing iodine concentration of 350 mgI/ml, injected with a flow rate of 5.5ml/sec, followed by a 20 ml saline flush at a rate of 4ml/sec with a pressure injector (PSI-325). The scan timing was determined with automated bolus tracking technique by placing the region of interest over mid ascending aorta and setting the trigger threshold to 180 Hounsfield (Hu). The subjects were asked to lie still on the "scanning bed" for a period of 5-10 minutes. The instruction was given to the subjects to maintain an inspiratory breath hold during which CT data and ECG tracings were taken. Computed Tomographic Coronary Angiography (CTCA) was performed 5 seconds after aortic peak density. Scanning coverage was from the level of carina to the diaphragm. Raw spiral CT data of coronary arteries were reconstructed in various phases of cardiac cycle on a work station (Brilliance 64 version 4.5) to obtain images with the highest quality (without motion artefact). This work station enabled generation of the images of coronary arteries in the standard and in various other anatomical planes. Reconstruction performed at 75% of R-R interval was found to be optimal for image analysis in most of the subjects. In some, if heart rate could not be stabilized properly, then reconstructions were performed at 45% of R-R interval. The reconstructed images were interpreted with the help of a cardiac radiologist. Subjects with previous bypass surgery and also those with suboptimal study due to breath hold artefacts were excluded.

All images were reviewed first in axial projection and then with post processing tools such as Multiplanar Reconstruction (MPR), Curved Planar Reformation (CPR), thin-slab Maximum Intensity Projection (MIP), and Volume-Rendering Technique (VRT) with transparent background display. MIPs were obtained using various thicknesses (5–30 mm). Volume-rendered images were also obtained using various orientations.

The statistical analysis was performed by using software SPSS (Statistical Package for Social Sciences) version 15.0. The values were represented in Number (%) and Mean ± Standard Deviation (SD).

III. RESULTS

In the present study, the *number* and the *origin* of conus artery were observed.

Variable Number and Origin of Conus Artery-

One conus artery was seen in 47 (*94%*) subjects [29 (*90.63%*) males and 18 (*100%*) females]. (Table 1 & Bar Diagram 1). Out of these 47 subjects, conus artery was seen arising from the RCA in 38 (*76%*) cases (Fig.1a, b, c & d) and from the anterior aortic sinus of ascending aorta in 9 (*18%*) cases (Fig.2 & Fig.3).In these 9 cases, conus artery acts as *third coronary artery*. In some cases RCA and conus artery have separate orifice in the AAS (Fig.2) and some cases have common orifice for RCA and conus artery (Fig.3). Among the 38 cases of origin from RCA, 23 (*71.88%*) were males and 15 (*83.33%*) were females. Among the 9 cases of origin from ascending aorta 6 (*18.75%*) were males and 3 (*16.67%*) were females (Table 2 & Bar Diagram 2).

Two conus arteries were observed in 1 (*2%*) case [1 (*3.13%*) male] (Table 1 & Bar Diagram 1). In this case one artery arose from AAS (*third coronary artery*) and second from RCA (Fig.4a). In 2 (*4%*) cases [2 (*6.25%*) males], conus artery was not visualized. (Table 1& Bar Diagram 1) (Fig. 4b).

IV.   DISCUSSION

Usually the first branch of right coronary artery (RCA) is the pulmonary conus artery or conus artery (CA). If the conus artery arises directly from the aorta it is named as *third coronary artery* . Incidence of this type of origination is between7% to 50% (Table- 3) [21].

Present study has revealed the incidence of *third coronary artery* (TCA) to be 20%. Other studies have reported various incidences as shown in Table- 3. The findings of present study are similar to *Udaya Sankari et al, 2011*[21] and nearer to *Pınar Kosar et al, 2009*[13].

The findings of different studies mentioned in Table3 show ethnic variability and appear to support a catheter angiographic study by *Naveen Garg et al., 2000* in which they proposed that there are geographical differences in coronary artery variations, which may have a genetic basis [11].

The conus artery supplies the pulmonary infundibulum and the supraventricular crest. It usually anastomoses with a branch from the left coronary artery. This anastomosis lies on the distal part of the bulbous cordis (truncus arteriosus) and is known as the Vieussen's arterial ring [25].

Collateral circulation is a key factor in the pathophysiology of Coronary Artery Disease (CAD). Symptoms and prognosis among patients with advanced CAD depend largely on the degree of collateral circulation [18]. The conus branch of the RCA has a special anatomic and functional significance in the development of collaterals between the right and left coronary arterial systems. The conus artery may also arise as a separate branch from the aorta, and may not even be visualized by selective angiography due to its small size in patients with mild disease, only manifesting itself in advanced CAD when it is recruited to provide collateral circulation to under- perfused myocardial territories [14].

Kurjia HZ, et al., 1986 found ectopic orifice of conus artery in AAS to be anomalous rather than ubiquitous [9]. *Sahni and Jit in 1989* reported extra openings for conus artery in 34.8% of male hearts and 27.8% of female hearts [17]. In the present study, extra orifice for conus artery in AAS was seen in 21.88% of males and 16.67% of females (Table 2).

Since the conus artery does not arise from the RCA always, the study of its origin gains importance for angiographic dye injection. An aberrant conus artery arising separately from the aorta is particularly at risk for injury from ventriculostomy or other maneuvers performed during heart surgery [22]. According to the opinion of *Edwards* and *Miyazaki* the *third coronary artery* is more frequently found in adult hearts than in fetal hearts, concluding thereof that it develops only after birth[2,10] .

In 1988 a stereoscopic study of *Miyazaki M & Kato T.* suggested that the *third coronary artery* develops and contributes to the collateral circulation after birth. They also found that pathologic hearts had a higher incidence than normal hearts but there is no relation to age and the orifice of TCA was wider in pathologic hearts than normal hearts [10].

The separate orifices for the TCA and the RCA had been explained by insufficient unification of these two vessels, during their growth towards the ascending aorta [16, 26]. The branches of TCA open up in some cardiac pathology to provide collateral perfusion and they have been shown to improve with age [20]. TCA may contribute to collateral circulation to the interventricular septum (IVS) during left anterior descending (LAD) occlusions hence protecting the septum. The clinical implication of this is that diagnostic tests carried out for the LAD occlusions may fail to detect any ischemic change in this region hence giving a false better report [26].

The TCA may extend epicardially to supply the apex of the heart. Therefore a caution should be taken during surgical procedures around the anterior wall of the RV and infundibulum since such a long TCA may present a surgical hazard [12]. *Ivan Stankovic et al. (2004)* suggested that the folding of the heart results in opening of the existing peritruncal capillaries at the cono truncal circle either directly into the newly formed aorta resulting in multiple ostia or secondarily attached to the existing blood vessels

surrounding the atrioventricular circle resulting in the right conus artery arising from right coronary artery [6]. The knowledge of ontogeny of the right conus artery requires further detailed study in foetus.

V.   CONCLUSION

The present study adds to the growing body of data on intrapopulation frequencies of conus artery variants among North Indians and supports the contention that postpartum development may modify the pattern of coronary divergence from the aorta. As the number of Caucasian patients undergoing surgical treatment for ischemic or valvular heart disease increases, additional comparative data on racial, sexual, and ontogenetic variation of the origin and number of conus artery are required to improve the care of these patients

ACKNOWLEDGMENT

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FIGURES
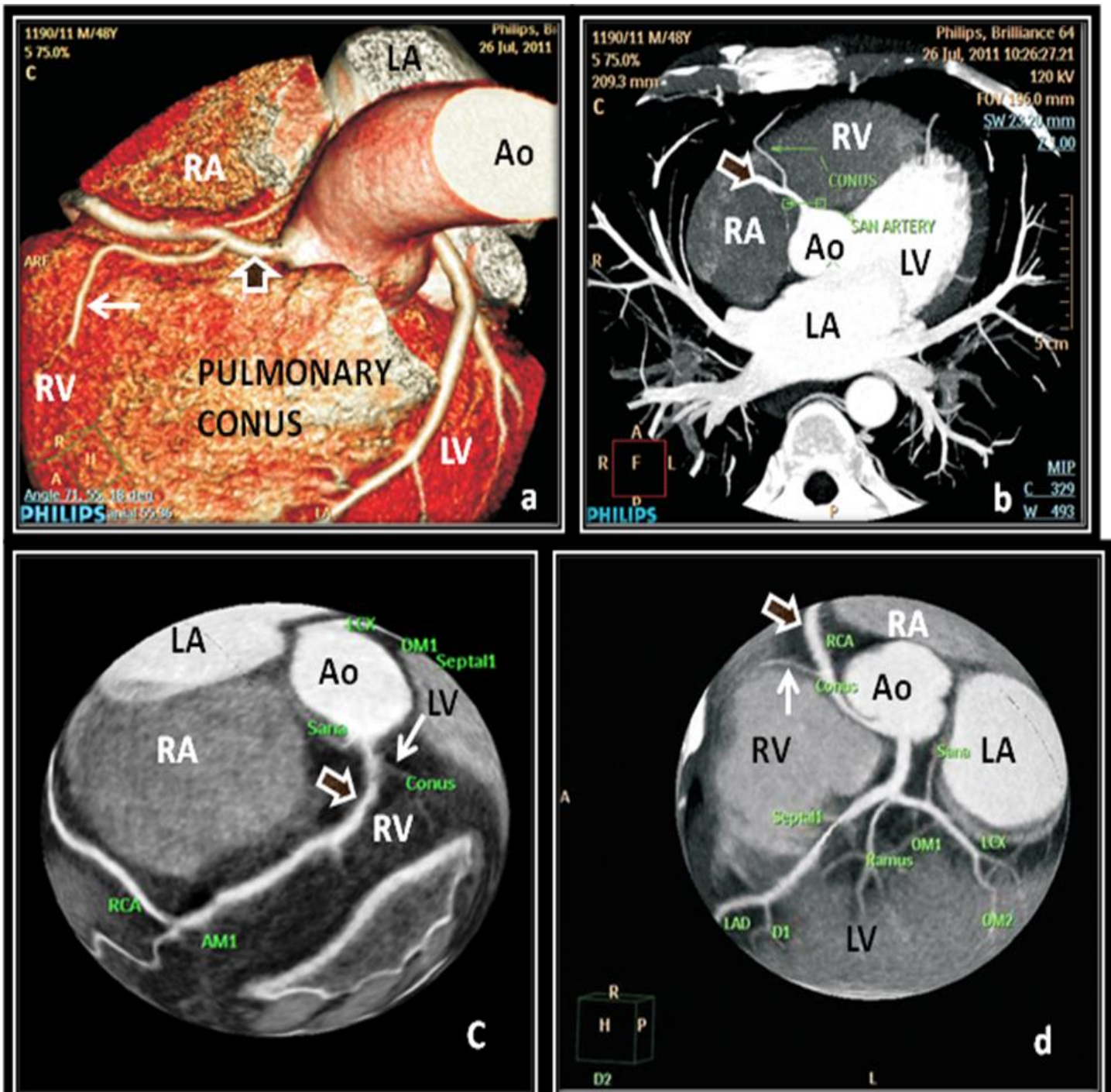
Fig.1-MDCTA images showing **single conus artery** *(arrow)* arising from **RCA** (*outlined arrow*). **(a)-** *3D VR image*, **(b)-** Axial *MIP image*, **(c & d)-** *CT globe. Image* (**d**) *is* showing **single conus artery** arising from an anomalous **RCA. Ao-** *Aorta,* **LA-** *Left Atrium,* **RA-** *Right Atrium,* **LV-** *Left Ventricle.* **RV-** *Right Ventricle.*
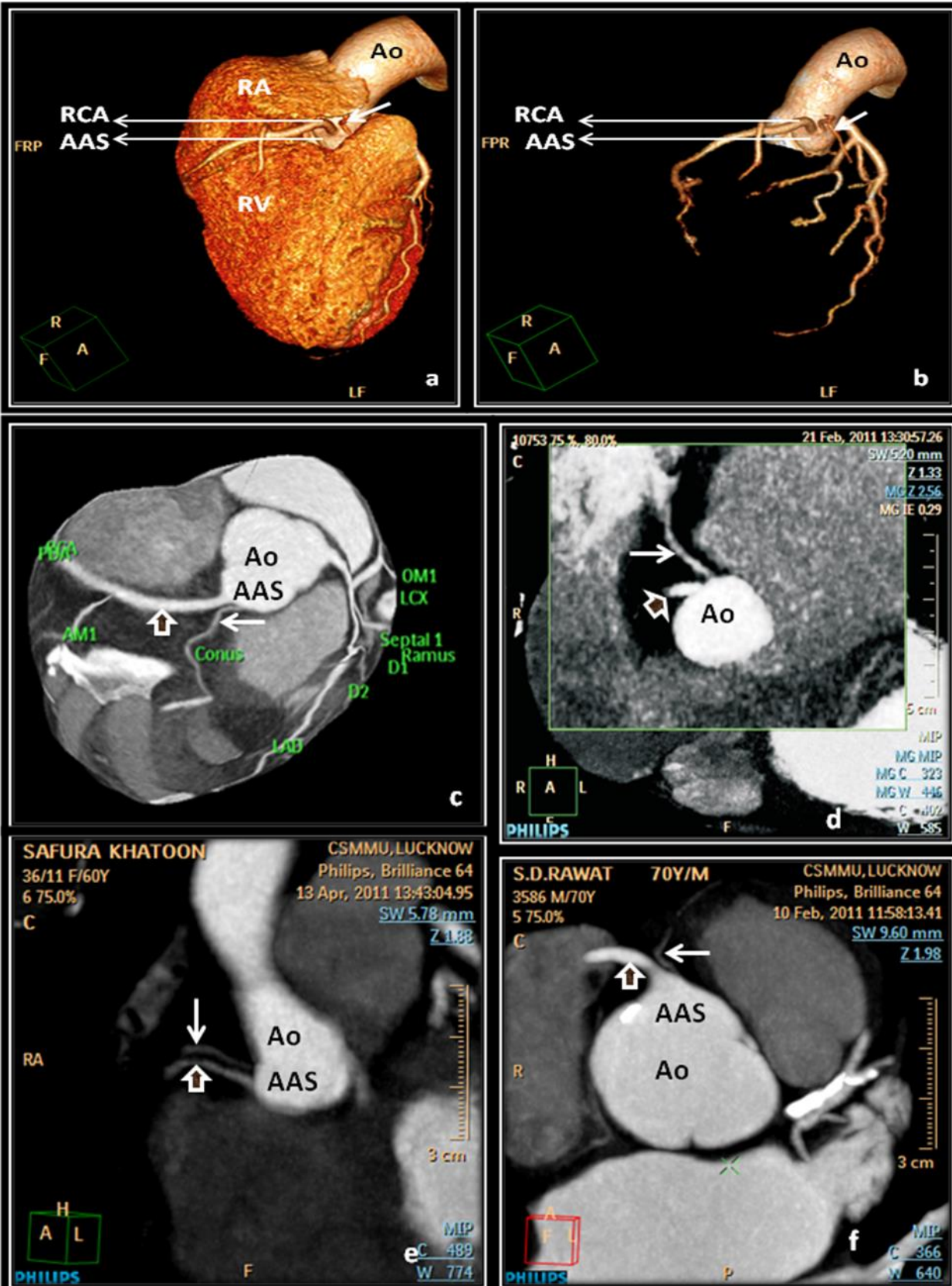
Fig.2 MDCTA images showing <u>**single conus artery**</u> *(arrow)* arising from AAS. **(a)-***3D VR image,* **(b)-***Contrast Vessel Tracking Tree*. **(c, d, e & f)-***MIP images.* **Ao**- *Aorta,* **AAS-** *Anterior Aortic Sinus,* **RA-** *Right Atrium,* **RV-** *Right Ventricle,* **RCA-** *Right Coronary Artery<u>. RCA and conus artery have separate orifice in the AAS.</u>* **RCA** *(outlined arrow).*

Fig.3- MDCTA images showing **single conus artery** (*arrow*) arising from AAS. **(a & b)-***MIP images,* **(c)-** *Contrast Vessel Tracking Tree*.**RCA** (*outlined arrow*). **RCA and conus artery have common orifice in the AAS.**
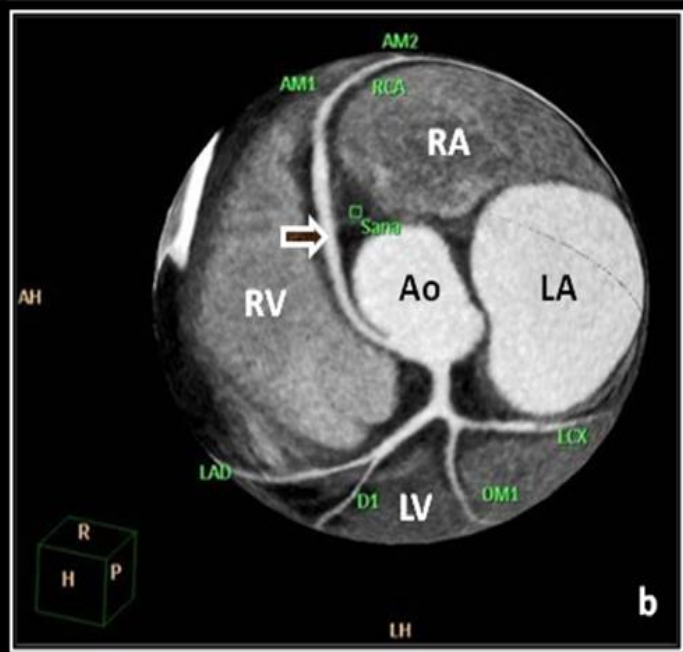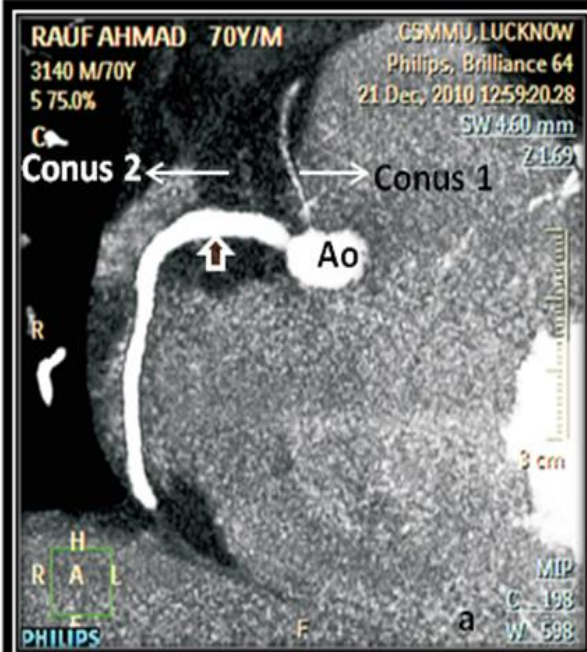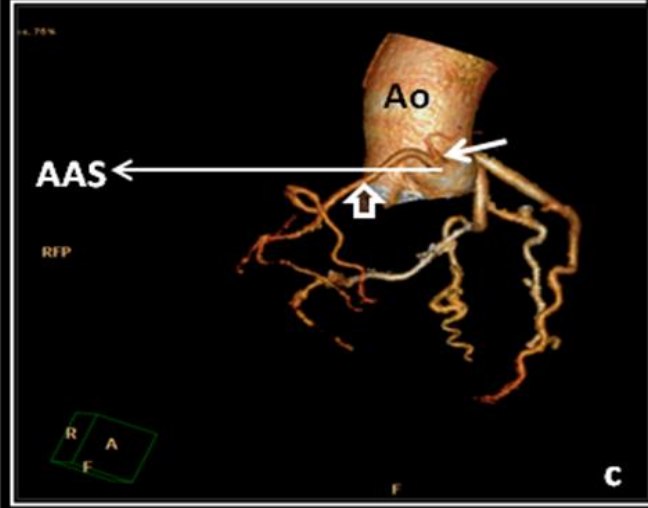
Fig.4- MIP images showing **(a)- two conus arteries,** conus 1 is arising from AAS and conus 2 from RCA, **(b)- no conus artery. Ao-** *Aorta,* **LA-** *Left Atrium,* **RA-** *Right Atrium,* **LV-** *Left Ventricle* **RV-** *Right Ventricle,.* **RCA** (*outlined arrow*).

BAR DIAGRAMS
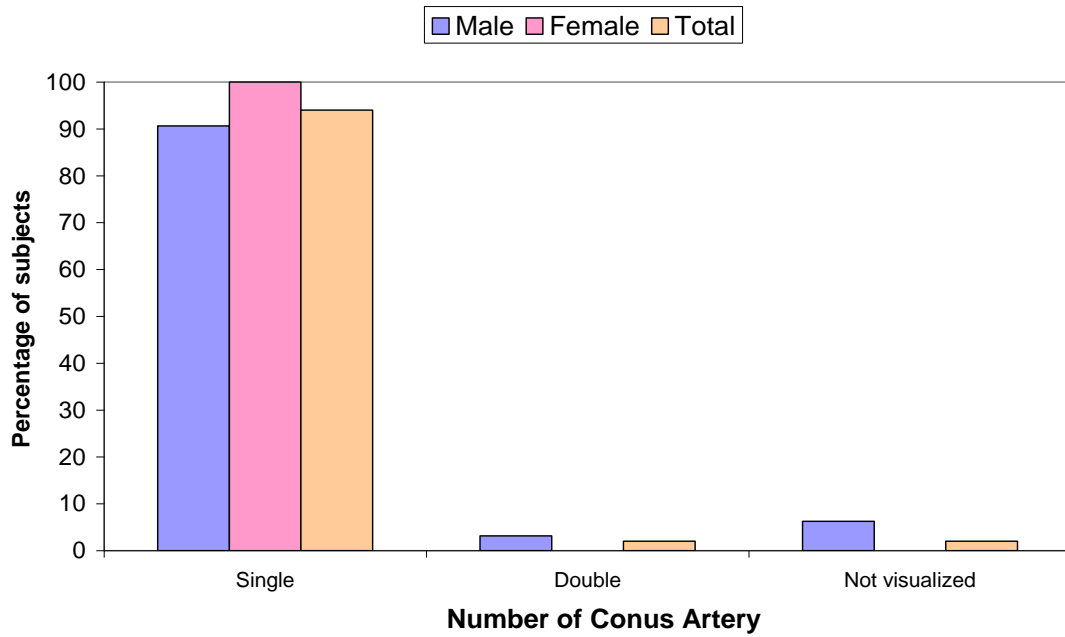
Bar Diag. 1- Gender wise distribution of number of conus artery
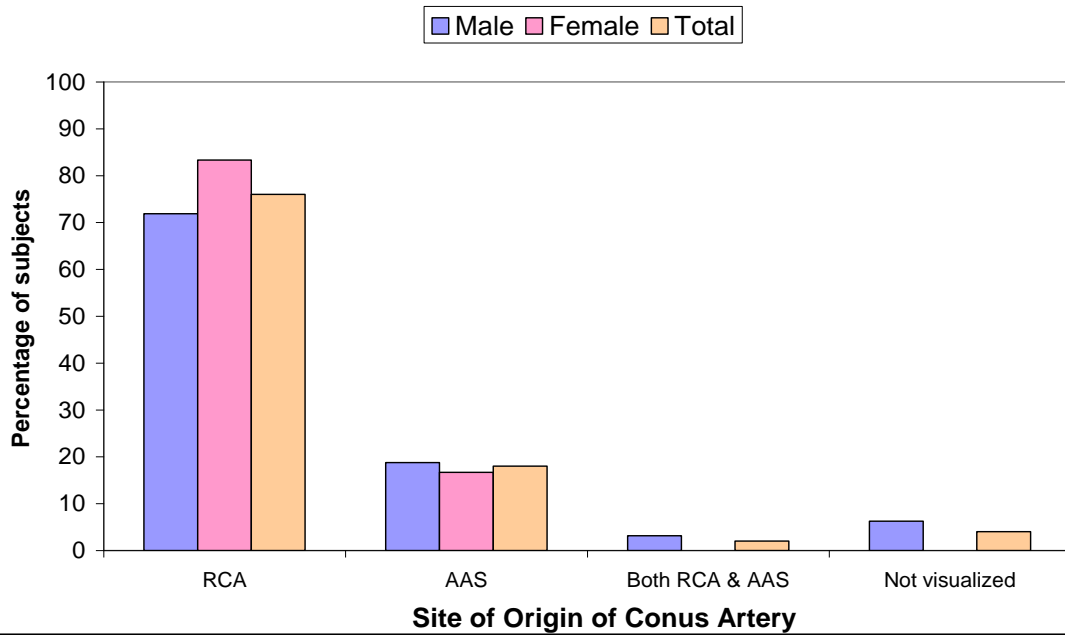
Bar Diag. 2- Gender wise distribution of the origin of conus artery

TABLES

Table- 1

Gender wise distribution of number of conus artery

Conus artery	Male(n=32)	Female(n=18)	Total(n=50)
Single	29 (90.63)	18 (100)	47 (94%)
Double	1 (3.13)	0	1 (2%)
Not visualized	2 (6.25)	0	2 (4%)

Figures in parentheses represent percentage.

$\chi^2 = 1.795$; p=0.407

Table-2

Gender wise distribution of the origin of conus artery

Site of origin of Conus artery	Males (n=32)	Females (n=18)	Total (n=48)	χ^2	'p' value
RCA	23 (71.88)	15 (83.33)	38 (76)	0.829	0.362
AAS	6 (18.75)	3 (16.67)	9 (18)	0.338	0.854
Both RCA & AAS	1 (3.13)	0	1 (2)	0.573	0.448
Not visualized	2 (6.25)	0	2 (4)	0.172	0.279

Figures in parentheses represent percentage.

$\chi^2 = 1.914$; p=0.590

Table - 3

Prevalence of the TCA in various populations

Authors and year of study	Type of study	Population	Incidence
Blake, 1964			23.5%
Kurjia *et al*., 1986	Dissection	Iraqi	8%
Miyazaki M. & Kato M., 1988	Dissection	Japanese	36.8%
Turner & Navaratnam, 1996	Dissection	English	15.8%
von Ludinghausen M. & Ohmachi N., 2001	Dissection	German	7.1%
Regi			33.8%
Kalpana R., 2003	Dissection	Indian	24%
Ivan Stankovic & Millica Jesic, 2004	Dissection	Bulgarians	34.8%
Koerig, 2006			50%
Almira Lujinović *et al*., 2008	Dissection	Bosnian	32%
Olabu B. O. *et al*., 2008.	Dissection	Kenyans	35.1%
Standring S, *et al*, 2008.			36%
Pınar Koşar et al, 2009	64-slice CT coronary angiographic study	Turkish	22%
Gajbe U.L., 2010	Dissection	West Indian	16%
Udaya Sankari et al, 2011.	Dissection	South Indian	23.33%
Udaya Sankari et al, 2011.	*CT coronary angiographic study*	*South Indian*	*20%*
Present study, 2011	*64-sliceCT coronary angiographic study*	***North Indian***	***20%***
Ritu Mehta, Sanjeev Agrawal, 2013	64-sliceCT coronary angiographic study	North Indian	***~33%***

Colonic Metastasis from a Squamous Cell Carcinoma of the Cervix Presented with Intestinal Obstruction

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Abstract- In patients with advanced squamous cell carcinoma (SCC) of the uterine cervix treated by radiation, 9-27% may develop distant metastasis. Common sites of distant metastasis are lungs, bones and para-aortic lymph nodes. Metastasis to the colon is very rare. We report a case of a 62 year old lady who was treated by Wertheim hysterectomy and adjuvant radiotherapy for stage III carcinoma of the uterine cervix. Three years later, she developed a metastatic growth in the transverse colon which was resected. It is important to differentiate squamous cell carcinoma metastasizing to the colon from a primary squamous cell carcinoma of the colon as latter has a better prognosis. Palliative resection of the colonic metastasis prevent further dissemination.

Index Terms- Carcinoma cervix, Colon, Metastasis, Squamous cell carcinoma

I. INTRODUCTION

Distant metastasis from carcinoma of the uterine cervix is reported in 9%- 27% of patients who were treated by radiation [1]. Frequently observed sites were lungs (21%), para-aortic lymph nodes (11%), abdominal cavity (8%), and supraclavicular lymph nodes (7%) [3]. Bone metastases occur in 16% of patients, commonly to the lumbar and thoracic vertebrae [3].

Metastasis to the gastrointestinal tract is rare and metastasis in to the colon is even rare [1,2].

We report a case of squamous cell carcinoma of the cervix metastasizing to the transverse colon and compared its histopathological features with that of a primary squamous cell carcinoma of the colon.

II. CASE REPORT

A 62 year old female was admitted to the emergency unit of Teaching Hospital, Kandy with history suggestive of intestinal obstruction. On Clinical examination she was dehydrated and had distended abdomen with exaggerated bowel sounds. Abdominal x-ray showed air fluid levels suggestive of intestinal obstruction.

The patient had been previously diagnosed as having a stage III carcinoma of cervix. Histological diagnosis was a keratinizing moderately differentiated SCC of cervix. In January 2010 she underwent total abdominal hysterectomy with bi lateral salphingo-oophorectomy and pelvic lymph node resection followed by adjuvant radiotherapy in March 2010. She was disease free during the subsequent follow up.

After a lapse of 3 years, she experienced altered bowel habits, with pain in the left hypochondrium. Two weeks prior to this presentation she underwent a colonoscopy and found to have a circumferential mass narrowing the lumen near the splenic flexure. The biopsy revealed a G2 squamous cell carcinoma. There was no evidence of synchronous lesions, polyposis syndromes or inflammatory bowel disease.

An exploratory laparotomy for acute intestinal obstruction performed, revealed a solitary hard, lump at the distal transverse colon, measuring 4 cm × 5 cm infiltrating to mesocolon and gastrocolic ligaments. There were multiple enlarged para aortic lymph nodes with significant amount of adhesions. The bowel segment containing the tumor was resected with adequate margins. A transverse colostomy was performed as a damage control procedure. Histopathological examination revealed a squamous cell carcinoma (Non Keratinised) which was arranged in large nests and present within the sub mucosa and muscularis propria. [figure1] There was no serosal or mucosal involvement by the tumour suggesting that it is most probably a metastatic tumour from the SCC of the cervix. The patient was referred to the oncologist for further management.

III. DISCUSSION

The incidence of distant metastasis in stage III carcinoma of the cervix is around 35%- 39% [2], the most common sites being the lungs, bones and para aortic lymph nodes[1,3]. Metastasis to the gastrointestinal tract is extremely uncommon.

Colonic metastasis have been reported from primary cancers of organs such as breast, cervix, kidney, ovary, and malignant melanomas [4-6]. Metastasis to the colon from any malignancy can occur through Transcelomic, Hematogenous, Retrograde lymphatic or Transluminal passages [1]. Most reports of secondary tumors in the transverse colon metastasized in the form of peritoneal seedlings.

In our case, since the serosa was uninvolved and there were no other peritoneal metastasis, the mode of spread is most likely to be through the lymphatic system.

Macroscopically, the tumor may either present as a mesenteric mass invading the bowel or as an intramural mass

ulcerating into the bowel. However, in this patient, the mucosa appeared to be intact and the bulk of the tumor was intramurally placed, narrowing the lumen.

Secondary squamous cell carcinoma of the colon needs to be differentiated from a primary squamous carcinoma arising in the colon since the former has a poor prognosis.

The pathogenesis of primary SCC of the colon is unclear due to its rarity. In 1979, Williams *et al.*, proposed three criteria for primary SCC of the colon namely a. metastasis from other sites must be excluded; b. Squamous epithelial lined fistulous tract must not involve the affected bowel because it may be a source of SCC; and c. SCC of the anus with proximal extension must be excluded.[4]

None of the criteria are fulfilled by our patient to diagnose possible primary squamous cell carcinoma. With the past history of squamous cell carcinoma of the cervix this tumour is most likely a metastasis from the cervical cancer.

Primary squamous cell carcinoma of the colon is also known to be associated with the presence of carcinoma in situ, squamous metaplasia in the adjacent mucosa, other synchronous colonic malignancies, adenomatous polyps or ulcerative colitis [1,7].

In our patient, there was no associated squamous metaplasia. Colonoscopy done two weeks prior did not reveal any of the above. In primary squamous cell carcinoma of the colon, malignant squamous cells arise in the mucosa and infiltrate transmurally with areas of squamous metaplasia or squamous carcinoma in situ in the adjacent mucosa [7]. Conversely, this patient with metastatic squamous carcinoma had islands of malignant squamous cells predominantly in the sub mucosa with occasional focal infiltration into the mucosa without associated squamous metaplasia. History of carcinoma of the cervix along with these features directs towards the metastatic nature of the colonic lesion. In the absence of clinical evidence of other metastatic deposits and apparently well after the treatment of the primary lesion, hematogenous spread is unlikely in our case, though the possibility of retrograde lymphatic permeation could only be evaluated by lymphangiography. But, in this patient the presence of lymph nodal enlargement suggests that lymphatic spread is likely.

Early detection with prompt intervention is the key factor required in the successful management of the secondary tumors and to improve the overall survival of the patient.

Metastasis to the colon from carcinoma cervix should be treated aggressively as the patient can remain disease-free for a long time. Our patient achieved good palliation after surgery, and remained disease-free till now. An emergency laparotomy saved her from

Possible future complications of intestinal obstruction such as intestinal perforation, which could have been fatal.

Figure 1: High power view of metastasis from the squamous cell carcinoma in the sub mucosa of the colon.
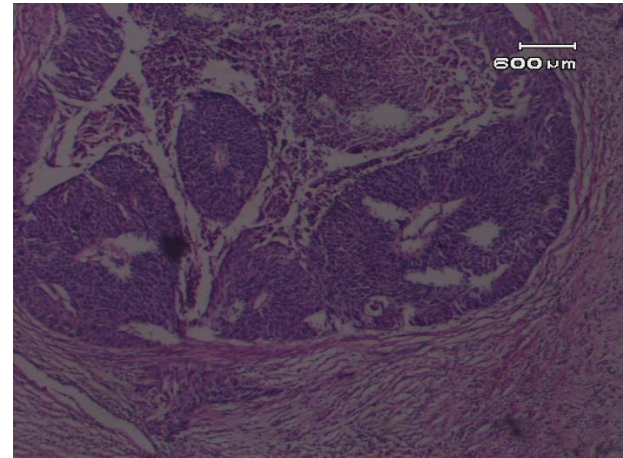
Figure 2: High power view of metastasis from the squamous cell carcinoma in the sub mucosa of the colon with vascular
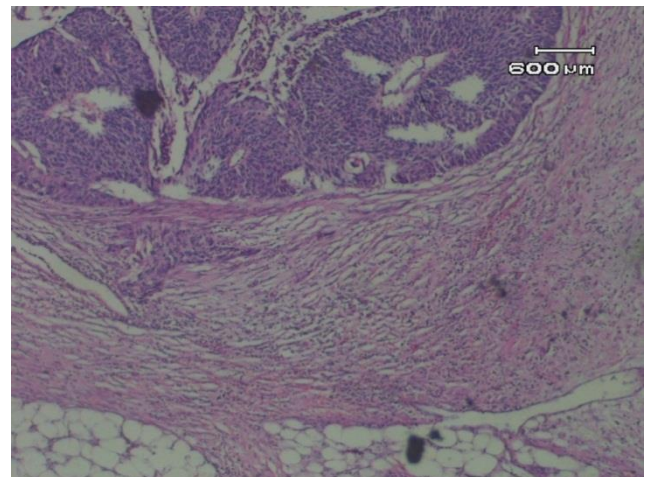
embolus

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The Economic Effects of High Speed Rail Investment

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Abstract- The rationale for HSR investment is not different to any other public investment decision. Public funds should be allocated to this mode of transport if its net expected social benefit is higher than in the next best alternative. The exam of data on costs and demand shows that the case for investing in HSR is strongly dependent on the existing volume of traffic where the new lines are built, the expected time savings and generated traffic and the average willingness to pay of potential users, the release of capacity in congested roads, airports or conventional rail lines and the net reduction of external effects.

Index Terms- Cost-benefit analysis, infrastructure investment, high speed rail, intermodal competition.

I. INTRODUCTION

Investing in HSR is on the front line of action to revitalize the railways. The ultimate objective is to change modal split in passenger transport with the aim of reducing congestion, accidents and environmental externalities. HSR investment is seen as a second best policy with the aim of changing modal split in the benefit of the railways.

High speed trains require high speed infrastructure, meaning that new dedicated track need to be built at a cost substantially higher than the conventional rail line. Infrastructure maintenance cost is comparable with conventional rail but the building costs and the acquisition, operation and maintenance costs of specific rolling stock make this transport alternative an expensive option. In any case, the cost of the HSR is not the point. The economic problem is whether the social benefits are high enough to compensate the infrastructure & operating costs of the new transport alternative.

Even this being the case, other relevant alternatives should be examined and compared with the investment in HSR.

This paper tries to shed some light on the economic dimension of HSR investment decision, which not only affects the transport sector but has significant effects on the allocation of resources. The European Commission has opted enthusiastically for this technology; meanwhile countries like UK or USA have been reluctant in the recent past to finance with public funds the construction of a high speed rail network, which is a priority in the European Union. Why some countries like France or Spain are allocating a high proportion of public money to the construction of new lines and others maintain their conventional railway lines? HSR is quite effective in deviating passengers from other modes of transport but the relevant question is whether the sum of the discounted net social benefits during the life of the infrastructure justifies the investment cost.

The description of the costs and benefits of the HSR lines is covered in section 2, where some figures on the average fixed and variable costs per passenger in a standard line are presented to compare with the alternatives. The source of the benefits of HSR is also discussed. The economic analysis of the investment in HSR is the content of section 3 where a simple model is presented to evaluate the social value of this public investment. In section 4 the intermodal effects are covered from the perspective of the deviated traffic and the impact in secondary markets. Pricing is a key element in explaining the economic results of the HSR. Price determines demand volume, social benefits and the financial outcome. In section 5 the economic consequences of pricing HSR services according to different economic principles are discussed as well as some of its long term effects.

II. THE COSTS AND BENEFITS OF A NEW HSR LINE

A. Total costs of building and operating a HSR line

Total social costs of building and operating a HSR line consist of the producer, the user and the external costs. *User costs* are mainly related to total time costs, including access, egress, waiting and travel time invested, reliability, probability of accident and comfort. *Producer costs* involve two major types of costs: infrastructure and train operating costs. *External* costs are associated to construction (e.g. barrier effect and visual intrusion) and operation (e.g. noise, pollution and contribution to global warming). In this section we concentrate on producer and external costs. User costs are dealt with in section 2.3.

A.1. Infrastructure costs

The construction costs of a new HSR line are marked by the challenge to overcome the technical problems which avoid reaching speeds above 300 km per hour, as roadway level crossings, frequent stops or sharp curves, new signalling mechanisms and more powerful electrification systems. Building new HSR infrastructure involves three major types of costs: planning and land costs, infrastructure building costs and superstructure costs (UIC, 2005).Feasibility studies, technical design, land acquisition, legal and administrative fees, licenses, permits, etc. are included in *Planning and land costs*, which can reach up to 10% of total infrastructure costs in new railway lines requiring costly land expropriations. *Infrastructure building costs* involve terrain preparation and platform building. Depending on the characteristics of the terrain, the need of viaducts, bridges and tunnels, these costs can range from 15 to 50% of total investment. Finally, the rail specific elements such as tracks, sidings along the line, signalling systems, catenary, electrification communications and safety equipment, installations, etc., which are called *superstructure costs*. Railway infrastructure also requires the construction of stations. Although sometimes it is considered that the cost of building rail stations,

which are singular buildings with expensive architectonic design are above the minimum required for technical operation, these costs are part of the system and the associated services provided affect the generalized cost of travel (for example, quality of service in the stations reduces the disutility of waiting time. From the actual building costs (planning and land costs, and main stations excluded) of 45 HSR lines in service, or under construction, the average cost per km of a HSR line ranges from 9 to 40 million of euros with an average of 18. The upper values are associated to difficult terrain conditions and crossing of high density urban areas.

A.2. Operating costs

The operation of HSR services involves two types of costs: infrastructure maintenance and operating costs, and those related to the provision of transport services using the infrastructure. *Infrastructure maintenance and operating costs* include the costs of labour, energy and other material consumed by the maintenance and operations of the tracks, terminals, stations, energy supplying and signalling systems, as well as traffic management and safety systems. Some of these costs are fixed, and depend on operations routinely performed in accordance to technical and safety standards. In other cases, as in the maintenance of tracks, the cost is affected by the traffic intensity; similarly, the cost of maintaining electric traction installations and the catenary depends on the number of trains running on the infrastructure. From data corresponding to several European countries, infrastructure maintenance costs per km are, on average, equal to €100,000 per year. The operating costs of HSR services (train operations, maintenance of rolling stock and equipment, energy, and sales and administration) vary across rail operators depending on traffic volumes and the specific technology used by the trains. In the case of Europe, almost each country has developed its own technological specificities: each train has different technical characteristics in terms of length, composition, seats, weight, power, traction, tilting features, etc. The estimated acquisition cost of rolling stock per seat goes from €33,000 to €65,000 (2002). The operating and maintenance costs vary considerably. Adding operating and maintenance costs and taking into account that a train runs from 300,000 to 500,000 km per year, and that the number of seats per train goes from 330 to 630, the cost per seat-km can be as high as twice as it is in different countries

A.3. External costs

A common place regarding the introduction of HSR services is that negative externalities will be reduced in the affected corridor, thanks to the deviation of traffic from less environmentally friendly modes of transport. Nevertheless, building a HSR line and operating trains lead to environmental costs in terms of land take, barrier effects, visual intrusion, noise, air pollution and contribution to global warming. The first four of these impacts are likely to be stronger where trains go through heavily populated areas. HSR trains are electrically powered, and therefore produce air pollution and global warming impacts when coal, oil and gas are the main sources to generate the electricity. The negative environmental effects of the construction of a new HSR have to be compared with the reduction of the externalities in road and air transport when passengers shift to HSR.

The final balance depends on several factors (see a more formal discussion in section 4) but basically the net effect depends on the magnitude of the negative externalities in HSR compared with the substituted mode, on the volume of traffic diverted and whether, and in what degree, the external cost is internalised. To the extent that infrastructure charges on these modes do not cover the marginal social cost of the traffic concerned there will be benefits from such diversion. Estimation of these benefits requires valuation of marginal costs of congestion, noise, air pollution, global warming and external costs of accidents and their comparison with taxes and charges. The marginal external costs (including accidents and environmental cost but excluding congestion) per passenger-km for two European corridors have been estimated in INFRAS/IWW (2000). The results show that HSR between Paris and Brussels have less than a quarter of the external cost of car or air. It is worth looking not only at the relative values but the absolute ones. In the HSR line Paris-Brussels the external cost of 1,000 passenger-km is equal to €10.4 (43.6 for cars and 47.5 for air transport). The external cost of HSR is highly dependent on the train load factors. In long distances the advantage over air is reduced as much of the environmental cost of the air transport alternative occurs at take-off and landing.

B. Where do HSR benefits come from?

Investing in HSR infrastructure is associated with lower total travel time, higher comfort and reliability, reduction in the probability of accident, and in some cases the release of extra capacity which helps to alleviate congestion in other modes of transport. Last but not least, it has been argued that HSR investment reduces the net environmental impact of transport and boosts regional development. The observation of existing HSR lines shows that user benefits deserve a closer examination. Let us start with total travel time. The user time invested in a round trip includes access and egress time, waiting time and in vehicle time. The total user time savings will depend on the transport mode where the passengers come from. Evidence from case studies on HSR development in seven countries shows that when the original mode is a conventional rail with operating speed of 130 km/h, representative of many railway lines in Europe, the introduction of HSR services yields 45-50 minutes savings for distances in the range of 350-400 km. When conventional trains run at 100 km/h, potential time savings are one hour or more, but when the operating speed is 160 km, time saving is around half an hour over a distance of 450 km (Steer Davies Gleave, 2004). Access, egress and waiting time are practically the same. When passenger shifts from road or air the situation changes dramatically. For road transport and line lengths around 500 km, passengers benefit from travel time savings but they lose with respect to access, egress and waiting time. Benefits are higher than costs when travel distance is long enough as HSR runs on average twice as fast as the average car. Nevertheless, as the travel distance get shorter the advantage of the HSR diminishes as `in vehicle time´ lost weight with respect to access, egress and waiting time. Benefits also come from generated traffic. The conventional approach for the measurement of the benefit of new traffic is to consider that the benefit of the inframarginal user is equal to the difference in the generalized cost of travel without and with HSR. The last user with the project is indifferent

between both alternatives, so the user benefit is zero. Assuming a linear demand function the total user benefit of generated demand is equal to one half of the difference in the generalized cost of travel. Where the conventional rail network is congested or the airports affected are working close to maximum capacity, the construction of a new HSR line has the benefit of relieving capacity for suburban or regional passenger services or freight. In the case of airport, the additional capacity can be used to reduce congestion or scarcity. In any case, the introduction of HSR would produce this additional benefit.

III. THE ECONOMIC EVALUATION OF HSR INVESTMENT

A. A simple cost-benefit model for the evaluation of HSR

Suppose that a new HSR project is being considered. The first step in the economic evaluation of this project is to identify how the investment, a `do something´ alternative, compares with the situation *without* the project. A rigorous economic appraisal would compare several relevant do something´ alternatives with the base case. These alternatives include upgrading the conventional infrastructure, management measures, road and airport pricing or even the construction of new road and airport capacity. We assume here that relevant alternatives have been properly considered.

B. HSR as an improvement of the railways

The public investment in HSR infrastructure can be contemplated as a way of changing the generalized cost of rail travel in corridors where conventional rail, air transport and road are complements or substitutes. Instead of modelling the construction of HSR lines as a new transport mode we consider this specific investment as *an improvement* of one of the existing modes of transport, the railway. Therefore, it is possible to ignore total willingness to pay and concentrate on the incremental changes in surpluses or, alternatively, on the changes in resource costs and willingness to

IV. INTERMODAL EFFECTS

A. Intermodal effects as benefits in the primary market

The construction of a new HSR line of a length within the range 400-600 km has a significant impact on air transport. Modal split changes dramatically in the affected corridor as the generalized cost of the railway is lower than the generalized cost of air transport. As the recently launched AVE Madrid-Barcelona illustrates, the introduction of HSR in a corridor of 600 km long gives railways a role unforeseen with the average rail speeds of recent past. The airlines carried 5 million passengers per year in the route Madrid-Barcelona and three months after the HSR services were introduced they are losing traffic at a rate that amounts to 1.2 million passenger-trips per year. What about other HSR lines?

The intermodal effect of HSR is stronger in lines with a longer period in operation. The effect of the introduction of HSR in medium distance corridors where conventional rail, car and air were the previous alternatives is quite significant as Table 2 and Figure 2 illustrate. The HSR market share is correlated with rail commercial speed and, with the exception of Madrid-Barcelona (recently launched), in those lines where the average speed of rail is around to 200 km the market share of the HSR is higher than 80 per cent. The high market share of railways in these medium distances has been an argument in favour of investing in the HSR technology. If passengers freely decide to shift overwhelmingly from air to rail it follows that they are better off with the change. The problem is that a passenger decides to move from air to rail because his generalized cost of travel is lower in the new alternative (certainly, this is not so for everybody as air transport maintains some traffic) and this is not a guarantee that society benefits with the change as it can easily be shown.

B. Effects on secondary markets

It must be emphasized that time savings in the primary market is an intermodal effect: the direct benefit obtained by users of other mode of transport who become HSR users. The reduction of traffic in the substitutive mode affects its generalized cost and so the cost of travelling of the users who remain in the conventional mode. The existing transport modes are not the only markets affected by the introduction of the new mode of transport. Many other markets in the economy are affected as their products are complements or substitutes of the primary markets. The treatment of these so called `indirect effects´ are similar for any secondary market, be the air transport market or the restaurants of the cities connected by the HSR services.

V. PRICING

A. Short-run or long-run marginal cost?

Let us assume that supplier operating costs, variable maintenance and operating infrastructure costs, and external costs are already included in the generalized cost. Should the investment costs and the cuasi-fixed maintenance and operating costs be also included in the full price? The European Commission proposes a charging system based on each mode of transport internalizing its social costs, to reach an efficient distribution of traffic across different modes and ensure that these operators are treated equally to achieve fair competition. How much a rail operator should be charged for the use of the infrastructure in a particular time or demand conditions? In principle the answer is the `marginal social cost´ of running the train in that particular situation. Given the presence of economies of scale, significant indivisibilities and fixed and joint costs, pricing according to marginal social costs is far from being an easy task. Despite some contradictions, the Commission seems to favour a short-run marginal cost pricing (European Commission, 1995, 1998, Nash, 2001). It is expected that marginal cost charging will allow full capital costs recovery, given that prices in congested corridors and the internalization of congestion and external effects will produce enough revenue to satisfy financial constraints, at least across the modes. In the cases of insufficient revenues the Commission recommends additional "nondiscriminatory" and "non-distorting" fixed charges (European Commission, 2001b). The consequences of charging according to short-run marginal cost on the expansion of HSR lines are significant. Low prices favour the reallocation of traffic from competing modes and encourage traffic generation, with a

feedback on the future expansion of the network. Pricing according with short-run marginal cost leaves a key question unanswered: are the rail users willing to pay for the new technology? Unless this question is answered before investment decisions are taken, marginal cost pricing is not a guarantee for an efficient allocation of resources.

B. The long term effect of pricing

Prices have different economic functions. Prices act as a device to maintain the equilibrium in markets avoiding both excess of demand or underutilized capacity; moreover, prices are signals in competitive markets guiding the allocation of resources where the consumer willingness to pay is at least equal to the opportunity costs of these resources elsewhere. Entry and exit in these markets follow the price adjustment when demand is higher or lower that supply. Transport prices are not different in this way to other prices in the economy. Competitive transport markets behave in the same way. Therefore, when price is lower or higher than marginal social costs in a particular mode of transport, the level of economic activity in this mode, and the traffic volume is suboptimal unless this is compensated in other markets related to the primary market through substitutability or complementarily relationships. It is well known that when a transport user chooses a particular mode of transport in a particular place and time imposes a marginal cost to himself (user cost and the share of the producer cost –infrastructure and vehicles- included in the price), to the rest of society (external cost of accidents and environmental externalities) and to the taxpayers (the share of the producer cost that has been subsidized). When the generalized price is lower than the marginal social cost, as happen to be when freight is transported by a heavy vehicle in a congested road, the amount of freight transport on that road and time is higher than the optimal one. Pricing according to marginal social cost would increase the generalized price of this transport option, reducing the amount of road traffic and inducing long-term adjustments from increasing rail freight transport share to reducing the need of specialized labour in the production of spare parts for trucks.

What is the difference when HSR fares are short to cover infrastructure costs? It might be argued that economies of scale and strong indivisibilities justify the deficits, but the question is that users should be willing to pay for the HSR infrastructure before new lines are built. HSR prices act as signals that transport users take as key information on where, how and when to travel, or even whether to travel or not. When infrastructure costs are not included in transport prices, according to the rationale of short-term marginal social cost, the problem is that the price signal is telling consumers that is efficient to shifts from road or air transport to rail transport, and this, of course, could be true in the short-term when optimal prices are not affected by the fixed costs of the existing HSR network, but the world is dynamic. The problem is that prices that do not reflect infrastructure costs in a transport mode where these costs exceed 50% of total producer costs, act as long-term signals for the consumers in their travel decisions and consequently in the future allocation of resources between transport modes or between transport, education or health. An extensive HSR network can be developed based on suboptimal prices decided by the government which keep no relation to the opportunity costs of its existence, but once the network is built bygones are bygones and the speculation on the counterfactual with a different allocation of resources and their effect on welfare is not very practical. The defence of cost-benefit analysis in this context is quite relevant. Even accepting that short-term marginal cost is the right pricing policy, investing in a new HSR line requires that the willingness to pay for capacity be higher than the investment costs and any other demand unrelated cost during the lifetime of the infrastructure. This does not solve the problems of fair competition between different transport modes or the equity issue of taxpayers paying HSR fixed costs, but at least it puts a filter on the most socially unprofitable projects.

VI. CONCLUSIONS

Investment in high speed rail (HSR) infrastructure is being supported by governments and supranational agencies with the declared aim of working for a more sustainable transport system. HSR is considered more efficient and less environmentally damaging that air or road transport. The truth in both arguments rests heavily on the volume of demand of the affected corridors and several key local conditions, as the degree of airport or road congestion, the existing capacity in the conventional rail network, values of time, travel distance, construction costs, or the source of electricity generation and the proportion of urban areas crossed by the trains. The engineering of HSR is complicated but its economics is very simple. High proportion of fixed and sunk costs, indivisibilities, long life and asset specificity make this public investment risky, with a very wide range of values for the average cost per passenger-trip. The social profitability of investing public money in this technology depends in principle on the volume of demand to be transported and the incremental user benefit with respect to available competing alternatives. The lack of private participation in HSR projects increases the risk of losing money; or reworded in more precise terms, of losing the net benefits in the best alternative use of public funds. HSR investment may be adequate for some corridors, with capacity problems in their railway networks or with road and airport congestion, but its convenience is closely related to the mentioned conditions and the volume of demand to be attended. Moreover, even in the case of particularly favourable conditions, the net present value of HSR investment has to be compared with other to do something´ alternatives as road or airport pricing and/or investment, upgrading of conventional trains, etc. When the investment cost associated to new HSR lines does not pass any market test, and the visibility is reduced by industry propaganda, short-term political interests and subsidized rail fares, conventional cost-benefit analysis can help to distinguish good projects from simple `white elephants´.
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Performance of Logistic Regression in Tuberculosis Data

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Abstract- This paper examined logistic regression for describing the relationship between an indications of suffering from complications pulmonary tuberculosis and its associated risk factors (predictors). Logistic regression was used as a tool to see the performance on tuberculosis data. The data used for this paper was collected from the Records Department of Federal Medical Centre, Ido Ekiti, Ekiti State, Nigeria, between the period of 2010 to 2011. At the end of the analysis, the estimated function

$$\lambda_j = 0.839 - 0.233x_{ij} - 0.311x_{2j} - 0.974x_{3j} + 1.793x_4 - 0.127x_{5j} + 0.5876_j + 0.161x_{7j}$$

revealed that complications of pulmonary tuberculosis were positively associated with social history of the patients , previous exposure to tuberculosis infection but negatively associated with age, nature of occupation. Also, the absence of complications of pulmonary tuberculosis was influenced by the presence of malaria fever.

Index Terms*-* Logistic regression, tuberculosis, pulmonary, risk factors

I.   INTRODUCTION

Tuberculosis is a chronic infection usually of life long duration caused by two species of Mycobateria: Mycobacterium tuberculosis and Mcyobacterium Bovis. It is a serious disease worldwide and it is more common in areas of high incidence of HIV infection (Erhabor, 2002).

Estimates from the World Health Organization shows that each year about 2 million people die worldwide with this condition many of these are never aware they have this disease. Tuberculosis continues to be a major public health problem in many countries, especially in developing third world nations. In the past, tuberculosis was a major health problem in North America and Europe, while the incidence of tuberculosis has declined in the US since the 1990's when it was the leading cause of death in the United States, it is still a major concern and a resurgence of the disease has taken place in the last few years. In the year 2000, 16,377 new cases of tuberculosis were reported in the US. About a century ago, it was the most common cause of death until it was curbed with discovery of effective antibiotics in the 1950s and Rifampicin in 1970, Osuntokun (40). The disease was on the decline between 1853 and 1984 and it became a disease limited to particular risk groups like the elderly, the homeless, alcoholics, refugees, immigrants and people living under poor socio – economic conditions. There were earlier projections that tuberculosis might be eliminated by the year 2010, Tandon (47). The longstanding downward trend suddenly took a reverse turn and began to rise in the mid 1980'a in Europe,

the Americans and Africa in part because Mycobacteria Tuberculosis frequently and dramatically infect persons with the AIDS / HIV, Daley (14).

The lethal association between HIV / AIDS and Tuberculosis has directed increasing attention to the problem of Tuberculosis HIV / AIDS destroys a persons immune system, leaving the HIV infected person highly susceptible to tubercle bacilli. This association is responsible for the observed increase in the tuberculosis incidence in areas of high incidence of HIV infection especially in Central and Southern Africa, Onadeko (39). In developed countries, the incidence is usually among the older individuals. Developing countries usually have a high incidence among the younger population, this means an increased likelihood of transmission to infants and young children and in the workplace.

In 1993, the WHO declared tuberculosis as a global emergency and they instituted W.H.O. global tuberculosis control policy as a measure to help combat this epidemic. The logistic model also called growth model, had been used by various statisticians in different fields of specialization. It was used by Pearl and Reed to describe the growth of an albino rat and of a tadpole's tail. Berkson J. employed the logistic model for analyzing bioassay data. Cox (1989) used the logistic model for handling quanta response data. Bishop et al (6) also used the model in the analysis of contingency tables. Besides, Agresti (1), Collett (13), Dobson (1990), Hosmer and Lemeshow (25), Raymond], Draper and Smith (1966), Morgan (1985), have all used this model to classify observations into two or more groups. In this work, the logistic regression model is used to analyze and classify a tuberculosis patient as having complications of pulmonary tuberculosis or otherwise.

II.   METHODOLOGY

Logistic Regression Model
        This model can give estimated probabilities that lie within the range of zero to one. It is for this important reason that logistic regression model is more suitable to use as a means of modeling probabilities.

Suppose that we have n Bernoulli observations $Y_1, Y_2 \ldots, Y_n$ in which Y_j = 0 or 1, j = 1, 2, …, n such that

$$P_r(Y_j = 1) = P_j \ and \ P_r(Y_j = 0) = 1 - P_j$$

$$E(Y_j) = 0 \ X \ P_r(Y_j = 0)] + (Y_j = 1 \ X \ P_j(Y_j = 1)] = P_r(Y_j = 1) =$$

$P_j the \ probability \ of \ success \ crresponding \ to \ teh \ j_{th} \ response \ or \ variable$.

For each j = 1, 2, …., n, there is a row vector $X_j = (x_{j1}, x_{j2}, \ldots, x_{jk})$ of explanatory variables. The idea here is

to find an equation that related the probability of success of the jth observation i.e. P_j to some factors, i.e. K explanatory variables, $x_{j1}, x_{j2}, \ldots, x_{jk}$ that we think may influence P_j.

The logistic regression model is usually formulated by relating the probability of success of the jth observation i.e. P_j conditional on a vector X_j of explanatory variables, through the logistic distribution functional form. Thus,

$$P_j = P_r\left\{P_j = \frac{1}{x_j}\right\} = \frac{e^{\beta + x_j\beta_i}}{1 + e^{\beta + x_j\beta_i}} 1 + e^\beta + X_j\beta_i \ldots \ldots \ldots \ldots 1$$

Where
$$X_j = (X_{j1}, X_{j2}, \ldots, X_{jk})_{1 \times k}$$

$$\beta_i = \begin{pmatrix} \beta_1 \\ \beta_2 \\ \beta_k \end{pmatrix} k x_1$$

And $1 - P_j = P_r\{Y_j = 0 | X_j\} \ldots \ldots \ldots \ldots \ldots \ldots 2$

$$= \frac{1}{1} - \frac{e^{\beta_o + x_j\beta_i}}{1 + e^{\beta_o + x_j\beta_i}} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots 3$$

$$= \frac{1}{1 + e^{\beta_o + x_j\beta_i}} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots 4$$

The $\beta_i i$ = 0, 1, 2, …., k are unknown regression coefficients or parameters that are to be estimated from the data and x_{ji} denotes the set of values of the k explanatory variables x_{ji}, x_{j2},…., x_{jk}, $i = 1, 2, \ldots, k$ associated with the jth observation.

The linear logistic model for the dependence of p_j on the values of the k explanatory variables $x_{ji}, x_{j2}, \ldots, x_{jk}$ associated with the jth observation is:

$$\frac{e^{\beta + x_j\beta_i}}{1 + e^{\beta + x_j\beta_i}} \cdot \frac{1 + e^{\beta + x_j\beta_i}}{1} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots 5$$

$$\frac{P_j}{1 - P_j} = e\beta_o + X_j\beta_i \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots 6$$

$$Log_e\left(\frac{P_j /}{1 - P_j}\right) = \beta_o + X_j\beta_i = \beta_o + \sum_{i=1}^{k} \beta_i X_{ji} \ldots \ldots \ldots \ldots \ldots 7$$

When a linear logistic model is fitted to explore the relationship between a binary response variable and one or more predictor variables as in the case of this study, the model is referred to as a logistic regression model.

When the response variable has j mutually exclusive and exhaustive categories denoted by j = 1, 2, …., j and j^{th} category is taken as the reference category for the response variable. The choice of the reference category is arbitrary because the ordering of the categories is also arbitrary.

There are also k explanatory variables $x_1, x_2, \ldots \ldots, x_k$. Hence, the multinomial logistic regression model is then specified in log odds form as:

$$log_e \frac{P_j}{P_j} = \sum_{k=0}^{k} \beta_{jk} x_k \quad j = 1, 2, \ldots, j - 1$$

$$\ldots \ldots \ldots \ldots \ldots \ldots 8$$

Where
j
$$\sum_{j=1}^{j} P_j = 1 \ldots \ldots \ldots \ldots \ldots \ldots \ldots 9$$

And $x_0 = 1$

The Odds and The Logit of P_j

The logit of P_j is derived from the logistic function

$$P_j = \frac{e^{\beta_o + X_j\beta_i}}{1 + e^{\beta_o + x_j\beta_i}}$$
10

From 1, it follows that
$$1 - P_j = \frac{1}{e^{\beta_o + X_j\beta_i}} \ldots \ldots \ldots \ldots \ldots \ldots \ldots 11$$

Dividing (1) by (2) yields
$$\left(\frac{P_j}{1 - P_j} /\right) = e^{\beta_o + X_j\beta_i} \ldots \ldots \ldots \ldots \ldots \ldots 12$$

Taking the natural logarithm (base e) of both sides, we obtain

$$log_e\left(\frac{P_j}{1 - P_j} /\right) = \beta_o + X_j\beta_i = \beta_o + \sum_{i=1}^{k} \beta_i X_{ji} = \lambda_j \ldots \ldots 13$$

The method is based on the logistic transformation or logit proportion, namely;

$$Logit_{(p)} = \frac{P}{1 - P} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots 14$$

Where;
$P = P_r(y = 1)$
$(1 - P) = P_r(y = 0)$

The odds ratio is a measure of association for 2 X 2 contingency table (Agresti, 2007). In 2 X 2 tables, the probability of "success: π_2 in row 2. Within row 1, the odds of success are defined to be:

$$\theta = \frac{P_j}{1 - P_j}$$

The quantity $\frac{P_j}{1 - P_j}$ is called odds denoted as θ and the quantity $log_e\left(\frac{P_j}{1 - P_j}\right)$ is called the log odds or the logit of P_j
And
$$logit\ P_j = log_e\left(\frac{P_j}{1 - P_j}\right) = Log_e\theta$$

Fitting the Linear Logistic Regression Model to Binary Data

Let Y_j be a Bernoulli (binary) response variable in which $Y_j = 0\ or\ 1$ for all j = 1, 2,…, n depending on k explanation variables $X_{j1}, X_{j2}, … X_{jk}$. If probability of success is

$$P_j = prob\,(Y = \tfrac{1}{j})$$

means probability of Y = 1, given j.

Hence, probability of failure is 1 – probability of success.

$$1 - P_j = q_j$$
$$q_j = P(Y = 0/_j)$$
$$q_j = 1 - P(Y = 1/_j)$$

From linear logistic regression model,

$$P_j = \frac{e^{\beta_o + \Sigma_{i=1}^{k} \beta_i x_{ji}}}{1 + e^{\beta_o \Sigma_{i=1}^{k} \beta_i x_{ji}}}$$

The logistic regression function is the logit transformation of P, where;

$$logit\,(P) = lin\frac{P}{1-P} = \beta_o + \beta_i x_i + … + \beta_k x_k$$

Where β_o = the constant of the equation and β_i = the coefficient of the predictor variables i. Using the logistic transformation in this way overcomes problems that might arise if p was modeled directly as a linear function of the explanatory variables; in particular it avoids fitted probabilities outside the range (0, 1). The parameters in the model can be estimated by maximum likelihood estimation.

The Hospital diagnostic index cards and the case notes of these discharged patients were thoroughly studied with particular attention being paid to some of the factors (explanatory variables or predictors) influencing the probability of having complications of pulmonary tuberculosis which formed the main focus of this study.

The dependent variable Y is defined as
Y (Outcome) = 1, Success (π_1)
0, Failure (π_2)

In this project work, a Tuberculosis patient is considered to have attained "Success" if he or she had suffered from complications of pulmonary Tuberculosis after clinical diagnosis; otherwise, he or she is considered to have attained "failure".

The predictors (independent or explanatory) variables available for this work are defined as follows:

Age (X_1) =
1, 15 – 24 years
2, 25 – 34 years
3, 35 – 44 years
4, 45 – 54 years
5, Age ≥ 55years

Nature of occupation before (X_2) = 0, No job

1, Student
2, Unskilled workers e.g. (traders, workers in the cement or tobacco factory or Quarry etc
3, Skilled workers e.g. workers in chest Hospitals or Tuberculosis wards etc.

Previous Contact with a person Having chronic cough or an infected person (X_3)
0, No sign of contact
1, Sign of contact

Social History
(Tobacco Smoking and (X_4) =
0, If the patient had not smoked or drank before
1, If the patient had smoked and drank before
2, If the patient had not drank at all but smoked

Alcohol consumption
3, If the patient had not smoked at all but had drank before.

Previous exposure
to diseases (X_5) =
0, None
1, Presence of HIV/AIDS as the main disease
2, Presence of at least one from diseases that can depress immunity apart from HIV/AIDS (Diabetes, Leprosy, Cancer, Malnutrition, Meascles)
3, Presence of at least one from Hypertension, Pneumonia with or without Malaria fever
4, Presence of only Malaria fever

Previous exposure
to Tuberculosis (X_6) infection
0, No previous Tuberculosis infection
1, If the patient had been infected before but failed to complete his/her treatment
2, If the patient had been infected before but completed his or her treatment.

Length of time of reporting
to the right hospital after (X_7) =
noticing persistent cough or discomfort.
Other discomfort
1, if the Patient had reported after 1-3 weeks of persistent cough or other discomfort.
2, if the patient had reported after 1-5 months of persistent cough or other discomfort.
3, if the patient had reported after 6-10 months of persistent cough or other
4, if the patient had reported after 11-15 months of persistent cough or other discomfort
5, if the patient had reported after 16-20 months of persistent cough

III. RESULTS

The data collected from fifty randomly selected discharged Tuberculosis patients consisting of the dependent variable (outcome) Y and the explanatory variables (predictors) X_1, X_2, X_3, X_4, X_5, X_6 and X_7 were analyzed using the SPSS (17.0). The cross-tabulation of each independent variable X_i with dependent variable Y was examined and the chi-squared Test was carried out for each independent variable in-order to ascertain whether they are dependent or not.

The table below shows the result of the chi-squared test for the eight independent variables.

Table1

Variable	Calculated Chi-Squared value	Tabulated Chi-Squared Value	Df	Significant P-Value
X_1	4.200	9.488	4	0.380
X_2	38.480	7.815	3	0.000
X_3	28.880	3.841	1	0.000
X_4	44.920	5.991	2	0.000
X_5	12.200	9.488	4	0.016
X_6	54.760	5.991	2	0.000
X_7	15.600	9.488	4	0.004

Test of Independence

It is important to test for the independence of variables which will tell us whether variable X_i is dependent or not with variable Y_i. That is, we wish to test the hypothesis

$H_0 : P_{ij} = P_i P_{\cdot j}$

Against
$H_1 : P_{ij} \neq P_{i\cdot} P_{\cdot j}$

For all i and j where P_{ij} is the probability that both X_i and Y_j occur

For testing independence in r X c contingency tables, the calculated chi-squared is obtained from
$$X^2 = \Sigma \frac{(0 - E)^2}{E} \quad (3.5.1)$$
Based on (r - 1) (c - 1) degrees of freedom
Where
O are the observed frequencies
E= $\frac{\text{Row Total x Column Total}}{n}$ are the expected frequency values.

Since the chi-square calculated for variables X_2, X_3, X_4, X_5, X_6 and X_7 as shown in the table 3.0 above are greater than their corresponding chi-square values from the table at $\alpha = 0.05$, we therefore reject the null hypothesis of statistical independence of these variables and the dependent variable and conclude that variables X_2, X_3, X_4, X_5, X_6 and X_7 are not independent of the observed outcome Y. this is also in conformity with their significant P – values [prob ($x^2 \geq$ observed] which are less than 0.05.

Correlation Matrix

The correlation analysis of the dependent variable and independent variables with one another were carried out using the SPSS (17.0) computer program and the results is shown below.

Table 2: Correlation Matrix

Variable	Y	X_1	X_2	X_3	X_4	X_5	X_6	X_7
Y	1.000	-0.379	-0.416	-0.313	-0.021	-0.529	-0.246	-0.579
X_1	-0.379	1.000	-0.475	0.340	-0.299	0.150	0.218	0.106
X_2	-0.416	-0.475	1.000	-0.035	0.105	0.052	0.219	0.164
X_3	-0.313	0.340	-0.035	1.000	-0.030	0.030	-0.104	0.143
X_4	-0.021	-0.299	0.105	-0.030	1.000	0.210	0.149	-0.076
X_5	-0.529	0.150	0.052	0.030	0.210	1.000	0.161	-0.075
X_6	-0.246	-0.218	0.219	-0.104	0.149	0.161	1.000	0.203
X_7	-0.579	0.106	0.164	0.143	-0.076	-0.075	0.203	1.000

It was discovered that the independent variables are correlated some are highly positive correlated while some are highly negative correlated and also low positive correlated with response variable Y, hence they could all be used for the analysis.

Estimation of the Linear Logistic Regression Parameters

Data used for the analysis comprised of fifty randomly selected discharged Tuberculosis patients consisting of the outcome variable Y (dichotomous values) and the predictors X_1 X_2 X_3 X_4 X_5 X_6 and X_7 were analyzed. SPSS software package was used for the analysis, the maximum likelihood method is used to estimate the coefficients and its standard error in addition the Newton – Raphson method solve the non linear equations for the logistic model maximum likelihood estimations.

Table3

Variable	Beta Estimate	Standard Error of Beta	Wald statistic value	Degree of freedom	Significant P-value
X_1	-0.233	0.345	0.457	1	0.499
X_2	-0.311	0.537	0.335	1	0.563
X_3	-0.974	1.031	0.893	1	0.345
X_4	1.793	1.156	2.407	1	0.121
X_5	-0.127	0.269	0.225	1	0.635
X_6	0.587	0.532	1.221	1	0.269
X_7	0.161	0.264	0.372	1	0.542
Constant	0.839	1.674	0.251	1	0.616

From the result shown in the table 3.3 above the estimated function is:

$$\lambda j = 0.839 - 0.233x_1j - 0.311x_2j - 0.974x_3j + 1.793x_4j - 0.127x_5j + 0.587x_6j + 0.161x_7j$$
…………………………………….. (3.7.1)

At 0.05 level of significant, Table 3.4 shows that variable X_4, X_6, and X_7 increases the probability of complications of pulmonary Tuberculosis while X_1, X_2, X_3, and X_5 decreases the probability of complications of tuberculosis. X_4 is highly significant in order words strongly contributes to the complications of pulmonary Tuberculosis next is X_3 while X_7 make negligible contributions to it. This then implies the larger the value of coefficient for a variable, the bigger is the impact of such a variable to the outcome variable.

Therefore, the logistic regression model is

$$Pj = \frac{e^{(\lambda_j)}}{1 + e^{(\lambda_j)}}$$

The Odds Ratio Results

The following odds ratios were calculated using the formula;

$$\theta = \frac{P}{1 - P_j}$$ and 95% confidence intervals.

While the formula for the upper and lower limit of the odd ratio is given by

$$\exp(\beta \pm Z\alpha/_2 S_\beta)$$

Where

β is the maximum likelihood estimate of β

α is the level of significance which is 0.05

$Z\alpha/_2$ is the upper (one sided) $\alpha/2$ point of the standard normal distribution which is 1.96

And

S_β is the standard error of β

The table below gives the odds ratio for each predictor variable and their corresponding 95% confidence interval.

TABLE4: Odd Ratio Results

Variable	Odds Ratio	95% C.I.	
		Lower	Upper
X_1	0.792	0.403	1.558
X_2	0.733	0.256	2.099
X_3	0.377	0.050	2.848
X_4	6.008	0.623	57.903
X_5	0.880	0.520	1.492
X_6	1.799	0.634	5.102
X_7	1.175	0.700	1.971

From table4 it is evident that variables X_4, X_6, and X_7 are susceptible for complications of pulmonary tuberculosis.

The Hypothesis Testing

The interest here is to find out which among the logistic regression coefficients or beta estimates contributes to the significance, by testing for the individual beta estimates using our Wald statistic. Hence, the hypothesis becomes:

$H_0 : \beta_i = 0$

against

$H_i : \beta_i \neq 0$

Hence from the test statistic, we conclude that since the Wald statistic value calculated for variables X_1, X_2, X_3, X_4, X_5, X_6 and X_7 as shown in table 3.1 are less than the chi-squared value from the table at $\alpha = 0.05$, we therefore accept H_0 and conclude that the variables are not significant. Hence, X_1, X_2, X_3, X_4, X_5, X_6, and X_7 does not significantly help to predict the complications of pulmonary tuberculosis. We can only base our assumptions on the chi-square test which is more powerful and reliable as an alternative to the Wald Test.

The Test Of Goodness-Of-Fit of The Model

It is always desirable to test for the goodness of fit for the logistic model which will tell us whether a model of this form provides a good fit to the data or not.

The hypothesis then becomes

$H_0 : y_i = \mu_i$

against

$H_i : y_i \neq \mu_i$

The Hosmer Lemeshow goodness-of-fit test divides the subjects (i.e. cases used in the analysis which are fifty discharged tuberculosis patients) into deciles based on predicted probabilities, then computes a chi-square from observed and expected frequencies.

The Hosmer Lemeshow statistic is employed to test for the goodness-of-fit of the model. The calculated Hosmer Lemeshow goodness-of-fit test statistic is obtain,

TABLE5: Contingency Table for Hosmer and Lemeshow Test

Group	Y = 0 Observed Expected		Y = 1 Observed Expected		Total
1.	4.000	4.463	2.000	1.537	6.000
2.	4.000	3.425	1.000	1.575	5.000
3.	3.000	3.201	2.000	1.799	5.000
4.	4.000	2.920	1.000	2.080	5.000
5.	2.000	2.596	3.000	2.404	5.000
6.	2.000	2.005	3.000	2.995	5.000
7.	0.000	1.706	5.000	3.294	5.000
8.	2.000	1.222	3.000	3.778	5.000
9.	1.000	0.448	4.000	4.552	5.000
10.	0.000	0.014	4.000	3.986	4.000

	Chi-square	df	Sig. P-value
Goodness-of-fit-test	5.776	8	0.672

Since the calculated Hosmer Lemeshow Goodness-of-fit test statistic is less than X^2 (8, 0.05) value obtained from the table (i.e. 15.507), we then accept H_0 and conclude that there is no difference between the observed and the model-predicted or fitted values of the dependent. This then implies that the model's estimates fit the data at $\alpha = 0.05$. Also the value of Hosmer Lemeshow goodness-of-fit statistic computed for the full model is C = 5.776 at the corresponding p-value computed from the chi-square distribution with 8 degree of freedom is 0.672 this indicates that the model seems to fit quite well.

Classification of Tuberculosis Patients

Table 6 gives the classification table. Using the obtained λ_j function observations are classified as follows using a prior probability of 0.56.

TABLE6: Classification Results

Observed	Predicted Y		
	Failure π_0	Success π_1	Percentage correct
Failure π_0	17	5	77.3
Success π_1	9	19	67.9
Overall percentage			72.0

From the table above, we conclude that 77.3% of all Tuberculosis patients not having complications of pulmonary tuberculosis are correctly classified, and 32.1% are incorrectly classified. 67.9% of all Tuberculosis patients having complications of pulmonary Tuberculosis are correctly classified, and 22.7% are incorrectly classified.

Therefore, the overall percent correctly classified by this model is 72% (17 + 19 x 100%) while the overall percent incorrectly classified is 28% (9+5) x 100%.

IV. DISCUSSION OF RESULTS

The estimated logistic regression function classified 17 of the 22 tuberculosis patients in the observed group (failure) correctly for 77.3% and also classified correctly 19 of 28 tuberculosis patients in the observed group (success) for 67.9%. The model incorrectly classified 5 of the 22 tuberculosis patients in the failure group as having complications of pulmonary tuberculosis (success group) when did not, for 22.7%. And also classified incorrectly 9 of 28 tuberculosis patients in the success group as not having complications of pulmonary tuberculosis (failure group) when they did for 32.1%.

In order to establish the association that exists between risk factors (predictor variables) and the complications of pulmonary tuberculosis (outcome variable) the estimator of the predictor variables for the logistic regression function were obtained and presented in table 3.4.

The estimated function is:

$$\lambda_j = 0.839 - 0.233x_{ij} - 0.311x_{2j} - 0.974x_{3j} + 1.793x_4 - 0.127x_{5j} + 0.58766_j + 0.161x_{7j}$$

The function obtained from (4.1.1) show that complications of pulmonary tuberculosis were positively associated with social history of the patient, previous exposure to tuberculosis infection and length of time or reporting to the right hospital but negatively associated with age, nature of occupation, previous contact with an infected person. It is also observed that absence of complications of pulmonary tuberculosis was influenced mainly by the presence of malaria fever than presence of complications of pulmonary tuberculosis. Presence of HIV / AIDS as the main cause disease associated most strongly to the occurrence of complications of pulmonary tuberculosis. Absence of complications of pulmonary tuberculosis was also associated with previous contact with an infected person. The presence of complications of pulmonary tuberculosis was strongly associated with previous exposure to tuberculosis infection, social history of the patients and length of time of reporting to the hospital.

In the context of this work, it was observed that is interesting however to note that the areas with high predicted probability of 'success' coincide with areas of presence of either HIV or other immune – suppressive disease with a longer duration of persistent cough before reporting to the hospital. The longer the patient stays at home before reporting after noticing persistent cough or other discomfort, the higher is the chance or probability of suffering from complications of pulmonary tuberculosis. It was observed that patients that smoke tobacco with poor socio – economic status are also prone to complications of pulmonary tuberculosis. It was also observed that some of this patient who had complications of pulmonary tuberculosis had RIP on their case notes, which supports the fact that tuberculosis is indeed a chronic disease.

V. CONCLUSION

The age, nature of occupation before infection, previous contact with person having chronic cough, social history, previous exposure to diseases, previous exposure to tuberculosis infection which are the predictor variables, and the complications of pulmonary tuberculosis (outcome variables) has been used to establish the logistic regression function for the complications of pulmonary tuberculosis.

The project work has successfully found logistic regression function for the patients owing to the fact that social history, previous exposure to tuberculosis and length of time of reporting to the hospital contributed significantly to the complications of pulmonary tuberculosis.

We conclude that the most powerful variables in determining complications of pulmonary tuberculosis are social history of the patients, followed by previous exposure to tuberculosis infection and length of time reporting to the right hospital.

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"A Study on Language Teaching for the Learning Disability Students" - With Special Reference to Kalyan School, Trivandrum

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Abstract- Learning disabilities are problems that affect the brains' ability to receive, process, analyze, or store information. These problems can make it difficult for a student to learn as quickly as someone who isn't affected by learning disabilities. There are many kinds of learning disabilities. Most students affected by learning disabilities have more than one kind. Certain kinds of learning disabilities can interfere with a person's ability to concentrate or focus and can cause someone's mind to wander too much. Other learning disabilities can make it difficult for a student to read, write, spell, or solve math problems. This paper focuses on difficulties, huntresses and lists faced by LD students in "English language learning and tries to solve the problems faced by LD students in schools with special reference to Kalyan School, Trivandrum.

Index Terms- Learning disabilities, LD Students,Kalyan School

I. INTRODUCTION

Language teaching practice often assumes that most of the difficulties that learners face in the study of English is a consequence of the degree to which their native language differs from English (a contractive analysis approach). Some students may have very different cultural perceptions in the classroom as far as learning a second language is concerned. Also cultural differences in communication styles and preferences are significant.

Learning disabilities are problems that affect the brains' ability to receive process, analyze, or store information. These problems can make it difficult for a student to learn as quickly as someone who isn't affected by learning disabilities. There are many kinds of learning disabilities. Most students affected by learning disabilities have more than one kind. Certain kinds of learning disabilities can interfere with a person's ability to concentrate or focus and can cause someone's mind to wander too much. Other learning disabilities can make it difficult for a student to read, write, spell, or solve math problems. This paper focuses on difficulties, huntresses and lists faced by LD students in "English language learning and tries to solve the problems faced by LD students in schools with special reference to Kalyan School, Trivandrum.

This paper examines spontaneous writing of a college student with a history of language learning problems. Writing samples, collected from tests and papers in college courses, were analyzed for syntactic complexity, spelling, grammatical errors, semantic errors, and organization. Meta-cognitive factors were analyzed by examining student's responses to questions about his perceptions about writing.

II. KALYAN SCHOOL

Kalyan School situated in pleasant surroundings at the heart of the city is a premium institution catering to the educational needs of the children of primary category. Equipped with colourful classrooms, qualified and dedicated teachers, able helpers and wonderful methods of teaching through playful way and Montessori, we aim to develop your child holistically. We have an annex at Pravachambalam.

The special features of Kalyan School are playful way and Montessori method of teaching, field trips to generate awareness, special competitions to kindle the artistic and cultural talents, exhibitions to promote creativity in the child, special attention to slow learners etc. The teacher to child ratio is at a very attractive high of 1:10.

III. KALYAN PLUS THE SPECIAL SCHOOL

A NEW addition to the Kalyan group of schools, it believes in the motto that every child in the world has the right to be enlightened with the light of knowledge. With an efficient and experienced team of Special Educators, Occupational Therapist, Speech Therapist, Child Psychologist and above all Neurologist.

IV. OUR SPECIALITIES

- ✓ Children with special needs (with autism, Down's Syndrome, Cerebral Palsy) are given special training to be self-reliant.
- ✓ Children trained according to their aptitude.
- ✓ 1:1 teacher student ratio for the special school children.
- ✓ Monthly medical check-ups & the records are maintained.

'KALYAN' signifying progress and goodness is the name of the group imparting excellent service in the field of education, medicine, day caring and teacher's training. Kalyan group is a part of the PRS group, the pioneers in the field of construction, medicine, hospitality and education.

V. OBJECTIVES OF RESEARCH

Our primary goal is to conduct a rigorous examination of existing research to identify and understand those practices and instructional principles that produced a positive impact on student learning. Our second goal is to help educators better understanding why some practices are more likely to be effective than others..

VI. WHAT IS A LEARNING DISABILITY?

Some individuals, despite having an average or above average level of intelligence, have real difficulty acquiring basic academic skills. These skills include those needed for successful reading, writing, listening, speaking and/or math. These difficulties might be the result of a learning disability.

The Individuals with Disabilities Education Act (IDEA), a federal law, defines a learning disability as a condition when a child's achievement is substantially below what one might expect for that child. Learning disabilities do not include problems that are primarily the result of intellectual disabilities, emotional disturbance, or visual, hearing, emotional or intellectual disabilities. The official definition is here.

Many children with LD have struggle with reading. The difficulties often begin with individual sounds, or phonemes. Students may have problems with rhyming, and pulling words apart into their individual sounds (segmenting) and putting individual sounds together to form words (blending). This makes it difficult to decode words accurately, which can lead to trouble with fluency and comprehension. As students move through the grades, more and more of the information they need to learn is presented in written (through textbooks) or oral (through lecture) form. This exacerbates the difficulties they have succeeding in school.

VII. WHAT ARE THE TYPES OF LEARNING DISABILITIES?

LD is a broad term. There are many different kinds of learning disabilities. Most often they fall into three broad categories:
• Reading disabilities (often referred to as dyslexia)
• Written language disabilities (often referred to as dysgraphia)
• Math disabilities (often called dyscalculia)

Other related categories include disabilities that affect memory, social skills, and executive functions such as deciding to begin a task.

Here is information on the more common forms of LD.

Dyslexia (difficulty reading)

Dyslexia is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. Reading disabilities affect 2 to 8 percent of elementary school children.

A person with dyslexia can have problems in any of the tasks involved in reading. However, scientists found that a significant number of people with dyslexia share an inability to distinguish or separate the sounds in spoken words. Some children have problems sounding out words, while others have trouble with rhyming games, such as rhyming "cat" with "bat." Yet, scientists have found these skills fundamental to learning to read. Fortunately, remedial reading specialists have developed techniques that can help many children with dyslexia acquire these skills. However, there is more to reading than recognizing words. If the brain is unable to form images or relate new ideas to those stored in memory, the reader cannot understand or remember the new concepts. Other types of reading disabilities can appear in the upper grades when the focus of reading shifts from word identification to comprehension.

Here is a fact sheet and a newspaper story that give you more information about dyslexia:
• Dyslexia Basics
• Dyslexia

Dysgraphia (difficulty writing)

Writing too, involves several brain areas and functions. The brain networks for vocabulary, grammar, hand movement, and memory must all be in good working order. A developmental writing disorder may result from problems in any of these areas. For example, a child with a writing disability, particularly an expressive language disorder, might be unable to compose complete and grammatically correct sentences.

How are learning disabilities identified?

Usually, the teacher or parent notices that the child is struggling to learn or is behind in class. An evaluation can be requested by the teacher or the parent. A comprehensive set of tests are given to see why the child has difficulty. Here are some articles on the evaluation process:
• Evaluation: What does it mean for your child?
• What do you do if you suspect that your child has a learning disability?

Traditionally, evaluators used the results from the assessments to determine if there was a discrepancy between the child's ability and achievement. In practice, this often meant waiting for the child to fail before a child was eligible for special education services. Today a greater effort is being made to respond to a child's special learning needs before he or she falls too far behind. This effort is called Response to Intervention.

VIII. WHAT IS EFFECTIVE INSTRUCTION FOR STUDENTS WITH LD?

Students with learning disabilities benefit from instruction that is explicit and well sequenced. Effective teachers help students with LD learn how to use strategies for managing their assignments. For example, a teacher might teach students to use a graphic organizer that outlines the important information from a text. A different type of organizer might be used to help students remember to bring home the right supplies for a homework assignment.

Teachers often need to provide accommodations to help children learn in class. These are changes in how tasks are presented or responses are received that allow the child to do the same work as their fellow students.

IX. How Do You Know If You Have a Learning Disability?

Just because you have trouble studying for a test doesn't mean you have a learning disability. There are as many learning styles as there are individuals. For example, some people learn by doing and practicing, others learn by listening (such as in class), and others prefer to read material. Some people are just naturally slower readers or learners than others, but they still perform well for their age and abilities. Sometimes, what seems to be a learning disability is simply a delay in development; the person will eventually catch up with - and perhaps even surpass - his or her peers.

But many people with learning disabilities struggle for a long time before someone realizes that there's a reason they're having so much trouble learning. For most people in their teen years, the first telltale sign of most learning disabilities occurs when they notice that there's a disconnect between how much they studied for a test and how well they performed. Or it may just be a feeling a person has that something isn't right. If you're worried, don't hesitate to share your thoughts with a parent or a teacher.

The first step in diagnosing a learning disability is ruling out vision or hearing problems. A person may then work with a psychologist or learning specialist who will use specific tests to help diagnose the disability. Often, these can help pinpoint that person's learning strengths and weaknesses in addition to revealing a particular learning disability.

X. Coping With a Learning Disability

Although a diagnosis of a learning disability can feel upsetting, it's actually the first step in resolving the condition. Once an expert has pinpointed a person's particular problem, he or she can then follow strategies or take medicines to help cope with the disability. And taking steps to manage the disability can often help restore a student's self-esteem and confidence.

Some students who have been diagnosed with a learning disability work with a special teacher or tutor for a few hours a week to learn special study skills, note-taking strategies, or organizational techniques that can help them compensate for their learning disability. If you've been diagnosed with a learning disability, you may need support just for the subjects that give you the most trouble. Your school may have a special classroom with a teacher who is trained to help students overcome learning problems.

Some schools develop what is called an Individualized Education Program (or IEP), which helps define a person's learning strengths and weaknesses and make a plan for the learning activities that will help the student do his or her best in school. A student's IEP might include some regular time with a tutor or in a specialized classroom for a certain subject, or the use of some special equipment to help with learning, such as books on tape or laptop computers for students who have dyslexia.

There are several medicines on the market today to help improve a student's attention span and ability to focus and to help control impulses and other hyperactive behavior.

There's no cure for a learning disability. And you don't outgrow it. But it's never too late to get help. Most people with learning disabilities learn to adapt to their learning differences, and they learn strategies that help them accomplish their goals and dreams

XI. Statement of the Problem

Although learning disabled students have always been part of the educational scene, it has not been until the 1990s that a significant number of LD students have attempted college. There are a number of reasons for this. Until approximately 15 years ago, it was quite possible for students-LD or otherwise-to finish high school and get a job that would provide support for a family. Today, that has changed. Even "trade" jobs now require at least a two-year college diploma. Most skilled labour jobs require significant computer ability, with training provided by local colleges.

Another reason for the increase in LD school students is the growing awareness among students, educational institutions, and guidance counselors which mandates that institutions of higher education which receive education funds, including student loans, are not allowed to discriminate on the basis of disability. This paper proposes to find new innovative methods in helping the LD students the most effective ways.

XII. Methodology : Primary – Questionnaire Survey

Interview Questions for Students
Demographic Information
Age _____, Gender _____, GPA _____
Number of years in school _____
Number of years retained in school _____

Questions
Understanding of Learning Disability
What is your specific learning disability?
How do you see yourself as student?
Tell me about when you first become aware of a learning disability?
Tell me what elementary/high school/college was like.
Tell me who you think you are-in terms of strengths and weaknesses.
Have you ever been in special education classes during your academic career?

Family
Are you aware of others in your family who are LD?
How important has your family been to your school success?
Describe how your family relates to your LD.
A. How have they been not helpful?
B. How have they been helpful?

Classes
How do you choose classes?
Describe a class where you felt comfortable.
a. Requirements b. Teacher c. Other students
What's your strategy for "managing" classes?
Tell me about "wrong" classes.
Have you ever studied a foreign language?

Support

What kind of support, remedial education, tutoring have you used prior to college?
What kind of "outside" support has been most useful to you?
What accommodations have you used through high school?
What kind of support have you tried and found to be not useful?
What kind of support have you used and found helpful here?
What do you do when you have difficulty with a class?
Are you aware of your "rights" as an LD student? What are they?

Dealing with Stress

How stressful is school for you?
What causes the most school-related stress?
How do you cope with the stress of school?
What do you do for fun?

Relationships

Are your friends/significant others aware of your learning disability?
Do you have friends with learning disabilities?
What are helpful peers like?
What is your life like socially?

Self-Perception

How do you think other people "see" you?
In what situations do you feel confident?
In what situations do you feel less competent?

Achieving

To what extent are good grades important to you?
What is your reaction when you receive a good grade?
How do you feel when you're given a poor grade?
What do you predict for your future?

Interview Questions for Parents

1. What is _____'s specific learning disability?
2. When did you first become aware of your child's LD?
3. What was elementary/high school/college like for your child?
4. What are your child's strengths? weaknesses?
5. Has s/he ever been in special education classes?
6. Are there other members of your family who have learning disabilities?
7. How important is a college education in your family?
8. How does your family relate to your child's LD?

Interview Questions for Teachers

1. _____has identified you as being a particularly "helpful" teacher.
Can you identify how you were helpful?
2. When were you first aware of _____'s learning disability?
3. What do you know about the rights of LD students?
4. What types of learning disabilities have you encountered in your classroom?
5. How many LD students have you encountered?
6. What strategies have you used in dealing with them?
7. What specific training have you had in dealing with LD students?

8. How much personal reading have you done, if any?
9. Are you aware of any resources on campus for dealing with LD students?
10. Have you have referred students to these sources?

XIII.   CONCLUSION

Although learning disabilities, in contrast to other disabilities, tend to be "invisible," the effects are not-to the student, to teachers, to parents, to employers, and to friends. The purpose of this study is not to solve the definitional problems surrounding learning disabilities which still exist, though perhaps to a lesser degree than they used to. Rather,our main concern is to inquire into the experiences of a few students within the learning disabled category who have worked-successfully-to complete a school education.

From this study we will look for emerging themes that may be useful to other LD students, their families, and educators so that they may be more aware of the needs and challenges of at least one group of LD students in college settings and how those challenges can be ameliorated. By emphasizing the elements of success, educators in particular can more intentionally provide the real support necessary to the growing number of LD students desiring school education.

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The art of Camel Carving in Cholistan, Punjab Pakistan

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Abstract- The previous princely state of Bahawalpur deceit south of the Punjab in Pakistan.Now the governmental division of Bahawalpur,it encompasses the districts of Bahawalpur and neighbouring Bahawalnagar and Rahim Yar Khan,maintaining accurately the equal boundaries as it did before the partition of the Indian subcontinent into India and Pakistan in 1947.Established in AD 1727,Bahawalpur emerged as one of the most notable Muslim States of British India.Located in southern Punjab,it funtioned as a princely state for about 229 years before finally ceding to Pakistan in 1956.Now,i come to the point the word "camel" is derived via Latin and Greek (*camelus* and *kamēlos* respectively) from Hebrew or Phoenician *gāmāl*. The Hebrew meaning of the word *gāmāl* is derived from the verb root g.m.l, meaning stopping, weaning, going without or repaying in kind. This refers to its ability to go without food or water, as well as the increased ability of service the animal provides when being properly cared for. Camel milk is a staple food of desert traveler tribes and is sometimes considered a food in and of itself; a nomad can live on only camel milk for almost a month. Camel milk is rich in vitamins, minerals, proteins, and immunoglobulins; compared to cow's milk, it is lower in fat and lactose and higher in potassium, iron, and vitamin C. Bedouins believe the curative powers of camel milk are enhanced if the camel's diet consists of certain desert plants. Camel milk can readily be made into a drinkable yogurt, as well as butter or cheese, though the yields for cheese tend to be low. Camel meat is halal for Muslims. However, according to some Islamic schools of thought, a state of impurity is brought on by the utilization of it. Consequently, these schools hold that Muslims must perform *wudhu* (ablution) before the next time they pray after eating camel meat. I am a Cholistani. The beautiful Desert of Cholistan is my Identification I belong here.The word Cholistan is derived from 'Cholna' which means moving and the word Cholistan is derived from the Turkic word *chol*, which means "desert". Cholistan thus means Land of the Desert. The people of Cholistan lead a semi-nomadic life, moving from one place to another in search of water and fodder for their animals. The dry bed of the Hakra River runs through the area, along which many settlements of the Indus Valley Civilization have been found.The local people are known as"Riasti"immigrants from other parts of the Punjab and India are known as abadkar and mohajir.Most local people speak Seraiki, but Punjabi and Urdu are also widely spoken. One of the first civilizations in the world developed in the valley of the Indus River in Asia. It engaged both sides of what is now the border between Pakistan and India. The Indus Valley civilization lasted from about 2500 BC to about 1700 BC.The Indus valley people were well versed in the art of carving. More than 2,000 seals have been discovered from the various sites in the Indus valley. The engravings of the various animals on the seals like those of the humped bull, the buffalo, the bison, the deer, the tiger, the rhinoceros, the

elephant, etc. reveal the artistic ability and technical skill of the engraver of the Indus valley. The figures on lather, metal, wood, ivory and soapstone are also vary remarkable and realistic.Four Civilizations were here such as **Arayan,Bhudhaist,Hinduism and Indus Civilizations** but these three civilization (Arayan,Bhudhaist,Hinduism) now,mixed or marged in Indus Civilization.Now,the Art of Camel Carving is a excellent art expert in the Cholistan desert, Punjab Pakistan. It only belongs to the experts of Cholistan who cut and shave completely developed hair of the camel with different seizers into the forms of simple lines and geometrical designs. There is no reproduction paint used but rather a natural colour of hair dye (mehndi) is mixed with water and applied to the negative area of the designs to make them look dark and prominent. The carved camels are designed for the yearly festival Of Channan Pir (start in Feb), planned between the Derawar and Mujh Gargh forts. They bring their carved camels on Channan Peer Urs and there they do camel show like as camels dance,the agony (camels fighting),the journey (camels race) and camels magic. The basic and extrinsic methods will be applied for the formal and contextual investigation of the camel carving motifs. The flowing lines of hair cutting represent the sun,moon,stars,vegitables shape,Cholistani Herbs,leaflike,animals,birds and humen figure like a micro-universe designed on the body of the camel. Nobody knows exact time frame that when was start this art and from where.

XIV. INTRODUCTION

Now let's review the art of Camel Carving in Cholistan. There are three types of camels in Cholistan such as

[1] Marychi (black camel) generation

[2] Desi also Wattai (white camel) generation

[3] Malguda-Rujhani generation

[4] Benroti generation

The people in Cholistan who recognize his camel just from one glance at the foot print of that camel from the heard of hundreds of camels. They and other experts says that Marychi generation is pure Cholistani camels but Marychi generation meet resemblance to Eygpt generation and India Rajistani generation.Desi or Wattai camels is also Cholistani generation but some camels experts says that it was come from Dubai and mostly used here for magic,race and dance.Malguda-Rujhani is a Pakistani generation (nasal) who came from Tehsil Rujhan Dist Rajanpur,Punjab Pakistan.Malguda Rujhani camels mostly used for the agony (for fighting).

The art of Camel Carving in Cholistan is a old technique or art on camels of Cholistan.It is an interesting and attractive art of Cholistan Bahawalpur. Cholistani experts have made a design on a camel about 8 eight to 15 fifteen days.They have created design in lines,geometrical forms with his skilled and imagination.Cholistani people says that carving pattern represent life in Cholistan desert.

Cholistani camel carving expert have taken inspiration from the following such as: Sun, Moon,Stars, Cholistani Herbs,leaflike,Animals,Birds,Humen figure, Butterfly Weed, Leafs of Dish Cloth Gourd, Onewayri(local name)a Cholistani Herb,Luseen (local name) and Korwal daa peeta(local name),a Cholistani Herb, Kadu Di wal etc. They live in Cholistani desrt.Cattle grazing Shephards with their heard move along from one place to another with green grazing land and do observe deep desert land of Cholistan from all over the place. The art of camel carving in Cholistan are being the following areas of Bahawalpur region: Chak 11 BC near Bahawalpur Airpor ,Chak 13 BC near Bahawalpur city,Channan Peer,Chak 111DNB Headrajkan, Shahiwala,Chak 88DB Yazman,Teilwala Bangla,Mithra,Khutri Bangla,Qazi Wali hatiyan,Chak 92 DB,Chak 116DNB Headrajkan,Chak 127DNB,Meerania,Azeem wala Toba,Kandha Fareed Feroza,Chak 75East Rahim Yar Khan,near Islam Ghar Fort Rahim Yar Khan,Derawar Fort,Angtraa Toba,Deen Ghar Fort, Kaaly Paar,Muj Ghar Fort,Kheer Sar,Thandi Khui,near Marot Fort,Chak 319 HR Marot,Chak 326HR Marot,Chak 340HR Marot,Chak 282HR Marot,Chak 333HR Marot,Kora Khu near Ahmadpur East,Hatayji near Mubarakpur,Basti Wani near Uch Sharif,Chak no 1/P near Khanpur,and Basti Darkhan near Liaqatpur,Latan Sighar near Yazman mandi etc. These are photographs of camel carved:
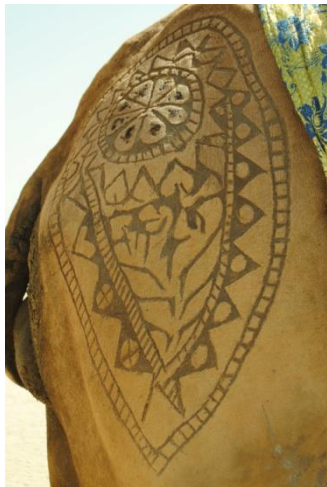
(fig 1-2-3-camel carving pattern of Cholistan)

(fig 4-5-6-camel carving pattern of Cholistan)
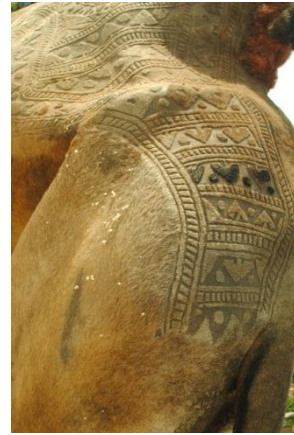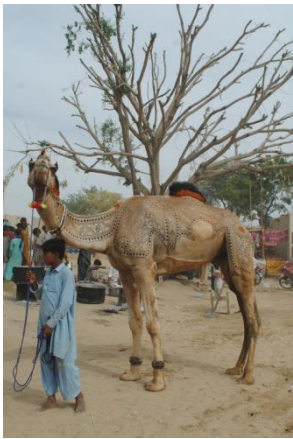
(fig 7-8-9-camel carving pattern of Cholistan)

(fig 10-11-camel carving pattern of Cholistan)

(fig 12-13-camel carving pattern of Cholistan)

(fig 12-13-camel carving pattern of Cholistan)
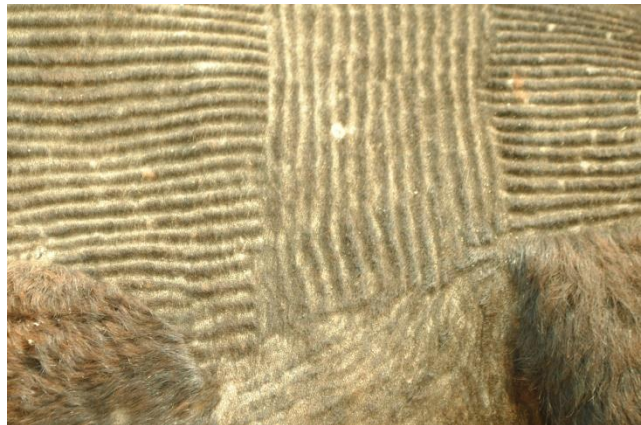
(fig 12-13-camel carving pattern of Cholistan)

(fig 14-15-camel carving pattern of Cholistan)

(fig 16-17-camel carving pattern of Cholistan)

(fig 18-19-camel carving pattern of Cholistan)
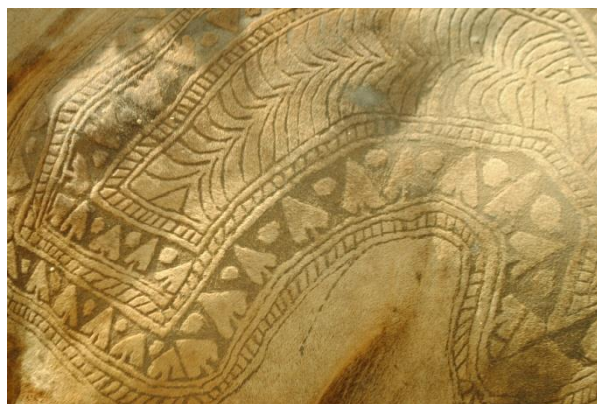
(fig 20-21-camel carving pattern of Cholistan)

(fig 22-23-camel carving pattern of Cholistan)

(fig 24-25-camel carving pattern of Cholistan)

It is also important that Cholistani primary source of water is rainfall which is utilized through natural depressions or man-made ponds called "Tobas"and "Dahars." The secondary source is underground water which is brackish and salty and not fit for human/animal consumption. Two livestock production systems prevail under pastoralism in Cholistan viz. transhumance and nomadic.

(fig 26-27-camel carving pattern of Cholistan)
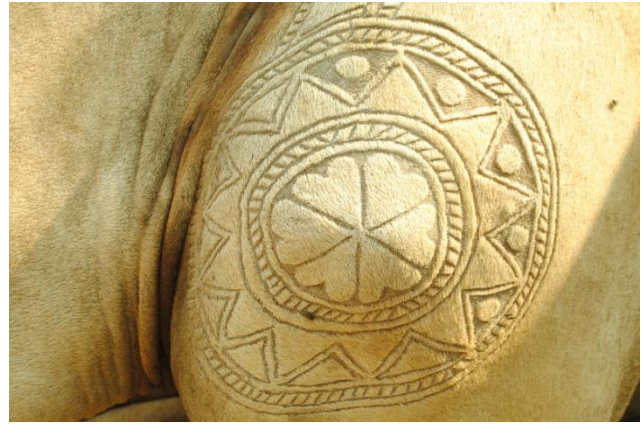
(fig 28-29-camel carving pattern of Cholistan)

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Study and Design of a Shannon-Energy-Envelope based Phonocardiogram Peak Spacing Analysis for Estimating Arrhythmic Heart-Beat

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Abstract- The heart rhythm is directly related to the electrical activity of the heart. Electrocardiogram (ECG) is generally used for obtaining information about the heart rhythm. In this paper, a method for calculating heart rhythm variation using the Phonocardiogram (PCG) and a method for finding characteristics of the that signal is described. The average heart rate is calculated from the Shannon energy signal and characteristics are found using mean, variance and autocorrelation. The analysis window for calculating the instantaneous heart rate is repeated for entire signal for every one second shift. It is shown that even for normal persons there is significant variation in the heart rate. Heart rate variation shows bi-modal distribution for an abnormal case.

Index Terms- Envelope Detection, Shannon Energy Envelope, Phonocardiogram, Systole, Diastole.

I. INTRODUCTION

Heart is one of the critical organs in our body pumping blood continuously throughout the entire life-time. The blood carries the nutrients and the oxygen for the proper functioning of the cells. Heart is made up of a strong muscle called myocardium, and has four valves for regulating the blood circulation. It beats almost regular intervals and is controlled by the electrical pulses generated from the sinus node near the heart. The rhythmic beating of heart produces a characteristic sound commonly referred to as "Lub-Dub" due to the closing of the atrio-ventricular valves and the aortic-pulmonic valves. Moreover, there are other sounds, which are generated due to the structural and functional defects of the heart, called as murmurs. Analysis of heart provides valuable information regarding the functioning of heart since the sound generated is related to the physiology of the heart valves and muscles [2]. Stethoscope is still used as the primary auscultation device for heart and lung sounds since its invention in 1817 [3]. However, analysis based on heart sounds heard using a stethoscope is subjective relying highly on the doctor's experience and hearing ability[1]. The current passive methods to check the functioning of the heart are by the use of electrocardiogram (ECG) [2]. ECG provides information on the electrical functioning of the heart system, but does not provide much information regarding the valve functioning or other structural or functional defect of the heart [2].

The purpose of this study is to develop an algorithm for Study and Design of a Shannon-Energy-Envelope based Phonocardiogram Peak Spacing Analysis for Estimating Arrhythmic Heart-Beat, which uses the heart sound signal as the sole source. Based on the algorithm, every cycle of the PCG signals is separated into four parts: the first heart sound, the systolic period, the second heart sound and the diastolic period. The locations and intervals of the first heart sounds and the second heart sounds are computed first. Then based on this information, the intervals of the systolic and diastolic period are obtained consequently. Then the systolic and diastolic both the periods are analysed separately as well as in combined manner. Then based on this study the heart signal are analysed whether the sound is arrhythmic or not. If it is arrhythmic then of which type whether it is overall arrhythmic or the systolic and diastolic periods are arrhythmic, which is justified using correlation between systole and diastole period. Both normal and abnormal heart sound recordings are investigated.

II. PROPOSED METHODOLOGY

The heart rhythm is very complex in nature. It varies from person to person and even varies rapidly for a single person depending upon his/her physical and mental condition. The heart rate and its variations are very important in clinical cardiology. The doctor usually calculates the heart rate roughly by noting the wrist pulse or the carotid pulse. The heart rhythm is directly related to the electrical activity of the heart as well as its valve movements. The Phonocardiogram (PCG) could be used as a simple but effective source for analysing and detecting the arrhythmic nature of heart beat pattern. The following methodology has been employed to study the effectiveness of PCG in estimating arrhythmia.

a. Pre-processing:

The recorded signals were first pre-processed before performing envelope extraction and cycle detection. Heart sound signals were normalized according to Eq. (1) as shown below:

$$x_{norm}(t) = \left(\frac{x(t)}{max(|x(t)|)}\right)^2 \quad \text{.........} \quad (1)$$

Where x(t) is the original signal and the square operation aims to make peak signal more prominent while weaken the noise.

b. Determination of Shannon Energy Envelope:
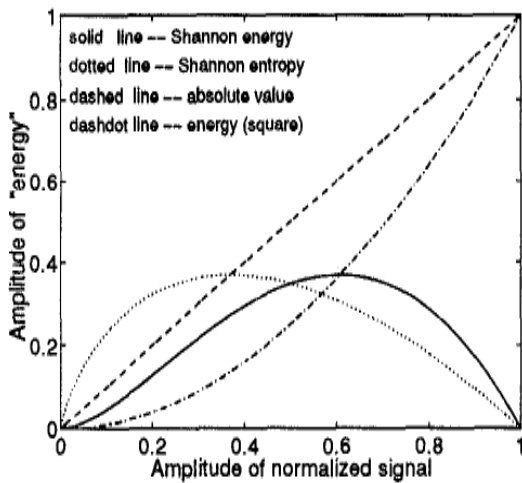
Figure 1 : Outcomes of various envelope detection methods

The envelope of the heart sound signal can be detected using different methods like absolute value of the signal, squared energy, Shannon entropy, and Shannon energy as depicted below. The normalized samples obtained through Eq. (1) makes it possible to evaluate its envelope in the temporal field. Fig. 1 plots outcome of various envelop detection methods against the normalized signal ranging from -1 to +1. The negative part is ignored in the graph due symmetry of results.

Absolute Value: $E = |x|$
Square Energy: $E = x^2$
Shannon Entropy: $E = -|x| \log |x|$
Shannon Energy: $E = -x^2 \log(x^2)$

Figure 1 provides a basic framework for comparing efficiency of various envelope detection methods. The squared energy method associates exponential weighing factors to high intensity components which will pose difficulty in isolating low intensity components. The absolute value technique associates same weighing factor to all components making it difficult to separate low from high amplitude signals. Shannon entropy method attenuates the high intensity signal since it gives more weights to low intensity signal. But it is evident from the graph that Shannon energy method emphasizes medium range amplitude components and attenuates low intensity signal more than the high intensity components. Shannon Energy can absorb the magnitude of oscillations of high intensity as well as those in low amplitudes. The square and the absolute value of the signal samples promotes oscillations of high amplitude more than those of low amplitude. To improve this beneficial effect, we can standardize or normalize this energy. The average Shannon Energy is standardized by the following relationship:

$$E_n = \frac{E - \mu}{\sigma}$$

In the above equation, E is the Shannon Energy, μ is the average value of energy E of thesignal, σ is the standard deviation of energy E of the signal and E$_n$ is the average Shannon Energy standardized or normalized. The average Shannon energy

(μ) can be calculated based on n number of normalized samples as below.

$$\mu = -\frac{1}{n} \sum_{i=1}^{n} x_i^2 \log(x_i^2)$$

Fig. 2 shows the standardized Shannon energy based envelop of a simple PCG signal which is convenient to find S1 and S2 locations.
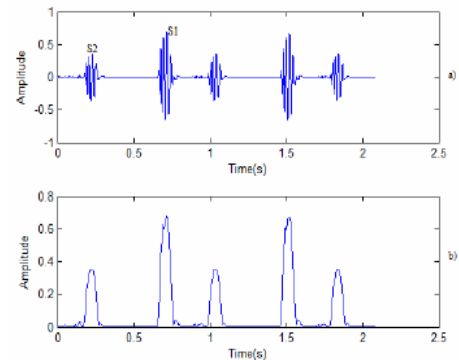
Figure 1: Shannon energy based envelop of a simple PCG signal

2.1 Identification of S1 and S2 peaks:

While it is easy to visually identify peaks in a small uni-variate time-series, there is a need to formalize the notion of a peak to avoid subjectivity and to devise algorithms to automatically detect peaks in any given time-series. A data point in a time-series is a *local peak* if (a) it is a large and locally maximum value within a window, which is neither necessarily large nor globally maximum in the entire time-series; and (b) it is isolated i.e., not too many points in the window have similar values. Not all local peaks are *true peaks*; a local peak is a true peak if it is a reasonably large value even in the global context. Let $T = X1, X2, …, XN$ be a given univariate uniformly sampled time-series containing N values. Without loss of generality, the time instants are assumed to be 1, 2, …,N (i.e., the time-series T is uniformly sampled). Let xi be a given ith point in T. Let S be a given *peak function*, which associates a score (which is a non-negative real number) $S(N, i, Xi, T)$ with ith element Xi of the given time-series T. A given point Xi in T is a *peak* if $S(N, i, Xi, T) > \Theta$, where Θ is a suitably estimated threshold value. The following algorithm finds peak position within a window of suitably chosen length. It employs binary search technique to examine whether the pivot candidate is on ascending part or on descending part or itself is a peak in the sample-sequence and based on the location of the pivot, the searching subsequence portion is determined.

2.2 Algorithm for peak finding
Algorithm *FindPeak(X, i, j)*
// Input: Sample Series (X), Starting Index (i), End Index (j)
// Output: Index of Peak Sample Value
1. $m = \lfloor (i+j)/2 \rfloor$
2. **if** ($X_{m-1} \le X_m$ **AND** $X_m \ge X_{m+1}$)

3.   *return m*
4. *else if (X$_{m-1}$ > X$_m$)*
5.   *return FindPeak(X, i, m-1)*
6. *else if (X$_{m < X_{m+1}}$)*

7.   *return FindPeak(X, m+1, j)*

2.3 Estimation of systole and diastole periods:
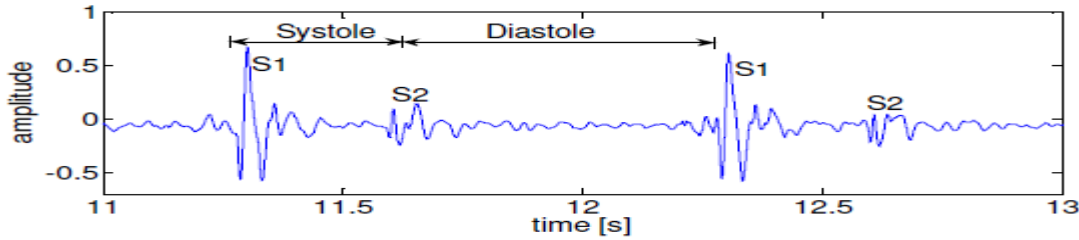
Figure2: Systole and Diastole Period with reference to S1 and S2 peaks.

The peak-locations and peak-amplitude values are analysed to identify S1 and S2 peaks in the sample sequence. Experimentally it has been observed that S1-peak values are normally larger than S2-peak values. The time-gap between consecutive S1 and S2 peaks represents systole period whereas diastole period is measured as the time-gap between consecutive S2 and S1 peaks. Every systole and diastole periods are recorded along the entire sample sequence for further analysis.

III.   RESULT AND ANALYSIS

By the methodology mentioned above heart sounds are analysed. Result of analysis of ten heart sound samples is given in the Table 1 and Table 2. From Table 1 it can be concluded that the value of Systole gap is always less than the diastole gaps. Also the correlation between the Systole and Diastole gaps are

shown in Table 1 that interprets the relationship between systole and diastole. In some cases the correlation between s1 and s2 sound is positive but in some cases it is negative. Positive correlation means that high scores of one signal is associated with high scores of the other, and that low scores on one are associated with low scores on the other. In our case correlation of HS_5 is positive it means high score of systole changes with high score of diastole and low score of systole changes with low score of diastole. Negative correlation, on the other hand, means that high scores on the first signal is associated with low scores of the second. Negative correlation also means that low scores on the first signal is associated with high scores on the second. In our case except HS_5,HS_7,HS_8 and HS_9 all are with negative correlation. As in these signals low scores on the systole are associated with high scores on the diastole and high scores on the systole are associated with low scores on the second.

Table 1

SOUNDs (ID)	Systole GAPS (Mean)	Diastole GAPS (Mean)	VAR_S1	VAR_S2	CORRELATION
HS_1	583.66	992.12	334.75	203.26	-0.1726
HS_2	740.90	1314.66	374.10	236	-0.3988
HS_3	481	915.83	290	184.15	-0.4911
HS_4	386.82	714.36	288.96	533.19	-0.0518
HS_5	634.76	938.25	532.69	4080.56	0.5331
HS_6	626.13	1011.14	1814.26	1759.51	-0.3347
HS_7	631.42	1304.71	385.64	7965.75	0.00010
HS_8	990.50	1696.62	1534.28	4107.12	0.0078
HS_9	502.09	863.30	410.49	91.78	0.2101
HS_10	1547	2286.16	1381	618.96	-0.3231

Table 2

SOUNDs (ID)	Actual Beat Rate (BPM)	Windowing with a window size=1 sec		On combining Systole and Diastole			Accuracy (%) (with respect to windowing)	Accuracy (%) (with respect to cardiac cycle)
		Mean (Beat_rate) (BPM)	Variance	Mean	Variance	Beat rate (BPM)		
HS_1	78.15	85.67	509.56	1579.25	372.78	77.14	90.37	98.70
HS_2	61.52	73.55	12.43	2058.33	333.75	60	80.44	98.36
HS_3	85.55	93.40	475.48	1397.16	271.60	86.66	90.81	98.71
HS_4	108.55	123.81	82.55	1100.77	791.04	110.40	85.93	98.32
HS_5	86	82.13	584.56	1571.25	6189.29	78	95.5	90.69
HS_6	73	80.89	407.67	1635.64	2474.09	75	89.18	97.33
HS_7	64	70.52	93.86	1936.14	8351.97	60	89.80	93.75
HS_8	90	86.36	898.63	2687.12	5680.69	80	95.95	89
HS_9	87	91.70	263.50	1365.60	628.93	82.50	94.59	94.82
HS_10	61	71.45	180.79	3836.83	1565.76	60	82.86	98.36

Correlation coefficients can vary numerically between 0.0 and 1.0. The closer the correlation is to 1.0, the stronger the relationship between the two variables. A correlation of 0.0 indicates the absence of a relationship. If the correlation coefficient is -0.80, then it indicates the presence of a strong relationship. It means that the taken heart sounds have the correlation as follow:
HS_5>HS_3> HS_2> HS_6> HS_10> HS_9> HS_1> HS_4> HS_8> HS_7

Here, The sign does not mean that it is having less correlation but it indicates the sign of correlation. A positive correlation coefficient means that as Systole increases, Diastole increases. And conversely, as Systole decreases, Diastole decreases. In other words, the variables move in the same direction when there is a positive correlation. A negative correlation means that as systole increases, diastole decreases and vice versa. In other words, the variables move in opposite directions when there is a negative correlation. The negative sign indicates that as class size increases, mean reading scores decrease. A correlation can only indicate the presence or absence of a relationship, not the nature of the relationship.

From the table no. 2

- The heart beat rate with sliced time of window size=one sec is taken. It is taken to analyse the signal in the interval of 1 second.
- Similarly beat rate using the measurement of complete cardiac cycle or, systole+diastole is also there.
- Finally we got our obtained beat rate with the accuracy of the beat rate is =90% in almost all the cases.
- From the above Table 2 it is clear that the measurement using cardiac cycle gives more exact result.

In both the table the mean and variance are there. In Table 1 the mean and variance of systole and diastole are there and in Table 2 the mean and variance of both overall signal with a time slice 1 sec & combination of systole and diastole or simply cardiac cycle are there.

IV. CONCLUSION

In this paper heart sounds are analysed. The analysis process includes the envelope finding using Shannon energy. Then the envelope is taken as input for the peak finding. Then we calculate the gaps between S1 and S2. After finding the peak the histogram of the gaps is calculated. Then thresholding technique is used to cluster the gaps into Systole and Diastole. Then we use the correlation to find that the signal is arrhythmic or not. In this study it is concluded that the abnormality of heart sound is not only depend on the overall cardiac cycle whereas it depends upon the individual analysis of systole and diastole period. By calculating the correlation, the clear picture of variability of systole and diastole period is found , which plays the key role for the testing of abnormality of heart sound.

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The Need for Clinical Pharmacy Services in Sri Lanka; a Study Based on the Prevalence of Drug Related Problems in Two Hospitals.

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Abstract- Clinical pharmacy is a discipline utilized in most countries to rationalize medication use. The key functions of a Clinical Pharmacist include the identification, prevention and solution of Drug Related Problems (DRPs).

The objectives of this study were to assess the need for clinical pharmacists in Sri Lankan hospital inpatient care focusing on the prevalence of DRPs to understand the perception of doctors and nurses on introducing this service to Sri Lanka.

This prospective observational study included 100 adult patients from government and private hospitals (50 from each). Their drug charts were reviewed to identify DRPs. Separate questionnaires were administered on 50 doctors and nurses respectively for the survey.

Prevalence of DRPs was high in both groups. 92% of the government hospital patients and 80% of the private hospital patients included in this study had at least one or more DRPs. A total of 86 and 83 DRPs were identified in the government and private hospital patient samples respectively. The most prevailing DRP identified in both hospitals is the "Drug Choice Problem". According to the survey study results, 60% of the doctors believe the addition of clinical pharmacists will increase support for them in rationalizing drug therapy, but, only 10% of the nurses think there will be an increase in support.

This study demonstrated that DRPs occur frequently in the hospital inpatient care; hence, there is a need for further studies in the intervention of the clinical pharmacists that can result I preventing these problems.

Index Terms- Clinical pharmacy, Drug related problems (DRPs), Medication review

I. INTRODUCTION

A drug can easily be the cause of a serious injury to health or even death. Therefore safety, appropriateness and effectiveness of drug therapy should be confirmed in patient care. In most of the countries clinical pharmacists share this responsibility with other healthcare professionals.

Clinical pharmacy is not currently practiced in Sri Lanka. Does that mean drug therapy in Sri Lanka is perfect and there is no need for clinical pharmacists? Or, are there drug related issues/ problems occurring, but the health care professionals are unaware of these because there is no professional (a clinical pharmacist) to monitor drug therapies and to give feed back to them? Even if there is a need, will the doctors and nurses welcome a pharmacist in the ward?

This study was carried out with the purpose of clarifying these questions.

I.I. Clinical Pharmacy

Clinical pharmacy is a health discipline in which pharmacists work in collaboration with other health care professionals to promote rational medication use, which is the safe, appropriate and cost-effective use of medications [1, 2]. It is defined by the American College of Clinical Pharmacy as "the area of pharmacy concerned with the science and practice of rational medication use" [2].

The responsibility of clinical pharmacy practice is aimed at optimizing the drug therapy outcomes while correcting detected problems in drug use. Clinical pharmacists work closely with the physicians and nurses monitoring drugs, dosage regimes, side effects, interactions and drug administration to confirm the appropriateness, safety and the effectiveness of therapy. [3] The technical term for this monitoring is "Medication Review". It is a systematic assessment of the patient's drugs to optimize the therapy outcomes and to identify the potential drug related issues. Other functions of a clinical pharmacist include medication history taking, patient counseling, providing drug information and research. [1, 3, 4]

The addition of this service has demonstrated significant improvements in patient care by reducing drug-related mortality and morbidity and by enhancing the quality of care in other countries [5]. Though no studies have been done in Sri Lanka to identify the significance of this service, a number of studies have been done in other countries. These studies have proved that the intervention of pharmacists on patient care through medication history taking, participating in ward rounds, medication review and patient counseling with feedback to the physicians result in improved care, improved patient safety and satisfaction while giving considerable economic benefits. [6, 7, 8] It is demonstrated that pharmacist-conducted medication history taking is more efficient and saves time and cost in comparison with doctors and nurses [9, 10].

I.II. Drug Related Problems (DRPs)

The core processes of clinical pharmacy services are the identification, prevention and solution of Drug Related Problems (DRPs) [11]. DRPs can be defined as "any event or circumstance involving drug therapy that actually or potentially interferes with desired health outcomes" [12]. A pharmacist in the health care

team contributes to improving therapy outcomes by addressing the actual and potential DRPs including inappropriate drug choices, untreated indications, interactions, cost-ineffective therapies etc. [13, 14].

Classifying DRPs is important in documentation by clinical pharmacists in practice and in research. There are a number of classifications used in the world. An optimum classification should be based on clear definitions, structured in a hierarchical manner clearly separating the causes from problems, validated and easy to use. But because of the complexity of the problems and causes, there is no such optimum classification at present. But the DRP classification of the Pharmaceutical Care Network Europe (PCNE) has most of the features above. It is based on clear definitions, structured in a hierarchical manner and some forms of validation are published. And it is used in a number of published research studies. [11]

The PCNE classification for DRPs is validated and adapted regularly and there are different versions released. The previous major release of the classification, referred to as the PCNE classification V.5.01, is used for this study. [12]

The problems are categorized into six domains in the PCNE V 5.01 classification system.

I.III. Study design

Clinical pharmacy is a new concept for the Sri Lankan health sector. The scope of pharmacy practice in Sri Lanka includes only the more traditional roles such as compounding and dispensing drugs. No studies have been done to assess the need for clinical pharmacy services.

We think the addition of clinical pharmacy service to the Sri Lankan hospital setting is very much in need. The main reason for that is the increased work pressure on doctors and nurses. According to the medical statistics unit, population per medical officer in 2007 is 1815 and population per a nurse in the same year is 636 [15]. This clearly indicates the limitation of time a doctor or a nurse has to spend for a patient. The possibility of medication errors occurring in a busy work environment cannot be neglected. Increased use of medications and availability of new drug therapies also increase the risk of irrational drug use and even patient harm [16].

A controlled study is best fitting for this concern where the impact of their intervention can be assessed against a group of patients having no intervention. With the limitations to carry out such a study, we directed our study towards the prevalence of DRPs. With no clinical pharmacists to identify the DRPs, the doctors and nurses are unaware of these issues and therefore these problems remain unaddressed. Thus, the occurrence of DRPs implies the need for clinical pharmacy services.

It is important to examine how the doctors and nurses will accept this concept. Would they welcome a pharmacist in the ward? Hence, we conducted a survey study as part of this study to look into this matter as well. For this, we were interested in knowing more about their perceived pressure as a doctor/ nurse, their belief on the need for improved support for them and finally in knowing if they would like to have this support offered by a clinical pharmacist.

II. METHODS

This study included a prospective observational study and a survey study.

The observational study was carried out in a Government Base Hospital and in a Private Hospital in Kurunegala district. A convenient sample of 100 patients (50 from each hospital) was taken from the medical wards including in-patients of either sex undergoing treatment for more than three days. Verbal consent was sought from the patients to be included in the study. Patients receiving treatment for less than three days and patients who did not consent were excluded.

Data were collected from the patients and from the Bed Head Tickets (BHT). These data includes patients' demographic data (age and gender), allergies, past medical and medication histories, co-morbidities, current medication chart and laboratory data. Medication review was carried out for these patients to identify the DRPs. The Australian Medicines Handbook (AMH) and the British National Formulary (BNF) were used in this process. The identified DRPs were categorized according to the PCNE V 5.01 classification scheme.

The survey study sample included 50 nurses and 50 doctors. Two questionnaires, one in English for the doctors and another in Sinhala for the nurses, were administered. Both questionnaires were short, with a limited number of questions that could be easily answered by busy professionals.

Demographic factors and other characteristics were summarized with counts and analyzed. The government hospital and private hospital data were analyzed separately.

III. RESULTS

III.I. Medication Review Results

As shown in figure I, out of the 50 patients of the government hospital, 46 patients (92%) had DRPs. Of them 24 patients (48%) had more than one DRP and 22 (44%) had only one DRP. Only 4 patients (8%) had no DRPs.

A total of 86 DRPs were identified in the government hospital patients and among those, "drug choice problem" was the most prevailing. It accounted for a 41% of the total DRPs. The identified problems are listed in table I below. And these data are graphically presented in figure II.

Out of the 50 patients of the private hospital, 40 patients (80%) had DRPs. Of them 22 patients (44%) had more than one DRP and 18 (36%) had only one DRP. 10 patients (20%) had no DRPs as shown in figure III.

A total of 83 DRPs were identified in the private hospital patients and similar to the government hospital patients, "drug choice problem" was the most prevailing DRP. This time it accounted for a 60% of the total DRPs. The identified problems are listed in table I and these data are graphically presented in figure IV.

Table I: Types of DRPs Identified. (Government Hospital Patients)

Types of DRPs	Government Hospital		Private Hospital	
	Number of DRPs	As a percentage of the total number of DRPs	Number of DRPs	As a percentage of the total number of DRPs
1. Adverse reactions				
Side effects suffered (non-allergic)	00		01	
Side effects suffered (allergic)	00	0%	00	0%
Toxic effects suffered	00		00	
Total	**00**		**01**	
2. Drug choice problem				
Inappropriate drug (not most appropriate for indication)	03		06	
Inappropriate drug form (not most appropriate for indication)	02		08	
Inappropriate duplication of therapeutic group or active ingredient	08		09	
Contra-indication for drug (including Pregnancy/breast feeding)	03	41%	02	60%
No clear indication for drug use	01		02	
No drug prescribed but clear indication	18		23	
Total	**35**		**50**	
3. Dosing problem				
Drug dose too low or dosage regime not frequent enough	01		01	
Drug dose too high or dosage regime too frequent	15		22	
Duration of treatment too short	00	19%	00	28%
Duration of treatment too long	00		00	
Total	**16**		**23**	
4. Drug use problem				
Drug not taken/ administered at all	00	0%	00	0%
Wrong drug taken/ administered	00		00	
Total	**00**		**00**	
5. Interactions	11	13%	00	(0%)
6. Others				
Patient dissatisfied with therapy despite taking drug(s) correctly	00		01	
Insufficient awareness of health and diseases	23	28%	08	11%
Unclear complaints; further clarification necessary	00		00	
Therapy failure (reason unknown)	01		01	
Total	**24**		**09**	
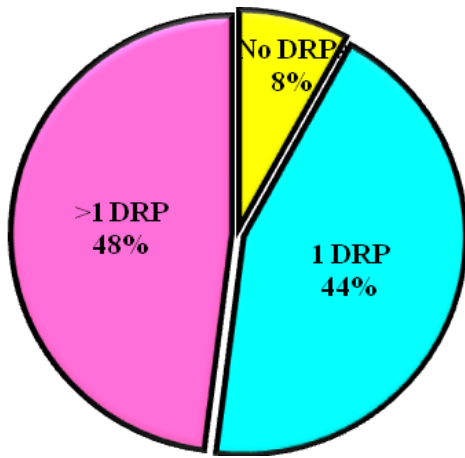
Figure I: Prevalence of DRPs (Government Hospital Patients)
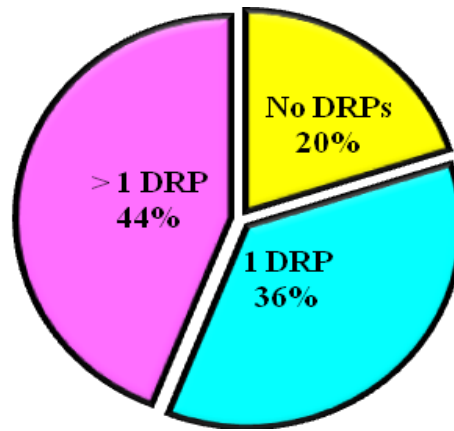
Figure III: Prevalence of DRPs (Private Hospital Patients)
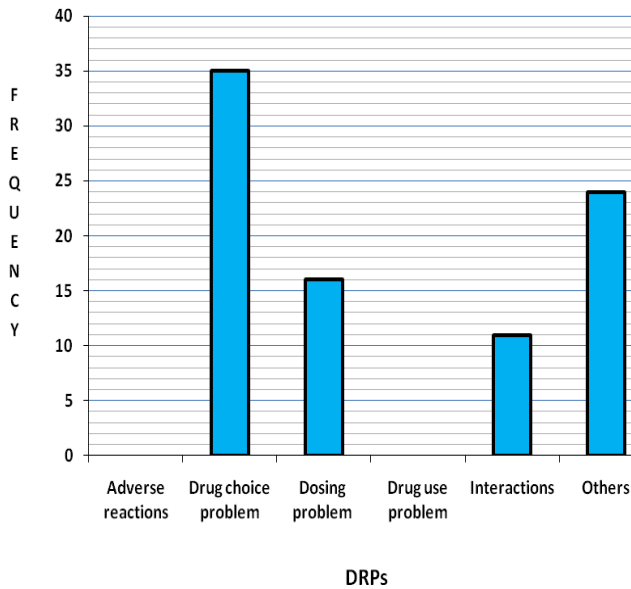
Figure II: Incidence of DRPs (Government Hospital Patients)
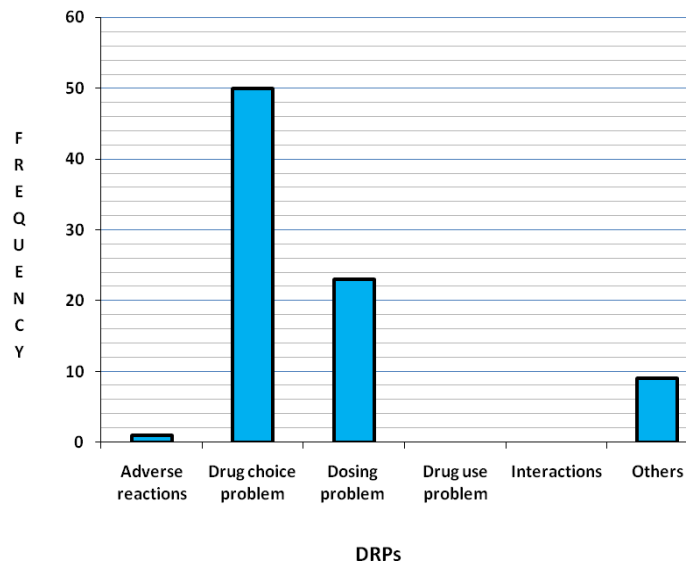
Figure IV: Incidence of DRPs (Private Hospital Patients)

III.II. Survey Study Results

Figures V to VIII below graphically present the results of the survey on the perception of doctors and nurses on introducing clinical pharmacy services.
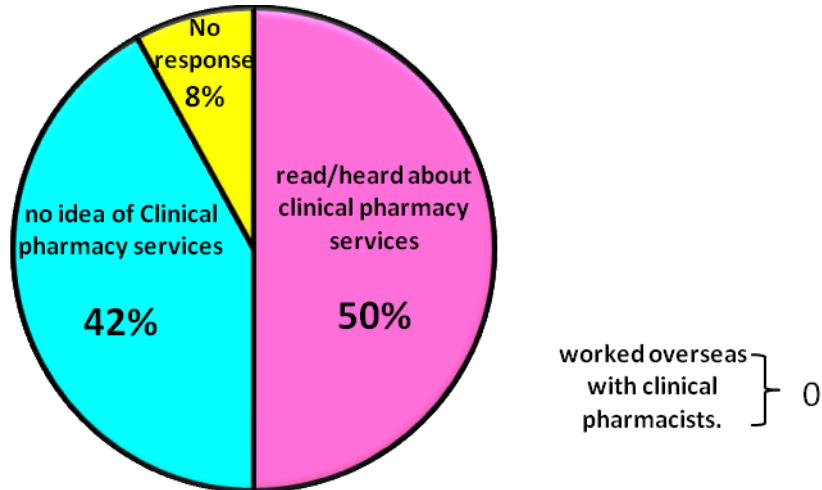
Figure V: Distribution of Awareness/Experience of the Doctors about Clinical Pharmacy Services
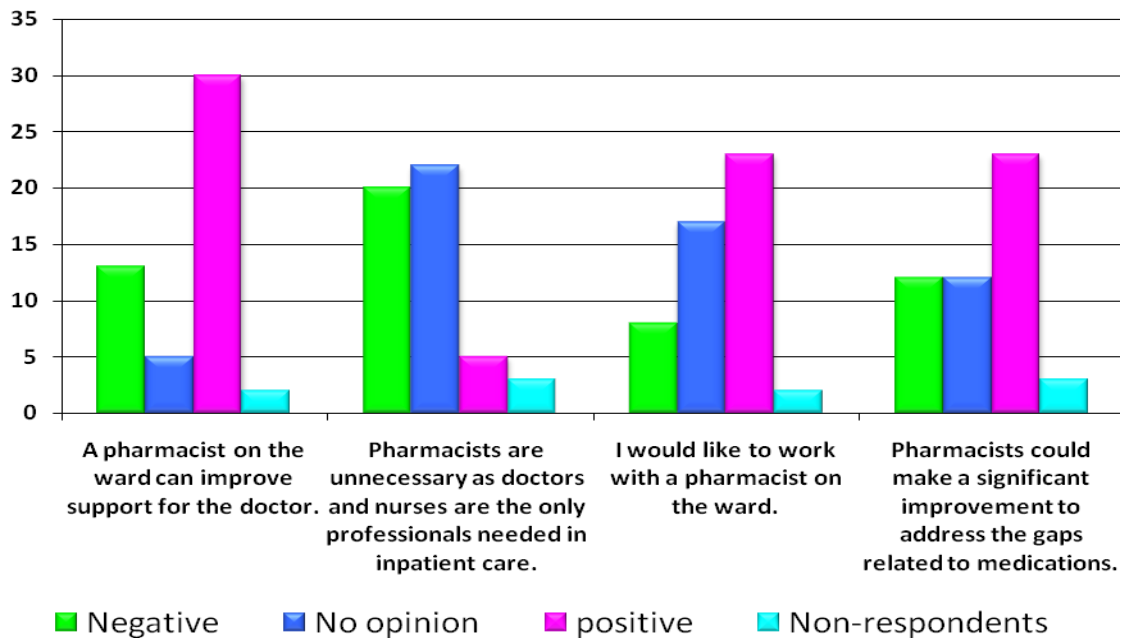
Figure VI: Distribution of Doctors' Opinion on Having a Clinical Pharmacist in the Ward to Support Them
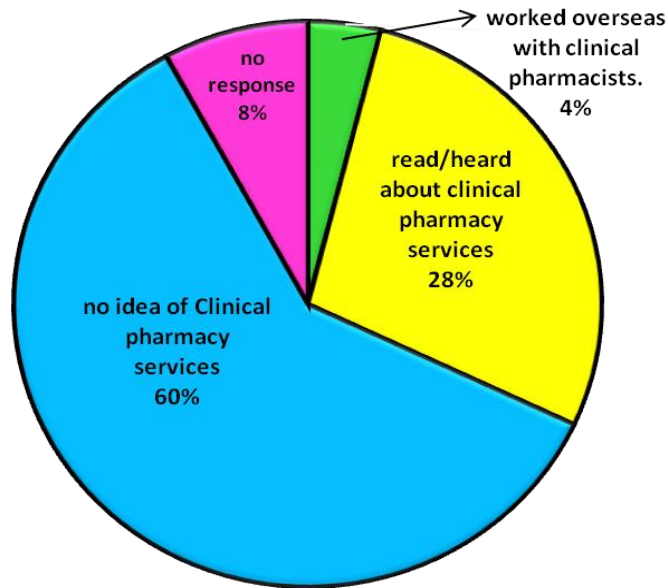
Figure VII: Distribution of Awareness/Experience of the Nurses about Clinical Pharmacy Services
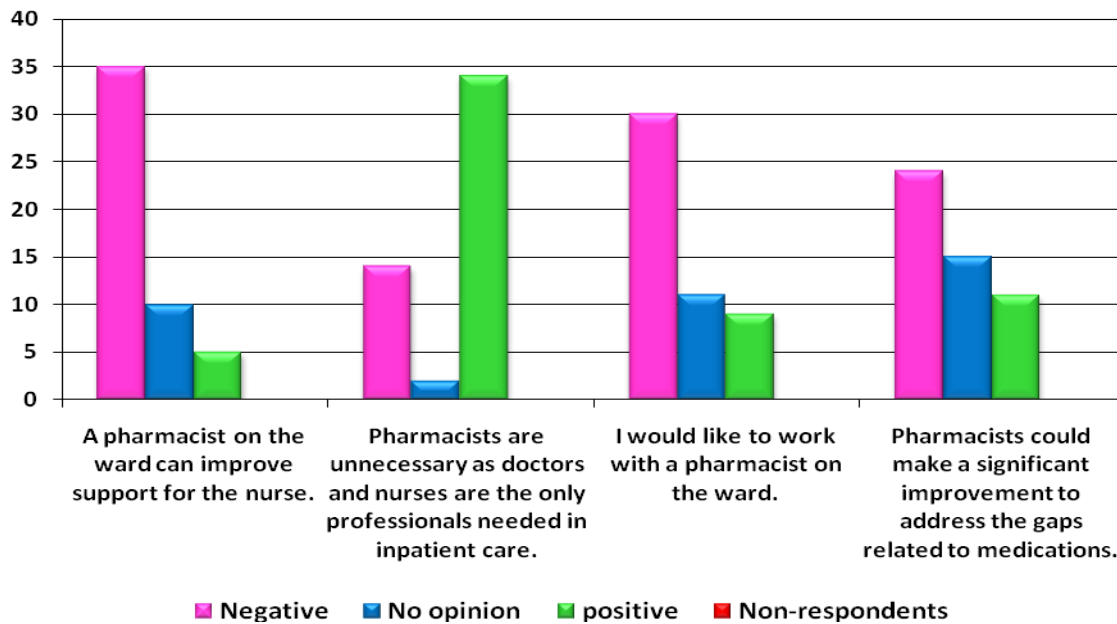
Figure VIII: Distribution of Nurses' Opinion on Having a Clinical Pharmacist in the Ward to Support Them

IV.   DISCUSSION

Clinical pharmacy is an emerging discipline in the world. It has been demonstrated that the addition of clinical pharmacy services reduces the DRPs and thus improve the quality use of medicine. [16]

The aim of this study was to assess the need for clinical pharmacy services in the Sri Lankan hospital setting focusing on the prevalence of DRPs in two hospitals. A Government base hospital and a private hospital in Kurunegala district were selected as the study locations. Patient were sampled from the medical wards given a large number of drugs are prescribed in a medical ward and patients present a variety of diseases.

Out of the 50 patients of the government hospital, 46 patients (92%) had at least one DRP and out of the 50 patients of the private hospital, 40 patients (80%) had at least one DRP. When compared to the studies done in the world these numbers are not surprising. It's a proven fact that DRPs occur commonly in the hospitals and that they cause patient morbidity and mortality [16]. In a study conducted by Joanne LaFleur et al to report the prevalence of DRPs and cost saving opportunities, only 8% out of 3750 patients had no DRPs or cost saving opportunities [17]. However in this study we did not consider the economical aspects of drug therapy.

More DRPs were identified in the government hospital compared with the private hospital. This was because there was a higher prevalence of the DRP category "other" in the government hospital. There were only 8 of the sub category "insufficient awareness of health and diseases" under "other" in the private hospital, but 23 classified as "other" were identified in the government hospital. The reason behind this is the inadequate laboratory monitoring in the government hospital which could be due to the inadequacy of laboratory facilities which may not an issue in the private hospital.

The most prevailing DRP identified in this study, in both (government/private) patient samples is the "Drug Choice Problem" which constituted of inappropriate drug and drug form, duplication, contra indication, drug needed – not prescribed and drug prescribed - not needed. This observation is similar to a study carried out by Ganachari M.S. et al in India [16]. However, in a study conducted by Gillespie in 2012 to evaluate the clinical pharmacists' intervention, the most prevailing problem was "Adverse Drug Reactions". "Drug Choice Problem" was the second most prevailing in that study [18]. Among the issues under "Drug Choice Problem", "drug needed-not prescribed" was the most common. Need of additional drug therapy (drug needed-not prescribed) is documented as the second most common problem identified in a study conducted by Gillespie [18]. The second most common problem was the duplication of drugs. Problems of drug choice could be due to poor development and adaptation of protocols and guidelines for drug selection. In a study conducted by Oborne et al, out of 215 elderly patients 40% were given one or more drugs had no indication, and 37% were on one or more inappropriate selections [19]

The second most prevailing problem was different in the government and private hospital. "Dosing Problem" was the second most prevailing problem in the private hospital patient sample. This is in similar to the study carried out by Ganachari M.S. et al [16]. "Dose-too high" was the most common amongst the issues under "Dosing Problem". In the government hospital sample, "Other" was the second most common DRP. This is because of the insufficient laboratory investigations which are necessary for the confirmation of appropriateness of therapy. For instance, dose of some drugs depend on the patient's Glomerular Filtration Rate (GFR). This problem was not significant in the private hospital sample. This could be due to the less availability of laboratory facilities in the government hospital either because of the lack of resources or the large number of patients.

In both hospitals "Drug Use Problems" could not be identified. This could be due to the limitation of not being able to monitor drug administration all the time during the entire hospital stay of the patients.

The prevalence of DRPs in the private hospital (80%) is less than that of the government hospital (92%). But still, the occurrence of DRPs is significant in both hospitals.

Out of the 50 doctors included in the survey study, no one had ever worked with a clinical pharmacist. 50% of them had an idea of what clinical pharmacy is and 42% of them had no idea of it. 60% of the nurses out of the 50 included in the study had no idea of clinical pharmacy services and only 28% knew about it. There were 2 nurses who had worked overseas with clinical pharmacists and they had included comments emphasizing the need of clinical pharmacy services in Sri Lanka.

Sixty percent of the doctors believe the addition of clinical pharmacists will increase support for them in rationalizing drug therapy. The majority of doctors believe there is a need of increased support for them in the wards. The majority had a positive opinion on adding clinical pharmacists to provide this support. Similarly, the study done by Ganachari M.S. et al also demonstrate that the joint work of doctors and pharmacists in wards is possible and that this result in identifying and preventing DRPs. In this study, all clinicians (100%) gave the opinion that this service is would have value as they recognized the possibility of improving the patient care and treatment outcomes by identifying and preventing the DRPs [16].

Nurses' opinion on addition of clinical pharmacists was different from that of doctors. According to this study, only 10% of them think there will be an increase in support by the addition of clinical pharmacists. This could be due to the lack of awareness on this subject and therefore it is very important to provide education on clinical pharmacy services before the addition of pharmacists into the wards.

There were some limitations in this study. Patients were not followed up during their complete hospital stay. This could have been resulted in missing important data. A clinical pharmacist gets involved in patient care from the point of admission to the point of discharge. Identifying DRPs by studying the Bed Head Ticket and getting patient's details only on one day is not an ideal method. Due to the practical difficulties in patient follow up, this method was adopted.

Another limitation is this study provides information on the occurrence of DRPs but does not necessarily demonstrate whether these can be prevented or minimized by the addition of clinical pharmacy services. An interventional study where the intervention of the clinical pharmacists can be assessed is the ideal in that purpose. Since other studies have demonstrated that their intervention results in preventing DRPs and significant improvement in patient care [20, 21, 22]. We argue that given a significant prevalence of DRPs in hospitals, clinical pharmacy services are needed.
There are some limitations on the use of clinical pharmacists and identification of DRPs. The identification of DRPs is subjective and is based on the judgment of the pharmacist. Therefore a different pharmacist could have come up with different prevalence rates of DRPs for these same cases. The uniformity of pharmacists' judgment is a controversial issue in most of this kind of studies [23].

V. CONCLUSION

The prevalence of Drug Related Problems is significant in the Sri Lankan hospitals as in other countries. Thus, we strongly believe that there should be a clinical pharmacist in the health care team to promote rational use of medications. There is a possibility of building a good professional collaboration between the pharmacists and the doctors. Therefore, how the intervention of the clinical pharmacists may result in preventing these problems should be further studied. If it could be demonstrated that the addition of clinical pharmacy services can reduce the DRPs and improve the patient care, further studies can be carried out to initiate the policy developments to implement Clinical Pharmacy services in Sri Lanka.
 Doctors and nurses should be given a comprehensive understanding of clinical pharmacy services and ensure if this service is implemented, there will be good physician-pharmacist-nurse collaboration.

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Influence of Ethical Leadership towards Organizational Commitment in Schools

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   Abstract- Effective leadership is one of the important indicators to determine the successful of organizational commitment in schools. This study aimed to identify the influence of ethical leadership towards the organizational commitment in schools. This cross-sectional survey involved 324 secondary school teachers in Kedah (state of peninsular Malaysia). The instrument included Ethical Leadership at Work (ELW) and Three-Component Model Employee Commitment Survey (TCM-ECS). Results showed that ethical leadership influence the organizational commitment in schools. Implication of this study is ethical leadership contributed to the organizational commitment in schools. Thus, ethical leadership should be applied and practiced by school leaders to improve the success of organizational commitment, thereby improving school performance .

   Keywords - ethical leadership, organizational commitment, secondary school.

I. INTRODUCTION

Teachers play important roles towards the students achievement. Teaching profession requires commitment and passion in order to produce human capital that are useful to the society and country. Through the report, released in the year 2012 during the National Dialogue Education as mentioned in the **Malaysia Education Development Plan (PPPM 2013 - 2025)** shows a finding of permanent and often voiced the concerns of teachers to administrative work increasingly reducing their ability to provide a strong commitment to the school. In fact, there are also among the new teachers five years of service have left the profession for reasons of low pay factors and working conditions that are not suitable (Anari 2012; Rusmini, 2006).

To achieve success in organizational commitment, every organization needs effective leadership with strong soft skills competencies to move teachers in the front line as an effort to achieve excellence in education . Therefore, the school organization must have an effective leader so that changes can be implemented at the school level good governance.

Commitment and efforts to enhance the quality of education is a major aspiration Ministry of Education (MOE) to Malaysia as a developed country in the future (Abd Ghafar, 2010 as cited in PPPM 2012-2025). Factors over time, and the era of globalization has brought changes and challenges of the teaching profession, including modification of the function and role of teachers that affect the level of their commitment to the school (PPPM 2013-2025). Thus, it is the responsibility of each school leaders to strive in order to improve performance, implement continuous improvement while managing the school effectively, particularly in the aspect of teachers commitment to meet the rapid developments. In addition, teachers also need to move fast and dynamic towards the new educational challenges to put the status of the first world-class education.

1.1   Organizational Commitment

Organizational commitment is one of the most fundamental concepts in relation to workforce motivation and productivity (Tolentino, 2013). Mowday et al. (1982) pointed out that the work is a commitment of loyalty and acceptance subordinated to the goals and values of the organization. A person who has been committed to a task will continue its commitment to the end even though he had a barrier during the process (Tolentino, 2013). Organizational commitment is defined as a strong belief against accepting the goals and values of the organization, willingness to exert energy and effort on behalf of the organization and a definite desire to maintain membership in the organization (Mowday, Steers, & Porter, 1979). Organization will give more priority to those working with a high level of commitment to the organization because of the belief of the administration that the challenge to achieve organizational goals can be overcome by higher employee commitment (Uygur & Kilic, 2009). Meyer and Allen have built and formulate organizational

commitment constructs comprising the affective dimension, continuous dimension and normative dimensions. These three dimensions are more accurately described as components or dimensions of organizational commitment.

According to Allen and Meyer (1990) there are three dimensions of organizational commitment. First, the affective component, refers to employees' emotional attachment to, identification with, and involvement in, the organization. Second, the continuance component refers to commitment based on the costs that employees associate with leaving the organization. Finally, the normative component refers to employees' feelings of obligation to remain with the organization.

1.2 Ethical Leadership

In the discussion on the quality and outcomes of education, one important component that often gets attention is the question of leadership (Tengku Ahmad Badrul Shah & Nik Azida, 2010). The role of school leaders is very important to focus specifically on strategies to increase the level of teachers' commitment in order to ensure the quality and educational outcomes of school is always at a high level (Anderman, Belzer, & Smith, 1991). Ethical leadership is a means to improve themselves as followers will see and evaluate what is seen in a leader (Mohammed Faizal, Shahril, & Maszuria, 2009). Reviews by Handford and Leithwood (2013) found teachers trust to principals most influenced by practices such as effective leadership, consistency, reliability, openness, respect and integrity. These practices are likely to encourage teachers to be more committed to their careers.

Starting early 1990, the reform leadership and insistence on the need for ethical leadership became more apparent when the researchers began to pay more attention to the needs of this particularly in the public and private sector organizations (Yukl, Mahsud, Hassan, & Prussia, 2011). This is because ethical leader behaviour identified can be a role model for their followers to follow and emulate (White & Lean, 2008).

Brown, Treviño, & Harrison, (2005) define the ethical leadership as the demonstration of normatively appropriate conduct through personal actions and interpersonal relationships, and the promotion of such conduct to followers through two-way communication, reinforcement, and decision-making. According to Brown and Trevino (2006), ethical leadership is composed of two main aspects of individual moral and moral manager. Individual moral aspect refers to the personality characteristics of the leader as seen, the behaviour and decision-making process. The moral aspect of the manager refers to deliberate efforts by a leader to influence others (role models), guiding the ethical behaviour of followers such as communicating about ethical standards and discipline employees who demonstrate unethical behaviour. Thus, the combination of the individual aspects of moral and moral managers make ethical leadership style is seen in contrast to the style of leadership of others. This is because ethical leaders although become role models who exhibit personality and appropriate behaviour, also uses aspects of reward and punishment to stimulate ethical conduct among followers (Brown et al, 2005; Trevino, Brown, & Hartman, 2003).

1.3 Dimensions of Ethical Leadership

There are seven dimensions of ethical leadership (Kalshoven, Den Hartog, & De Hoogh, 2011). First, fairness is seen as an important form of ethical leader behavior. Ethical leaders act with integrity and treat others fairly. They make principle and fair choices, are trustworthy and honest, do not practice favoritism, and take responsibility for their own actions (Brown et al., 2005; De Hoogh & Den Hartog, 2008; Treviño et al., 2003). Second, power sharing. Ethical leaders allow subordinates a say in decision making and listen to their ideas and concerns and also provide followers with voice (Brown et al, 2005; De Hoogh and Den Hartog, 2009). Sharing power also allows subordinates more control and makes them less dependent on their leaders (Yukl, 2006). Third, ethical leaders are transparent and engage in open communication which known as role clarification (Brown et al., 2005). Ethical leaders clarify responsibilities, expectations, and performance goals, so that subordinates' know what is expected from them and understand when their performance is up to par. Subordinates do not worry unnecessarily about unclear expectations and know how they can meaningfully contribute to meeting the unit's or organization's goals. An important one is people orientation or having a true concern for people(Trevino et al, 2003). The people orientation component in ethical leadership reflects genuinely caring about, respecting and supporting subordinates and where possible ensuring that their needs are met (Kanungo & Conger, 1993; Treviño et al., 2003).

Next, ethical guidance that ethical leader conveys standards regarding ethical conduct. Organizations and top management set rules, standards and codes of conduct, which provide guidelines for ethical behaviour and leaders can raise subordinates awareness of such guidelines, use rewards and punishments to hold subordinates responsible for their actions (Treviño et al., 2003). Next, ethical leaders concern for sustainability of stakeholders and society. In line with this, Kanungo and Mendonca (1996) argue that ethical leaders take the effects of their behavior on the surroundings into account, including the society and environment. Ferdig (2007) takes a responsibility point of view and argues that sustainable leaders act beyond their self-interests. Finally, integrity based on the behavioral integrity literature. Integrity behaviors are described as word-deed alignment or the extent to which what one says is in line with what one does.

1.4   Relationship between Ethical leadership and Organizational Commitment

Kim, Tavitiyaman, and Kim (2009) conducted their study on hotel employees in Thailand and found the hotel manager who practice power sharing with employees are likely to encourage their employees to provide better service to the organization. Leaders who practice behavioral ethos of trust, distribute the power and the importance of leadership responsibilities with members also found has significant relationship with organizational commitment (Ghamrawi, 2011). In the school context, the study by Abg Hut (2005) and Zulkafli (2008) found that the level of power sharing between the leaders of the school with teachers remained at a low level and have an impact on the decline in the level of commitment of teachers.

Zhu, Norman, Peng, Riggio, & Sosik, (2012) in their study found that ethical leadership has a positive effect on increasing the organization's commitment to a higher level, especially in terms of perception of the sense of security among workers due to environmental disturbances. Moreover, ethical leadership is concerned with the work load, role conflict and employee stress, is significantly associated with retention of members in the organization (Malik, Waheed, & Khalil-ur-Rehman, 2010; Yousef, 2002). The findings by Alhyasat (2012) on workers in Jordan Press Foundation also shown that individuals who are in a climate of positive work ethic will lead to an increase in the level of individual commitment to the organization. In contrast, a study conducted by Putranta (2008) found that organizational climate encrusted ego significantly related to the difficulty of retaining staff who are committed to the organization.

II.   RESEARCH QUESTION

The purpose of this paper is to identify the influence of ethical leadership towards organizational commitment in schools. More specifically, the purpose of this study is to identify the aspects of ethical leadership as a major contributor to the organizational commitment in schools.

III.   METHODOLOGY

The study was conducted by survey method using a questionnaire to collect information required from teachers of secondary schools Kedah state (peninsular Malaysia). Using of the questionnaire is a data collection tool that is used in a lot of school management and leadership studies. Questionnaires were able to collect detailed data, structured and standards. Measuring instrument is easily administered, saving time, energy, mind and money at the time of the data collection process is done (Sekaran & Bougie, 2009).

Sample consisted of 324 secondary school teachers in the Kedah state. Samples were selected by using random sampling technique. Only teachers who served two years and only taken into account as the sample for a period of two years is sufficient for a person to draw conclusions about the characteristics of the school to which he belongs (Sala, 2002) .

Ethical leadership is measured by using instrument Ethical Leadership at Work (ELW) developed by Kalshoven et al. (2011) and instrument and Three-Component Model Employee Commitment Survey (TCM-ECS) by Meyer and Allen (2004) was used to measure organizational commitment in schools. Ethical Leadership at Work (ELW) consists of 38 items and 18 items contained of TCM-ECS. It is divided into three parts, Part A (8 items) to obtain background information on teachers, Part B (38 items) to measure the ethical leadership and Section C (18 items) was designed to test the organizational commitment.

Data were analyzed using SPSS version 19. Descriptive statistics using percentage, mean and standard deviation. Multiple regression analysis is used to identify the aspects of ethical leadership as predictors of the organizational commitment in schools.
 Now it is the time to articulate the research work with ideas gathered in above steps by adopting any of below suitable approaches:

IV.   FINDINGS

Influence of Ethical Leadership On The Organizational Commitment in Schools

Table 1 summarizes the results of multiple regression analysis used stepwise. R square is not statistically different from zero (R = 0.423; F = 9.032; p<.05) This finding suggests that ethical leadership positively and significantly influenced organizational commitment in school.

Based on Table 1, there are two dimensions of ethical leadership that become predictors for organizational commitment in schools, which is people orientation (t = 2.477, p<.05) and ethical guidance (t = 2.169, p<.05). The combination of predictor variables contributed 15.9 percent to the variance of organization commitment in school.

People orientation is the most significant dimension influencing organizational commitment (B = .202, t = 2.477) compared with the dimension of ethical guidance (B = .210, t = 2169).

Table 1
A summary of the results of multiple regression analysis dimensions Ethical Leadership on The Organizational Commitment

Predictors	B	Beta	t	P
People orientation	.128	.202	2.477	.014
Fairness	.009	.013	.201	.841
Power sharing	.033	.037	.590	.556
Concern for sustainability	-.053	-.078	-.841	.401
Ethical guidance	.170	.210	2.169	.031
Role clarification	.066	.083	.888	.375
Integrity	.029	.038	.415	.679

R= 0.423   R Square = 0.179   Adjusted R Square = 0.159
F = 9.032   P = .000

V. DISCUSSION

Ethical Leadership Aspects To Predictors Organizational Commitment in Schools
The results showed two dimensions of ethical leadership has a significant influence toward organizational commitment in schools, where the prioritize people orientation and ethical guidance. Predictor variables combined contribution of 15.9% to the variance of organizational commitment in schools. Thus, the results of this study could expand the ideas about the influence of ethical leadership as presented by Brown et al. (2005) and Knipper, (2012). With this, the aspects of ethical leadership are the influence on organizational commitment in the school.

These findings are consistent with studies conducted by Becerra (2010), Fu and Deshpande (2011), Handford and Leithwood (2013). These findings are also in line with studies by Klein (2012), Neubert et al. (2013), Neubert et al. (2009), Tengku Ahmad Badrul Shah and Nik Azida (2010) who found that ethical leadership contributed greatly to the organizational commitment. Dimensions of people oriented are most significantly influenced by organizational commitment in school. This dimension explains that ethical leaders   that is sincere in maintaining the well-being of teachers, welfare caring and considerate, will encourage teachers to feel more committed to the organization and feel the values of togetherness with their employer (Becerra, 2010; Othman & Wanlabeh, 2012; Vogel, 2012).

But when leaders do not behave professionally, unethical, incompetent, failing in social interaction and do not preserve the organization it will create the impression that the leaders do not give support to the teachers (Klein, 2012; Othman & Wanlabeh, 2012). A failure of ethical leadership in providing this support will cause the teachers in difficulties to get recognition or they cannot challenge themselves to do more difficult tasks and fail in giving commitment in schools.

People orientation aspects shown by ethical leaders not only influence the teachers to be more committed to the organization but also to nourish the cultural autonomy of the teachers themselves. Teachers also can develop their own ethical standards without being influenced by others, confident acting on moral beliefs and the courage to defend their confidence (Becerra, 2010; Bogler & Nir, 2012).

Ethical leaders will always promote ethical policies, procedures, reporting processes and decisions making before implementing policies. This is in line with the concept of ethics proposed by Brown et al. (2005) in which the leader is responsible for setting the agenda ethical organization, show the influence of the top and act as role models who adhere to ethical standards in an effort to improve corporate governance practices in an ethical (Mayer, Kuenzi, Greenbaum, Bardes, & Bombie, 2009). Thus, in the end will be able to create the foundation of confidence among teachers and can guide and encourage them to follow the leaders and eventually led to the success of organizational commitment.

VI. CONCLUSION

Overall, the findings demonstrate that ethical leadership plays an important role in improving the organizational commitment in schools. Therefore, school leaders in Malaysia should be given adequate exposure and training to improve their ethical leadership in order to implement more effective management toward organizational commitment in schools. To achieve the transformation agenda of education, aspects of ethical leadership and organizational commitment should be given due attention.

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Efficacy of Isometric Neck exercises and stretching with ergonomics over ergonomics alone in Computer Professionals

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Abstract- Neck pain has become a common epidemiological problem. One major reason for the neck pain is a sedentary way of life, along with using a personal computer in all daily activities.

Work place and work duration have not been properly modified to the personal physical conditions of these employees. Ergonomics is the application of scientific information concerning humans to the design of objects. Ergonomic intervention results in enhancement of working posture and a decline in incidence of musculoskeletal symptoms. The human body is designed to move and health depends on it. Stretching and resistance exercises to the neck are easy to do, when performed 1-2 times daily decrease discomfort and ease neck stiffness. This study is aimed at finding if ergonomics with exercises to the neck would provide better improvement from neck pain than ergonomics alone, in computer Professionals. Outcome measures used were VAS and Oswestry Neck Disability Index. Results showed that Neck exercises and stretching along with ergonomic intervention proved more beneficial than ergonomics alone for neck pain in computer professionals (p<0.001).

Index Terms- ergonomics, exercises for neck pain, neck pain, physiotherapy for neck pain

I. INTRODUCTION

Neck disorders remain a common problem in modern industrialized countries. Since early and mid – 19 eighties the use of computer has increased dramatically along with the increasing reports of pain from inflamed soft tissues in the neck Computer, a hallmark of technological advancement has ushered in a new genre of occupational health problem, i.e., of computer related health problems the fore runner on the Cyber World the occupational health personnel is slowly awakening to this group of modern occupational diseases which are slowly taking roots among computer professionals India being. These problems, if ignored can prove debilitating and can cause crippling injury forcing one to change one's profession. Neck pain is assumed to be a multifactorial disease and it has been suggested that there are several risk factors contributing to its development. The contributing factors of neck symptoms are - Physical workloads, poor ergonomic work design and certain psychosocial factors. Lisinski P et al, stated that neck pain has become a common epidemiological problem. One of the reasons for this is a

sedentary way of life connected with using a personal computer during daily activity. Work place and work duration has not been properly adapted to the personal physical conditions of the employees. It is not possible that any individual has not suffered from neck pain. This pain can be trivial in nature and can lead to complications. Neck pain usually arises due to diseases of cervical spine and soft tissues of the neck. muscular pain can be due to spasm of muscles caused by injury, falling asleep in awkward position or prolonged working at computer desk with bent necksort of pain is usually self-limiting. If this spasm is for a long period, it becomes chronic pain. Neck pain should be identified and treated by posture correction and exercises to avoid complications

Slumped over documents and staring all day into a computer screen do no end of damage to musculoskeletal exacerbating tension and tightness around neck and shoulder. Forward head posture and flexion of the trunk form the main components of slumped sitting with the cervical alignment deemed to be poor when the head and trunk are held forward relative to the lumbopelvic region. A flexed spine results in higher activity in cervical erector spinae, trapezius and thoracic erector spinae muscles. There is evidence linking prolonged trunk flexed posture with increased muscle loading and a subsequently increased risk for symptoms in the upper body

Musculoskeletal disorders represent one of the leading causes of occupational injury and disability in developed and industrially developing countries loss due to such disorder affects not only the individual but also the organization and the society as a whole. At present time, musculoskeletal disorders are one of the most important problems ergonomists have encountered in the work place around the world. In many countries prevention of work-related musculoskeletal disorders has been considered as a national priority. WRMSD is a worldwide concern and distributed among both industrialized countries and industrially developing countries. In industrially developing countries the problems of workplace injuries are extremely serious. Studies showed that among computer professionals, 30 % of musculoskeletal problems is neck pain. These results indicated serious ergonomic deficiencies in office computer workstation, design, layout and usage . In a Canadian study 54 % of the general population had experienced neck pain for 6 months in which 5 % were highly disabled by neck pain.

A positive relation has been found between various neck disorders and work related risk factors, such as, static neck and arm postures, duration of sitting as well as workplace design. Among other job characteristics, high quantitative job demands,

having little influence on one's work situation and limited rest-break opportunities have been found as predictors of neck pain.

Computer use in sustained non-neutral postures, such as neck rotation and shoulder abduction, has been identified as risk factors for neck and shoulder symptoms. Low frequency neck exercises have been found preventive in some studies.

The human body is designed to move and health depends on it. Dynamic activity such as stretching should be incorporated in a work day and performed frequently. Isometric exercises ease neck stiffness and it becomes more flexible, there is little or no joint movement. DM Kietrys, stated that stretching and resistance exercises to the neck are easy to do and when performed 1-2 times daily reduce discomfort in the neck.

Most people with neck disorders experience a low level of disability of a large variety of therapeutic interventions available for treatment of mechanical neck pain, exercise therapy is a widely used treatment. The Verhagen 2004 update indicated the use of active interventions was more effective than passive ones.

The objective of the present study is to determine if ergonomic intervention with exercises are more efficient than, only ergonomic intervention for neck pain among computer professionals.

II. OBJECTIVES

1. To determine the effects of intermittent isometric exercises and stretching for
neck pain in computer professionals.

2. To find out the effectiveness of ergonomic intervention and exercises during
working hours in neck pain among computer professionals.

III. LITERATURE REVIEW

1. Arpita Desai and Shruti M Shah (2004) in a study on a 100 computer professionals by using ergonomic intervention and intermittent exercises for neck in the work day concluded that educating computer operators the importance of ergonomics and work modification techniques and intermittent exercises protocol can reduce risk of cumulative trauma disorders.

2. Kilroy, Niamh (2000) in a study on 47 female subjects treated with physical work place change and advice on risk factors showed that ergonomics intervention resulted in an improvement in working posture and a decrease in musculoskeletal symptoms and body discomfort.

3. Vernon H, Mior (1991) stated that modified Oswestry Neck index is a good practical tool to give information on how neck pain has affected ability to manage in everyday life. It has been proved valid and reliable.

4. Shikdar AA, Al-Kindi (2007) in a study in 40 workstations treated 138 workers with ergonomic interventions and found that of the musculoskeletal problems seen among computer employees 30 % was neck pain, due to ergonomic deficiencies in computer workstation.

5. Kary TN, Gross A (2005) (used 16 trials with multiple comparison, 6 studies compared stretching and strengthening exercises to control treatment showed that there is evidence that stretching and strengthening exercises have benefit on neck pain.

METHODOLOGY

A randomized controlled trial to find if ergonomic intervention with isometric exercises and stretching for neck proves more effective than ergonomics alone for neck pain in computer professionals.

POPULATION - Subjects with neck pain from IT Company in Bangalore.

SAMPLE - 100 female subjects satisfying the inclusion criteria were selected from
population and assigned in 2 groups: -

Group I – 50 subjects received ergonomic intervention.

Group II - 50 subjects received ergonomic intervention with stretching and isometric
exercises for neck.

SAMPLING DESIGN – Simple random sampling.

SAMPLING METHOD – Subjects were selected through simple random sampling using lottery method (Alphabets A & B).

INCLUSION CRITERIA

- Duration of pain 3 to 4 months.
- Age 25 – 35 years.
- Patients having primary complaint of neck pain with no radiculopathy.
- No treatment for neck pain taken before.

EXCLUSION CRITERIA

- History of trauma to neck.
- History of whiplash injury.
- Bilateral upper limb symptoms.
- Prior surgery to cervical and upper thoracic spine.
- Diminished or absent sensation to pinprick in upper limb dermatome.
- Positive 2 or more neurological signs.
- Physiotherapy interventions taken before for neck pain.

TOOLS: -

- A copy of Visual Analogue Scale for pain.
- A copy of Modified Oswestry Neck Disability Inde
- Ergonomic Guidelines.
- Neck Exercises.
- Knee Hammer.
- Cervical Tests- Neck Distraction Test
  Neck Compression Test

PROCEDURE

Female patients with neck pain since 3 to 4 months, between 25 to 35 years of age were selected. A complete standardized history taking and Physical examinations to rule out neurological signs were done by the physiotherapist.

Modified Oswestry Neck Disability Index was used: have shown that modified version has high levels of reliability, validity and responsiveness. It's a self report measure of function used in patients with neck pain. It contains 10 questions and each has to be scored between 0 -5 and the total score out of 50 was noted. It has high test – retest reliability with ICC – 0.93.

VAS: was used to indicate the intensity of pain. The scale has shown to have adequate reliability and responsiveness in patients with neck pain. It has high test-retest reliability with ICC - 0.91.

Following baseline examination patients were randomly assigned to two groups:

Group A- (Ergonomic intervention and Exercises group)

The patients were explained about the procedure and informed consent was taken.

Patients were given a copy of ergonomic guidelines, which included –

  Arms –Place frequently used items within close reach.

  Constraint head postures - Keep reference material upright at desk and do not move the head, instead raise and lower eyes to read.

  Incorrect screen height – Adjust monitor height so that top of screen is at or slightly lower than eye level.

  Poor posture habits – Do not slouch, sit upright.

  Adjust chair height correctly- Seat height should not compress the thigh.
- Front edge should be curved downwards.
- Chair seat height should be 25 to 35 cm below Work surface.
- Chair seat should be 2 inches behind the Popliteal level.
- Arm rest should allow elbow to rest at 90 degree.
- Alternate tasks – In between prolonged duration of typing and viewing the monitor, Some other tasks like- drinking water, speaking on phone, Speaking to a colleague, whole body stretch should be done.

  Cradling phone between neck and shoulders: use head set
Patients were taught isometric neck exercises:
Patients were in sitting position on the working chair.

Isometric flexion - They were taught to place their dominant hand flat on the forehead. Next, they were told to firmly push forehead against the right hand and hold for 5 seconds and were told to repeat 5 times.

Isometric extension – Patients were taught to place their dominant hand behind their head, over the occipit. Next, they were told to firmly push the head backwards against the hand, and hold for 5 seconds and repeat 5 times.

Isometric side flexion – Patients were taught to place the right hand flat on the right side of the head. Next, they were told to firmly push the head against right hand and hold for 5 seconds and repeat 5 times. Same exercise was repeated with the left hand against the left side of the head.

Isometric neck rotation – Patients were taught to place the right hand on the right cheek. Next, they were told to firmly turn the face against the right hand and hold for 5 seconds and repeat 5 times. Same exercise was repeated with the left hand on the left cheek.

Patients were taught neck stretching:

Neck Extensors stretch- They were taught to gently bend neck forward, as if to   touch the chin to jugular notch, and hold the position for 10 seconds and repeat 5 times.

Neck Flexors stretch - Patients were taught to gently bend the neck backwards as much as possible and hold the position for 10 seconds and repeat 5 times.

Neck side flexors stretch- They were taught to gently bend their neck on the right side, trying to touch the ear lobe to the shoulder and hold the position for 10 seconds and repeat 5 times.

Stretch for right side - They were taught to gently bend their neck to the left side, trying to touch the ear lobe to the shoulder

and were told to hold the position for 10 seconds and repeat 5 times.

Neck lateral rotation stretch- They were taught to gently turn the neck to the right side, looking over the shoulder and were told to hold the position for 10 seconds and repeat 5 times.

Stretch for Right side - They were taught to gently turn the neck to the left side, looking over the shoulder and were told to hold the position for 10 seconds and repeat 5 times.

-    Patients were instructed to do the isometric exercises and neck stretching every 2 hours of their work.

- Patients were instructed to follow the ergonomic guidelines regularly.

Group B- (Ergonomic intervention group)

 - Patients were explained about the procedure and informed consent was taken.

 - Patients were given a copy of ergonomic guidelines, same as was given to

Group A.
Follow up –
Evaluation using VAS and Modified Oswestry Neck disability index was done before starting treatment, and subsequently every 15 days for 2 months.

IV.   RESULTS

Student t test (two tailed, independent) has been used to find the significance of study parameters (NDI) on continuous scale between two groups Inter group analysis) Mann Whitney U test has been used to find the significance of study parameters of VAS score between two groups.

<u>Statistical analysis between the 2 groups based on NDI score</u>

The day 1 observation of experimental group was 18.36 (SD – 4.07) and in control group it was 19.58 (SD – 3.36). Hence, the NDI was not statistically significant on day 1. At day 15 the mean in experimental group was 17.80 (SD – 3.87) with 3.1 % reduction and in control group it was 19.52 (SD – 3.31) with 0.4 % reduction, with a difference of 2.7 % (p value- 0.789) so it is statistically significant. On day 30 the mean in experimental group was 14.5 (SD – 2.36) with 20.9 % reduction and in control group it was 18.42 (SD – 3.09) with 5.9 % reduction, the difference being 15 % (p value – 0.056) it was statistically significant. At day 45 the mean in experimental group was 10.70 (SD – 1.79) with a decrease of 41.7 % and in control group it was 16.58 (SD – 3.15) with a decrease of 15.3 % the difference in improvement being 26.4 it was statistically significant. On day 60 the mean was 4.12 (SD – 1.15) and a reduction of 77.6 % and in control group it was 13.66 (SD – 1.45) and a reduction of 30.2 % difference in improvement was 47.4. Hence, the improvement in Experimental group was statistically significant.

Graph 1.1: Represents evaluation of NDI score between experimental and control group, from day 1 till end of 02 months
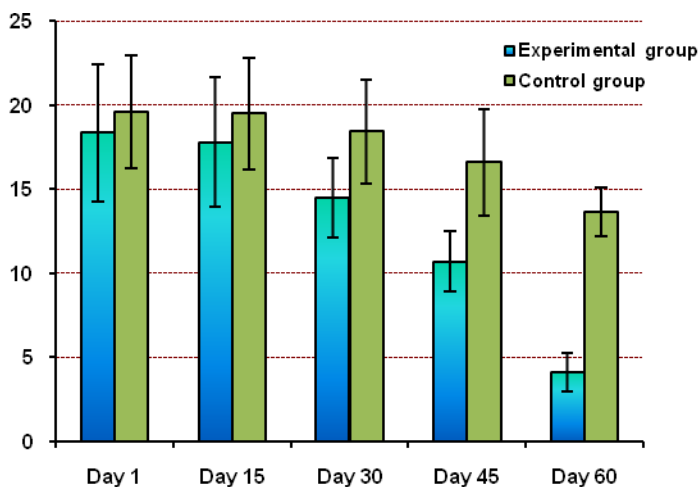
Evaluation of NDI

Evaluation of VAS

Statistical analysis between Experimental and Control group based on VAS score.

The day 1 observation of experimental group was 4.82 (SD – 0.83) and in control group it was 5.00 (SD – 0.76). Hence, it was not statistically significant. At day 15 in experimental group the mean was 4.46 (SD – 0.71) and a change of 7.5 % and in control group it was 4.98 (SD – 0.74) and percentage change of 9.2 %, with a difference of 1.7 in percentage (p value 0.195) it is statistically significant. At day 30 in experimental group the mean was 3.98 (SD – 0.38) and percentage change of 17.4 % and in control group it was 4.54 (SD – 0.58) and a percentage change of 9.2 %, there is a difference of 8.2 in percentage (p value – 0.361), hence, it is statistically significant. On day 45 in experimental group the mean was 3.22 (SD – 0.47) and a change of 33.2 % and in control group the mean was 4.02 (SD – 0.47) with a change of 19.6 %, the difference in percentage is 13.6 (p value – 0.188), so it is statistically significant. Finally on the 60th day the mean in experimental group was 1.54 (SD – 0.58) with 68.1 % improvement and in control group it was 3.40 (SD – 0.49) with 32 % improvement, the difference in percentage of improvement being 36.1 (p value- 0.001), the result is statistically significant.

Graph 1.2: Represents the analysis between the control and experimental group based on VAS score
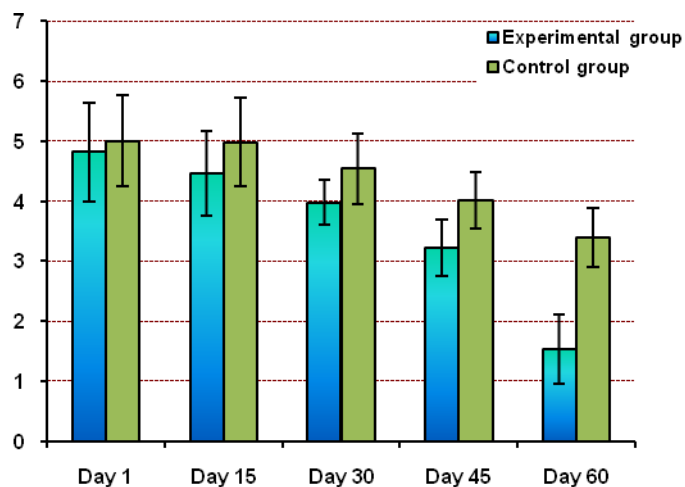
V. DISCUSSION

The data collected in the study was analyzed using Mann Whitney U test and Paired t- test. The age group selected was from 35-45 years. The statistical analysis of the data supports the beneficial effects of exercises and ergonomics over ergonomics alone for neck pain in computer professionals.

Arpita Desai and Shruti M Shah in their study on 100 computer professionals by using ergonomic intervention and intermittent exercises for neck in the work day concluded that educating computer operators the importance of ergonomics and work modification techniques and intermittent exercises protocol can reduce risk of cumulative trauma disorders.

Kilroy, Niamh in a study on 47 female subjects treated with physical work place change and advice on risk factors showed that ergonomic intervention resulted in an improvement in working posture and a decrease in musculoskeletal symptoms and body discomfort. As in the present study this study was also done on female subjects and ergonomic intervention was given. But as in the present study exercises to the neck was not used as an intervention.

DM Kietry, JS Galper in their study on 72 subjects to find the efficacy of at-work exercises for computer operators concluded that resistance and stretching exercises are easy to do and when performed 1-2 times daily reduced discomfort in the neck. This study also included at-work exercises and proved to reduce discomfort in the neck.

Observing the efficacy of exercises and ergonomic intervention in reducing neck pain, the present study aimed at combining both these interventions to explore if exercises together with ergonomic intervention proved to be more beneficial than ergonomics alone for neck pain in computer professionals.

Following intervention the severity and incidence decreased for pain and disability. The subjects appreciated the ability to overcome the disabling effects of wrong posture and lack of physical exercise which were hindering their work performance. Subjects also improved from psychological stress due to neck pain to feelings of control and empowerment over their health which affected their quality of life. Changes in behavior were also seen with participants reporting efforts to continue ergonomic guidelines even after work in other daily activities.

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Cryptosporidiosis in Drinking Water: Analysis of Surveillance data from Health Protection Scotland (2006 – 2012)

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Abstract- **Objective:** This study seeks to update understanding of the public health issues round the epidemiology of cryptosporidiosis in Scotland between 2006 and 2012. By examining the patterns, trends and seasonal effects of cases of cryptosporidiosis amongst different age groups, sex and health boards in Scotland during the reference periods. **Data Sources, Design and Methods:** Data on notified cases of cryptosporidiosis was supplied by Health Board Scotland between 2006 -2012, based on 16 health boards, which were modified to 14 health boards. Other variable used is the population data which was sourced from the website of the General Register office for Scotland. The Harmonic Poisson Regression model was utilized in examining the potential effects of cryptosporidiosis among different age group, sex, health boards as well as their pattern of occurrence in Scotland. **Results:** The models predicted that the highest number of cases of cryptosporidiosis in Scotland occurs in the fourth quarter (Autumn Season). There were 4195 reported cases of cryptosporidiosis in Scotland between 2006 and 2012. Of these number of cases, those associated with the female sex was higher with 2239 (53.27%), compared to the number of cases reported for the male sex 1926(45.91%), while a total of 30 (0.72%) cases were reported as unknown sex. The Age band of all the reported number of cases during the period under consideration were 0-14, 15-44, 45-64, and 65+ and their results were; 1978(47.15%), 1748(41.67%), 331(7.89%), and 138(3.29%) respectively. As regarding the health boards, Greater Glasgow and Clyde, had the highest number of cases of cryptosporidium infection 677(16.14%). Next to Greater Glasgow and Clyde is Lothian with 641(15.28%) number of cases. Those health boards with less than 1% are Shetland, Orkney Western Isles with 0.81%, 0.10% and 0.17% number of cases respectively between 2006 and 2012. **Conclusions:** The study has shown that the season with highest risk of cryptosporidium infection in Scotland is autumn and the higher the population in a health board in Scotland, the more likely the population have a higher risk of cryptosporidium parvum infection.

Index Terms- Cryptosporidiosis, health boards, autumn, cryptosporidium parvum

I. INTRODUCTION

Cryptosporidiosis has been identified as a major re-emerging public health issue that is linked to waterborne and foodborne diseases among humans and animals [1, 2]. The causative bacteria, cryptosporidium are chlorine-tolerant protozoan parasites which are the major cause of gastrointestinal illness in humans and animals. Although studies have shown that individuals who have weakened immune systems (HIV Positive individuals) are at a higher risk of more severe effects or protracted illness, there have been outbreaks and incidences in healthy populations as well [3,4]. The incubation period for the illness is between 7 and 12 days [5]. Cryptosporidium is transmitted through the ingestion of contaminated drinking water or recreational water. Occasionally, food sources (such as bagged salad, watermelon) can also be a channel of transmission of cryptosporidium [6]. The disease can further be contracted through surfaces that have been contaminated with the stool from infected persons or animals, through sexual practices that might result in oral exposure to stool e.g. oral-anal contact, as well as humans or domesticated animals that are infected with the illness [6]. The transmission of the disease from human to human is caused by Cryptosporidium hominis while the transmission of the disease from animals (such as cattle, lamb, sheep, etc) to humans is caused by Cryptosporidium parvum [7]. However, apart from the two mentioned species, molecular studies have demonstrated that cryptosporidiosis can be caused by 20 other cryptosporidium species as identified and were described based on the hosts from which they were originally isolated [8,9].

II. METHODS

The source of the data for this analysis is Health Protection Scotland. The administration of public health activities in Scotland is divided into 14 Health Boards. These health boards are as follow**;** Ayrshire & Arran(AA), Borders(BR), Dumfries & Galloway (DG), Fife(FF), Forth Valley(FV), Grampian (GR), Greater Glasgow & Clyde(GC), Highland (HG), Lanarkshire(LN), Lothian(LO), Orkney(OR), Shetland(SH), Tayside(TY), Western Isles(WI). Population size was also added to the data. The source of the population variable is the General Registrar's office for Scotland. The reason for introducing population in the data set is to allow us adjust for the different

sizes of the health boards. The design was based on surveillance data on microbiologically confirmed cases of cryptosporidiosis in Scotland. The reference period under consideration was 2006 to 2012.

Frequency tables, charts and plots were used to explore relationships between and among variables under consideration. Furthermore, in order to assess the relationships between the variables, contingency tables were introduced and the relationships among the variables were analysed.

Contingency table is considered a useful and simple technique for detecting statistical significant association between two variables. We used the quarterly counts of cryptosporidiosis against other explanatory variables. It was also used to capture the patterns and effects of the seasonal (spring, autumn, summer, and winter) cases of cryptosporidiosis on some crucial explanatory variable.

These cyclical parameters are calculated based on values predicted by the harmonic regression

Equation;

$$y = \alpha + \partial_1 \cos(2\textstyle\prod x/53) + \partial_2 \sin(2\textstyle\prod x/53) + \Upsilon_1 \cos(4\textstyle\prod x/53) + \Upsilon_2 \sin(4\textstyle\prod x/53) + \epsilon$$

$$y = \alpha + \partial_1 \mathcal{z}_1 + \partial_2 \mathcal{z}_2 + \epsilon$$

where $\mathcal{z}_1 = \cos(2\textstyle\prod x/53)$

$\mathcal{z}_2 = \sin(2\textstyle\prod x/53)$

$p_1 = \cos(2*pi*week/53)$

$p_2 = \sin(2*pi*week/53)$

$p_3 = \cos(2*pi*week/53)$

$p_4 = \sin(2*pi*week/53)$

Therefore, p1, p2, p3 and p4 are the harmonic Parameters.

A Poisson regression may be used when the response variable is a count as in the case of cryptosporidiosis occurring independently. Counts are all positive integers and for rare events the Poisson distribution rather the normal distribution is more relevant since the Poisson mean is greater than zero and it has the special property that the mean and variance are identical. Poisson distribution

$$f(y_i; \theta) \frac{e^{-\theta}\theta^{y_i}}{y_i!} \qquad y = 0,1,2,3,\ldots$$

where y is the response variable (independent cases of cryptosporidiosis)

θ (lambda) is the rate of occurrence of cases of cryptosporidiosis per unit of time.

The model for this study is express below;

$$log(\mu_i) = \alpha + \partial_1 quarter_i + \partial_2 year_i + \partial_3 age_i + offset(population) + \partial_4 sex_i + \partial_5 Healthboards_i \quad \Rightarrow \quad \textbf{model}$$

Offset term

The offset term in the model is a quantifiable variable whose regression coefficient is known to be 1(one) [10]. The offset is usually used to include the exposure term, which is often taken in terms of log of exposure of the variable.

III. RESULTS

The data was analysed using R Software, version 2.15.2 (2012-10-26) -- "Trick or Treat" Copyright (C) 2012 The R Foundation for Statistical Computing.

Variables	Categories	Pooled (%)
sex	Male	1926(45.91)
	Female	2239(53.37)
	Unknown	30(0.72)
Age - Band	0 - 14	1978(47.15)
	15 - 44	1748(41.67)
	45 - 64	331(7.89)
	65 +	138(3.29)
Health Boards	Ayrshire & Arran	325(7.75)
	Borders	149(3.55)
	Dumfries & Galloway	252(6.01)
	Fife	239(5.70)
	Forth Valley	163(3.89)
	Greater Glasgow & Clyde	677(16.14)
	Grampian	574(13.68)
	Highland	227(5.41)
	Lanarkshire	449(10.70)
	Lothian	641(15.28)
	Orkney	34(0.81)
	Shetland	4(0.10)
	Tayside	454(10.82)
	Western Isles	7(0.17)

Table 1 Demographics of Respondents Reported In Percentage (Pooled results between 2006 - 2012)

Summary statistics show that there were 4195 reported cases of cryptosporidiosis in Scotland between 2006 and 2012. Of these number of cases, those associated with the female sex was higher with 2239 (53.27%), compared to the number of cases reported for the male sex 1926(45.91%), while a total of 30 (0.72%) cases were reported as unknown sex. The Age band of all the reported number of cases during the period under consideration were 0-14, 15-44, 45-64, and 65+ and their corresponding results were 1978(47.15%), 1748(41.67%), 331(7.89%), and 138(3.29%) respectively. This is an indication that cases of cryptosporidiosis in Scotland have higher

prevailence among children (0 - 14). As regarding the health boards, Greater Glasgow and Clyde, had the highest number of cases of cryptosporidium infection 677(16.14%). Next to Greater Glasgow and Clyde is Lothian with 641(15.28%) number of cases. Those health boards with less than 1% are Shetland, Orkney Western Isles with 0.81%, 0.10% and 0.17% number of cases respectively, on the average between 2006 and 2012 (see Table 1.1).
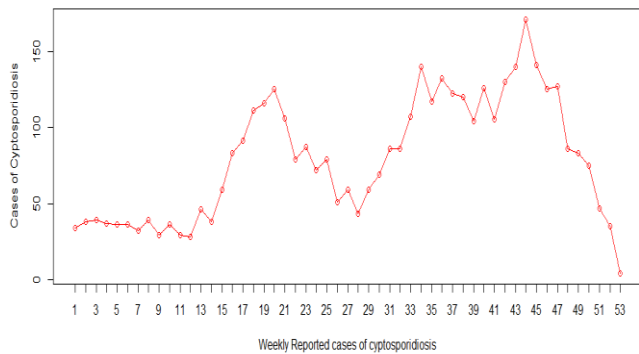
Figure 1 Pooled weekly cases of cryptosporidiosis between 2006 and 2012

Figure 3.1.2, shows the pooled weekly reported cases of cryptosporidiosis for the years under consideration (2006 – 2012). While this shows differences between weeks, the data reflects some seasonality though the seasonality is not regular. Double peak periods were observed at week 20 and week 45 respectively. There was another attenuated increase in week 28 without much significant decrease compared to the initial peak. The autumn cases may be caused by holiday travel and swimming pool use however; there is no substantial evidence to support this claim. In short, routine surveillance in Scotland over the last 7 (seven) years showed that the majority of cases occurred in autumn.

Model: $\log(\mu_i) = \alpha + \partial 1\ quarter_i + \partial 2 year_i + \partial 3 age_i +$ offset(population) $+ \partial 4 sex_i + \partial 5\ Healthboards$

	RR(95% CI)	P-Value
(Intercept)	1.18(0.99,1.40)	0.06
quarter(2)	2.55(2.27,2.87)	<0.001
quarter(3)	2.84(2.53,3.19)	<0.001
quarter(4)	3.15(2.81,3.53)	<0.001
year2007	0.85(0.75,0.96)	0.01
year2008	1.06(0.94,1.19)	0.32
year2009	1.07(0.95,1.20)	0.26
year2010	0.93(0.82,1.05)	0.24
year2011	0.77(0.68,0.88)	<0.001
year2012	1.15(1.03,1.29)	0.02
Age (15-44)	0.89(0.83,0.95)	<0.001
Borders	0.50(0.41,0.62)	<0.001
Dumfries & Galloway	0.79(0.66,0.94)	0.01

Fife	0.75(0.63,0.90)	<0.001
Forth Valley	0.50(0.41,0.62)	<0.001
Greater Glasgow & Clyde	2.19(1.90,2.53)	<0.001
Grampian	1.90(1.65,2.20)	<0.001
Highland	0.69(0.57,0.83)	<0.001
Lanarkshire	1.45(1.25,1.69)	<0.001
Lothian	1.97(1.71,2.29)	<0.001
Orkney	0.11(0.08,0.16)	<0.001
Shetland	0.01(0.00,0.03)	<0.001
Tayside	1.49(1.28,1.74)	<0.001
Western Isles	0.01(0.00,0.03)	<0.001
sex (M)	0.90(0.85,0.96)	0.002

Signif. codes: '***' 0.001 '**' 0.01 '*' 0.05

Table 2 Results from Model: The Poisson Harmonic Model

On the average, number of cases of cryptosporidiosis is 155%, 184% 215% more likely to occur in the second quarter, third quarter and fourth quarter respectively compared to the reference category (first quarter) holding other variable in the model constant. On the average, cases of cryptosporidiosis is 11% less likely to occur among those in the age group (15 - 44) compared to those in the reference age group (0 -14) in Scotland between 2006 and 2012. The reference health board is Ayrshire & Arran. On the average, persons living in Greater Glasgow and Clyde, Grampian, Lanarkshire, Lothian and Tayside were 119%, 90%, 45%, 97% and 49% more likely to be infected by cryptosporidiosis than those living in Ayrshire and Arran. As regarding the years, on the average, in year 2008, 2009 and 2012 the number of cases of cryptosporidiosis in Scotland were 6%, 7% and 15% respectively more likely to be reported compared to the reference year, 2006. On the average, the risk in number of cases of cryptosporidium infection among the male sexes is 10% less likely compared to the female sexes in Scotland between 2006 and 2012. Observing the age group, on the average, those in the age group 15 – 44 are 11% less likely to report the cases of cryptosporidiosis compared to the reference age group (0-14). With respect to statistically significance, quarter 2, quarter 3 and quarter4 are significant predictor of the model. Years 2007, 2011 and 2012 were statistically significant predictors of the model. While Age group (15 – 44), Sex (male) and all the health boards were statistically significant.

IV. DISCUSSION

The total number of cases of cryptosporidiosis reported annually fluctuated during the reference period (2006 -2012). It is unclear whether the fluctuation in the number of cases across the years is associated with the reporting pattern, actual change in the pattern of infection or the diagnostic testing procedures. Year 2012 recorded the highest number of cases of cryptosporidiosis. The high cases of cryptosporidium infection may be associated with the amount of rainfall in that year,

according to BBC report; year 2012 exceeds the existing highest record of rainfall of over 50 years in the United Kingdom [11]. Findings from other studies have shown that there is higher rainfall to evaporation ratio associated with increased rate of cryptosporidium infection [12, 13].

As seen in this study, health boards with larger population size tend to have higher number of cases of cryptosporidiosis. It was also observed from all the models that health boards with higher population are more likely to predict increase in the number of cases of cryptosporidiosis compared with health boards with smaller population size. This is consistent with other studies which show a relationship between densely congested area and number of cases of cryptosporidium infection [14, 15]. Finding from this study shows that cases of cryptosporidiosis is predominantly reported among children (0 - 14) compared to other age groups. It has been recognized that there is a degree of bias in the reporting of illness among children for different kinds of disease, this is because parents are more likely to seek medical care for their children. Health personnel are more likely to take specimens for children than for adult. This finding is consistent with other studies on cases of cryptosporidiosis among children [16, 17, and 18]. There are more numbers of cases among male sex in the age group 0 - 4 than other age group in Scotland. Comparing this to the female sex in similar age group shows that the number of cases of cryptosporidiosis tends to be more among those in the age group 15 - 44. The marked difference may be attributed to care services which are predominantly rendered by the female sex, who in the course of discharging their services gets infected through contact with the stool of the babies. Similar results have previously been obtained in surveillance study of cryptosporidiosis in the United States [16].

Some limitations to this study are as follow; variables which would have made the study more robust were not captured by the data provided by the Health Board Scotland. An example of such variables includes; sources of water supply to the different health boards risk factor of cryptosporidium infection by exposure, information on race and ethnicity. Modelling count data is a task that is commonly used in the public health [19]. Secondly, the classical Poisson regression model assumes that the conditional means and variance are equal. This is however, considered as a major limitation for the classical Poisson model. In order to overcome this limitation, a negative binomial harmonic regression model would be used in future study, so as to take into account the issues of over - dispersion and under – dispersion.

V. CONCLUSION

The study has shown that the season with highest risk of cryptosporidium infection in Scotland is autumn. The higher the population in a health board in Scotland, the more likely the population have a higher risk of cryptosporidium infection. Improving the completeness and quality of data collection methods by the health boards in Scotland would increase knowledge and reduce risk of cryptosporidiosis in Scotland.

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Waste Cooking oil: A Resourceful Waste for Lipase Catalysed Biodiesel Production

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Abstract- The growing concerns for environmental sustainability, economic and energy security had made it obligatory to source energy alternatives that harmonize environmental friendliness with biodegradability, renewability, and less reliance on petroleum products dependence. One of such energy sources is called biodiesel. Wide range of substrate; vegetable oils e.g. palm oil, soybean oil, sunflower oil, coconut oil, rapeseed oil, micro algal oils, animal fats, waste products of vegetable oil refinery, used frying/cooking oils was used in its production. To produce biodiesel with these substrates conventionally is complex, as the method is faced with limitations in the downstream processing costs, byproducts recovery and environmental issues. Enzymatic method, involving enzymes particularly lipases in a process of alcoholysis with waste cooking oil emerged to be efficient in curtailing the problems. The potentiality of the waste cooking oil for this purpose among other applications qualified it as a resourceful waste in view of the fact that no concrete waste definitions limit it to only waste. This review focuses distinctively on how biodiesel fuel is produced by lipase catalysis of waste cooking oil, waste concept and definitions and how waste oil can be a viable recourse. Sources of different lipases and substrates were reviewed to include specific substrate modifications to describe the current substrate used in this article. Thus, the economic feasibility of biodiesel production from waste cooking oil is conclusively viable.

Index Terms- ImmobilizedLipase; Biodiesel production; Waste cooking oil, Waste.

I. INTRODUCTION

There is an increasingly spurring necessity for an environmentally sustainable alternative energy sources that completely harmonize its environmental friendliness with biodegradability, renewability, low toxicity and less reliance on petroleum product dependence. One of such energy sources is called biodiesel. The current issue of energy security is an additional goal for alternative sources of fuels as prices hikes in recent times; around $65–67/barrel, approaching $70/barrel [1]. Shortage of fossil fuels, economic politics and global warming are among other reasons. Biodiesel referred to as fatty acid methyl/alkyl ester can be produced from a wide range of substrate; vegetable oils e.g. palm oil, soybean oil, sunflower oil, coconut oil, rapeseed oil, micro algal oils, animal fats, waste

products of vegetable oil refinery, used frying/cooking oils. Chemically, they are known as monoalkyl esters of fatty acids.

The conventional production of biodiesel is complex, as the techniques employed is faced with a number of problems. This conventional method involves the normal acid and base catalysts to form fatty acid alkyl esters. Downstream processing costs, by-product recovery and environmental problems associated with biodiesel production have made it a requisite for the search of alternative production methods and unconventional substrates.

The marginal substitute for viable biodiesel synthesis is to supplant the conventional processes with enzymatic methods, involving a wide range of enzymes, particularly lipases in a process of alcoholysis; a form of transesterification reaction. With this enzymatic technique, the aforementioned problems associated with the conventional process is practically solved and the downstream processing costs, a significant limitation of the conventional methods is overcomed but replaced with the enzymes cost. Since the outstanding concern now focuses on costs, the application of enzymatic and whole cell immobilization can cut down these costs and enable its multiple and successive usage in an environmental-friendly manner. In further pursuance to reduce these costs, waste cooking oil, a readily discarded by-product which serves as nuisance to many individuals is a potential resourceful waste for enzymatic biodiesel production. The concept of using waste cooking oil as previously highlighted also satisfies the European Waste Act (though emphasis more on prevention) and promotes efficient waste recycling, primarily in the form of biomaterial transformations and secondarily, as a sustainable energy source [2].

Therefore, the aim of this paper is to discuss the potentiality of waste cooking oil as a resourceful waste in biodiesel production and to bring out its cost effective prospect of biodiesel production. Other cost effective improvement means includes the production of quantum lipase using recombinant DNA technology, immobilized lipases and immobilized whole cell technology have tendencies to lower the overall cost, with less downstream processing problems.

II. CONCEPT OF WASTE RECYCLING

Having understood the importance of waste cooking oil in diverse application particularly its role in biodiesel production become necessary to have a clearer look at its functional

meaning. European Council 1991 Directive recognizes the need to ensure a common terminology and definition of waste and also emphasizes the desirability of heartening the recycling and re-use of waste as raw materials [3]. The waste Act, which emphasis more recovery of waste in primary form as materials and, secondarily, as energy has received a criticism by The European Chemical Industry Council (CEFIC) which argues that it is not the nature of the material that determines if it is a waste, but only the holder's action and intention [4]. Waste definition becomes a serious issue among EU member state and other countries, mainly due to its legal dispute, the implication is that when a substance is defined as waste, is regularly restricted in its transport, sale and re-use, or has a lot of administrative protocols in its import export processing as such become cost incurred. In the 90s, this led to agreeing Waste Catalogue, but individual, state laws still have different definitions and interpretation [5] as a result that it lacks precision individual member has various interpretation as illustrated in Table 1. McKinney [6] describe waste as the unnecessary (meaning preventable) costs that result from inefficient practices, systems or controls.

The notion of waste definition remained the same owing to the fact that a clear and concrete waste characterization is yet to be established since opposing views are now seen by various researchers. The waste notion is relative in different respects. A waste becomes a waste when it loses its primary function for the user, thus someone's waste output is often someone else's raw material input. Secondly, the notion of waste is also relative to the technological state of the art and to the location of its generation. Here going by this definition in this case, the waste cooking oil has a vivid understanding role in energy production as biofuel.

As scientists aim for progressive research, waste cooking oil as so called, has joined other waste as therefore a very dynamic concept since a concise definition of waste is yet to be provided for regional or global consumptions. To be fair not to go extreme, we viewed it as a resourceful waste or otherwise a raw material.

Table 1: EU and EU members Definition of waste in Directive 91/156/EEC (Bontoux & Leone 1997 In [2].

Countries	Waste definition	Legislation
EU	Any substance or object in the categories set out in Annex I which the holder discards or intends or is required to discard	91/156/EEC
	Any substance or object, which the holder disposes or is required to dispose of pursuant to the provisions of national law in force.	75/442/EEC
Austria	Objects which an owner or holder wishes to dispose or disposed of, or where their collection and treatment as waste is required by the public interest. EWC is not mentioned	Austrian Waste Management Act 1990 last revised by GBI. Nr. 434/ 1996
Belgium	As 91/156/EEC, but without mentioning EWC	Region Wallone: Decree 27 June 1996; Flamish Region: Decree 2 July 1982, amended 20 April 1994
Denmark	As 91/156/EEC with EWC	Statutory Order no. 299 of 30 April 1997
France	Material originating from a production or transformation process, or use, which the holder discards or intends to discard. The distinction between waste and ultimate waste is made	French Act 75-633 1975 revised 13 July 1992
Finland	As 91/156/EEC with EWC.	Waste Act 1072/1993
Greece	As 75/442/EEC not updated to 91/156.	n.a.
Germany	As 91/156/EEC with EWC	Waste Management Act (RWMA) 1994
Italy	As 91/156/EEC with EWC.	Decree 22/97
Ireland	As 91/156/EEC with EWC	Environmental Protection Act July 1996
Luxembourg	Any substance or object which the holder abandons or is required to discard, Also considers waste any product or substance that sent for recovery until it enters the commercial chain again	N.A.
Portugal	As 75/442/EEC not updated to 91/156.	N.A.
Spain	As 75/442/EEC not updated to 91/156	N.A.
The Netherlands	As 91/156/EEC, but without mentioning EWC	Wet Milieubeheer 1993

United Kingdom	As 91/156/EEC, but without mentioning EWC	Environmental Protection Regulations (1991)

Sources of Lipase for Biodiesel

Lipase are classified broadly from intracellular and extracellular origins, they are solemnly obtained from life organisms. The sources from which they originates also forms the basis of their classification where there are plants, animals and microbial or microorganism lipases. Plant lipase include those obtained from; castor seed lipase, canola seed lipase, elm seeds, oat seed lipase papaya latex and pinus seed lipases [7, 8]. Animal sources of digestive lipases are pancreatic lipases, gastric and hepatic lipases.

The optimum yield of these enzymes is obtained from microorganisms particularly fungi and bacteria as they are produced at higher concentrations with less restrictions which makes it prominent for its products to possess the properties that ease their commercialization [9, 10, 11].

These lipases are commonly used industrially to obtain a diverse range of products which include biodiesel and other agricultural yields. Lipid modification for industrial application is based on the nature of the modification in question, which dictate the lipase to be selected. These modifications may also include fatty acids- specific modification, position-specific modification of triacylglycerol, modification by synthesis i.e. direct synthesis and transesterification and modification by hydrolysis [1]. The analysis of literature revealed the following microbial lipases, to start with fungi then bacteria; *Aspergillus niger, Candida cylindracea, Candida rugosa, Geotrichum candidum, Fusarium heterosporum, Fusarium oxysporum, Humicola lanuginose, Mucor miehei, Oospora lactis, Rhodotorula rubra, Penicillium cyclopium, Penicillium roqueforti, , Rhizopus arrhizus, Rhizopus boreas, Rhizopus thermosus, Rhizopus usamii, Rhizopus stolonifer, Rhizopus fusiformis, Rhizopus circinans, Rhizopus delemar, Rhizopus chinensis, Rhizopus japonicus NR400, Rhizopus microsporus, Rhizomucor miehei, Rhizopus nigricans, Rhizopus niVeus, Rhizopus oryzae, Rhizopus rhizopodiformis, Rhizopus stolonifer NRRL 1478, Thermomyces lanuginosus, Chromobacterium Viscosum, Bacillus thermoleoVorans, Enterobacter aerogenes, Pseudomonas aeruginosa, Pseudomonascepacia, Pseudomonasfluorescens, Pseudomonas putida and Staphylococcus hyicus,* [7, 1, 12]. Several researchers [13, 14, 15] have published the application of lipases for biodiesel production using vegetable oil substrate. The production can also be achieved by waste cooking oil with a considerable productivity. Maceiras *et al.* [16] reported 89.1 methyl ester conversion by *Candida antarctica* (CALB) while Wu *et al.*, [14] reported ethyl ester yield of 85.4%, with Lipase PS-30 (specific activity 34 IU/mg solid) from *P. cepacia* at an alcohol concentration of 95%.

III. LIPASE MICROENVIRONMENT

The microenvironment of an enzyme molecule depends on its electrostatic charges and the rate at which reaction occurs in non-aqueous media depends on these environmental charges. When the amino acid polar group of protein dissolves in aqueous medium, the pH of the medium determines the charges. In this case, the charge becomes uniform as the protein is transferred to another medium like oil. At this point, the pH memory of protein comes [17]. pH memory has been attributed to a fixation of protein catalytic group ionizations after the biocatalyst preparation. The standard model of the enzymatic fixation process is the maintenance of all of the ionization states present, i.e. buffers species and protein before the freezing. The various effects of additives on the ionization state of low-water proteins has been studied [18].

Therefore, production by optimization of enzyme activity in the non-aqueous medium requires the stabilization of the pH of the microenvironment, as previously observed in our study [19] (Deba, 2013) with *Candida rugosa* lipase with phosphate buffer, at both free and immobilized form in preparation for transesterification to attain higher catalytic activity. Thus, the process of enzyme pre-treatment and solution buffering ensure the maintenance of its pH ionization power is essential for all biocatalysis and contributes to higher catalytic activity of enzymes as well as its stability [10].

IV. ENZYMATIC ALCOHOLYSIS OF TRIGLYCERIDES

Enzymes are biological molecules (catalysts) which promote numerous chemical reactions to take place within the homeostasis limit of a living system. Enzymes have enormous potential for reducing environmental crisis and energy claim in the chemicals and pharmaceutical industries [11]. Mass scale enzyme applications have been reported for the production of drinks and textiles, leather, detergents, baking, rare sugars, starch hydrolysis and fructose production, pulp, antibiotics (semisynthetic penicillins) and genetic engineering [20, 11] .

Transesterification or alcoholysis can be carried out or without enzymes, and numerous examples are overflowing in the literature on the application for biodiesel [12, 11, 21]. Recently, interest is ongoing in using lipases as the biocatalyst, which is basically to commercially convert vegetable oils/ fats to FAME as biodiesel fuel, as a result of the benefits it has over the acid and alkali catalysts;

- *Free of soap formation*
- *Washing step is avoided to esterify both FFA's and triglycerides in one step mechanism*
- *Capitulate a better quality glycerol*
- *Ability in handling large variation in feedstock quality*
- *A second generation raw materials like waste cooking oils, animal fat and similar waste fractions, with high FFA and water content, can be catalyzed with complete conversion to alkyl esters with considerably reduced quantity of wastewater and*
- *Works under friendly conditions leading to less energy consumption*
- *Highly selective*

- *Can be genetically engineered to improve their efficiency*
- *The reactions catalyze by enzymes are considered "green" reactions*

[1, 22, 21]

A comparison of conventional (alkali catalyst) transesterification versus biocatalyst transesterification is presented in Table 2.

Table 2: Distinctive differences between Conventional and Biocatalyst Transesterifications [11]

Major factors	Biocatalyst Transesterification	Conventional Transesterification (Alkali)
Biodiesel production yield	Relatively lower than alkali catalyst, around 90%	High, nearly 99%
Downstream processing	None	Multi-step purification of end products
Production cost of biodiesel	Really expensive as biocatalyst are expensive	Cheap, as catalysts are comparatively cost less
Commercialization	Not exactly	100% commercialized
Waste water generation	No waste water generation	Saline and alkaline effluents need treatment No waste water generation before discharge
Temperature	20-60°C	60-80°C
Presence of FFA's in feed stock	Completely conversion into the methyl ester	Soap formation
Presence of water	No effect on final product	Towards for more soap formation as hydrolysis No effect on the final product of the oil may take place

The reactions catalysed by lipase can be classified into two (2) stages; Hydrolysis and Synthesis reaction: the later is further subdivided as represented in Figure 1.
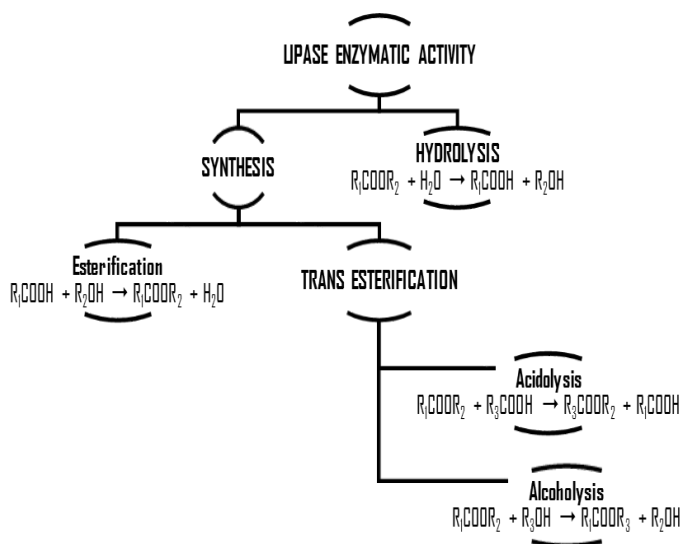
Figure 1: Reaction classifications of lipase enzymatic activity

The vast majority of enzyme researches for biofuel synthesis have been concerned in determining the most reliable enzyme source and optimizing the reaction conditions; substrate molar ratio, solvent, temperature, acyl migration, water content [1, 22, 23, 24], for increase in the production yield to enable industrial scale application. The problem associated with the enzyme reaction, particularly lipase is methanol inactivation. This problem has been examined and most probably solved by Shimada *et al*. [13], the authors reported stepwise addition of methanol in alleviating methanol inactivation of *Candida antarctica* lipase and the results was 90% yield of FAME from waste edible oil. Moreover, they reported enzyme stability in recycling for >50 times without considerable lost in activity. Few studies have considered the nature of the alcohol used in the transesterification reaction. In the presence or absence of solvents enzymes catalyzed alcoholysis can occur, this requires even less energy and practically no purification in obtaining FAME compared to base-catalyzed alcoholysis, in which soap formation presents downstream processing drawbacks. Table 3 presents the enzymatic production of biodiesel from waste cooking under various reaction conditions with various lipases.

Nevertheless, enzymatic transesterification have been characterized with limitations such as:
(a) Longer reaction time
(b Higher catalyst concentration is needed to complete reaction,
(c)High cost in enzyme production i.e. ~ $1000 US/ kg, whereas sodium hydroxide is only $0.62 US/ kg
(d)Although reuse of the lipase becomes possible after immobilization, it loses its activity in 100 days of use [25, 21].

Table 3: Enzymatic biodiesel production from waste cooking oil under various reaction conditions with various lipases

Oil/fat	Lipase/form	Alcohol/ Acyl-acceptor	Reaction Conditions	Yield realized	Reference
Waste frying oil	*Candida antarctica* (CALB)/ Imm on acrylic resin (Novozym 435) with an activity of 10,000 PLU/g	Methanol	2 g of WFO, 0.2 g of lipase, methanol to oil molar ratio of 25:1, 10% of Novozym 435, period of 4 h at 50 C incubation, & constant stirring at 150 rpm.	89.1%	Maceiras *et al.*, [16]
Waste cooking oil	*Pseudomonas cepacia*/Imm. on ceremic beads	Methanol	Methanol:oil molar ratio 1.00, 50 g of WCO and different methanol conc ranging 4.3 to 8.3 ml. 1 ml of enzyme solution containing 0.2% g immobilized lipase per g oil	> 40 %	Al-Zuhair, [31]
Waste cooking oil	Candida sp. 99-125,	Methanol	Batch reactor, temperature controlled at 40 ◦C, mixture was stirred with an electric stirrer at 220 rpm, methanol step-wise addition into 150 g WCO, 20 min.	2.5 mmol/g after 30 h	Liu *et al.*, [38]
Recycled restaurant grease	Pseudomonas cepacia (PS-30, specific activity 34 IU/mg solid)	95 % Ethanol	Mole ratio of grease to ethanol of 1:6.6 , 13.7 wt% lipase (PS-30), at 38.4°C for 2.47 h.	85.4%	Wu *et al.*, [14]
Waste vegetable oil (acidic oil)	Candida antarctica (Novozymes)/ Imm. on macroporous acrylic resin	Methanol	30-g mixture of dehydrated first-step product and 5.5 wt% MeOH was stieed at 30°C using 6 wt% imm. lipase. Reaction repeated 5 times by enzyme transferred to a fresh substrate mixture every 48 hrs.	>98.5 wt% after a24hrs	Watanabe *et al.*, [39]
Waste vegetable oil (In waste bleaching earth)	Rhizopus oryzae/ Free form	Methanol	Oil/methanol molar ratio of 1:4, 75% water content (by weight of substrate), an, and 67 IU/g of substrate, agitation of 175 rpm for 96 hrs. at 35 °C.	55% (w/w) after 96 hrs.	Lara Pizarro and Park, [69]
Sunflower, soybean, and waste cooking oils	Thermomyces lanuginosus/Imm. covalently on Microporous polymeric matrix (MPPM)	Methanol	Operation conditions were: Alcohol:oil ratio 6:1, water 15%, substrate flow 21 ml/min, temperature 65 °C, , total reaction time 5 hrs & 24 hrs, temperature 25 °C	Sunflower oil (63.8%), Soybean oil (55.5%) & Waste cooking oil (50.9%,). In 24 hrs reaction 90.2%, 93.9%, & 97.0%	Dizge *et al.*, [70]
Waste edible oil	Candida antarctica (Novozym 435)	Methanol	At 30◦C with shaking (130 oscillations/min) in a 30 g mixture of oil, 1/3 molar equivalent of MeOH for the stoichiometric amount, and 4 wt.% immobilized lipase	>90%, >100 days without loss in activity.	Shimada *et al.*, [13]
Waste cooking oil	Candida sp. 99–125/ imm. on textile cloth.	Methanol	Lipase/hexane/water/WCO weight ratio of 25:15:10:100, temperature of 45 °C and reactant flow of 1.2 ml/min	91.08%	Chen *et. al.*, [71]
Waste cooking oil	Penicillium expansum/ Imm. on resin D4020	Methanol	2 g waste oil with, 0.4 g t-amyl alcohol, 168 U immobilized PEL	92.8%, 68.4%	Li *et al.*, [72]

			and different amounts of blue silica gel. 1 molar equivalent of methanol was added at 35°C and 200 rpm for 24 hrs.	original activity retained after used for 10 batches	
(high acid value)					
Waste cooking oil	Lipase enzymes (Lipozyme-TL IM)/Imm. on hydrotalcite and zeolites, & free form	Methanol	9.65 g of waste cooking oil mixed with lipase (4% by weight of grease), 1.4 g methanol. Alcohol to oil molar ratio as 4:1 mixture kept at 24 ^{o}C, 200 rpm.	92.8% (imm.) & 95% (free)	Yagiz *et al.*, [40]

V. Mechanism of Lipase Reactions and its Kinetics

Lipases are hydrolases as a result of their natural tendency in hydrolysing triacylglycerols. Lipase like other enzymes have a three dimensional structure in an aqueous environment with their non polar group retained inert and the polar region is always exposed. In contrast to other enzymes, lipase lipolytic reaction is somewhat complex, as its lipid substrate are insoluble in water [7]. It has become necessary in order to have active lipase catalysis, lipid immiscibility of water to form a liquid-liquid interface. Thus the interface is the point of accessibility of lipase to the substrate to bring about the reaction [1]. Therefore the nature of the interface and interfacial area as well as interfacial properties influence the activity.

Lipase catalysed alcoholysis reaction occurs in two-step mechanism, occurring for each bond (ester) of triglyceride molecule. It begins with the hydrolyzation of ester bond releasing the alcohol moiety, then esterification with the second substrate followed [15, 26]. The Ping-Pong Bi-Bi mechanism is followed by alcoholysis of triglycerides, the most commonly used reaction to illustrate reactions catalyzed by lipases [27, 28, 12]. To fit to experimental results, simplification kinetics i.e the Michaelise Menten kinetics could be applied [29], as Michaelise Menten kinetics reaction can possibly explain the enzymatic conversion agreeably with appropriate fitting of models of varying complexity, though further rationalization is needed for the accuracy [21]. Numerous kinetic studied for the alcoholysis of triacylglycerols have been established in the literature [28, 30, 21, 12]. The Al-Zuhair kinetic model that follows the classical Ping-Pong Bi-Bi mechanism with alcohol inhibition but also take in an extra parameter, taking into account the release of fatty acids primarily [31]. Another kinetic model is that of Pilarek and Szewczyk [30] which also consider the Ping-Pong Bi-Bi manner with competitive inhibition by alcohol with the suppositions of an irreversible acyl bond sliced in glycerides, a reversible monoglyceride isomerization and an irreversible enzyme deactivation. To enable one have a full image of the rate of enzymatic alcoholysis of triglycerides, parameters to be considered include; lipase type, presence of organic solvents, amounts of reactants, mass transport limitations, the temperature's influence on enzyme deactivation (the equilibrium limitation for conversion) formation and conversion of intermediates, [21].

To add to the aforementioned parameters, the nature of the enzymes which is either in free form or immobilized form. As all the mentioned parameters can seriously have an effect on it. Therefore, by trying to determine kinetics in such systems all these factors become significant.

Sources of Renewable Oils and Fats for Biodiesel Production

Non renewable recourses are the major sources of our fuel energy, such resources are the fossil fuels which are characterized as non renewable exhaustible, non biodegradable and highly toxic. These resources are in the form of petroleum, coal, natural gas. etc.The renewable energy sources come primarily from plants, animal and microbe, which are categorised as plant derived oils, waste oils/fats and microbial oils respectively. The microbial oils are basically algal derivatives.

A. Plant-Derived Oils

These category of fuel source are biodegradable, renewable, nontoxic and inexhaustible, with an energy content analogous to that of the conventional fuel (fossil diesel fuel). Fuel obtained from this source is more expensive than doing so from petroleum-based fuels. This is partly as a result of the the contention between their needs either for food, food industry, feed, oleochemical industries or as a biofuel. Plant derived oils as a feed stock was identified as an eligible environmentally friendly fuel source as a result of the CO_2 fixation during the course of plant light production. Where the fixed carbon dioxide serve as a carbon source to the process. For that reason, combustion of fuel from this source is more or less paying back what was fixed naturally. The whole dwindling process of the enzymatic method lied to the fact that the method is not cost wise. With development in agro-genetic engineering, Non edible types of these oils would surely be produced, with that the competition for use as food, fuel or oleochemical industry surely would fade, cost arising conflict with massive production of such oil would surely fade. Other conflicting issues adding to the cost is the cost of enzyme, though immobilization method significantly tried to cut down, but not to the level of cost balancing. Through advancement in microbial molecular genetics (Genetic engineering), enzymes might be produced at huge number.

The fatty acid content of the source crops of oil or fat is significant in biodiesel because, in the winter, oil rich in saturated fatty acid tend to solidify as such clogging the fuel ways [1]. Low production scale are seen with refined oil which are even more costly. Rapeseed, palm kernel, sunflower, Soybean, peanut/ groundnut, cottonseed, castor bean, safflower oils are the more regularly used oils in biodiesel production, [1]. Upon all the vegetable oil used oleic acid rich oil is most suitable because of their better fuel properties [32] and increased stability of their alkyl ester on storage.

Other plant derived oils which are equally important include *Camelina sativa* oil [33], rubber seed oil [34], Coffee oil [35], peanut (*Arachis hypogea* L.) seed oil [36]. Seed oil like *Camelina sativa* (camelina) is a annual oilseed plant of the genus *Cruciferae* that grows well in temperate conditions, and matures earlier than other oilseed crops [33]. Therefore its early maturity can highly be an advantage in its market flow. Fröhlich and rice [33] also reported that methyl ester from this oil were mainly within specification, though low-temperature behaviour could be a problem in some climate which can of course be overcome by the use of suitable pour-point depressants or by blending with diesel oil. Nowadays research has shown the feasibility of defective crop seed to be employed in bio production which otherwise may result in poor quality oil to the market. Oliveira *et al.,* [35] tested the viability coffee oil for biodiesel production, both from healthy and defective beans, both of which were good conversion to fatty acid methyl and ethyl esters. *Arachis hypogea* L. commonly refered to as Peanut, oil from this plant was solvently extraxted and investigated for biodiesel by transesterification, methyl ester conversion was 89%.

Most of the later seed oils are also relatively available like most of the commonly used oils (Rapeseed, palm kernel,

sunflower, Soybean, peanut/ groundnut, cottonseed, castor bean, safflower oils). Being that almost all the feedstock of biodiesel are regionally and seasonally specific. There is need for more exploration on enzymatic catalysis of these oils.

B.   Waste Oils and Fats

This category of oil are derivatives of plant oil (vegetable oils) and Animal fats. As such they are oil-based substance consisting of vegetable matter that has been used in preparing food and is no longer suitable for human consumption. Waste/used frying oils, beef tallow, lard, yellow grease [14], Waste Edible Oil [37] and other hard stock fats [1] as generally called are good substrate for biodiesel production. These oils are cheap, may have some drawback due to vulnerability to oxidation, high free fatty acid composition, the contents of high polymerization products and high viscosity. As a result, pretreatment of such oils become necessary in order to reduce the mentioned components, in preparation to transesterification if basic catalyst where to be used, a times even enzymes [1].

Researchers established the application of waste cooking oil as an alternative energy in the form of biodiesel. Maceiras *et al.* [16] investigated the used of waste frying oil and reported methyl ester 89.1 % using *Candida antarctica* (CALB). Al-Zuhair [31], reported methyl ester > 40 % with Pseudomonas cepacia Immobilized on ceremic beads Recent study by Liu *et al.* [38], reported the applicability of waste cooking oil in batch reactor by Candida sp. 99-125 (2.5 mmol/g after 30 h). Acidic oils can also be applied in the quest for the alternative fuel. Watanabe et al. [39] established the potential waste vegetable oil (acidic oil from vegetable refining) in biodiesel production, fatty acid methyl ester conversion was >98.5 wt% after a 24-h reaction, catalysed by *Candida antarctica* (Novozymes) , immobilized on macroporous acrylic resin. And also reported reusability of the biocatalyst >100 days without significant loss in activity. Yagiz *et al.* [40] using waste cooking oil obtained 92.8% methyl ester for from Lipozyme-TL IM Immobilized on hydrotalcite and zeolites. Even the free lipase from the same reaction gave 95%.
Other prospective energy supply can be from the biodiesel produced from the waste cooking oil in the form of blend. Blending of fuels such as biodiesel and fossil diesel (for example, B20) 20% B100 and 80% diesel), or pure 100% biodiesel (B100) and 100% vegetable oils and ethanol and gasoline (gasohol), are global effort strive to reduce the 100 % dependency on petroleum diesel fuels.   Researchers [41,42] identified the following advantages with the used of blend fuels; less smoke and particulate discharges, a low sulfur content and higher cetane numbers, oxygenated, readily available, little aromatic content and higher heat content of about 88 percent of number 2 diesel fuel, lesser carbon monoxide and hydrocarbon emissions above all they are biodegradable and renewable.

C. Microbial Oils

Microalgal oils represent another low-priced source of renewable raw materials for biodiesel production that has more or less received attention. Out of the estimated more than 50,000 species known, only a limited number, of around 30,000, have been studied [43], among which Chlorella seems that greater option for biodiesel production. However, other species are as efficient and fruitful as this one, but the selection needs to take into account factors, such as the capability of microalgae developing using the nutrients available or under definite environmental conditions [44].

The use of bioreactor are normally employed for algal oil conversion to biodiesel. This is achieved through substrate feeding and heterotrophic fermentation [1]. Photobioreactors are normally used in cultivating micro algae for biodiesel production. Viewing it pragmatically, the points are; they are simple to handle because they easily cultivated and grow with little or even no attention, using water not fitting for human utilization and easy to acquire nutrients [44]. Biodiesel production was reported by Li *et al.* [45] on large scale *Chlorella protothecoids*, micro alga in bioreactors. Lipid content derived reached up to 44–48% (of the cell dry weight), and then used to obtain 98% conversion to FAAE, catalysed by Candida sp. lipase (immobilized), substrate molar ratio of 3:1 and a reaction time of 12 h. Such biodiesel produced was sulphur free and performs as well as petroleum diesel, while reducing discharges of particulate matter, hydrocarbons, and SOX and CO. Nevertheless emissions of NOX could be higher in some engine types [46]. The resulting biomass that accumulates after oil extraction can be further used in methane, ethanol, livestock feed and organic fertilizer [47].

VI.   Virgin Oil Modification to Waste Cooking Oil

The term waste cooking oil is a product of frying different foods in vegetable oil. During the course of the frying a number of changes are accompanied the natural structure of the molecules. These changes are in the form of, thermolytic, oxidative and hydrolytic reactions.

At the thermolytic stage, heat has a central role during food preparation, as such different degrees of temperature are exerted in the form of frying depending on the food in question, technique and frying conditions (oxygen concentration, time, temperature, presence or absence metals) and oil/fat (presence of native antioxidants) [48]. Oil are usually heated in the air in the presence of light for a long time at around 160-200 °C [49]. Though depending on the number of frying cycles which varied based on socioeconomic status and also the oil composition, In general the changes would be in these forms [50];

- *Alteration in the surface tension,*
- *Increase in thickness and stickiness*
- *Colour modification*
- *Increase in the specific heat*
- *Increase in the tendency of fat to foam.*

While in the absence of oxygen thermolytic reaction may follow, this is at a very high temperature. If the oil is heated up to 180 °C in the free oxygen state and the triglycerides contain saturated fatty acids, sequence of regular alkanes, alkenes, symmetric ketones, CO and CO_2, and lower fatty acids. But if it is unsaturated fatty acids mainly dimeric compounds, including saturated dimers, and polycyclic compounds are formed [49].

In two other processes, oxidation and hydrolysis reactions; in the former, Hydroperoxides are formed as a primary product during the process and could form compounds, such as isomeric hydroperoxides (conjugated diene group content). This a result of the complex reactions between unsaturated fatty acid and molecular oxygen through free radical mechanism as illustrated in Figure 2. Hydrolytic reaction occur due to the steam produced

during food making, this steam causes the hydrolysis of triglycerides to monoglycerides and diglycerides, FFA and glycerol [51]. Modification of oil composition can be determined by the content of monoglyceride and diglyceride since FFA are lost in the frying process [52].

Figure 2: Reaction Pathway for free radical autoxidation

Quality assessment of oil after frying is based on the polar content, any further heating increase the polarity. Fresh unused oil have around 0.4 and 6.4 mg/100 g [53]. In Europe, most countries have set highest polar content level of 25% in edible oil meaning that the fats and oils must be discarded when its polar fraction is greater than 25% [53]. In Slovak Republic, current legislative give a yardstick of polar components in edible oil set to 25 %. Any limit exceeding necessitate replacement of the oil/fat [48]. But for Polymeric substances, composition of more than 10 % is also a ground for oil/fat replacement. A research conducted on olive oil, sunflower oil, and a mixture of the two oils demonstrated that after 20 fryings cycles, the polar content of olive oil by 480% and that of sunflower oil is raised by 640% and after 40 fryings, all the used oils have a polar fraction of >25% [53].

Therefore to determine such quality, technique that can be applied include column chromatography [54]. However, this technique is require chemicals input and enormous time. The use of spectrophotometer was reported as one of the simple and fast method [55]. Sample that were examined were measured at an absorbance of 490 nm, in 250 to 650 nm region. Region of 350–2500 nm were used using UV/Vis/NIR [56]. Collected results revealed that NIR is comparatively faster and non destructive technique for UFO quality determination. And during intensive frying FTIR spectroscopy can be used for monitoring of oil/fat quality [57].

In general, as vegetable oils are been fried they possess various polar point and should be discarded upon its attainment. Additionally, UFO requires systematic monitoring in order to uphold the quality as the quantity and the type of unattractive

products negatively influence properties of UFO for their further utilization as substrate in biofuels production.

Economics Feasibility of Biodiesel from Waste Cooking Oil and Future Expression

The economics of biodiesel production have taken a new look with the current flow in crude oil price in the world market. Recent report from BBC [58] reported that the new crude oil price was set at $109 per barrel. In US diesel price is around $4 per gallon [59] the value of diesel fuel indicate shoot in price over 2 decade. This value correspond to a 33% raise over 2010, a 60% raise over 2009. As conventional diesel fuel prices continue to amplify, impose allocation should therefore be channelled towards transportation costs, against other sectors.

In the year 2008, Chinese petroleum utilization increased from 164 million tons to 553 million tons, while crude oil imports increased from 2.9 million tons to 178.9 million tons, 1990-2008 [60]. This may be due to high economic growth which make even the number of cars to raise. Data from 1990 to 2008 showed that the market passenger cars grew from 0.51 to 9.38 million. . The Chinese car market is the second-largest car market in the world with sales of about 7.28 million, in 2006 followed by Japan [61]. The IEA projection had it that Chinese oil consumption for transportation use would raise by 5.3% per annum from 2006 to 2030. This is an assumption that Chinese oil consumption will get bigger in future time. After the USA, China is the leading CO2 emission country on earth [62]. The increase in fuel consumption has caused air pollution problems.

With continuous hike in oil prices in the global market and consumption, biodiesel turn out to be a more feasible alternate energy source. Transportation sector presently produced around 25 percent of worldwide energy-related CO2 emissions and accounts for approximately 50 percent of worldwide oil consumption [62]. Data from clean air task force has shown that Public health expenses as a result of conventional diesel emissions pollution is approximately $139 billion per annum [63]. Vulnerable groups (aged, children) especially Children, due to their developing respiratory systems, are at a bigger risk to filthy air quality. It is further stressed that approximately 4.5 million US children are suffering from asthma, even though not all of these cases can be attributed to diesel emission exhaust. However, exposure to diesel exhaust can cause swelling and irritation of airways and can aggravate symptoms in children that already have respiratory ailment [63].

An improvement in the biodiesel market is so much more related to the development of agricultural industry ensuring environmental sustainability. In U.S for example, improvement of the U.S. biodiesel industry was buoyant by the efforts of soybean producers who sought to extend markets and demand for their crops. After federal policies to gear up biodiesel production were introduced beginning in 1998 the industry commenced meaningful production. A reflection of the past, in 2004-2005 Production of biodiesel in the U.S. has risen dramatically tripling from 25 million to 75 million gallons, in 2006 this value spirochete to 250 million gallons. By September 2008, reaching an estimated 700 million gallons [64]. It may also be on this light and also to improve on the air pollution situation the Chinese government decided that all biofuel producers receive subsidies to cover operating losses, moreover, VAT of 17% for
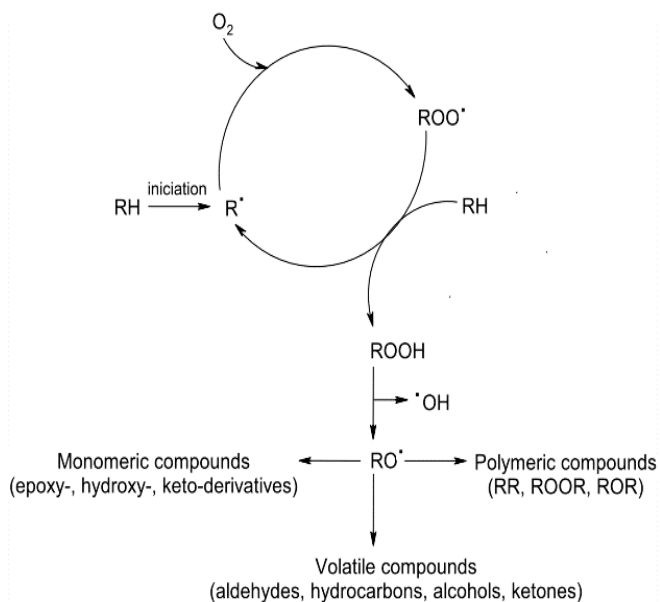
biofuel plants had been cut down [61]. Lack of feedstock availability can be a limiting factor as the main feedstock for biodiesel is used cooking oil and china a net importer of oilseed and vegetable oil. This kind of intervention was seen by some government, as part of the Energy Policy in US, Fund authorization was disbursed to DERA ranged from $100 million to $300 million yearly, to be circulated by the Environmental Protection Agency for Clean Diesel Campaign. The first four years since 2008, appropriated funding has fluctuated between $50 million to $60 million per year. It further reduced to 1 half to that of the year 2008 in 2012 ($30 million). This followed by $20 million for 2013 [65]. A dramatic reduction was seen in the year 2014, the Administration's proposed 2014 budget further reduces DERA's funding with a 70% cut, bringing it to $6 million. This decline in fund may be attributed to the economic fluctuations as a result of direst in various part of the world [66]. Kemp [67] reported the division of biodiesel production costs which is attributed to the major cost in the production accounting up to 70 % to that of the Oil feedstock, which can also be followed by the price of petroleum diesel and the cost of transportation to distant areas. As it is a known fact that increase in demand of fuel with limited supply would cause increase in cost of the fuel. For these reason, if the waste vegetable oil is utilized as biodiesel raw material, biodiesel economics would be significantly improved. In addition, reduction in the waste treatment costs since there are no stringent legislations prohibiting the disposal of waste cooking oil into drainage systems [58]. Food store and restaurant as well do not need to spend money conveying the waste oil to dump site. Several decades had passed with restaurant operators had to pay for a service to collect their unwanted waste vegetable oil in compliance with state and local environmental regulations. Producers of biodiesel for their own use had the chance to take for free. However, with the eye opener of biodiesel as lucrative business many collection services began offering token to take a restaurant's oil in order to make their personal biodiesel. Such collectors in some cases began paying restaurants to collect their waste oil. Collector services can pay $0.20 per gallon or above depending on the oil quality, collection frequency, market force and the quantity collected. Although this new income stream does not provide substantial supply of income, nonetheless can help make up for other business expenses.

Table 4 shows the domestic waste cooking oil generated by some selected countries. As a giant industrial stride, which is also a zero discharge concept, Currently, Fast-food giant McDonald's is developing a biodiesel program in several countries, after its efforts in Austria in 2003. The used oil from the company's restaurants is converted into biodiesel, which is then used to fuel the company's distribution trucks. It has extended its tentacles to Malta and of recent the United Kingdom (UK). Effort is on progress to establish in United States which is under experimentation. The Delta Institute, which is a Chicago-based environmental and economic development profit free organization is exploring the viability of a project that would translate McDonald's used cooking oil into biodiesel in the Chicago area [68].

Biodiesel from waste cooking oil is noteworthy in that it has the potential for considerable cost savings and serve as one of the several emission reducing technologies. Therefore The establishment of a sustainable biodiesel industry is a feasible way for to turn away the dependency on fossil fuel imports, create new employment opportunities particularly in the agricultural sector and improve the economic.

Table 4 Used domestic waste oil generation by various countries [37]

Country	Quantity (million tons/yr)
Europe	0.7-10
United States	10.0
Canada	0.12
Ireland	0.153
China	4.5
Malaysia	0.5
Japan	0.45-0.57
Taiwan	0.07

VII. CONCLUSION

Biodiesel has become very attractive replacement to petroleum fuel. Literatures mostly covered alcoholysis of biodiesel by edible oils with little insight in the application of waste cooking oil and non edible oils. Lipase catalysing the production of biodiesel from waste cooking oil has been successful as reported in the bulk of this article. The potentiality of waste cooking oil for this purpose among other applications qualified it as a resourceful waste in view of the fact that it can be an economic booster and a supplement for the current dilemma of environmental sustainability and dependence on petroleum recourses. It is a major cost saving raw-materials.

Bearing in mind a notion that waste management is often viewed as the last step of the material chain.,the actuality in this regards is that waste management is part of resources management. Our view to the waste is a huge loss of resources in material form and energy. Therefore reusage effort is a necessity to regain what seemed to be missing.

An assumption is that if a waste vegetable source is available for free, the key recurring capital costs of biodiesel production would be the enzymes necessary to convert the oil into biodiesel, therefore the free or cheap supply of the oil would cover up the expensive cost of the enzyme.

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Household Food Security and Coping Strategies: Vulnerabilities and Capacities in Rural Communities

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Abstract- Food security is significant issue for development programming given this is a basic need that impacts survival, growth and development of human being.. As 49% of the households in Nepal are food insecure (National Demographic and Health Survey: NDSH, 2011), it is very important to explore how households in the rural communities are coping with food insecurity situation and discuss about the way out. Disasters, climate change effects on production, exploitative economic systems, growing distraction of youth from agriculture are some significant issues that are likely to intensify the risks for food security in future. Food insecurity further puts households and communities vulnerable to disasters and weakens their capacity to restore to the normal life. The objective of the study is to assess (a) household food security situation in the rural communities and (b) various coping strategies being adopted with regards to their capacities and vulnerabilities to cope with food insecurity due to disasters or adversities. The researcher used the data from multi-sector baseline surveys of three areas and special study on coping strategies of one area, carried out by World Vision International- Nepal (WVIN) in 2013, which were led by the researcher himself. This paper reveals the household food security situation of those areas; existing practice of adaptive and non-adaptive coping strategies; and causes of the household food insecurity. The findings can be helpful to policy makers and actors in development to devise appropriate programming.

Index Terms- Food security, coping strategies, resilience, community, development.

I.   FOOD SECURITY AND RESILIENCE

A resilient community can be defined as having capacity to withstand considerable disruption when it happens and the ability to restore to normal life without negatively affecting future quality of lives of the community members. According to Turnbull, Sterrett and Hilleboe (2013, p.9); "resilience refers to the capacity of an individual, household, population group or system to anticipate, absorb, and recover from hazards and/or effects of climate change and other shocks and stresses without compromising (and potentially enhancing) long term prospects." Coping capacity and resilience are not the same, and the latter is a broader concept; however these terms are being used interchangeably. A focus on resilience means putting greater emphasis on what communities can do for themselves and how to strengthen their capacities. (Twigg 2009, p.8).

Food insecure communities and households have potential to be highly impacted by the disasters- both slow onset and rapid onset; and by the local shocks, for example, loss of job or business. Availability, access and assets base helps a family and community to ensure the food security; as this is the foundation of the development. To quote World Food Summit Plan of Action (FAO,1998), "Food security exists when all people at all times have physical or economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life[8]." Food security has four dimensions, a) Physical availability of food; b) Economic and physical access to food; c) Food utilization and d) Stability of the other three dimensions over time. A development programme that encourages farmers to produce foods, can help the communities many ways such as poverty reduction of the individual farmers; increase the availability of food; stabilizing the food prices in the community; and ultimately benefitting the poor. This ultimately improves the resilience of the community.

After a crisis or disaster, the coping strategies that families or individuals can adopt is categorized into the following two: (1) Adaptive coping strategies: are measures which deal with the capacity to accommodate or adjust to the new situation without long term effect to human well-being. (2) Negative coping strategiess: are measures which are adopted by the households to survive the situation that are detrimental to human well-being. Food security is an important aspect of a resilient community.

II.   A GLIMPSE INTO FOOD SECURITY SITUATION IN NEPAL

Based on Nepal Living Standards Survey 2011, the average size of agricultural land area in the country is 0.7 hectares per household [9]. Only 49% of HHs in Nepal is food secure and has access to food year round, based on Nepal Demographic and Health Survey-2011[10]. This shows half of the population food insecure. The food insecurity is rooted in poverty and leads to poor health, low productivity, low income, inability to support growth and development of children; thus keeping into vicious cycle of poverty.

According to Food Balance Sheet of Nepal, 2013 (MOAC, 2013) 33 out of 75 districts were estimated to be food deficient in that year; although total domestic cereal production was slightly higher by 8% than then total national demand. Although total domestic cereal production is able to meet national demand during the year of good harvest, the distribution system is affected by trade with India, transportation and storage costs.

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8 http://www.fao.org/cfs/cfs-home/en/

[9] NPC: Nepal Living Standard Survey 2011-Vol.-1, p.6
[10] NPC: Nepal Demographic and Health Survey (NDSH)-2011, p.13

Foods are not available in the inaccessible rural communities, in affordable price due to high transportation cost. On the other hand, Nepal has not been able to produce agricultural products to its potential; due to low quality inputs, traditional technology, high production cost and inadequate input subsidy and rain-fed farms (MOAC, 2011, NASP p.14).

Based on NDSH (2011, p.36), approximately 12% of households (HHs) are mildly, 23% moderately and 16% severely food insecure. Rural HHs (46%) are less food secure compared to Urban HHs (67%). Furthermore, not surprisingly, HHs in the highest wealth quintile are much more likely to be food secure (82%) than those in the lowest wealth quintile (18%). The table below shows the coping strategy that the HHs adopted during food crisis; which suggests that people resort to taking loan from individual or institutional money lenders.

Table-1: Coping strategy during food crisis (source: NDSH 2011, p.38)

Coping strategy	Took loan	Consumed seed	Sold livestock	Sold other HH assets	Worked as labor
Urban	63.0	5.9	12.8	8.4	1.9
Rural	70.8	20.3	33.0	8.7	4.2
Average	70.1	19.0	31.2	8.7	4.0

Moreover, there is correlation between food security and stunting. NDSH (2011, pg.165), concludes that children in the HHs with food security (33%) are less likely to be stunted than those with mild food insecurity (41%), moderate food insecurity (46%), and severe food insecurity (49%).

There are good government policies regarding the food security. Three years approach paper mentions under its strategy, "Ensure food security (food availability, stability in use, and continuity) through the protection, promotion and efficient use of agro-biodiversity and the development and expansion of climate change-adaptive technologies" (NPC, 2013, p.59). Notably, promotion of agro-biodiversity and technologies for climate change is considered for long term food security. It is also notable that MDG has given a high priority to invest in increasing food production and improving food security (MDG, 2013, p.92). However, the progress towards achieving the objectives of those policies is very slaking.

III. PROCESS AND METHODOLOGY OF THE FIELD STUDY

3.2   Process

This analysis is drawn from datasheets of multi sector baseline survey of 3 programme areas and one special case study. Mobile phone technology, with use of internet based software named 'episurveyor', was applied to record the responses on-the-spot. Key steps involved:

1. **Preparation**: The researcher developed methodology and tools for the multi-sector baseline survey of each of the programmes in the 3 districts. The sectors/ projects included: Livelihood; Maternal Child Health and Nutrition; Education; and Water, Sanitation and Hygiene. Prepared team of the surveyors.

2. **Quantitative information process**: For each multi-sector baseline, the process included (1) Orientating programme team on the objective of baseline and methodology, (2) Developing questionnaire, finalization and entering into the mobile phone; (3) Orientation to enumerators on survey; (4) Pilot test; (5) HH survey administration using mobile phone record system;(6) Supervision of the survey; (7) Data checking through the internet system; (8) Data export from episurveyor to spreadsheet; (9) Data cleaning, analysis and (10) determining baseline value for each of the indicators .

3. **Qualitative information process:** Carried out FGDs and analyzed

4. **Secondary information process**: Collected facts and figures from line agencies and communities

5. **Feedback process**: Baseline survey report was prepared and shared with the stakeholders for their information and feedbacks.

6. **Special study:** Additional special quantitative data collection was carried out for Shrilanka village of Kailali district.

7. **Extraction of data and analysis**: In preparing this report, author pulled out relevant information from datasheet of the baseline surveys.

3.2   Sampling for quantitative measurement

To determine sample size, 95% confidence level was considered. The sample sizes required for statistical significance in the results were calculated using the following formula:

$$n = deff \times \frac{(Z_a + Z_b)^2 \times (P_1(1 - P_1) + P_2(1 - P_2))}{(P_2 - P_1)^2}$$

where:

- n = required minimum sample size per survey
- deff = design effect (adopted 2 for 30 cluster sampling)
- Z_a = Z-score for statistical significance (adopted 1.645 for 0.05 significance)
- Z_b = Z-score for degree of statistical power level with which it is desired to be certain that an actual change of size = (P2-P1) will be detected (adopted 1.282 for 90% power)
- P1 = estimated level of an indicator as a proportion at the time of the first survey
- P2 = estimated level of an indicator as a proportion at some time in the future, such that the quantity calculated by (P2-P1) is change that it is desired to be able to see

Table-2: Sample size and area

Programme Area	No. of VDCs	Respondents	Sampling technique	VDCs	Characteristics of the district[11]
Rupandehi	8 VDCs	660	30 cluster (proportion to population sampling)	Makrahar, Gangoliya, Manmateriya, Pa.Amawa, Kha.Bangai, Harnaiya, Mainahiya and Manpakadi	13th rank out of 75 district, Terai
Lamjung	9 VDCs	840	-do-	Besisahar, Gaun Sahar, Baglungpani, Chandisthan, Banjakhet, Sundar Bazar, Tarku, Parewadanda and Nalma	Mild, 22nd rank out of 75 district, Hill
Udayapur	7 VDCs	840	-do-	Rauta, Bhuttar, Aaptar, Pokhari, Jante, Laphagaun and Khanbu	Moderate, 41th rank out of 75 districts, Hill

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[11] Ranks are based on the Poverty and Deprivation Index from "District of Nepal: Indicators of Development" by GoN, ICIMOD, SNV

Others:

- Case study with quantitative: 100% sample taken from a small cluster of 32 HHs named Shrilanka at Geta VDC in Kailali. It is a marginalized community in Terai, populated predominantly by Tharu ethnic group. This is highly a flood prone area.
- Focused Groups discussions in Rupandehi, Lamjung and Udayapur with marginalized farmers (total 15 FGDs)

8. Key findings

8.1. Main source of Income:

The table below shows that, while main income source is agriculture, but the percentage is varying. It is low in Rupandehi and Lamjung and higher in Udayapur. Dependency on agriculture is very low in Shrilanka village.

Table-3: Percentage of HHs according main source of income (primary, field survey 2013)

Sources	Lamjung	Rupandehi	Udayapur	Kailali (Shrilanka)
Agriculture	29.7	19.6	84.9	17.0
Livestock and poultry	2.8	5.4	2.2	-
Business	4.2	7.8	1.6	3.0
Employment/job	14.0	6.4	1.4	10.0
Skilled worker	7.4	14.4	1.3	6.0
Daily wage labour	5.0	20.0	2.00	47.00
Pension	13.7	0.3	4.0	-
Remittance	23.0	12.0	2.6	17.0
Fishery	-	0.40	-	-
Other	0.2	13.7	-	-
Total	**100.0**	**100.0**	**100.0**	**100.0**

In Lamjung and Udayapur, 45% and 27% of the HHs have at least one family member abroad respectively. Comparing these information with national data, 25.4% population is absentee and the highest proportion (44.81%) of absent population is from age group 15-24 years. (CBS, 2011)

Based on baseline survey in Lamjung, 27% respondents said that their interest on agriculture is declining. They also expressed that declining number of family members available for farming has affected their farming. This is because youth prefer going out for foreign employment. It was also observed that in a house, when the bread winner goes out for foreign employment, the other family members tend to come to town for education for children

8.2. Involvement in Saving and Credit or Cooperatives

Saving and Credits (S&C) groups are prevalent in each VDCs where studies were carried out and many As illustrated on the table below, households who are involved in these groups range from 30% to 84.3%. Cooperatives are also expanding and involvement of HHs is varying from 7% (lowest at Shrilanka village) to 29.1% (highest in Rupandehi).

Table-4: Percentage of HHs involved in Saving & Credit and Cooperatives (primary, field survey 2013)

Involvement	Lamjung	Rupandehi	Udayapur	Kailali (Shrilanka)
HHs involved in S&C Groups	66.50	62.10	84.30	30.00
HHs involved in Cooperatives	46.50	59.20	37.60	10.00
HHs involved either in S&C or Cooperatives	78.10	76.80	85.80	37.00
HHs involved in both S&C and Cooperatives	34.90	45.00	36.10	8.00
HHs involved in none	21.9	23.2	14.2	63.0
Food insecure HHs involved in Cooperatives	22.0	29.1	17.2	7.0

It is notable that significant proportion of households are involved neither in S&C nor in Cooperatives; and frustratingly, very low proportion of the food insecure households (varying from 7% at Shrilanka village and 22% at Lamjung), are involved in Cooperatives.

8.2. Food Security Status

As illustrated by table-5, food security situation shows worse condition in Udayapur. Rupandehi is good. Lamjung and Shrilanka village are below national average.

Table-5: Percentage of HHs according to food security months (primary, field survey 2013)

Food Sufficient Months	Lamjung	Rupandehi	Udayapur	Kailali (Shrilanka)
0-3 months	1.60	2.40	6.50	6.90
3-6 months	6.30	2.50	33.10	7.20
6-9 months	15.00	5.00	22.90	14.10
9-12 months	5.00	4.70	5.90	13.80
12 or more months	72.10	85.40	31.60	58.00
Total Percentage	**100.00**	**100.00**	**100.00**	**100.00**
Food secure HHs	72.10	85.40	31.60	58.00
Food security @95% Confidence Interval	69.1-75.1	82.6-88.2	28.5-34.7	58.00
Food insecure HHs	27.90	14.60	68.40	42.00
Mean food sec months of food insecure HHs	7.2	6..7	5.7	7..2

From the study, Udaayapur is the most food insecure among the areas of study. On the contrary, Rupandehi is the most food secure. It is noted that Rupandehi is better district. Among the food insecure HHs, the mean value of food security month is 5.7. The highest mean value is at Lamjung, which shows a little bit better condition for food insecure families.

8.3. Farming diversity and food security:

The table below shows the comparative status of food secure and insecure families who sold some vegetable, did off-seasonal farming and cultivated 3 or more crops in the past 12 months.

Table- 6: Involvement of food insecure HHs in crop diversity (primary, field survey 2013)

Area	% of HHs who sold vegetable	% Food insecure HHs who sold vegetable	% of HHs who did off-seasonal farming	% Food insecure HHs who did off-seasonal farming	% of HHs cultivated 3 or more crops a year	% Food insecure HHs cultivated 3 or more crops a year
Rupandehi	16.6	18.8	7.1	14.2	22.4	33.0
Lamjung	NA	NA	12.5	23.0	18.5	25.2
Udayapur	NA	NA	9.8	27.2	7.2	14.6

This table also gives glimpse on a few aspects of commercial farming and crop diversification situation. Overall, status of the both has been found weak. Furthermore, selling vegetable is regardless if they consumed at home or not. Poor and rich sell the vegetable for their earning. But from the table-6, it is obvious that a significant proportion of food insecure households are not able to gain income from vegetable farming. Very low proportion of them was involved in off-seasonal farming; and so is the case for cultivating multi-crops.

8.4. Coping Strategies

The following table illustrates the coping strategies adopted by the respondents, who experienced food insecurity past year.

Table-7: Percentage of food insecure HHs according to coping strategy (primary, field survey 2013)

Coping strategies	Lamjung	Rupandehi	Udayapur	Kailali (Shrilanka)
1. Reduced size/number of meals	0.8	1.9	2.2	5.0
2. Took low quality food	3.3	11.30	1.1	
3. Child discontinued school	0.4	-	1.2	
4. Sold land, productive assets	7.2	1.90	5.30	5.0
5. Took loans from local money lender	7.9	-	50.5	37.0
6. Some family members left village to seek job in other villages or towns	40.9	10.40	16.9	17.0
7. Sold livestock	5.8	0.90	7.5	17.0
8. Family members worked work longer hours than normal including seasonal labour	17.1	50.00	0.5	19.0
9. Took loans or borrowed money food from relatives/ friends/ neighbors	10.8	17.90	11.5	
10. Took loans from bank	5.8	5.70	3.30	
Total	100.0	100.0	**100.0**	**100.0**

The main coping strategy found is taking loan from local money lenders, from relatives or friends or from the bank (item no. 5,9,10). Taking loan from money lenders is not the preferred option, as they tend to charge higher interest, as expressed by the respondents. Banks provide loan in cheaper interest rates when banks are assured that the loanee is able to pay back. Based on transformational development indicator frame-work and the community defined categories, taking loans from the local money lenders has been considered as non-adaptive coping mechanism.

Family members leaving village to work and extra labour work like daily wages or seasonal works are the other common coping mechanism, which are adaptive strategies. In Terai villages, unskilled labour has good market; whereas in hill areas, people may need to go to other areas for search of work.
Areas with better food security are found to have adaptive coping strategies. The following table show the status of adaptive (summary of item no. 1,2,3,4 and 5) and non-adaptive strategies (summary of item no. 1,2,3,4 and 5), adopted by the households.

Table-7: Percentage of HHs according to adaptive and non-adaptive coping strategies

Category of coping strategies	Lamjung	Rupandehi	Udayapur	Kailali (Shrilanka)
Adaptive	80.4	84.9	47.7	53
Non-adaptive	19.6	15.1	52.3	47

8.5. Major causes of food crisis

Based on FGDs, based on the crisis that occurred in the past 12 months , major factor of food crisis is illustrated in the diagram below. It shows the biggest factor is chronic problem of low family income. Loss of employment is the second biggest factor given the widespread high unemployment rate and risk involved in foreign employment. The other factors are disasters and unexpected situations and family and land issues.

Chart-1: Major factors of HH food insecurity in rural communitiess (Primary, based on FGDs 2013)
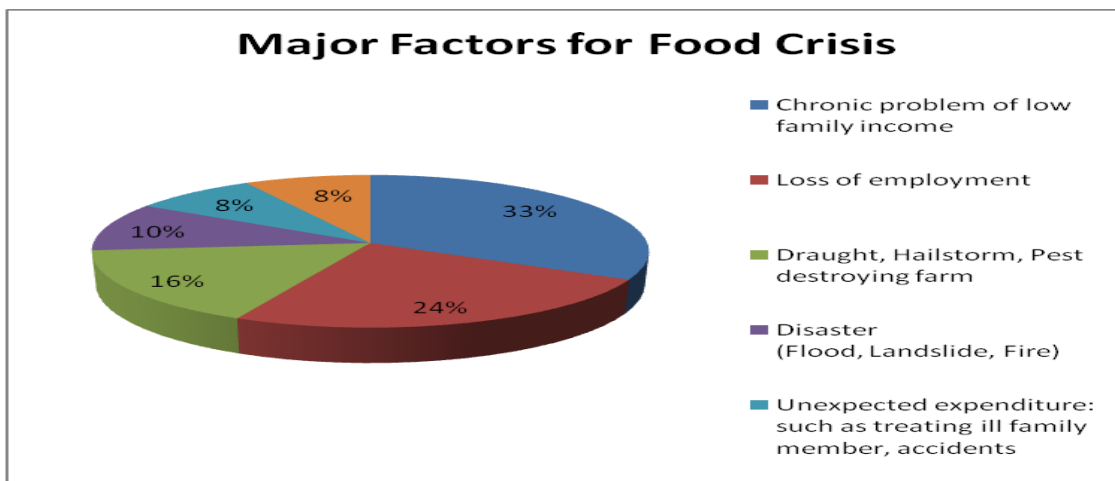
8.6. Effect of food insecurity in child nutrition

Based on Lamjung and Udayapur analysis, proportion of children with malnourishment is comparatively higher in food insecure HHs. The association of food insecurity with child nutrition is illustrated by the chart below.

Chart-2: Food insecurity and child malnutrition
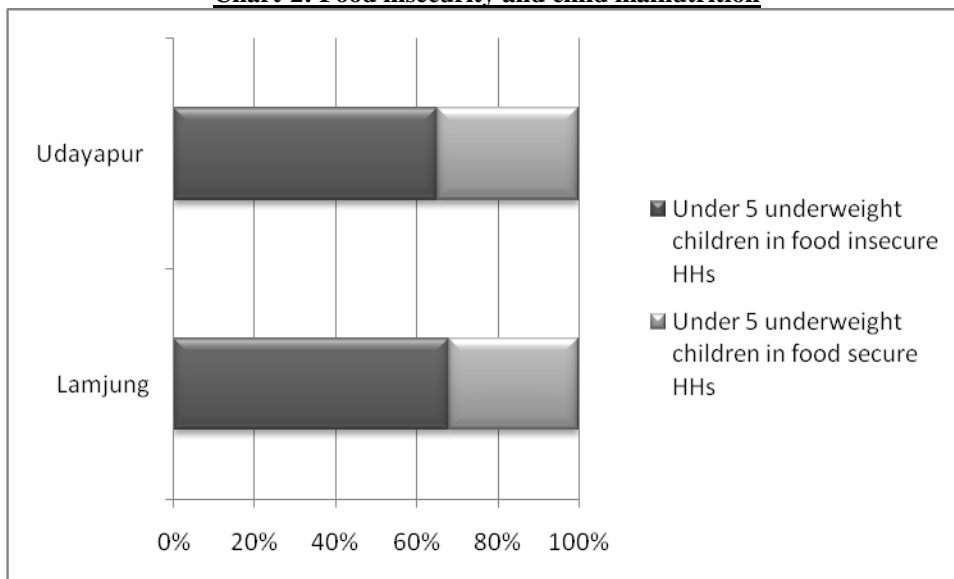
IV.   CONCLUSIONS

Improving Food security for the disadvantaged communities

From the field studies, food security situation is found poor in the marginalized communities.   A significant proportion of households do not suffice food till 6 months too. It is important to address this issue. Government has good policies on ensuring food securities but lacks focus and the progress is slaking. Development actors need to seek for long term solution for food security with special attention to vulnerable households. Possible options are farm based income generating activities based on their interest, feasibility and landholding status.

Strengthening adaptive coping strategy

Households applying non-adaptive coping strategies such as selling productive household assets and taking low quality food is a significant concern. The most common coping strategy the households are adopting is taking loans such as from local money lenders. At this, insufficient income to pay back the loan is likely to result into selling productive assets and migration. Self/employment opportunities are to be expanded as discussed already. Affiliation in the Saving and Credit Groups and Cooperatives need to be promoted; since there is low proportion of poor families in these organizations. This improves the social networks and provides access of fund during the crisis.

There are already existing good practices of coping stratgies in the communities, some of which this study might not have explored. Good coping strategies need to be promoted. Adopting farming technologies to adapt the climate change are something important to look for.

Addressing vulnerabilities to food crisis

In section 7.5, the causes of the food insecurity has been discussed. Chronic poverty, loss of employment and the other adversaries such as localized disasters or unexpected adversaries to productions are the key risks for food security. In section 7.6, impact of food insecurity in nutritional status of children has been highlighted. Therefore, given food security is a multi-faceted issue, there should be a good sectoral integration to address these issues and improve the food security in the long term. Sectors like education, agriculture, health, forestry, infra-structure need to have a common effort on access, availability, utilization and stability of the food security.

For building disaster resilient communities, systematic capacity of community to prepare for and respond to local disaster needs to be strengthened. Moreover, developing measures to store and process foods; protect livestocks and household assets can be helpful to prepare well for any local disasters. Disaster Risk Reduction need to be integrated at the local among the development sectors. Three years approach paper envisions that local bodies will design and implement programmes to address the issues of climate change adaption and disaster management. (NPC, 2013, p.113), which is very important to pursue.

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Evaluation of Maternal and Foetal Outcome of Pregnancy with Heart Disease with Special Reference to Surgically Corrected Heart Diseases

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Abstract- **Objective:** To study maternal and foetal outcome of pregnancy in women with heart disease with history of corrective surgery/ intervention

Methods: Pregnant women with cardiac disease attending antenatal clinic were studied over one year to assess their profiles and maternal and foetal outcome of pregnancy with women having corrective surgeries is evaluated.

Results: Majority of women belong to 20 to 24 year age group. Most of the patients were multigravida (55%). Incidence of heart disease is 0.9 %. Rheumatic heart diseases constitute 76.66 % of all cardiac disorders in patients delivering in our Hospital. Most common surgery observed is valve replacement (56%).There is improvement in maternal and foetal outcome with respect to antenatal complications, prematurity, APGAR score at 5 minute, low birth weight and mortality.

Conclusion: Surgical correction improves maternal and foetal outcome.

Index Terms- Cardiac surgery, pregnancy with heart disease

I. INTRODUCTION

Heart disease is one of the most important medical complication during pregnancy as it is one of the common, indirect obstetric cause of maternal death. Approximately 1% of pregnancies are complicated by cardiac disease[1] & management of these cases [may] challenge the entire team providing care to the mother & fetus.

The advancement in cardiology & obstetrics has provided major improvements in the management of pregnant patients with cardiac disorders. In recent era, we are facing more patients with previous history of surgical correction of congenital or rheumatic heart disease. It mainly includes correction of ASD, valve replacement surgeries and balloon mitral valvuloplasty. Although rheumatic mitral stenosis was commonest cardiac lesion in past associated with maternal mortality, death rarely occurs today[2]. Indications for surgery are same as in the non pregnant state, i.e. failure of medical therapy with intractable medical symptoms, history of pulmonary edema before pregnancy with risk of recurrence in pregnancy and profuse hemoptysis.

Objective: To study maternal and foetal outcome of pregnancy in women with heart disease with h/o corrective surgery / intervention.

II. MATERIAL AND METHODS

It was prospective study carried out from Sept. 2009 to Sept. 2010. Before conducting this study approval from institutional ethical committee was taken. The present study consists of cases with cardiac disease either congenital or acquired with history of corrective surgery in the past. It includes those patients attending ANC clinic in tertiary centre as well as those who presented directly in labour room on emergency day with history of corrective heart surgery.

After Careful history taking, patient was allocated to one of the functional class (NYHA) according to the severity of symptoms. Patients were monitored throughout the pregnancy for any deterioration or worsening of NYHA class.

After classifying patient in NYHA grade, the investigations such as 2D echo, chest x ray, ECG, hemogram were done. Patients with NYHA grade I & II were managed on outpatient basis with the advice to take adequate rest, dietary instruction, regular haematinics & penidura prophylaxis. Intrapartum details, postpartum complications & fetal outcome were recorded. Patients were studied on the basis of anticoagulation used, maternal outcome in view of thromboembolism, heart failure, death and perinatal outcome in view of embryopathy, abortion, stillbirths, IUGR, preterm delivery.

Associated maternal medical complications like anemia, infection, chronic hypertension and cardiac complication like CCF, respiratory infections, endocarditis, arrhythmias and obstetric complications like PROM, PIH, low lying placenta, preterm labour were evaluated.

Pregnancy is allowed to continue upto term and labour was awaited for spontaneous onset. Anticoagulants like heparin or warfarin continued throughout pregnancy. LSCS is only for obstetrics indications. All patients were given infective endocarditic prophylaxis. Inj. Furosemide 40 mg I.V. is given at the end of second stage. Routine use of Inj. Methylergometrine was avoided. Concentrated oxytocin drip was used to prevent postpartum hemorrhage.

III. OBSERVATIONS AND RESULTS

Total no. of deliveries in study period are 6404. Sixty (0.9 %) patients had cardiac disease (congenital or acquired). There are total 25 patients with h/o corrective cardiac surgery. Out of 25 patients, 20 patients had rheumatic heart disease and 5

patients had congenital heart disease. Of these 60 women 25 (41.66 %), had undergone some form of cardiac intervention, 23 before and two during the current pregnancy.

Of all the types of heart lesions, RVHD with mitral stenosis was most common cardiac lesion present. Age of women varied from 19 to 34 years of age with most belonging to 20 to 24 year age group. Most of the patients were multigravida (55%) and majority of patients 29 (48.33%) were in NYHA class II and only 13 (21.66%) patients were in class III. No patient with class IV was detected.

There were certain antepartum complications associated, out of which infections anemia, atrial fibrillation and CCF were commonly present in non operated group while PROM is commonly present in operated patients.

The operations include valve replacement, Balloon mitral valvuloplasty, ASD repair and temporary pacemaker in patients with complete heart block. Most common surgical correction observed is valve replacement (56%) secondary to rheumatic valvular disease followed by valvuloplasty in 24 % of patients.

The mean birth weight in non operated group is 2.3 ±0.43 kg while in operated patients mean birth weight is 1.9 ± 0.44 kg.

Mode of delivery in operated group is predominantly vaginal (92%), out of which 36 % were instrumental deliveries. In non operated patients most of them (79%) delivered by vaginal route, out of which 28.5% were instrumental deliveries. So incidence of vaginal deliveries was higher in operated group. Incidence of LSCS were lower (8%) in surgically corrected patients, while it is almost 20% in non operated patients. P value is 0.28 (Fischer test) which is statistically not significant. All LSCS were done for obstetric indications.

Mean gestational age in non operated patients is 33 ± 3.44 wks while it is approx. 34.3 ± 4.49 wks in surgically corrected group. Mean Apgar score at 5 minute is 6.4 ±1.9 in non corrected patients while it is 6 ± 2.4 in surgically corrected group. Regarding NICU admission, five (14.2%) babies went into NICU in non operated patients while only one baby in operated group went to NICU.

Drugs: Out of 14 patients of valve replacement, ten patients were taking anticoagulant i.e. T. Warfarin and INR was maintained between 2.5-3. All patients had metallic prosthetic valves. In patients on warfarin, mode of delivery: vaginal delivery in 6 patients, forceps application in 4 patients. Maternal outcome in operated patients – no patient had complications like thromboembolism, PPH, arrhythmia, infection, death. Neonatal outcome: Three stillbirths/IUD occurred in patients in taking warfarin while 2 in those not taking warfarin.

In post partum complications, one patient develops congestive cardiac failure which is treated promptly with digoxin and diuretics.

Table-1. Type of cardiac lesion

Type of Cardiac	No. of cases Operated(25)	No. of cases Not operated(35)
Congenital	5	9
Rheumatic (acquired)	20	26

Table- 2. Patients characteristics

		No. of cases operated (25)	No. of cases Not operated (35)	Total
Age group (in yrs)	<20	2	1	3 (5%)
	20 – 24	14	19	33(55%)
	25 – 29	8	12	20(33.3%)
	30 – 34	1	3	4(6.6%)
Parity	Primigravida	15	12	27(45%)
	Multigravida	10	23	33(55%)

NYHA functional class.	I	11	7	18(30%)
	II	12	17	29(48.33%)
	III	2	11	13(21.66%)

Table- 3: Type of surgical correction

Type of surgical correction		Cases (25)	%
Valve replacement	Single valve replacement	11	44
	Double valve replacement	3	12
Balloon mitral valvuloplasty		6	24
ASD repair		2	8
PDA ligation		1	4
Temporary pacemaker		2	8

Table 4: Antepartum complications.

Antepartum complications	No. of surgically corrected cases (25)	Non operated cases (35)
Anemia	0	5 (14.28%)
Infections	2	4 (11.42%)
PROM	3	7
PIH	3	1
Placenta praevia	1	1
Atrial Fibrilation	0	2

CCF	0	1
Hypothyroidism	0	1
Syncopal attacks	2	0

Table -5   Mode of Delivery (Classification based on surgical correction)

Mode of delivery		Pre-pregnancy Surgically Corrected		Non corrected heart disease		P Value (Fisher test)
		No. (25)	%	No. (35)	%	
Vaginal delivery	Preterm	5	20	8	22.8	0.4 Not statistically significant.
	Full term	9	36	10	28	
LSCS		2	8	7	20	
Forceps/Ventouse		9	36	10	28.5	

Table- 6: Perinatal outcome (Classification based on surgical correction)

Perinatal Outcome	Surgically Corrected		Non operated		P Value
	No. (25)	%	No. (35)	%	
Prematurity	10	40	18	51.42	0.43
Stillbirth/IUD	5	20	2	5.7	0.11
APGAR <5 at 5 minutes	3	12	9	25.7	0.32
Birth weight <2.5kg (full term)	8	32	24	68.5	**0.008**
NICU	1	4	5	14.2	0.38

Table- 7: Details of maternal death.

Age	parity	Heart disease	NYHA	LVEF	Surgical correction	Cause of death
34	G4P3L3	Severe MS + Severe MR + mild pulmonary	III	35%	uncorrected	Severe MS & Severe MR with congestive

		Hypertension				cardiac failure not in labour.

IV. DISCUSSION

Pregnant women with associated cardiac disease represent a major challenge for obstetrician & cardiologist involved in their care. Careful clinical evaluation & judicious use of diagnostic tools (2 D echo) can result in better outcome[3]. In this study, 60 women were analyzed according to risk factors into antenatal, intrapartum & postpartum complications, and maternal and neonatal outcome compared with reference to surgical correction. Rheumatic heart diseases constitute 76.66% of all cardiac disorders in patients delivering in our Hospital. The rate of RVHD was falling slowly since last decade with incidence of 66-75 % due to better awareness of antenatal surveillance through media and availability of antibiotics[4].

Most of the women in childbearing age who have cardiac surgery, suffer from rheumatic heart disease, and therefore mitral valve replacement are the commonest procedures carried out in them. The majority of women had surgery between 20 and 30 years of age.

Valve replacement was performed using mechanical prostheses which, as compared to bioprosthetic valves, have a lower risk of deterioration in function due to additional burden of pregnancy. Pregnancy being a hypercoagulable state has an increased risk of thromboembolism and thrombosis of prostheses, therefore anticoagulant therapy is indicated in these women [5, 6].

Incidence of cardiac disease in pregnancy in our study is 0.9%. Rate of antepartum complications like anemia (14.2%), infections (11.42%), cardiac arrhythmias (5.7%), CCF (3%) were more in non operated group when compared to operated patients, suggests better antenatal, intrapartum and postpartum management and follow up.

Out of 7 stillbirths/IUD, five (20%) occurred in surgically corrected group while two (5.7%) in non corrected group with P value is 0.11 which is not statistically significant. Incidence of low birth weight in non operated group is more 24/35 (68.5%) while in operated group it is 8/25 (32%) with P value of 0.008 which is statistically significant.

Out of 60 patients, one patient succumbed and died due to CCF from non corrected group having NYHA class III dysnoea. There is no maternal mortality from surgically corrected group due to improved perinatal care. One maternal death (2.8%) is noted in non operated group of patients.

V. CONCLUSION

Heart disease is a genuine risk factor for mother and foetus. Recent advances in management of heart disease are associated with favorable maternal and foetal outcome and thus improving obstetric career of the patient. It is necessary to emphasize the need for an interdisciplinary approach between cardiologist and obstetrician for the adequate diagnosis of the disease, proper treatment including operative intervention where required, as it gives better outcome and reduces mortality[7]

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Performance Evaluation of Outsourced Medical Equipment Maintenance Service in a Tertiary Care Hospital

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   Abstract- Outsourcing of non-core activities has become a growing trend in healthcare industry. It provides multiple advantages to the healthcare organizations, like increased operational efficiency, technical expertise & risk sharing. However at the same time is found to be associated with various types of risks. Periodic evaluation of the services provided by the third party service provider & matching them against set standards is primary requisite to mitigate occurrence of such risks. This study evaluated the performance of outsourced medical equipment maintenance service in a tertiary care teaching hospital by retrospective analysis of records. A set of Key Performance Indicators (KPIs) were used for this purpose. Outsourcing ensured high operational efficiency of the department in terms of high completion rates of planned preventive maintenance (PPM) and breakdown maintenance (BM) work orders(WO) as well as maintenance of equipment uptimes above 95%.User satisfaction score of 83.67% and Cost of service ratio(COSR) of 4.20% portrays outsourcing as a cost effective decision for the organization.

   Index Terms- Breakdown Maintenance, Cost of Service Ratio, Key Performance Indicators, Planned preventive maintenance, Outsourcing

I. INTRODUCTION

Outsourcing can be defined as "transferring services or operating functions that are traditionally performed internally, to a third-party service provider and controlling the sourcing through contract and partnership management". [3] Hospitals outsource their peripheral activities to specialized non-hospital organizations in order to ensure better focus of management over the core activities. It also ensures increase in operational efficiency, access to skilled expertise, better risk management, cost-effectiveness, flexible staffing as basic advantages. However if not properly managed, outsourcing decisions may lead to performance and financial risks.

KPI is the tool that enables service users to validate the performance of service providers & ensures that the services have met their contractual obligations. It can be used to ensure Service Delivery; to validate realization of benefits of Outsourcing; to trace the path of performance & to drive continuous improvement as well as innovation in provision of their services. For those KPIs which do not have any standard or benchmark for comparison, performance should be measured over time to identify and investigate significant trends & opportunities for improvement. [1]

Health-care facility regardless of its size should essentially have a maintenance program for medical equipment. Clinical engineering (CE) department or the medical equipment maintenance department in the hospital is responsible for implementation of such programs. The complexity of the maintenance program depends on factors such as the type of facility, its size and the resources required.[2] Basic functions provided by medical equipment maintenance department are preventive & breakdown maintenance, planning and purchase consulting, replacement planning, technical inventory management, acceptance tests, training, safety checks and functional control.
Performance of clinical engineering (CE) department in prior studies has been evaluated in terms of the ratio of total CE expenses and total equipment acquisition costs, full-time employees (FTEs) per beds, service time, equipment uptime etc. [7][8][9]

II. PERFORMANCE METRICS FOR EQUIPMENT MAINTENANCE DEPARTMENT

Performance evaluation was done using a set of Key performance indicators as the research tool. This study was done by defining KPIs, categorizing them according to the benefits of outsourcing, measuring them by retrospective study of departmental records, and finally the monthly performances for one year was evaluated by comparison with the Service Levels (SL) and empirical standards or by time series analysis in the form of control charts.
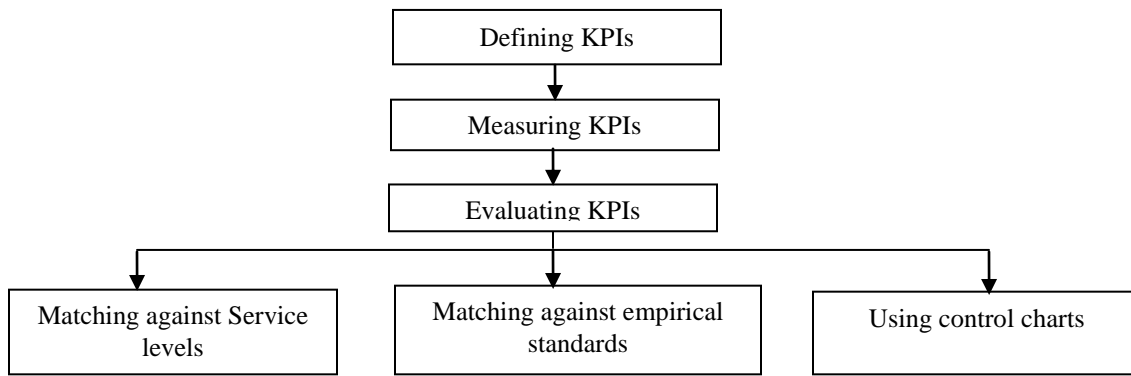
FIGURE1: Flow chart of performance evaluation methodology

A. DEFINING KPIs

Defining of KPIs was done by considering expert opinion captured by conducting nonstructural informal interviews with hospital's top management as well as with the technical manager and engineers in clinical engineering department. Thorough review of previous literature was done & framing of KPI was done using WHO guidelines for medical equipment maintenance program. [2]

B. CATEGORIZING KPIs

Indicators are classified into 4 categories based on core advantages of outsourcing i.e. operational efficiency, technical expertise, risk management, cost effectiveness

OPERATIONAL EFFICIENCY
A) Related to planned preventive maintenance (PPM)
- Completion rates for PPM
- PPM yield

B) Related to breakdown maintenance (BM)
- Mean Time To Repair(MTTR)
- Equipment downtime
- Obtaining time for spare parts
- Completion rates for BM

TECHNICAL EXPERTISE
- Devices supported per technical staff
- Percentage technical staff
- Percentage of clinical engineer
- User training
- Training of technical staff

RISK MANAGEMENT
- No. of incident report per month
- Uptime for life saving equipments
- No. of critical equipment work order

COST EFFECTIVENESS
- Cost of Service Ratio(COSR)

C. EVALUATING KPIS

Performance evaluation is done in following 3 ways:
  i.   Matching of KPIs against the normative standards (i.e. service levels as specified in organizations Service level agreements)
  ii.   Matching of KPIs against empirical standards [2]
  iii. Evaluation using control charts, in case of KPIs for which SLs & empirical (universal) standards were not defined or unavailable

USER SATISFACTION ANALYSIS

To ensure the validity of repository data, retrospective analysis of 93 user satisfaction forms was done on eight criteria mentioned in the user satisfaction form.
  i.   Accessibility of service engineer
  ii.   Response of breakdown calls
  iii. Response to emergency calls
  iv.   Quality of repair(Repeated failure)
  v.   Quality of PPM
  vi.   Feedback on Equipment status
  vii. Courteousness of Service Personnel
  viii. Overall satisfaction

III. RESULT ANALYSIS WITH GRAPHS

1) Operational Efficiency

TABLE1: KPIs (Operational Efficiency)

Month	PPM completion rates (%)	PPM Yield (%)	BM completion rates (%)	Equipment uptime	MTTR (in minutes)	Spare part obtaining time(in days)
May13	98.17	1.83	90.03	97.69	38.43	9.12
Jun13	98.96	1.04	91.45	97.7	48.22	6.98
Jul13	97.71	2.29	89.53	97.76	55.6	7.12
Aug13	96.76	3.24	86.93	98.01	37.3	5.97
Sep13	98.38	1.62	90.03	98.52	44.6	6.63
Oct13	98.32	1.68	91.07	98.69	22.64	7.47
Nov13	97.33	2.67	90.38	98.75	52.24	8.92
Dec13	95.52	4.48	94.14	98.68	16.78	7.95
Jan14	97.99	2.01	95.9	98.54	48.26	6.1
Feb14	95.13	4.87	96.45	99.0	28.94	9.53
Mar14	97.19	2.81	95.31	99.09	53.64	3.76
Apr14	96.83	3.17	94.64	99.0	39.58	7.76
Mean ± Standard deviation	**97.35±1.15**	**2.64±1.15**	**92.15±3.02**	**98.45±0.52**	**40.51±12.45**	**7.27±1.59**

PPM Completion Rates
A good completion rate goal is to be above 90% [2]
PPM completion rates for all the months are above 90% indicating good performance

PPM yield

Evaluation of this KPI is done using control charts. Values for all the months are under the control limits indicating stable performance. No violation of control rule is found (Fig2)
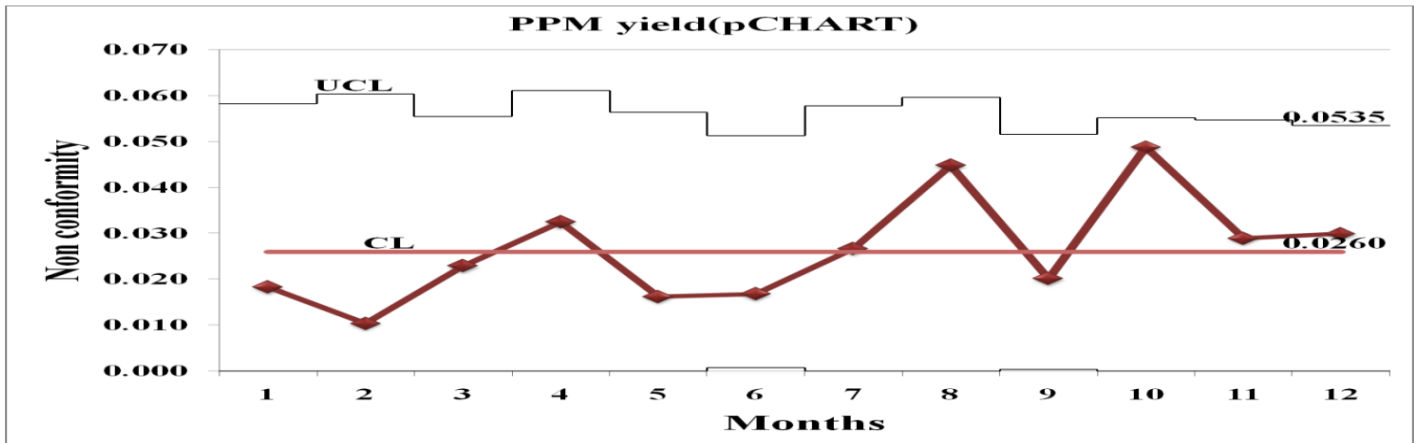
FIGURE2: PPM YIELD (p-CHART)

BM Completion rate

A good completion rate goal is to be above 90% [2]

All BM rates are above 90%, except for the month of July13 & August13

Equipment Uptime

Equipment uptimes for all the months are above 95% irrespective of the age of equipment Performance not only matches the service levels, but there is progressive increase in the performance over the months.

Service Level (SL)

Outsourced service provider caters to following three service levels pertaining to **equipment uptimes.**

TABLE2: Service Levels for Equipment Uptime

SL no.	Age of Equipment	Equipment Uptime
1	Less than 3 years	95%
2	3-8 years	90%
3	Above 8 years	85%

MTTR (Mean Time To Repair)

Performance is evaluated using individual control charts & values for all months are under control limits, there is no violation of control rules as well (Figure 3)
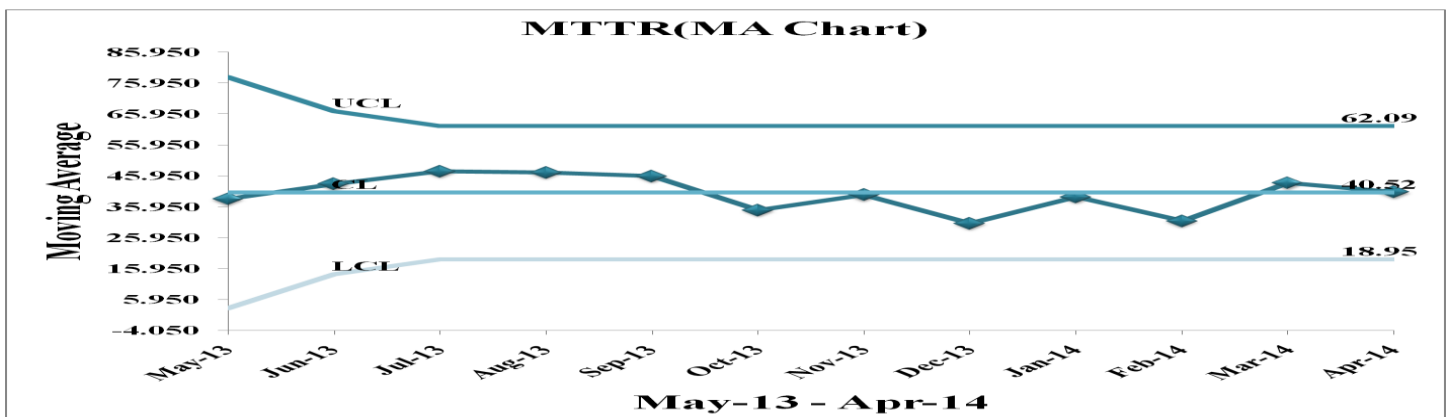
FIGURE3: MTTR (MA-CHART)

Spare Part Obtaining Time
Spare parts obtaining time is applicable to those spares which are unavailable at department stores & are ordered from head quarters. Performance is evaluated using individual control charts & values for all months are under control limits, there is no violation of control rules as well (Figure4)
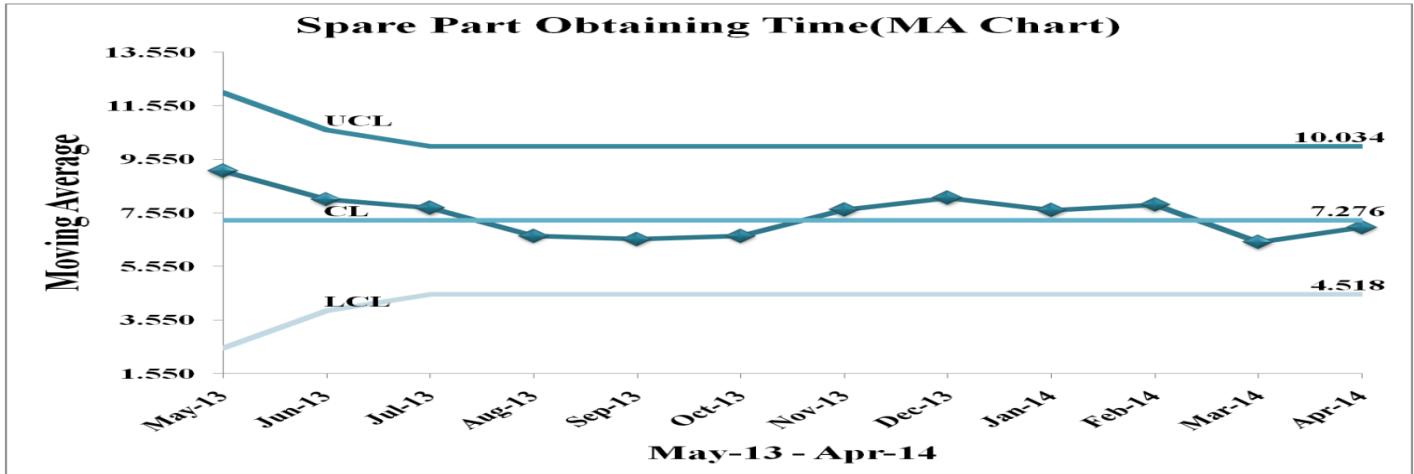
FIGURE4: Spare Parts Obtaining Time (MA-CHART)

2) Risk Management

TABLE3: KPIs (Risk Management)

Month	Equipment uptime (%)	Critical Equipment Work orders (%)	Incident Reports
May13	97.69	9.97%	1
Jun13	97.7	12.09%	2
Jul13	97.76	11.05%	5
Aug13	98.01	9.54%	4
Sep13	98.52	11.84%	5
Oct13	98.69	11.61%	6
Nov13	98.75	16.03%	6
Dec13	98.68	8.98%	3
Jan14	98.54	16.04%	4
Feb14	99.0	9.47%	6
Mar14	99.09	25.00%	5
Apr14	99.0	17.26%	5

Life Saving Equipment Uptime
Equipment uptime for all the months is above 95% irrespective of the age of equipment. Thus the performance matches the service level.

Critical Equipment Work Orders
Performance is evaluated using control charts. All values are within control limits except for the month of March14 where WOs were 80. No other value violates the control rule. Performance can thus be interpreted as fair performance. (Figure5)
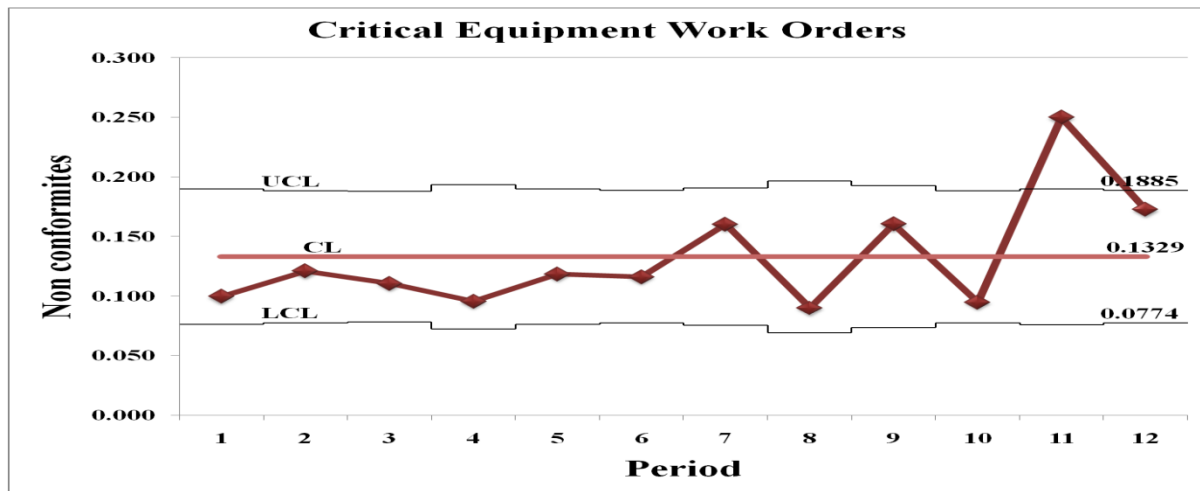
FIGURE5: Critical Equipment Work Orders (p chart)

Incident Reports
Performance is evaluated using control charts. No violation of control rules is indicative of good performance (Figure6)
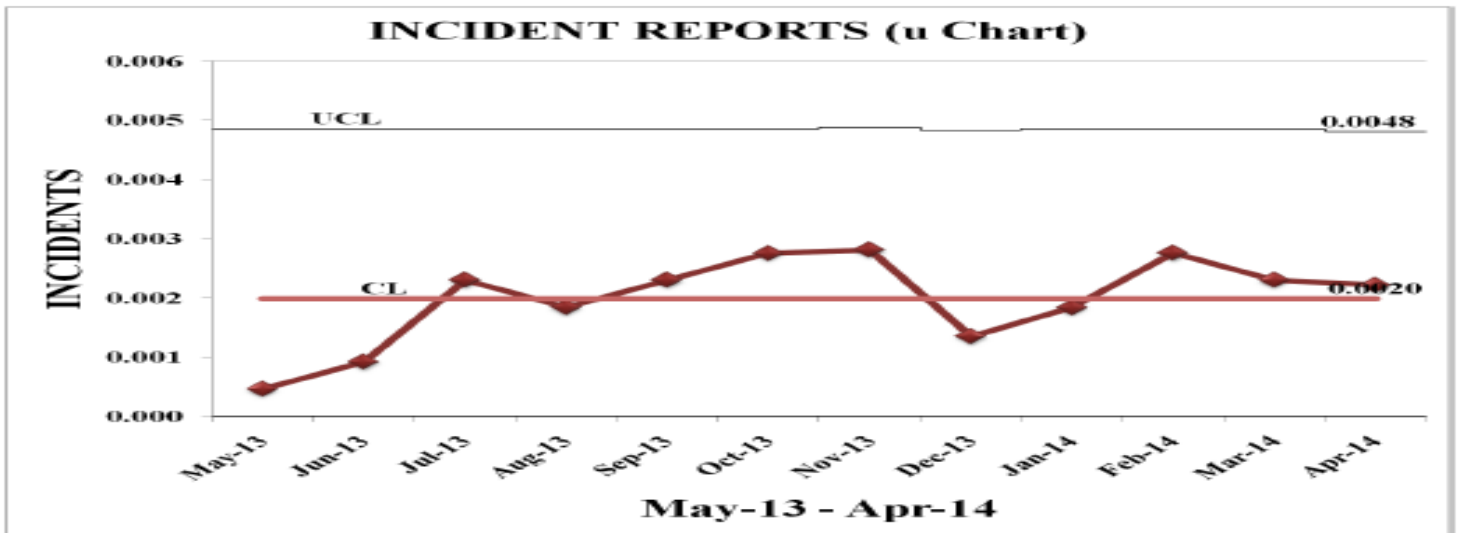
FIGURE6: Incident Reports (u-CHART)

4) Technical Expertise
    i.   Percentage Technical staff   - 90.0%
    ii.   Percentage clinical engineer   - 90.0%
    iii.   Device supported per technical staff (KH Equipments) – 361.11
    iv.   User training programs (in 2013) - 10
    v.   Continued Nursing education training – 627
    vi.   Staff training programs (in 2013) – 12

Above mentioned indicators shows that outsourcing adds up to the technical expertise not only to the staff involved in the maintenance of equipment but also the hospital staff (i.e. the users of medical equipments), by providing them with adequate training. Training was provided to users on topics such as Care & Maintenance of equipment, Infusion pumps, Cardiac Monitors, Defibrillators, Electrosurgical units, ventilators. Training imparted to staff included induction and orientation at the time of joining the organization , followed by training on various other topics including standards in healthcare engineering, administration aspect of clinical engineering, equipment related training.

5) Cost Effectiveness

Cost of Service Ratio = (Maintenance cost/Equipment Acquisition Cost)* 100

$$= (14884398.1/ 354390431)* 100$$
$$= 4.20 \%$$

COSR equivalent to 4.20% can be considered as cost effective decision as literature supports COSR of 8% ranging from 6% to 12% .[30]

USER SATISFACTION ANALYSIS

User's perspective of the service provided by the outsourced department was analyzed by evaluating the user satisfaction forms for that year. Analysis of 93 user forms was done based on 8 criteria. Scoring is as follows

- 100 – very good
- 75 – good
- 50 – average
- 25 – poor
- 0 – very poor

Category wise & overall user satisfaction scores were calculated.

TABLE4: Category Wise User Satisfaction Score

CATEGORIES	Score	Category wise satisfaction score
Accessibility of service engineer	8075	86.83%
Response of breakdown calls	7875	84.68%
Response to emergency calls	7775	83.60%
Quality of repair(Repeated failure)	7375	79.30%
Quality of PPM	7425	79.84%
Feedback on Equipment status	7700	82.80%
Courteousness of Service Personal	8300	89.25%
Overall satisfaction	7725	83.06%
Total score (74400)	62250	**83.67%**
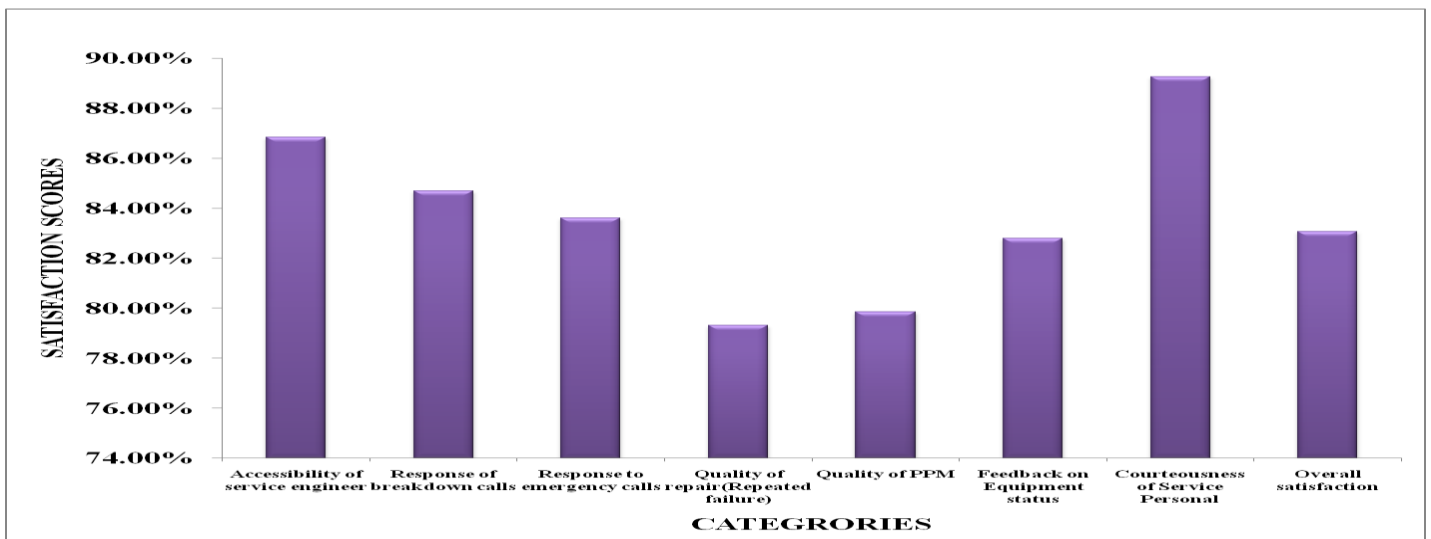
FIGURE7: Bar Graph (User Satisfaction)

IV.   CONCLUSION

The key issue in successful management of outsourcing contract is to measure the performance of outsourcing service provider's, to ensure that all the agreed outcomes are achieved. As the very famous business axiom says "If you cannot measure it, you cannot manage it". This study focuses on measuring the performance of outsourced service, aimed basically at quantifying the extent to which benefits of outsourcing viz. operational efficiency, technical expertise, risk sharing are achieved in the organization.

Study results showed good performance indicators in all the categories. Completion rates (both BM & PPM) above 90% with an average of 92.15% and 97.35% respectively. Average monthly equipment uptime for all equipment is 98.45% & 98.05% for lifesaving equipment indicating that the service levels are achieved successfully throughout the year. Good technical expertise can be expected from service providers as 90% of the department staff are clinical engineers. COSR of 4.20% can be stated as cost effective outsourcing decision. Although there minor non-conformities were identified in terms of critical equipment working orders, overall outsourcing performance can be considered satisfactory. Above concluded facts are well supported by a user satisfaction rate of 83.67%. Detailed studies can be done further to find out the user's perspective of the outsourcing service quality, by using tools such as SERVAQAUL to identify gaps. This will lead to development of a proactive management system. Root cause analysis of individual indicator can be done to further device strategies to minimize such occurrences.

APPENDIX

FORMULAE FOR KPIs

I.   *PPM completion rates*
The completion rate is percentage of procedures completed
PPM completion rate = (Number of PPM completed/Number of PPM schedule)*100

II.   *PPM Yield*
PPM yield is the percent of scheduled PPM procedures performed where problems were found that affected equipment operation or safety
PPM yield = (Number of WO in which problems identified/PPM scheduled)*100

III. *Mean Time to Repair*
Average of all repair time (The time between the start and finish of repair)

IV.   *Equipment Downtime*
The percentage of time that a device is out of service
Equipment downtime = (No. of hours equipment was out of service/total available time)* 100

V.   *Spare Parts obtaining Time*
Time elapsed between making a purchase requisition for spare part and the time when spare part is received.

VI.   *BM completion rates*
The completion rate is percentage of procedures completed
BM completion rate = (Number of BM completed/Number of BM schedule)*100

VII. *Cost of Service Ratio (COSR)*
The ratio of the total cost of service to total equipment acquisition cost is sometimes called the Cost of Service Ratio (COSR)
Cost of Service Ratio = (total cost of service/total equipment acquisition cost)* 100

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Time Dilation

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Abstract- The explanation of Time in Einstein's Special Theory of Relativity[1] is different from the explanation of Time in Classical Mechanics. In Relativity[1], Time is considered as fourth dimension. But, I would argue against Einstein's concept of Time as I do not see Time as a separate dimension. In this paper, I would explain Time Dilation and details of when and why it happens.

Index Terms- Spacetime, Special Relativity, Time, Time Dilation

I. INTRODUCTION

Albert Einstein said in his Special Theory of Relativity[1] that we live in a 4 dimensional world, which has 3 space dimensions and the fourth dimension is called 'Spacetime'. The theory says motion of a reference frame in space dimension reduces the passage through time dimension which results in time running slow in a moving reference frame.

I do not agree with Einstein's view of time. According to me "Time is just a measure of duration of events and time is measured by the pace at which some activities happen". For example the vibration of Cesium atom is an activity and we measure time using this activity in a Cesium atomic clock.

In this paper, I will explain time dilation and details of when and why time dilation happens.

II. WHAT IS TIME?

I would describe 'Time' similar to what a layman describes it as. As said above, Time is just a measure of duration of events and time is measured by the pace at which some activities happen. For example, the vibration of Cesium atom is an activity and we measure time using this activity in a Cesium atomic clock. I do not think time is a separate dimension as said in relativity[1].

2.1 What is Time Dilation?

Under some circumstances almost all activities slowdown which results in Time Dilation, because Time is measured by the pace at which the activities happen.

III. WHEN DOES TIME DILATION HAPPEN?

The passage of time is affected in the following cases:
1. When the frame of reference is in motion.
2. When a force is acting on the frame of reference.
3. In a denser medium [Time dilation as a result of restriction by an ideal medium].

3.1 Case 1: *When the frame of reference is in motion.*

Time is measured by the pace at which some activities happen, these activities which measure time are related to motion. For example in case of atomic clocks we measure time by vibrations of an atom. Vibration is a motion, and this motion is reduced by the linear motion of entire frame of reference. So the Time in a moving reference frame runs slower than Time in a stationary reference frame.

Note: This Time Dilation by motion happens in an ideal medium. It may not happen where there is no ideal medium at all. Later in this paper (in Case 3 below), I will explain what an ideal medium is.

3.2 Case 2: When a force is acting on the frame of reference.

Imagine you are on a spaceship, suppose a force is acting on the spaceship and on everything inside it. Then the clock inside spaceship ticks slower. This happens only if the force is acting on the reference frame and "everything inside it".

3.2.1   An Example:

Inertial force (sometimes called pseudo force) is one such force that acts on everything. Like gravity, when inertial force acts on an object it acts on every particle in it and it affects the time in that reference frame. So, inertial force acting on a reference frame slows down the clock inside the reference frame. Centrifugal force is also an inertial force and hence it will affect the passage of time.

To test 'Time Dilation by Force' one can tie/attach an atomic clock to a wing of a rotating fan in the absence of gravity.

3.2.2   Special Cases:

3.2.2.1   Opposite Forces:

Time Dilation happens if two forces act on every particle inside the reference frame in opposite directions and even if they cancel out each other. But the factor by which Time slows down may not be always same as compared to the case when the resultant force is non-zero and it will also vary based on the magnitude of the forces.

3.2.2.2   Freely falling reference frame

When the frame of reference is freely falling under gravity the time dilation will happen. However, in this case, Time Dilation will be very small (almost negligible).

3.3 Case 3: In a denser medium [Time dilation as a result of restriction by an ideal medium]

We all know what a medium is. For example, water is a medium. Imagine you are running in a swimming pool, you may not be able to run or move your hands freely and faster as you do when you are out of the pool. The water medium restricts your motion by exerting a force opposite to the direction of your motion, even when you are at rest there will be pressure exerted by the medium (in a gravitational field). But we do not see time ticking slowly in such medium as the medium cannot reach all particles. There will be lot of space between sub-atomic particles and something as big as water molecule cannot fill such space.

Now imagine an ideal medium such that when a frame of reference is in that medium, the medium reaches and replaces all (or almost all) empty space in that reference frame. The clock in such a medium ticks slower.

Going ahead when I say 'Medium', I would be referring to an 'Ideal Medium'.

For the sake of thought experiment the medium is assumed to be static relative to the clock. However a moving ideal medium may also slow down a static clock. In most cases time dilation happens even when the medium is moving relative to the clock.

At this point of time, let's not debate whether any such ideal medium exist. My perception is "Clock in such an ideal medium ticks slowly". And more the 'mass/field' density of such a medium more will be the 'Time Dilation'. [I say Field density because 'Field, according to me, is an equivalent of mass. And a gravitational Field, according to me is an ideal medium. I will talk more about Gravity in my next paper]

Note: In none of these above cases (Case 1, Case 2 and Case 3) of Time Dilation, time goes backwards. Even at speeds faster than light (if it can be achieved), time does not go backwards. What I mean is 'activities or events will not be reversed/rewinded'.

IV.   WHY DOES TIME DILATION HAPPEN?

4.1 Third Case of Time Dilation

Let me start with the Third Case – 'Time Dilation in a denser medium'. Here, Time Dilation happens because of the force exerted by an ideal medium against the activity/motion. Denser the medium more will be the Time Dilation. The medium is assumed to be static relative to the clock (or frame of reference)

4.2 First Case of Time Dilation

The First case of Time Dilation (Time Dilation by motion) is because of the space itself resisting the activity. When the reference frame is in motion the resistance becomes more, resulting in Time ticking slower compared to the stationary reference frame. Here I am telling that Space (Space having field) is not completely empty, it has a very little mass (or equivalent of mass), which acts as an Ideal Medium.

4.3 Second Case of Time Dilation

The Second case of Time Dilation (Time Dilation by Force) is because of the Force acting on the reference frame and everything inside it.

So, basically in all above cases Time Dilation happens as a result of 'Force'.

V.   LIMITATIONS

5.1   According to me, time dilation by motion (first case) may not happen in perfect space (nothingness) where there is absolutely NO mass or gravitational field or any other field or any other equivalent of mass. Actually, field is an equivalent of mass and Gravity is property of mass and not the space itself (I will be explaining this in one of my next papers). At this point of time, let us not worry about whether such place of nothingness exist or not.

5.2   In second case of time dilation, time slows down when the direction of force is not same as the direction of activity. If the direction of force is same as the direction of activity, the time may not slowdown in all cases. For example, imagine a static spaceship and consider an activity which is 'linear uniform motion of a ball' inside the spaceship. [This activity is unidirectional – ball moving only in one direction, it is NOT 'to-and-fro' motion of the ball]. Now if there is a force on the spaceship (and on everything inside it) in the direction of motion of the ball, then the ball would not always slow down relative to an observer inside spaceship. However, other activities inside the spaceship may slow down.

5.3   Similarly in the first case of time dilation if the direction of unidirectional activity is parallel to the direction of motion, the activity may not slowdown in all cases.

5.4   And in the third case of time dilation, if the medium itself is moving relative to the observer and the direction of a unidirectional activity is parallel to the direction of motion of the medium, then that unidirectional activity may not slowdown in all cases.

VI.   EXPERIMENT TO TEST 'TIME DILATION BY FORCE' (2ND CASE OF TIME DILATION)

6.1 Apparatus required:

Two synchronized atomic clocks and a rotating fan to which one of the clocks can be attached.

6.2 Procedure:

Attach an atomic clock to the wing of fan and turn-on the fan for considerable period, the fan should rotate with very high RPM (rotations per minute).
During this period, the locus of moving clock (attached to fan's wing) will be a circle and faster the fan rotates more will be the centrifugal force exerted on the reference frame (clock, in this case) and time dilation can be easily observed.
After few hours/days of rotation, stop the rotation of fan and detach the clock. The time on clock detached from the fan should lag the time on the other clock (static clock).

6.3 Conclusion of the experiment:

Force causes Time Dilation, as said in Case 2 of Time dilation above.

6.4 Notes

6.4.1   It is good to have short wings for the fan as the centrifugal force will be high if the wings are short. Also if the wings are short, time dilation by motion would be very less and time dilation by centrifugal force can be easily noticeable.

6.4.2   The above test must be performed in the absence of gravity or in negligible gravity. It can also be performed in the presence of gravity (on the surface of earth), but for better results the magnitude of centrifugal force acting on the clock should be considerably higher than the gravitational force acting on the clock.

6.4.3   In the above experiment, Time Dilation is because of the Centrifugal Force acting on the reference frame and the force acted by the ideal medium against motion of the clock [Here, I am assuming that Space is not completely empty and it has mass (or equivalent of mass), however its mass density is very less].

6.4.4   Gravitational Time dilation is a result of Time Dilation by Force and not the bending of Space-time. So, one might ask me "if time is not a dimension then how does gravity work?" This will be the question I will attempt to answer in my next paper on Gravity.

6.4.5   The Third case of Time Dilation (Time Dilation by Medium) also contributes to Time dilation in the above experiment though it will be very small and negligible. Also, since this Time Dilation by Medium affects both clocks this effect can be neglected in this experiment.

VII.   DIFFERENCES BETWEEN MY VIEW AND EINSTEIN'S VIEW OF TIME

7.1   According to Einstein's Special theory of Relativity[1], Time is a separate dimension. But according to me, Time is just a measure of duration of events and it is measured by the pace at which some activities happen.

7.2   According to Einstein, Time Dilation is a result of motion in space dimension or it is a result of curvature of space-time fabric. According to me time dilation is a result of 'force' acting on the reference frame and everything inside it.

7.3   According to me, Time Dilation happens even when the reference frame is freely falling under gravity but the factor of time dilation in this case will be very less (almost negligible). To understand why this happens one should understand gravity.

7.4   According to Special theory of Relativity[1], Time Dilation happens everywhere if the reference frame is in motion. According to me, as said above, time dilation by motion (first case) may not happen in perfectly empty space (nothingness – where there is absolutely no mass or any type of field or any other equivalent of mass).

7.5   According to Special theory of Relativity[1], Time should run backwards at speeds faster than light. However Einstein also stated that it is impossible for any object to travel faster than light. According to me, even at speeds faster than light (if such speed can be achieved) time does not go backwards. What I mean is 'activities or events will not be reversed/rewinded' at speeds faster than light.

7.6   When I was about to complete this paper, I realized that there could be some activities that happen even at the speed of light (when the frame of reference is moving at the speed of light). For example, we know from Maxwell's theory[3] that electric and magnetic fields create each other when they move at the speed of light.

But according to Special theory of Relativity[1], time itself stops at the speed of light. If Time itself stops at the speed of light as said in Special theory of Relativity[1], how can such activity (electricity turning to magnetism and vice-versa) could ever happen at the speed of light? If time itself stops at the speed of light, then how can something change at the speed of light?

This is an indication that Time is not like what is described in relativity[1].

VIII. CONCLUSIONS

8.1 Time is not a separate dimension. Time is just a measure of duration of events and it is measured by the pace at which some activities happen. These activities can be vibrations of an atom and so on.

So, Time Dilation is just slowing down of these activities under some circumstances. With these activities almost all activities slow down giving us an impression that the time itself slows down.

8.2 Time Dilation happens as a result of 'Force'.

8.3 Some activities happen even at the speed of light.

ACKNOWLEDGMENT

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Study and Analysis of Transient Stability in Power Systems

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Abstract- A power system is considered to be transiently stable if it can regain and maintain synchronism after a sudden disturbance. Circuit breakers play a pivotal role in maintaining transient stability of power systems. Using high speed circuit breakers, transient stability can be achieved efficiently in power systems. The project has aimed at the improvement of the transient stability using high speed breakers. The implementation of the technique has been carried out through MATLAB R2009b.

Index Terms- Transient stability , high speed breaker, restriking voltage, RRRV, resistance switching, manual switching, power system

I. INTRODUCTION

A power system has transient stability if after a large sudden disturbance it can regain and maintain synchronism. A large sudden disturbance includes application of faults, clearing of faults, switching on and off the system elements (transmission lines, transformers, generator, loads etc).Usually, transient stability studies are carried out over a relatively short time period that will be equal to the time of-3-5 cycles. The analysis is I a relatively short- time period that will be equal to the time of-3-5 cycles. The analysis is carried out to determine whether the system loses stability during the first swing or not. In case the power system remains stable, it is assumed that subsequent swings will diminish and the power system will remain stable, as usually happens.

However, circuit breakers play a pivotal role in maintaining the transient stability of power system. The best method of improving transient stability is the use of high speed circuit breakers. The quicker a breaker operates, faster the fault is removed from the system and better is the tendency of the system to restore to normal operating conditions. The use of high speed breaker has materially improved the transient stability of the power systems and does require any other method for the purpose. Therefore to obtain faster and proper breaker operation, the restriking of the arc has to be prevented between its contacts. The arc quenching phenomenon can be explained as follows:

"At zero crossing instant of ac wave, the arc vanishes, which can be prevented from recycling by rapid buildup of dielectric strength of the medium between the contacts by injecting various insulating fluids like air, oil, SF6 etc(between the contacts) under pressure so as to deionize the arc path and thus providing a transition from current carrying state to voltage insulating states of the contacts"

II. MATHEMATICAL FORMULATION

The expression of restrikìng voltage can be given as:

$$v = v_{MAX}(1 - \cos\left(\frac{t}{\sqrt{LC}}\right))$$

For the above expression of restriking voltage, V_{MAX} is the peak value of recovery voltage (phase -to-neutral),t is time in seconds, L is inductance in henrys, C is the capacitance in farads and v is the restriking voltage in volts.

The maximum value of restriking voltage is $2V_{MAX}$ and occurs at $t = \frac{\pi}{\omega}$ or $t = \pi\sqrt{LC}$

The rate of rise of restrikìng voltage (RRRV) can be expressed as follows:

$$RRRV = \frac{dv}{dt} = \frac{v_{MAX}}{\sqrt{LC}} . \sin\frac{t}{\sqrt{LC}}$$

Hence maximum value of RRRV, $RRRV_{MAX} = V_{MAX}/\sqrt{LC}$

Where high RRRV is expected circuit breakers with shunt resistances are employed. Now for ensuring exponential buildup of voltage across the breaker to 50Hz recovery voltage ,without overshoot, instead of exhibiting the oscillatory doubling effect associated with an achieve critical damping is $1/2\sqrt{LC}$. Inclusion of shunt resisters increases the rupturing capacity of the breaker. Thus, minimization of the restriking voltage will resuit in proper and faster operation of the circuit breaker and the transient stability limit will not be exceeded.

III. CALCULATION

f=frequency of restriking transient

$f = \frac{1}{2\pi\sqrt{LC}}$=863.138 Hz, where L=5mH and C=6.8μF

Tp= $\pi\sqrt{LC}$ = 0.58ms

Maximum value of restriking voltage=$2V_{MAX}$=(2*9.3)=18.6V which is obtained at 0.58ms

However in case of working model,

Restriking voltage=12=9.33(1-cos(1/$\sqrt{LC}$*t))

1.2856=1-cos(1/$\sqrt{LC}$*t)

T=0.343ms

Thus the time of manual switching is at 0.343ms.

Therefore,   RRRV=(18.6-12)/(0.58-0.343)=6.6/0.237=27.848 V/ms.

IV. MATLAB IMPLEMENTATION

The restriking voltage has also been obtained through MATLAB simulation.
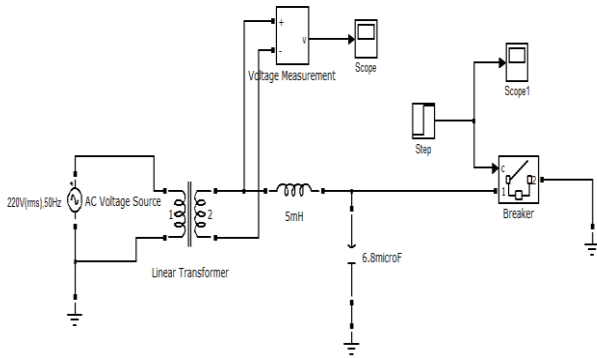
Fig. 1 Simulink model for manual switching

The complete system has been represented in terms of simulink blocks in a single integral model. Initially, the circuit breaker is closed but opens after some time and the restriking voltage transient is as shown in fig.1. The reactor representing the reactance of the transmission line is taken as 5mH. The line to ground capacitance is 6.8µF. The circuit breaker is externally controlled through the step pulse as shown in figure above. The restriking voltage as obtained in MATLAB simulation is shown in fig. 2
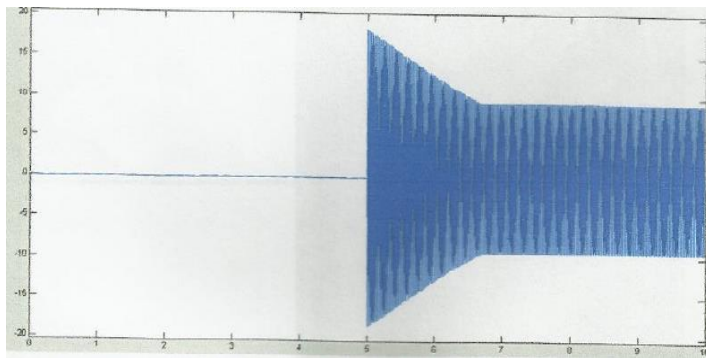
Fig.2 Graph showing restriking voltage transient across breaker contacts

Restriking voltage obtained from MATLAB simulation =18.5V

Here, the values of L and C are same as that taken in the hardware model.

Similarly, the circuit for resistance switching has also been developed, hence minimizing the restriking voltage. In case of resistance switching, a 2Ωresistor is connected across the circuit breaker as shown in the diagram below.
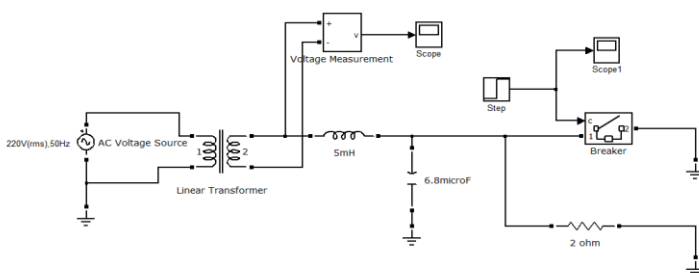
Fig.3 Simulink model for resistance switching

The graph obtained through MATLAB simulation is shown below.
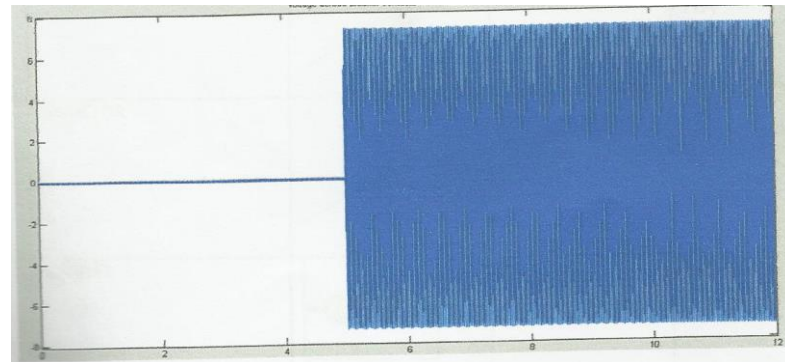
Fig.4 Graph showing restriking voltage in resistance switching

HARDWARE MODEL

The hardware model for obtaining the restriking voltage has been designed as follows.
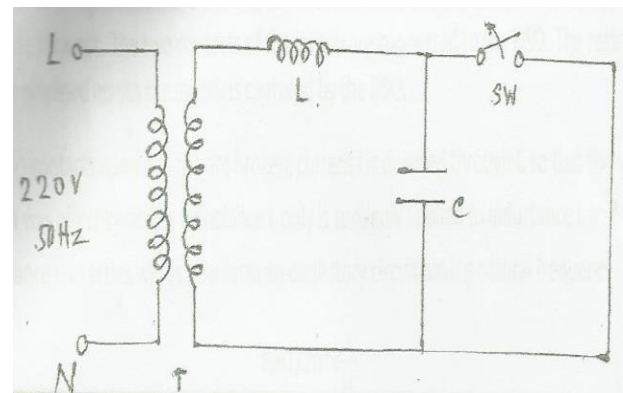
Fig.5 Hardware model for manual switching

V. COMPONENT SPECIFICATION

Sl No	Component	Diagram	Quantity	Specification
1	Capacitor		1	6.8µF, 50V, 85^0C, ELECTROLYTIC TYPE
2	Inductor		1	5mH
3	Resistor		2	100Ω each

4	Transformer		1	220/6.0V, 300mA

VI. DESCRIPTION

L represents the inductance per phase of the system upto the fault point and C represents the capacitance to the earth of the circuitbreaker porcelain brushing. The switch S1 acts as the circuit breaker which here is manually opened under short circuit. The two contacts of the switch are connected to the DSO. The restriking voltage obtained across the switch is captured by the DSO. With the contacts open and the arc broken, the current I is diverted through C so that the voltage V which was effective across inductance L only is suddenly applied to inductance L and capacitance C in series which now form an oscillatory circuit having natural frequency

$$F_n = \frac{1}{2\pi}\sqrt{\frac{1}{LC}}$$

The initial charging current surge tends to carry the voltage across the capacitor and therefore across the circuit breaker contacts to double its equilibrium value, i.e, 2Vmax, this is the restriking voltage transient which tends to re-establish the arc in the circuit breaker.
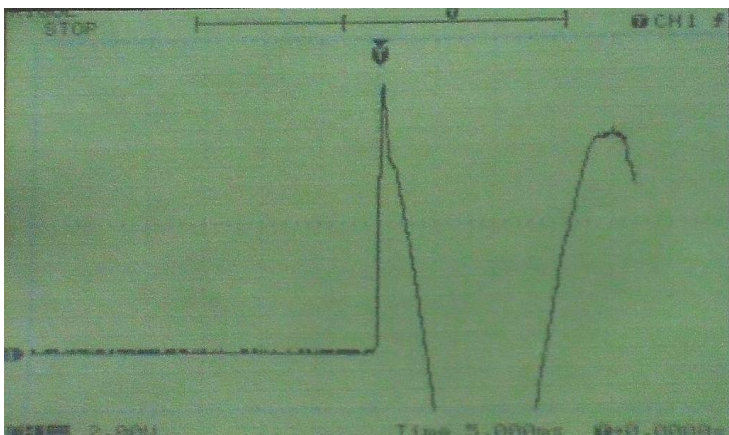
Fig.6 Graph obtained in DSO by manual switching

- Restriking voltage obtained from the DSO= 11.8V,i.e 12V
- Peak time obtained from the DSO= 0.5ms

VII. RESISTANCE SWITCHING

The circuit diagram of resistance switching is as follows :
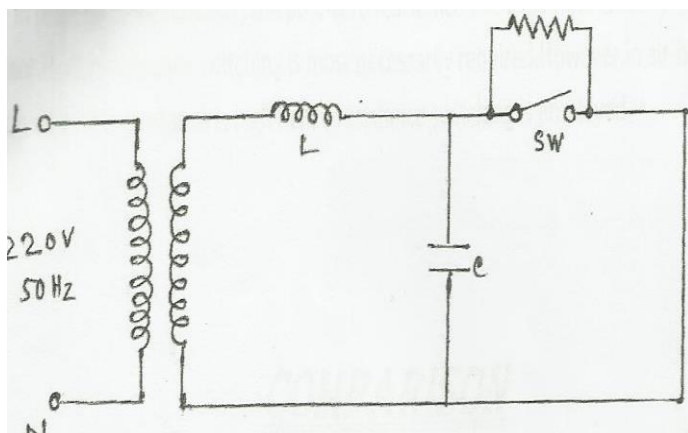
Fig.7 Hardware model for resistance switching

In case of resistance switching a resistor is placed across the circuit breaker (here a switch) as shown in the diagram above. The graph obtained from the DSO with resistance switching is as follows:-
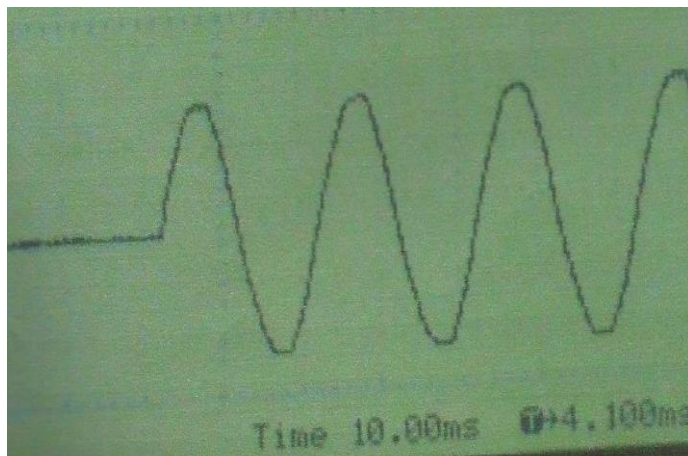
Fig.8 Graph obtained in DSO by resistance switching

The resistor performs the following functions :
1. It reduces RRRV and thus reduces the burden on the circuit breaker.
2. It ensures the dampening of the high frequency restriking transients during the switching out inductive or capacitive load.

In plain oil-circuit breaker, the post-zero resistance of the contact space is constant. Hence, resistance switching is most necessarily required. However, in air-blast circuit breaker post zero resistance is high hence resistance switching is employed.

VIII. COMPARISON

The comparison of mathematical analysis, MATLAB and hardware analysis can be done as follows :

PARAMETERS	Mathematical Analysis	MATLAB	Hardware
RESTRIKING VOLTAGE	18.6V	18.5V	12V
PEAK TIME	0.58ms	0.57ms	0.5ms

In case of MATLAB and mathematical model, the transformer impedance(leakage impedance and magnetizing reactance) has been neglected. The resistance of the transformer winding results in damping of the voltage transient. Moreover, manual operation of switching has also not been done at the instant of maximum voltage transient. However the time of manual switching is 0.343ms where as the peak time from calculation is 0.58ms.

IX. FUTURE SCOPE

The transient voltage obtained is related to rotor oscillation. The transient torque produced due to transient voltage component results in tremendous rotor oscillation. A further study on rotor oscillation can be done during various fault conditions such as L-G or L-L-G or L-L. Production of transient torques can result in damaging of shafts and produce detrimental effects on bearings. The rotor oscillations can be damped or sustained. Sustained oscillations lead to loss of synchronism. A further study can be done on this basis.

X. CONCLUSION

The restriking voltage transientas obtained due to circuit breaker switching can result in damaging of breaker contacts. Moreover high restriking voltage can result in delay in arc quenching. Hence, the system is subjected for more time under faulty condition. Resistance switching results in damping of voltage transient enabling faster arc quenching. The phenomenon has been observed here in a hardware model as well as MATLAB simulation. The resistance reduces RRRV and thus reduces burden on the circuit breaker. The resister also increases the breaking capacity of the breaker.

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Extensible GUIs for Remote Application Control on Mobile Devices

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Abstract- A chasm exists between the desktop and mobile worlds in terms of hardware performance, graphics capabilities and input devices. Some kinds of software, such as 3D graphics or advanced word-processing tools, are still out of reach for handheld devices. So, although redesigning a desktop application for mobile environments is often possible, mobile devices' limitations discourage using such software in nomadic scenarios. One type of solution to this problem employs well-known remote-computing techniques in which a remote server executes specific application and sends only the resulting graphics representations to the client devices a sequence of still images or a video stream.1, 2 In most cases, these techniques require shrinking the server's video output (including the application interface) to fit mobile displays' low resolution and wireless-network bandwidth. This results in poor quality at the mobile site that severely impairs application usability. To overcome this limitation, a second type of solution employs ad hoc remote visualization to deliver only the application work area (the area displaying the effect of user interface manipulation) to the client side while redesigning the application interface from scratch. But this wastes time and money and results in a strict dependency on the original application. A third possible solution involves Web applications and, more generally, Web operating systems. However, development of enabling technologies in the mobile scenario is at an embryonic stage. So, only a few of the existing implementations can run on today's devices.

We've developed a fourth solution: a software independent approach that extends the basic remote-control paradigms to maintain a separate work area and interface. Using image processing, our approach automatically analyzes and classifies the server-based application and then generates an interface description. On the client side, the user's mobile application reloads the description. Any interaction with the client interface produces an interaction on the corresponding graphics element in the application interface on the server. This approach manages the work area as a flow of still pictures that the server delivers to the client. Prototype implementations show how our solution can effectively transfer simple and complex applications to mobile environments, letting users remotely interact with applications

Index Terms- GUI, Remote Application, Mobile Devices.

I. INTRODUCTION

Any strategy for designing mobile-device applications must clearly separate GUI elements from the work area. Then, we can adopt optimization (and automatic-generation) approaches to tailor layout, appearance, and interaction modalities to both user needs and device capabilities. To enable all this and allow deployment of existing desktop applications on mobile devices, we've developed a novel client-server framework as an evolution of established remote-computing and remote-visualization solutions.
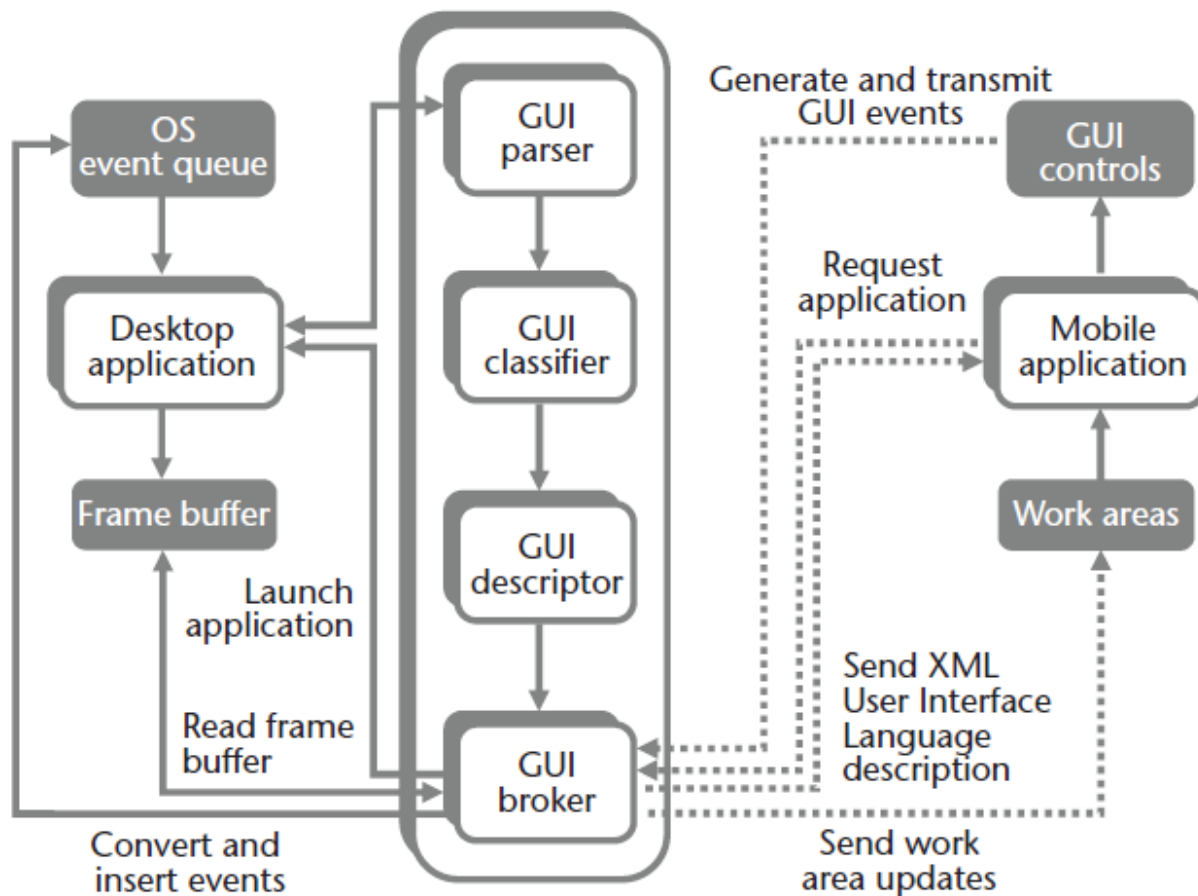
Figure 1. An overview of the architecture for extending GUIs to mobile devices.

The four main elements—the GUI parser, classifier, descriptor and broker modules—reside on the server.

Figure 1 shows the overall architecture. On the server side, the GUI parser analyzes the interface of an application running on the same machine by simulating mouse movements and clicks. It can identify the image elements belonging to the graphical lexicon that were used to build the application.

The GUI classifier then places each element in a specific category (for example, menus, buttons, check boxes, and work areas). The GUI classifier can also disclose element relations with the surrounding context. For example, it might classify an element as a combo box item because that element is in an image that appears only when the user presses the combo box's drop-down arrow.

When this classification is complete, the category, location, size and container are known for all GUI elements. The GUI descriptor converts this information into a User Interface Description Language (UIDL) file containing the whole interface's description. A mobile application connects to the GUI broker and requests access to an application. The GUI broker sends the UIDL description to the client and launches the requested application on the server.

The mobile application parses the description file and presents to the user all the constituent elements, which the user can rearrange to create a personalized GUI. The GUI broker converts user generated events into suitable mouse and keyboard events to insert into the OS event queue. Finally, the GUI broker

transmits images representing work area updates to the mobile device, giving the user the impression of a local interaction.

II. GUI ELEMENTS

Using trivial edge detection and pattern-matching techniques, we can discover a white background text area, a radio button group with characteristic circular icons, or a bounding box. However, analyzing the user interface to produce a functional description to reuse in application development takes more than just image processing. For more complex elements such as menus and combo boxes, we must investigate in depth their behavior with respect to user interaction. Moreover, a main goal of designing the GUI parser was to achieve a high portability across various platforms. This will help develop an infrastructure that can work with different OSs with different GUI styles.

One aspect common to almost all window based operating systems is highlighting. When the mouse moves over an interface element, this element is highlighted; that is, it becomes brighter, is bounded with a colored box, or becomes 3D. Independent of the specific highlighting technique, this effect helps focus user attention on that element. Even more important, thanks to this behavior, the system signals any user interface element's presence and position. This lets the user interface participate in element identification (and classification), thus easing the GUI parser's job. For example, clicking on a highlighted box

containing some text could open a drop-down list, signifying that this element is probably a menu.

So, for the GUI parser to locate GUI elements, we obtain from the frame buffer the graphical representation of the user interface before and after element highlighting. Then, we simply compute the difference (that is, the XOR) between them to get the element's position. The resulting image's pixels are all black except those corresponding to the element region, because the difference represents the highlighting itself.

(a)   **(b)**
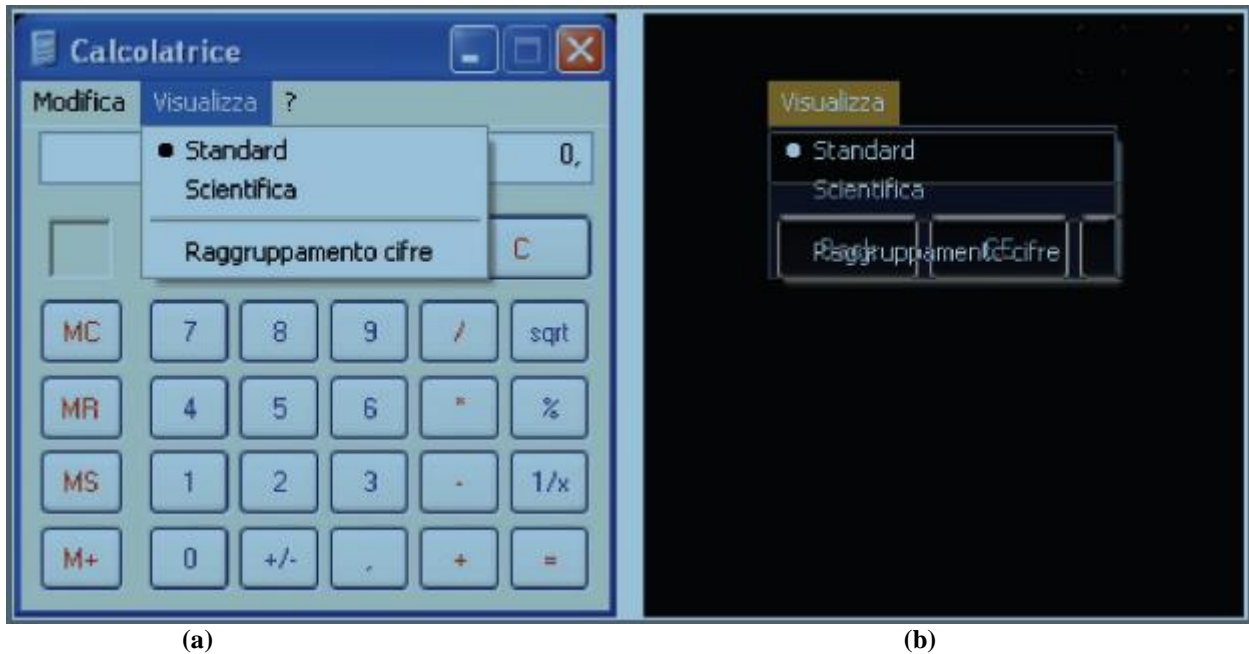
Figure 2. For the MS Windows Calculator
(a) Highlighting effect over a menu and
(b) Corresponding difference image. Computing the difference image lets us determine interface elements' location and size

A simple algorithm identifying the non-black region's boundaries gives the element's exact location and size (see Figure 2).This algorithm assumes that highlighted and non-highlighted representations of the user interface for a specific element are available. However, this requires prior knowledge of element position Moreover we need to instruct the system to take a snapshot of the user interface before and after positioning the mouse over the selected element.

Because we aimed to design an automatic tool for interface description, we had to integrate this algorithm into a programmable logic to produce highlighting when needed. We achieved this through an ad hoc algorithm that interacts with the OS's native event queue and mimics mouse movements and mouse clicks through specific system calls. This algorithm has two phases. The first identifies the interface's basic elements, including buttons; check boxes, text fields, radio buttons, and sliders. This phase moves the mouse using discrete steps from the interface's upper left corner to the bottom right corner over imaginary horizontal lines. We compute the difference images and identify the elements' location and size. Figure 3 shows this phase's results for the Blender (www.blender.org) 3D modeling tool.
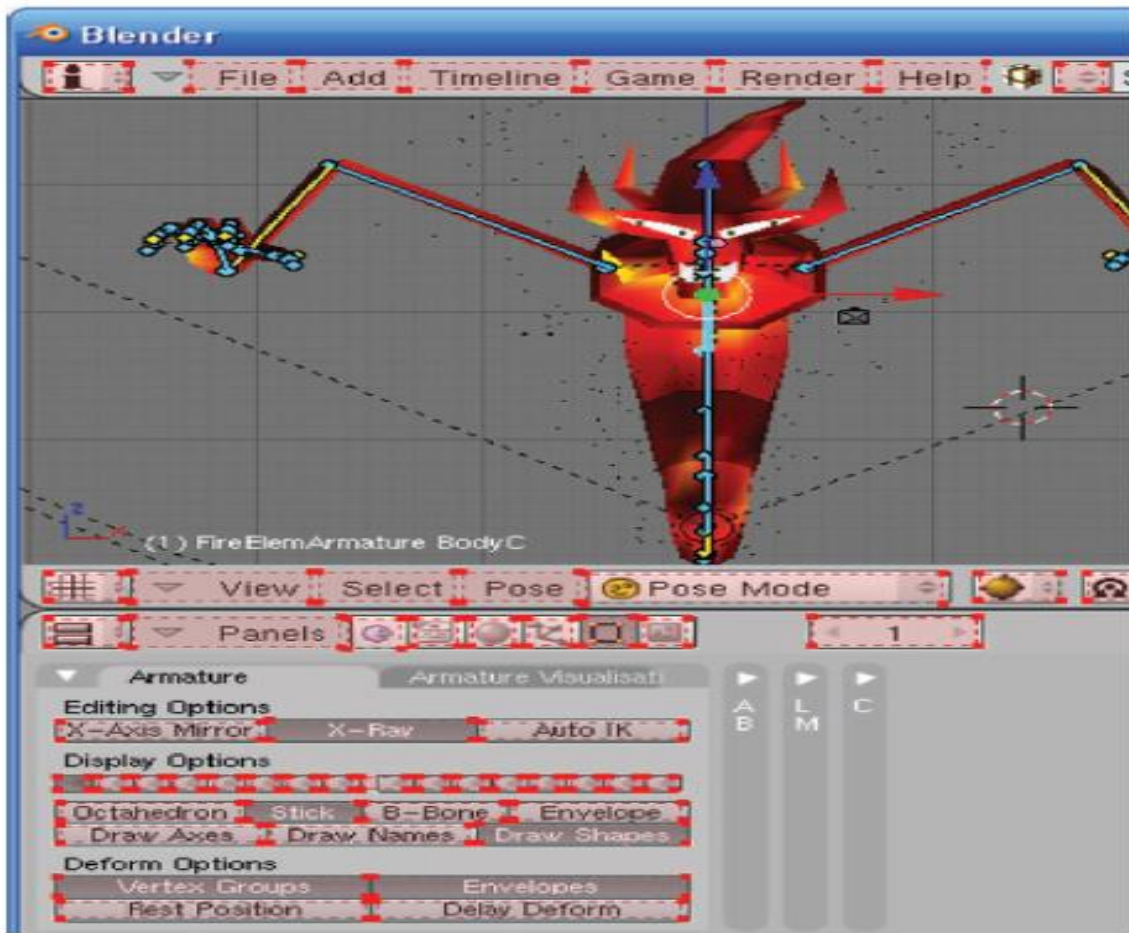
Figure 3.Results from the GUI parser for the Blender 3D modeling tool.

The parser has identified elements of the user interface

Some elements identified in the first phase undergo another processing. This second phase correctly identifies menus and combo boxes that don't appear until the mouse interacts with them. In this case, the logic moves the mouse over the various elements and simulates a mouse click, simultaneously collecting the highlighted representation. An ad hoc algorithm processes the difference image and retrieves required information including submenus, icons and hot keys.

To speed up the process, we created wizards that let users specify interface regions. With the wizards, users can also analyze and select the application work area. For example, in a common WYSIWYG (What You See Is What You Get) word-processing application such as Microsoft Word, the work area is the white page in which the user types. In a 3D modeler, it will probably be the various model views (that is, top, front, side, and camera).

Figure 4. Results from the GUI classifier for MS Word.

Different colors indicate different categories of graphics elements that the classifier has identified.

III. CLASSIFYING GUI ELEMENTS

Given the variety of styles and the existence of nonstandard graphics building blocks in existing GUIs, designing a classification algorithm using traditional pattern recognition techniques is extremely difficult. Image resolution and contrast, which in some cases could be very low, further complicate this task.

To address this problem, we developed two ad hoc algorithms. The first segments the image representing a GUI element into its sub blocks. It analyzes the image from left to right; extracts information concerning each sub blocks width and content, and stores that information for later use. Optical-character-recognition (OCR) techniques recognize text in the element's bounding box.

The second algorithm works on the sub blocks, exploiting pattern-matching techniques (specific for each GUI element) to check for characteristic shapes and attributes. Then it assigns the element to a category. The parameters that control algorithm behavior include the number of sub blocks, existence of icons, distance between sub blocks, presence of characteristic shapes (for example, arrows), and number of text characters. Figure 4 shows the results for MS Word.

We designed this process to be as general as possible to adapt to various user interface styles. However, the pattern-recognition-based techniques only demonstrate the overall architecture's feasibility and aren't comprehensive. Nevertheless, as the following sections show, our current method works well enough to let us reuse complex existing applications on mobile devices.

IV. GENERATING THE GUI DESCRIPTION

To generate a reusable description of the interface, the GUI descriptor uses XUL (XML User Interface
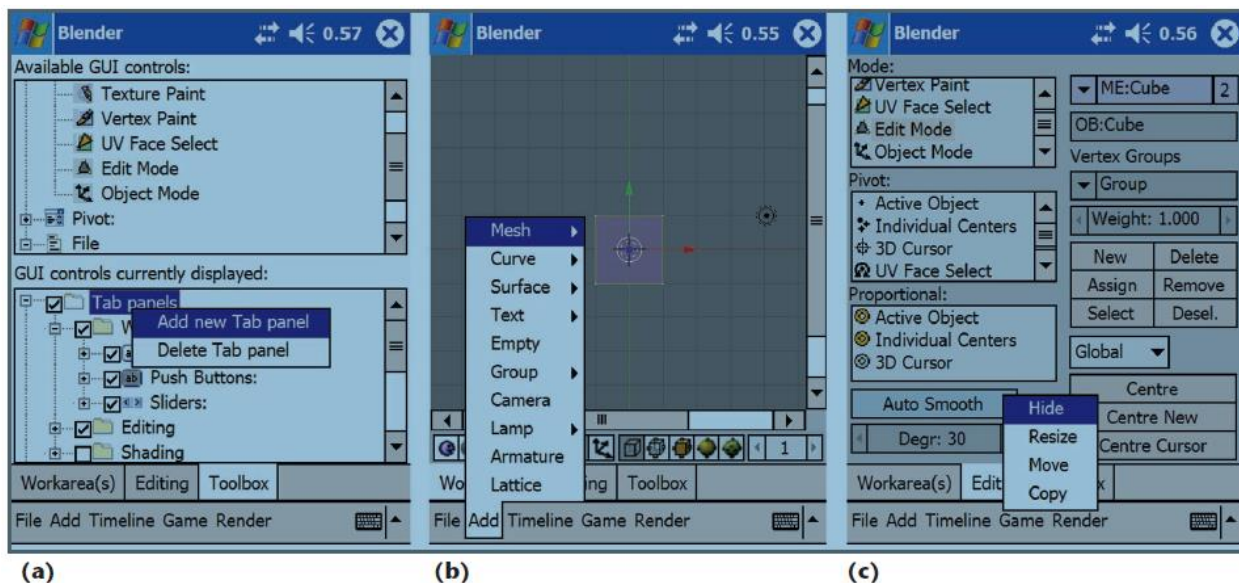
Figure 5. The Pocket PC remote-control application on a Dell Axim x50v PDA:
(a)A hierarchical tree view keeps track of the native GUI structure.
(b) Elements from the XUL description of the Blender interface have been placed into a tab   panel.
(c) This display shows other elements of possible interest to a user.

Language). With XUL, the programmer specifies what the interface must include, not how it must be displayed. This separates the application's look and feel from its control logic. A predefined set of structured basic elements characterized by a predefined set of attributes extended by the user describes the interface. Basic elements can be nested to create complex controls found in GUIs. The main XUL elements allow the description of windows, buttons, menus, combo boxes, scroll bars, checkboxes, radio buttons, text fields, labels, and images (the complete XUL documentation is at www.mozilla.org/projects/xul).Despite XUL's expressiveness, it can't natively record the necessary information related to remote visualization and control. So, no XUL tag exists for describing the work area or the address of the server running the GUI broker. Moreover, XUL doesn't provide specific tags for all the elements used in modern interfaces. To overcome these limitations, we extended XUL. Specifically; we added a server tag to record the connection parameters for configuring the remote control session. We also defined work area and slider graphics tags. Finally, we inserted an attribute in the button tag to distinguish between normal buttons and push buttons.

V. GENERATING THE GUI AND PROVIDING REMOTE INTERACTION

The GUI descriptor saves the generated GUI description into an XUL file. Remote users can access the file when they need to use a portable version of a desktop application. For this, we've developed a remote-control application for a Pocket PC PDA, using Microsoft C#.net, and for Java-enabled mobile phones,

using J2ME (Java 2 Platform, Micro Edition). When the user connects to the server, the GUI broker sends the user a list of applications installed on the server. The user selects an application, and the GUI broker transmits the associated XUL description. (The system can be configured to activate the GUI identification, classification, and description tasks if the description isn't available.)

In the Pocket PC version, the mobile application displays a box containing the elements available for GUI construction, using a hierarchical tree view that keeps track of the native GUI structure (see Figure 5a). To customize the GUI, the user can drag and drop icons between this tree and an underlying tree displaying the elements to be placed in the interface. The user can arrange elements into tab panels, menus, and context menus (which appear when the user presses the stylus over the touch screen for a while). In a tab panel, the user can reorganize elements as needed, even radically changing the interface's original appearance. So, elements originally organized through a

menu can be positioned into a list box, and a combo box can display menu elements in the remote application's GUI. This lets the user find a more comfortable organization of GUI elements, allowing optimized application control even on platforms with limited input devices.

In Figure 5b, some GUI elements extracted from the XUL description of the Blender 3D modeler tool GUI have been placed into a tab panel. The panel's upper part hosts the work area. Below the work area, some Blender buttons have been positioned with a slider. Instead of relying on the native set of graphics controls made available by C#.net for the Pocket PC, we've created new GUI elements that start from basic building blocks such as panels and images. This lets the mobile application recreate the XUL description's content. Figure 5b shows how we've recreated original menus starting from information extracted by the OCR software. Figure 5c shows other GUI elements of possible interest to a user of this mobile application.
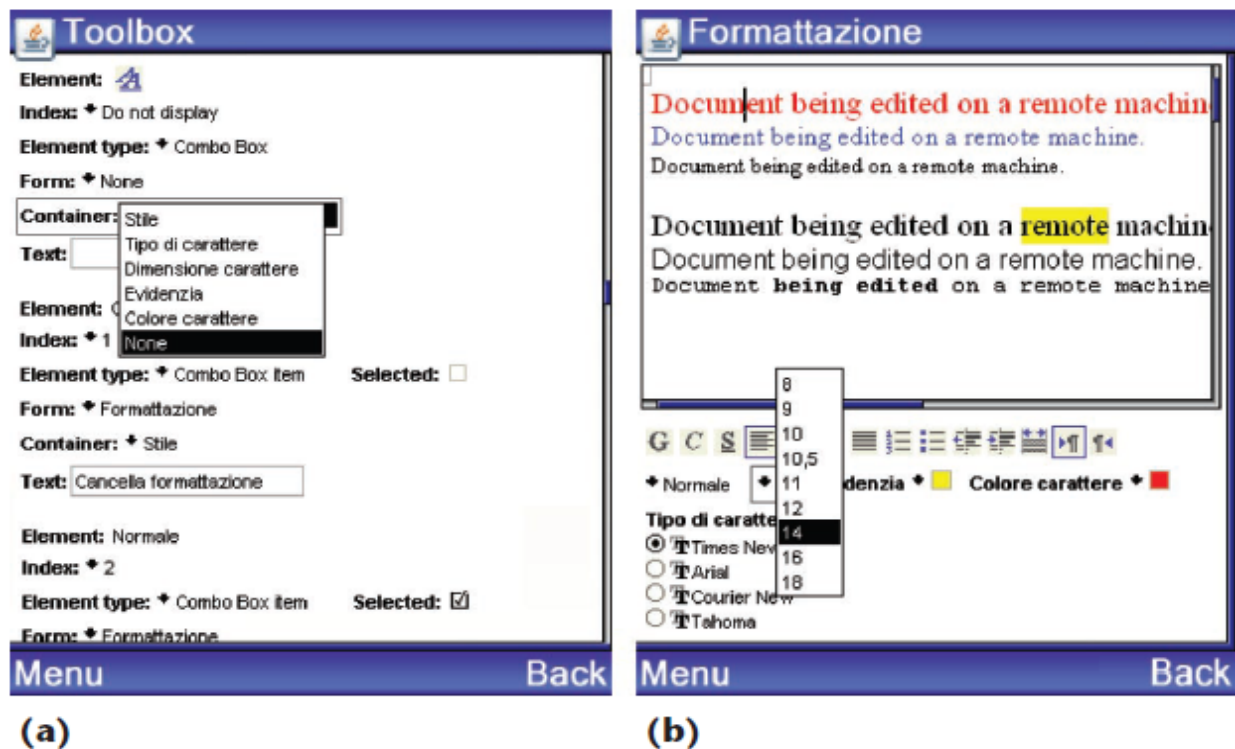
Figure 6. The Java J2ME remote-control application on a Nokia N80 mobile phone:
(a) With this form, users can customize the MS Word GUI.
(b) This window displays a possible customized interface for remote control.

Here we can see how, on the basis of user preferences, our framework has translated the original combo boxes into list boxes to let the user display both the original icon and text. Native C#.net controls wouldn't have allowed this. By using a context menu, the user can hide each GUI element, resize it, or move it within the current tab panel or to another one. This lets the user precisely control any aspect related to the interface's final appearance and behavior.

The Java J2ME version provides comparable functionalities. However, we had to adjust its appearance and control capabilities

to account for the limitations of a mobile phone's screen size and input devices.

Figure 6(a) shows the initial form allowing GUI customization for MS Word over a Nokia N80 phone. Figure 6(b) shows a possible customized interface for remote control. When the user manipulates GUI controls (for example, presses a button, selects a menu item, or activates a check box) or interacts with the work area by moving and tapping the PDA stylus or using the phone keyboard, the device transmits the corresponding events to the GUI broker. On the basis of the knowledge of

element location in the original GUI, the GUI broker converts the received information into suitable mouse and keyboard events and inserts them into the OS event queue. When the system processes these events, they affect the work area's appearance. The GUI broker extracts the updated representation of the work area from the frame buffer and sends it to the mobile application, where it's redrawn on the device display.

Currently, we encode work area updates as JPEG images. This encoding strategy can be replaced with any other solution commonly used in remote visualization architectures2 without significantly altering our approach's overall philosophy. Doing this might achieve higher update frame rates and lower latencies. This solution has two main advantages over similar techniques (see the sidebar for a discussion of some techniques). First, remote applications don't require modification. Graphic elements of the GUI at the client site are directly connected to the corresponding objects at the server site. Second, the user can customize the mobile device's GUI, thus fulfilling most of the guidelines for (handheld) mobile-device interface design.3 According to these guidelines, GUI elements for mobile devices should be as similar as possible to the corresponding items of a desktop interface to preserve consistency (or continuity). Our approach lets the mobile device's GUI recreate the desktop application's original icon and text for buttons, check boxes, menus, and so on. This maintains the native application look and feel. Moreover, the user can personalize the element placement and GUI appearance. Original elements can be radically transformed (menus can become list boxes, buttons can be grouped into combo boxes, and soon) or discarded. This enhances GUI aesthetics and improves the mobile application's attractiveness and usability.

Our solution is based on the remote-visualization paradigm. So, from the client GUI viewpoint, memory load isn't a concern because it mainly affects the application on the server while preserving local-resource usage. The interface's configurability lets the user manage shortcuts and other items enabling access to special functions. Moreover, this approach lets users implement a hierarchical organization on the mobile device even when such organization is missing (or limited) in the desktop application. Furthermore, they can integrate access to hidden application logic, multimedia and multimodal interaction, and context-awareness functionalities in the mobile GUI without redesigning or rewriting the original applications.

This solution's limitations mainly concern the detection and classification of graphics elements that produce dynamic changes over the GUI. A pressed button can change both the work area's content and the interface itself (that is, create new graphic elements such as panels and dialog boxes).In other cases, GUI manipulation can cause modifications that affect previously existing elements. We've partially solved these problems by letting the user intervene during GUI analysis through the ad hoc wizards. At this stage, our approach can't manage these situations automatically. So, future research will aim to integrate techniques for continuously processing the remote-application GUI, detecting dynamic changes, and generating on-the-fly descriptions of the interface for the client device.

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Control System for Retaining the Orientation of Cables in a Suspension Bridge

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Abstract- Orientation of cables in a suspension bridge is a major factor affecting the stability of the bridge. In this paper we are proposing a new method of controlling the orientation of cables of a suspension bridge with the help of gyro and actuators by using an appropriate control system with negative feedback.

Index Terms- Suspension Bridge, Cable Suspenders, Control System, Automation, Gyro

I. Introduction

The basic design of a suspension bridge has been in use for centuries: thousands of years ago, people crossed waterways and chasms by swinging hand over hand on suspended cables. Later, walkways were hung from the cables to make the process easier, and the original vines and ropes began to be replaced with chains. A suspension bridge is a type of bridge which is built by suspending the roadway from cables attached to a master cable which runs above the length of the bridge. The design of a suspension bridge is simple and straightforward, and takes advantage of several techniques to distribute the weight of the bridge safely and evenly. Suspension Bridges have received more attention due to their ability to cover the large spans. For bridging the long and unsupported spans, the Suspension Bridges present the most elegant and efficient structural solution.

Effect of aerodynamic forces on suspension bridge is predominant at Bridge Deck and Cables. When aerodynamic forces acts, the bridge deck will have a tendency to fail and at the same time the cables will have a tendency to change its orientation from initial position. In this paper we are focusing on the orientation of cables and are proposing a method to overcome the same.

A gyroscope shall be used for this purpose. Gyroscope is a device for measuring or maintaining orientation, based on the principles of angular momentum. Mechanically, a gyroscope is a spinning wheel or disc in which the axle is free to assume any orientation. Although this orientation does not remain fixed, it changes in response to an external torque much less and in a different direction than it would with the large angular momentum associated with the disc's high rate of spin and moment of inertia. The device's orientation remains nearly fixed, regardless of the mounting platform's motion, because mounting the device in a gimbal minimizes external torque.

Gyroscopes based on other operating principles also exist, such as the electronic, microchip-packaged MEMS gyroscope devices found in consumer electronic devices, solid-state ring lasers, fibre optic gyroscopes, and the extremely sensitive quantum gyroscope.

II. Proposed System

Orientation of cable is major factor that must be maintained for aerodynamic stability of suspension bridges. The proposed system consists of a gyro, Analog to Digital Convertor, processor, driver circuit and an actuator as shown in the figure. The gyro reads the position of cables in x, y and z axes and feeds data to the processor through A/D. The processor compares the value from gyro to the threshold value, that is, the desired value of cable orientation.
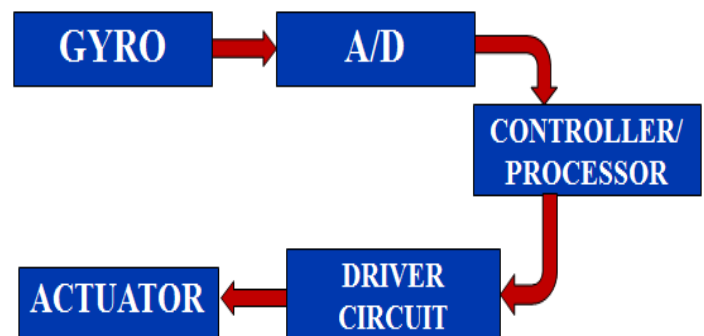
Fig 1 – Block Schematic of Proposed System

If there is a variation in the actual values from desired value, then the processor gives appropriate signal to the actuation circuit consisting of the driver circuit and the actuator.

The gyro is mounted on the cables and actuator is appropriately connected to the end of cables.

III. Control System

In order to make the above mentioned system more effective, we need to design an appropriate control system for the same.

The control loop uses negative feedback for controlling the position of cables. The threshold value of cable position is the primary input for the control loop followed by summing point and then by a controller and actuator driven by appropriate driver

circuit. The position of the cable is fed back to the summer using the gyro. The feedback is negative so that it forms a simple feedback type to control the position of the cables.

The figure below shows the control system and signal flow graph of the proposed system.
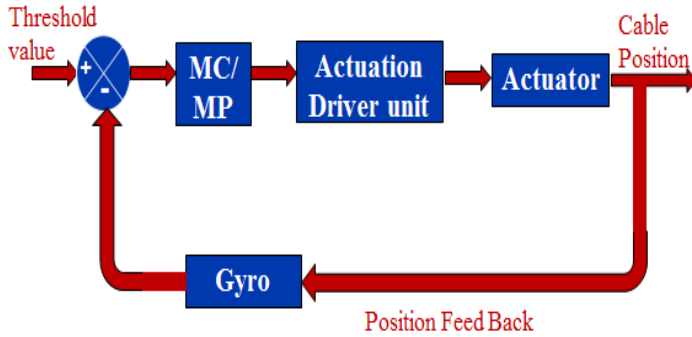
Fig 2 – Closed Loop Control System

The threshold value or desired orientation of cables are fed to the processor which initiates the actuation using actuator circuit and the position of cables are observed by the gyros mounted on them. The position values of the orientation of cables are sent back as a negative feedback to the summer where it is summed with the threshold value.

Fig 3 Signal Flow Graph
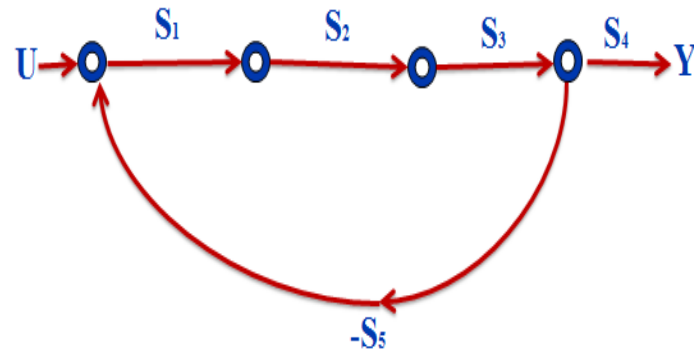
Sl. No.	Threshold Value	Feedback Value	Actuation Value (= Threshold – Feedback value)
1	1,2,1	1,2,1	0,0,0
2	1,2,1	2,2,5	-1,0,-4
3	1,2,1	-3,-4,-2	4,6,3

Table 1 – Sample Values

It is very clear from the table that, when there is a positive change in the cable position, the controller initiates a negative actuation and if there is a negative change in the orientation, the controller initiates a positive actuation. This is because of the use of negative feedback.

IV. IMPLEMENTATION
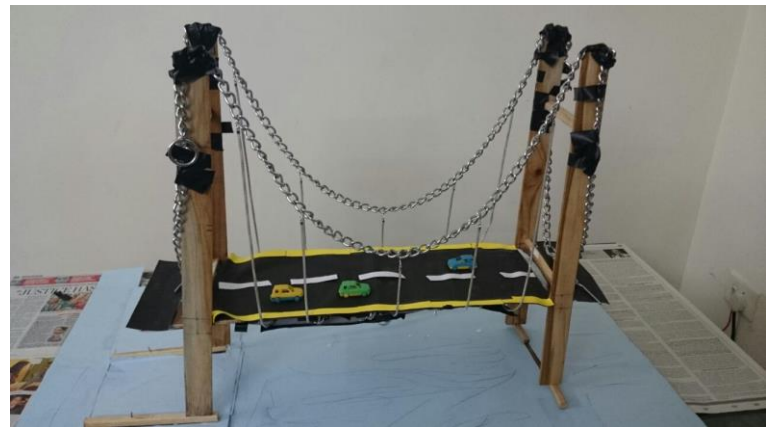
Fig 4 – Prototype for testing

The above shown figure shows the prototype developed for testing the proposed system. The gyro is attached to the cables and the actuation is given at the end using electric motor with appropriate coupling. Initially, the system will be stable and the gyro shows the threshold readings.

Now an external disturbance is introduced using an air blower which causes the cables to deviate from its mean position which is observed by the gyro and fed back to the controller. Now the controller gives signal to the driver circuit by sending a logic high value to the isolator and initiates the actuation.

The controller stops actuation when the cables attain back their mean position.

Fig 5 – Zero reading of gyro
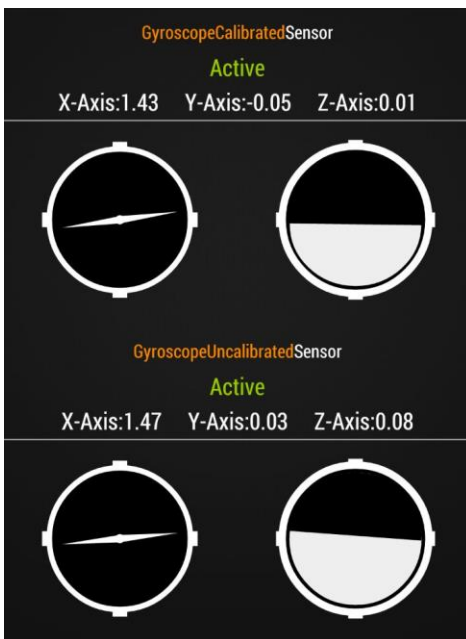
Fig 6 –Gyro Reading at Mean Position
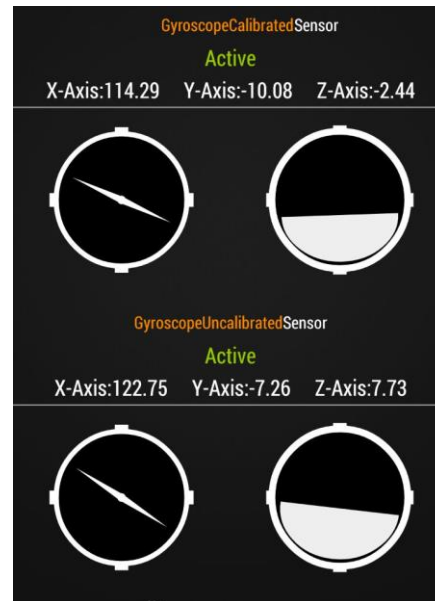
Fig 7 – Gyro reading after introducing external disturbance

V. FUTURE WORKS

The proposed system may be implemented in real time with the help of more accurate gyros and hydraulic actuation systems. Also the system may be made more efficient by designing a feed forward system instead of a feedback system.

VI. CONCLUSION

The change in orientation of cables in a suspension bridge is a major problem and this was addressed successfully at the design level by introducing a closed loop control system. This system may be modified so as to increase the efficiency by replacing the feedback with a feed forward control system.

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Microbiological Quality of Paediatric Oral Liquid Drug Formulations during Consumption

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Abstract- This preliminary study was conducted to evaluate the microbiological quality of paediatric oral liquid drug formulations during consumption. Paracetamol, Salbutamol, Cephalexin, Amoxicillin and Lactulose are few oral liquid medicines prescribed in Sri Lanka. These oral liquid medicines are at a greater risk of microbial contamination during consumption. This can lead to co-infection in paediatric patients. Therefore, it is important to evaluate microbial quality of oral liquid medicines during consumption. In methodology, organoleptic examination, pH determination and assessment of microbiological quality of two bottles from each five commercially available samples were done. Selective media were employed for quantification and isolation of the microbial contaminants. Quantification of viable microbial colonies was expressed as colony forming units per mililitre (cfu/ml). These procedures were conducted in duplicates at each consumption day and cfu/ml was expressed as a mean. All liquid drug formulations had <1000 cfu/ml bacteria during the consumption period except Lactulose, which had 12733 cfu/ml bacteria during the last consumption day. In conclusion, this study has revealed that the good microbial quality of paediatric oral liquid drug formulations should be maintained during consumption period.

Index Terms- paediatric, liquid drug formulations, microbial quality, consumption

I. Introduction

Paediatrics is the branch of medicine that deals with the medical care of infants and children. The gastrointestinal tract of a normal fetus is sterile. During birth and rapidly thereafter, bacteria from the mother and the surrounding environment colonize the infant's gut. Immediately after the vaginal delivery, the microorganisms of the upper gastrointestinal tract of the babies may have acquired from the mothers' feces (Walker *et al*, 2004). Environmental, oral and cutaneous bacteria are readily transferred from the mother to the infant through suckling, kissing, and caressing. After the introduction of solid food and weaning, the microflora of breast-fed infants becomes similar to that of formula-fed infants.

Orally administered aqueous solutions, suspensions, emulsions, syrups etc. are among the preparations that are at the greatest risk of microbial contamination during consumption. These foods as well as paediatric oral liquid drug formulations may introduce pathogenic microorganisms to infants. Further, these pathogenic organisms may be highly detrimental for immuno-compromised infants. Therefore, microbiological quality of such oral liquid medicines is a very important factor for the above mentioned patients.

According to United States Pharmacopoeial standards, microbial contamination of the raw material should be not more than 10^3 viable micro-organisms per gram or per milliliter; total viable aerobic bacteria count not more than 10^4, fungi not more than 10^2 per gram or per milliliter, enterobacteria and certain other gram-negative bacteria not more than 10^2 per gram or per milliliter. Also these preparations should show absence of *Salmonella* (10 g or 10 ml), *Escherichia coli* (1 g or 1 ml) and *Staphylococcus aureus* (1 g or 1 ml) (USP-NF, 2008).

Many factors can increase microbial contamination during consumption includes improper storage conditions, unhygienic handling of the product, not following aseptic procedures when opening of the bottles and reconstituting. Air, water, reconstituting equipments, reconstituting personnel and the consumer can be taken as the major sources of microbial contamination of oral liquid drug formulations. There have been an increasing number of reports of infections due to above mentioned reasons (Adeshina *et al*., 2009).

Children might well not appreciate a medicine with an unpleasant taste. And it is not just about taste; unusual flavors, texture, mouth feel, color and smell; all add to the complex problem of giving medicines to children. Also with paediatrics there is a need often to provide for variation in dose and for swallowability. Both these are advanced by the use of liquid formulations (Morgan, 2009). Most commonly used oral liquid drug formulations for the paediatrics are aqueous solutions, suspensions, emulsions, syrups etc. They can be easily administered to paediatrics and allow dosage flexibility. Such oral liquid medicines must contain excepients suitable for paediatric use and ensure physical, chemical and microbiological stability (Salgado *et al*., 2005).

Therefore **objectives** of the present preliminary study was designed to evaluate the microbial quality (quantitative and qualitative identification of Staphylococci, Streptococci, *E. coli*) of Paracetamol (oral syrup), Salbutamol (oral syrup), Cephalexin (oral aqueous suspension / dry syrup), Amoxicillin (oral suspension), Lactulose (oral syrup) during consumption and changes of their organoleptic properties (pH/colour/odor) during the same period.

II. Methods and Materials

A. *Oral liquid solutions selected for the study*

Three bottles (triplicate) of the each from the following oral liquid medicines were taken (Paracetamol, Salbutamol,

Cephalexin, Amoxicillin and Lactulose).One bottle from the each was taken as the control and other two were taken as the test samples. Sample bottles of the infant oral liquid medicines were opened aseptically, according to their dose and frequency

(Salgado *et al*., 2005). In this study, dose regimen of infants was considered (Table 01) (BNF:Paediatrics, 2005).

Table 01 -The dose frequencies, dose and the consumption period for each oral liquid medicine

Oral liquid medicine	Consumption period	Dose			Dose frequency		
		Infants	Children 1–5 yrs	Children 6–14 yrs	Infants	Children 1–5 yrs	Children 6–14 yrs
Paracetamol	3 days	60-120 mg	250 mg	500 mg	8 hrly	6 hrly	6 hrly
Salbutamol	3 days	100 mcg	1 mg	2 mg	6 hrly	6 hrly	6 hrly
Cephalexin	7 days	125 mg	125 mg	500 mg	bd	tds	Tds
Amoxicillin	5 days	62.5 mg	125 mg	250 mg	8 hrly	8 hrly	8 hrly
Lactulose	3 days	2.5 ml	5 ml	15 ml	bd	bd	Bd

B. Enumeration of microbial contaminants in paediatric solutions

The following selective and non selective culture media were employed for quantification and identification of the microbial contaminants: MacConkey Agar (Oxoid CM0007), Blood Agar (Oxoid CM0055), Sabouraud Dextrose Agar (Oxoid COM0041).

A dilution gradient (10^{-1} to 10^{-5}) of the original paediatric solutions was prepared in normal saline (0.9% NaCl) and 100 µl of each diluents and that of the original sample was cultured using spread plate method on above mentioned media in duplicates. Thereafter, the plates were incubated for 24 – 72 hours at 37 ^{0}C. Colonies were counted and number of viable cells in original sample and each diluent was expressed as colony forming units per mililitre (cfu/ml). Colony forming units per mililitre was calculated by using the following equation.

CFU/mL =CFU/plate x dilution factor x 1/aliquot

C. Identificaion of microbial contaminants in paediatric solutions

Solutions were analysed for the presence and absence of *S. aureus*, *Strepococcus*sp and *E. coli* and they were identified by using their Culture characteristics, morphological features by the Gram stain, catalase test, oxidase test and coagulase test.

D. Examination of organoleptic properties

Label information such as manufactured date, expiry date and batch number of the packaging were checked. The pH of the samples was determined by using a pH meter during consumption period and colour, odour, taste of the samples were tested by using the sense of organs.

III. RESULTS

A. Results in summary

Microbial growth was higher on blood agar medium than on Mackonkey agar medium. Significant microbial growth observed in Lactulose on the third consumption day. No growth observed in Salbutamol during the particular consumption period. Minute microbial growth observed in Paracetamol, Amoxicillin and Cephalexin during the consumption period. The microbial growth of Paracetamol was high in blood agar medium on the third consumption day comparing to Amoxicillin and Cephalexin.

E.coli and *streptococci* species observed in Paracetamol, Amoxicillin, Cephalexin and Lactulose except Salbutamol during the particular consumption period.

The results of microbiological quality assessment of samples are shown in table 02.

Table 02 - Microbial assessment during consumption period.

Drug	Consumption day	Mean Cfu/ mL in BA*	Mean Cfu/ mL in MA
Paracetamol syrup	1	120	0
	2	198	10
	3	925	60
	Control	0	0
Salbutamol syrup	1	0	0
	2	0	0
	3	0	0
	Control	0	0
Amoxicillin suspension	1	0	0
	3	0	0
	5	0	10
	Control	0	0

Cephalexin suspension	1	0	0
	3	0	10
	5	20	55
	Control	0	0
Lactulose syrup	1	850	10
	2	1322	55
	3	12733	55
	Control	145	0

*MA- Mackonkey Agar, BA- Blood Agar

The pH variations observed in Paracetamol, Amoxicillin, Cephalexin and Lactulose except Salbutamol during the particular consumption period. Slight colour change observed only in Lactulose during the second and the third consumption days.

Paracetamol showed a pH change of 0.06 compared to the control. The pH reduction of Amoxicillin suspension was 0.13 and pH reduction of Cephalexin suspension was 0.14 in the particular consumption period. The pH change of lactulose was 0.11 during the particular consumption period.

The results of organoleptic examination and pH determination during the particular consumption period are shown in Table 03.

Table 03 - Organoleptic examination and pH determination

Drug	Consumption period (Day)	Color	Odour	Taste	pH(mean)
Paracetamol syrup	1	Red	Strawberry	Sweet	4.35
	2	Red	Strawberry	Sweet	4.33
	3	Red	Strawberry	Sweet	4.30
	Control	Red	Strawberry	Sweet	4.36
Salbutamol syrup	1	Colorless	Soda smell	Pungent	3.18
	2	Colorless	Soda smell	Pungent	3.18
	3	Colorless	Soda smell	Pungent	3.18
	Control	Colorless	Soda smell	Pungent	3.18
Amoxicillin suspension	1	Yellowish green	Fruity smell	Sweet	4.60
	3	Yellowish green	Fruity smell	Sweet	4.55
	5	Yellowish green	Fruity smell	Sweet	4.49
	Control	Yellowish green	Fruity smell	Sweet	4.62
Cephalexin suspension	1	Orange	Fruity smell	Sweet	5.25
	3	Orange	Fruity smell	Sweet	5.20
	5	Orange	Fruity smell	Sweet	5.17
	Control	Orange	Fruity smell	Sweet	5.27
Lactulose syrup	1	Yellow	No	Sweet	3.68
	2	Yellow	No	Sweet	3.67
	3	Dark yellow	No	Sweet	3.57
	Control	Light yellow	No	Sweet	3.70

IV. DISCUSSION

The present preliminary study to evaluate the microbiological quality of paediatric oral liquid drug formulations during consumption is an indicator to identify the potential co-infections of paediatric patients. Syrups, suspensions, emulsions and solutions can be taken as the most common oral drug formulations that are used by paediatric patients. Children, neonates and infants differ from adults in their response to drugs. Therefore special care is needed in the consumption period of a paediatric drug to reduce secondary infections because the immune system of paediatric patients is immature. For this study three commercially available paediatric syrups and two commercially available suspensions were used.

This preliminary study has identified drug formulations which had high sweet taste are at a greater risk of microbial contamination during consumption due to consecutive bottle opening for drug administration. In microbial assessment, different culture media has been employed to identify the growth of micro-organisms. MacConkey Agar is used to isolate and differentiate members of the *Enterobacteriaceae* based on the ability to ferment lactose. This is a selective and differential medium containing lactose, bile salt, neutral red, and crystal violet. Bile salt and crystal violet inhibit the growth of gram positive bacteria.

Blood Agar is a bacterial growth medium that can be used to distinguish normal from pathogenic bacteria based on the effect of bacterial hemolytic enzymes on red blood cells. Blood Agar is a culture medium consisting of blood (usually sheep's blood) and

nutrient agar, used in bacteriology to cultivate certain microorganisms, including *Staphylococcus epidermidis, Streptococcus pneumoniae,* and *Clostridium perfringens.* This medium is used for the isolation and cultivation of fastidious and slow growing, obligatory anaerobic bacteria from a variety of clinical and nonclinical materials. It also supports good growth of most aerobic, facultatively anaerobic and micro-aerophilic bacteria if incubated appropriately. Sabauraud's dextrose agar is a culture medium for fungi, containing peptone agar and glucose that has the pH adjusted to 5.6.

Considering the results of microbial assessment in Table-02 microbial contamination was observed in all other commercially available paediatric liquid medicines except Salbutamol. The growth of lactose fermenters and fastidious organisms were identified in Paracetamol syrup during the consumption period. This may be due to the sweetening agents included in the preparation, but the number of colony forming units per mililitre of bacteria is not significant according to the standards (viable bacteria $< 10^3$ and yeasts $< 10^2$). No microbial growth was identified in Salbutamol syrup. This is because of adequately added antimicrobial preservatives in the drug formulation.

For microbial assessment of suspensions, Amoxicillin and Cephalexin were selected. They are antibiotic suspensions catergorized under peniciilins and cephalasporins respectively. Amoxicillin is active against gram positive aerobes, gram positive anaerobes and gram negative aerobes. But Amoxicillin is susceptible for degradation by beta lactamases, therefore the spectrum of activity of this preparation does not include organisms which produce these enzymes, including resistant *staphylococci* and all strains of *Pseudomonas*, *Klebsiella*, and *Enterobacter*. Very minute numbers of microorganism colonies were identified in this reconstituted preparation because of its extended microbial spectrum. The less number of cfu/ml of bacteria may be due to reconstitutional contaminations. Lactose fermenters which were identified during the consumption may be resistant to Amoxicillin, thereby resistant organisms can go into body and lead to cause drug resistance in the future administration. This can be a health hazard to paediatric patients. Cephalexin belongs to the first generation of cephalasporins active against gram positive organisms and has a limited activity against gram negative organisms. Some strains of *Escherichia coli, Klebsiella species, Proteus mirabilis* are susceptible for this drug. Therefore the growth of microbes in the preparation can be resistant organisms. Consuming such preparation may lead to drug resistance and serious health hazards in the future. But the number of cfu/ml of bacteria was not significant according to the standards mentioned in USP.

Microbial contamination is very high in Lactulose syrup during the consumption period. Lactulose syrup contains lactulose with other sugars such as galactose and lactose is used in the treatment of constipation and hepatic encephalopathy. Lactulose is a disaccharide containing two sugar molecules bounded together, in here Fructose and Galactose. This is a solid substance, which is very soluble in water and has a sweet taste. It is very sticky and viscous. Sugar bases are favorable for microbial growth. One of the mechanisms of action of Lactulose is metabolizing lactulose by bacteria in colon. It can stimulate peristalsis and decrease stool transit time. There is no enzyme capable of hydrolyzing this disaccharide present in human gastro

intestinal tissue. Following administration by mouth, lactulose pass essentially unchanged in to large intestine. If it has metabolized earlier due to microbial contamination during consumption period, the patient may not get the desired therapeutic effect from the drug.

Microbial growth in liquid preparation may cause foul odour, turbidity and appearance. In this study, no colour, odour and taste differences were detected during the particular consumption period of Paracetamol, Amoxicillin, Salbutamol, Cephalexin except Lactulose. Considering the results that were obtained during the particular consumption period, (Table-03) slight differences in colour and viscosity was detected in Lactulose. This may be due to microbial byproducts of microbial contaminants during the consumption period.

High titers of microbial contamination of oral liquid drug preparation may cause spoilage of final product and health hazards to paediatric patients. Byproducts of microbial contamination may cause a change in the pH of liquid drug preparations and reduce the chemical stability and solubility of the drug. According to USP standards pH of Paracetamol ranges in between 3.8 to 6.1. When considering the results of pH determination of Paracetamol syrup during consumption period, it shows pH change of 0.06 compared to the control. But that pH reduction does not affect the standards and the pH of Paracetamol syrup lies within the standard range in the particular consumption period. No pH reduction observed in Salbutamol with comparing to the control during the consumption period. This may be due to the added preservatives and flavors in the preparation.

Amoxicillin and Cephalexin are two beta lactam antibiotic suspensions which have to be reconstituted before use. The pH reduction of Amoxicillin suspension is 0.13 and pH reduction of Cephalexin suspension is 0.14 in the particular consumption period, but according to the USP standards pH of Amoxicillin ranges in between 3.5 to 6 and pH of Cephalexin ranges in between 3 to 6. With reference to that, pH change of Amoxicillin and Cephalexin during the consumption period is not significant. This pH reduction may be due to chemical degradation of the preparation. When these medicines are once reconstituted Amoxicillin and Cephalexin can be used only for 14 and 7 days respectively.

Lactulose is sticky, viscous syrup. The pH of Lactulose ranges between 2.5 to 6.5 according to the USP standards. The pH change is 0.11 during the particular consumption period. This can be due to microbial byproducts, but these pH values stand within the range of the standards and therefore pH change is negligible.

Liquid preparations are less portable and less stable. Therefore expiration dates tend to be shorter. Careful attention is required to assure that the pharmaceutical product will not allow a heavy microbial burden to develop on standing or under normal conditions of use once opened. Microbial contamination may be easily prevented by adding anti-microbial preservatives to the preparations. But high amount of preservatives can make toxicities in paediatric patients. Suitable preservatives should be added according to the standards. Also special care should be given when bottle opening in consumption and in drug reconstitution. Minimal opening time should minimize the microbial contamination during the consumption period. Finally

microbiological quality should be taken into account by caregivers when administering paediatric oral liquid drug formulations to their children.

V. CONCLUSION

This study has revealed that the microbial contamination is very high in Lactulose solution during the consumption period. *E.coli* and *streptococci* species were found in Paracetamol, Amoxicillin, Cephalexin and Lactulose except Salbutamol.

Addition to the above, this study has identified that good microbial quality of paediatric oral liquid drug formulations can be maintained by careful opening of the bottles during consumption period. However, the presence of sweetening agents makes the formulations susceptible for microbial contamination even when stored at particular conditions. Consecutive bottle opening, air, water, reconstituting equipments, reconstituting personnel and the consumers are the factors leading to microbial contamination. Therefore microbiological quality of oral liquid drug formulations is a crucial issue to be considered when paediatric patients consume them.

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Increased Prevalence of Obesity and Fragmented Germ Cells with Reduced Endogenous Estrogen: Androgen

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Abstract- Back ground: Era of contraception, abortions, [20th, 21st centuries] implemented as family welfare schemes, witnessed increased global prevalence of obesity.

Objectives: Altruistic association of contraception [if any], with increasing obesity, was sought after.

Methods: In 2012, retrospective analysis of, prevalence of obesity in 350 patients of 20-35 years, 35-50 years, >50 years age groups, from data collected by convenient, stratified random sampling, from different geographical locations, between 2003-2012 and its association with presence, absence of contraception, abortion was undertaken; simultaneously, serum oestrogen levels obtained from 105 patients, was also analyzed.

Results: Contraception status was associated with 3 fold increase in obesity [without secondary sexual dimorphism] among 20-35 years with a p value of <0.025; 6 fold increase in obesity among 35-50 years with a p value of <0.0005; 1.5 fold increase in obesity among >50 years with a p value of <0.001.

Cholesterol deprived diet without contraception was associated with 10 fold increase in obesity among <20 years including adolescents with a p value of <0.0005.

Endogenous oestrogen was reduced below normal in 61% of contraceptive users, with a p value of <0.0005; 25% of contraceptive users had low normal levels of serum oestrogen.

Conclusion: Concept is acquired contraception, abortion status, with smashed fragmentation of germ cells, consequent reduced endogenous oestrogen: androgen, results in defaulted genomic repertoire, deranged cell cycle, cell metabolism, consequent increased incidence of obesity as part of metabolic syndrome.

Cholesterol deprived diet with resultant decreased endogenous oestrogen: androgen synthesis, consequent deranged cell metabolism results in obesity; tight attires around pelvis causing thermogenic destruction of germ cells with consequent reduction of endogenous oestrogen: androgen also can lead to defaults in genomic repertoire and obesity.

Physiological genomic repertoire, cell cycle of growth differentiation controlled multiplication, cell metabolism, is dependent upon endogenous oestrogen: androgen surveillance; hence reduced endogenous oestrogen: androgen surveillance results in metabolic syndrome and resultant obesity.

Contraception reversal slimmed obesity remarkably, as a cause and effect phenomenon.

Index Terms- without secondary sexual dimorphism; germ cell fragmentation; contraception reversal [medical miracle]; autologous germ cell replant; endogenous oestrogen.

I. INTRODUCTION

People in ~1989 complained of weight gain, low back aches and were attributing to aftermath of puerperal permanent sterilization, though ignored by medical personnel, since contraception was presumed to be without side effects, [permitted by Life Sciences, without evidence base or studies prior to or after implementation of family welfare schemes, implemented without therapeutic indication,] and the contraceptive procedures as such were uneventful. Global incidence of diseases including obesity was rising; hence an altruistic analysis was planned to assess, if any correlation existed with global implementation of contraception and rising incidence of diseases including obesity.

II. METHODS

As advised by a scientist, 30 sample size being essential for statistical analysis, minimum of 30 samples was planned for, in each of 3 age groups, namely 20-35 years, 36-50 years, >50years; though people from the community are visiting the hospital, analysis of hospital patients alone can create a bias, hence data from the community, hospital, health screening camps, of different geographical locations were included; data from each person depicted, prevalent diseases, status of contraception, hysterectomy, type of oil ingested, life style, level of nutrition, presence of anaemia; the data was tabulated as prevalent diseases, matched against the variables in each age group; retrospective bioinformatics analysis was done, by plotting histograms for the 3 age groups and cumulative graphs for each disease in 2012; an example of tabulation of the data is provided in the supplementary file.

In 2003 house to house survey in the community, spread over 3 weeks, was conducted by the corresponding author, to collect data of prevalent diseases of 100 people; the people who were present during the survey were included at random, by convenient sampling into the 3 age groups namely 20-35 years, 35-50 years, >50 years, to include a minimum of 30 people in each age group; serum oestrogen estimation was done for 12 people as per their request; the reduced oestrogen levels [5-8pgm] found in young contraceptive users, was the eye opener, leading to further data analysis.

In 2004 data of 93 hospital patients was collected over a period of 6 months, including diseases prevalent, contraception status, life style, nutrition, type of oil ingested, level of haemoglobin and were assigned to the 3 age groups by stratified random sampling with a minimum of 30 patients in each age group; serum oestrogen estimation was done for all 93 patients;

the data was tabulated matching diseases against status of contraception and other variables; one patient was a foreign national.

In 2011, 96 people [43 couples] working in different states of our nation had attended a health screening camp conducted in the community, spread over 3 days and their data was analyzed after assigning into the 3 age groups at random, for association of diseases with status of contraception, hysterectomy and other variables; effect of contraception in both partners after contraception also could be analyzed; none had sedentary life style, low nutrition or anaemia or had worn tight attires around the pelvis.

In 2012, data of 61 hospital patients including a foreign resident, from another geographical location, was collected over a span of 6 months, assigned to the 3 age groups at random and was pooled to the other data from 2003, 2004, 2011 and retrospective bio informatics analysis was undertaken for the 350 patients in 2012, by plotting histogram for the 3 age groups and cumulative graphs for each disease.

Data of 94 obese patients seen in clinical practice from 1989-2012 were grouped at random to the three age groups and the association of contraception status, consumption of cholesterol deprived diet with obesity was analyzed retrospectively.

Every participant was informed about their data being included for study purpose and the concerned hospital authorities were also informed; an engineering college student of Karunya University did the bio informatics analysis as his project.

III. RESULTS

Contraception status was associated with 3 fold increase in obesity [without secondary sexual dimorphism] among 20-35 years with a p value of <0.025; contraception was associated with 6 fold increase in obesity among 35-50 years with a p value of <0.0005; contraception was associated with 1.5 fold increase in obesity among >50 years with a p value of <0.001 figure 1

Cholesterol deprived diet [consumption of refined, bleached, cholesterol depleted ground nut oil, gingili oil, palmolein oil, coconut oil, sunflower oil] without contraception was associated with 10 fold increase in obesity among <20 years including adolescents with a p value of <0.0005 figure 2.

Endogenous oestrogen was reduced below normal in 61% of contraceptive users, with a p value of <0.0005; 25% of contraceptive users had low normal levels of serum oestrogen [figure-3]

275% increased prevalence of total diseases was seen among contraceptive users (colour figures-supplementary file)

Two subsets of population were emerging one with, the other without contraception with significant differences in incidence of diseases and associated decreased endogenous oestrogen.

Morbid obesity with loss of secondary sexual dimorphism i.e. >40 kg/m2 body mass index, presenting with hypoventilation syndromes was seen with 25-35 fold increase among contraception users only with a p value of <0.0005, who were also on cholesterol deprived diet i.e. consuming sunflower oil[sunflower seed has 6 times less vitamin E than ground nut seed], cholesterol depleted ground nut oil, refined gingili oil, bleached coconut oil, cholesterol depleted palmolein oil (cholesterol deprived diet) figure-2

Tight attires were associated with overweight attributing thermogenic destruction of germ cells with consequent reduced endogenous oestrogen: androgen with absolute significance.

People without contraception, on normal diet showed no obesity but physiological weight gain only above 50 years, when the endogenous hormones dip to 15pg from100- 300pg at 17 yrs of age.

~30 people could undergo tubal recanalisation for medical grounds, (patients fear surgery, non existing protocols, policies to recanalyze due to lack of awareness of health restoration, therapy effectiveness, with contraception reversal) ~5 patients had removal of Copper-t, of these 15% had overweight, 25% had normal weight, 60% were obese; Contraception reversal as a cause and effect phenomenon resulted in, 100% obvious, remarkable slimming, (with pleasurable difficulty to recognize them) restoring secondary sexual character build with fertile beauty, health, within 15 days without any other medications [figure-supplementary file.]

Tubal recanalisation restored survival of germ cells (autologous germ cell replant effect), 79.9%retrieval of increase in endogenous oestrogen.

Unfortunately over obese people have not undergone tubal recanalisation yet, persuasion, recommendation is being continued; that's the pity of permanent methods of sterilization requiring surgical corrections to reverse contraception, which my dear mother land has adapted mainly; Indians face early demise, epidemic of obesity (clear reflection of the global scenario) unless global health policies to implement global contraception reversal is considered with urgency.

IV. DISCUSSION

Body mass index >25kg/m2 is considered overweight, >30kg/m2 is considered obese, >40kg/m2 is considered over obese [1] prevalence of obesity has increased for the past 20 years; there has been little success in describing genetic disposition to general obesity using genetic probes to scan the human genome for loci; leptin an adipose tissue derived hormone was originally thought to be the homeostatic factor for maintaining body weight; changes in mortality are difficult to analyze in association with obesity; an association of obesity is seen with increased incidence of cancers of colorectal region, gallbladder, biliary tract, prostate, endometrial tissue, and cervix; increased incidence of type 2 diabetes mellitus, systemic hypertension, dyslipidemias, coronary artery disease, obstructive sleep apnea are also seen with obesity; 14%increased cancer deaths are observed in men with obesity, 20%increase in cancer deaths in women with obesity is observed; obesity cannot be treated in isolation; prevalence of obesity in American adult population with body mass index of >30kg/m2 has increased from 14.5% (1976-1980) to 33.9%(between 2007-2008); 68% of adults in united states are over weight i.e. body mass index of >25kg\m2; over obesity affects 5-7% of people; increased obesity is seen in blacks, poor [2] and Hispanics; increased prevalence of obesity in children is a global concern.

Bodyweight is regulated by complex interplay of neurohumoral factors; major regulator of this adaptive between energy intake, energy expenditure is adipocyte derived hormone leptin which acts through brain circuits predominantly in the

hypothalamus to influence appetite, energy expenditure and neuroendocrine functions (including ovarian cyclical function, endogenous oestrogen);

Appetite is influenced by neural afferents like vagal inputs, hormones like insulin, cortisol, gut peptides like ghrelin expression, release of hypothalamic peptides e.g. neuropeptide gamma, agouti related peptide, melanin stimulating hormone.

Daily energy expenditure is by adaptive thermo genesis i.e. 70% (significant component of energy consumption is fixed) is used for basal metabolic rate, 5-10% for physical activity;

Exquisite regulation of energy balance cannot be monitored easily by calorie counting in relation to physical activity.

Adipose tissue is composed of the lipid storing adipose cell, stromal vascular compartment in which pre adipocyte, macrophages reside; adipose mass increases by enlargement of adipose cells through lipid deposition, increase in number of adipocyte; obese adipocyte has increased number of infiltrating macrophages; adipose cells are derived from mesenchymal preadipocytes through orchestrated series of differentiation, steps mediated by cascade of specific transcription factors e.g. peroxisome proliferators activated receptor gamma.

Adipocyte is an endocrine cell that releases numerous molecules in a regulated fashion-energy balance regulating hormone leptin, cytokines e.g. tumour necrosis factor alpha, interleukin 6, complement factors as factor D (adipsin), prothrombotic agents such as plasminogen activator inhibitor 1, angiotensinogen; adiponectin decreases in obesity, resistin and RBP4 are increased in obesity; although molecular pathways regulating energy balance are beginning to be illuminated, the cause of obesity (what leads to the derangement of these marvellous molecular pathways)remains elusive;

Heritability of bodyweight is similar to height; prevalence of obesity in the United States of America is far too rapid to be due to changes in the gene pool; environmental factors play a role; in industrial society poor women are obese, in underdeveloped countries rich women are obese; 80% of patients with diabetes mellitus are obese, not all obese have diabetes mellitus.

Obesity hypoventilation syndromes [3] with a body mass index of >30kg/m2, sleep disordered breathing, chronic day time hypoventilation producing hypercapnia of >45mmhg, hypoxemia of<70mmhg is suggested to be estimated in more than 5 lakh individuals in United States of America; global obesity epidemic persists.

The concept is contraception, abortion results in smashed fragmentation of germ cells with consequent reduction of endogenous oestrogen: androgen leading to defaulted genomic repertoire, deranged cell metabolism and obesity as part of metabolic syndrome; germ cells: slender chromatids by union(fertilization) stem to life, by orchestrisation of cell cycle with their organelles, to form organs, systems its marvel physiology being governed by endogenous oestrogen[4] androgen surveillance; this wonderful fertility is targeted by contraception (believed to be harmless without evidence)rendering smashed fragmentation of germ cells [5] with resultant decreased hormonal surveillance for cell cycle, cell metabolism, leading to disharmony, degeneration, deregulation, derangement of cell, organelle, neurohumoral transmitters, mediators, cytokines, peptides, interleukins` functions resulting in varied pathologies including unexplained Obesity. How will the unaware,

microscopic germ cell destruction not but produce these afore mentioned pathologies?!; decades of globally increased prevalence of diseases with millions of deceased young lives illuminate this possibility; should reluctance to admit still these facts, perpetuate our failure in effective therapy in spite of advanced technologies unlike earlier century the era before contraception; because once the aetiology is addressed our therapy can be made effective by cell`s optimum function to heal-genomic repertoire but not after contraception with cell`s early degeneration.[we can only suture, healing is God ordained in the cells;] people using contraception equate to withered trees(with artificial iatrogenic acquired destruction of germ cells and consequent reduced endogenous hormones) and cannot heal optimally till we reverse contraception, to restore autologous germ cells function with endogenous oestrogen: androgen to revive optimum somatic cell, tissue functions to enhance recovery from diseases including obesity]

Retrospective analysis showed 275% increase in diseases (supplementary figure) including degenerative, neoplastic, autoimmune aetiologies among contraception users; 500% increase in prevalence of diseases after hysterectomy: orchidectomy as a result of germ cell destruction with resultant reduced endogenous oestrogen mediated by endorphins to the hypothalamic pituitary axis, leading to defaulted genomic repertoire and deranged cell metabolism.

Recommendation of cholesterol deprived diet (consumption of refined oil, bleached oil, sunflower oil with 6 times less vitamin E than groundnut oil) resulted in decreased availability of essential fatty acids, transferred from nuts, seeds harbouring baby plants, which are the moieties required for the synthesis of steroid hormones, [6] with resultant decreased endogenous oestrogen, androgen and increased degenerative diseases including obesity without secondary sexual dimorphism.

Concept is cholesterol was dammed from being converted to endogenous oestrogen, androgen due to contraception, absence of placenta of the foetus (capable of producing 4200pg of oestrogen during pregnancy); cholesterol was not the culprit but contraception with decreased hormones; further deprivation of essential cholesterol compounded problems.

Tight pelvic attires (e.g. jeans, tights, barrel, boot model, pencil cut) due to increased heat around the pelvic region similar to undescended testis effect (loss of cooling effect of dartos muscle, pelvic plexus of veins on the extremely fragile germ cells-slender chromatids, 1\2 cell performing alone) results in loss of viability of germ cells with decreased hormones, resultant obesity without secondary sexual dimorphism; viability of germ cells is lost with 100% carcinogenesis and degenerative diseases also increase with absolute significance.

As a cause and effect phenomenon reversal of contraception including tubal recanalisation resulted in obesity slimming remarkably with restoration of secondary sexual dimorphism; over obesity with hypoventilation syndromes also can revert if surgeons can comprehend this, frame protocols, to revert contraception, reserve hysterectomy (associated with 500% increased prevalence of diseases) for cancer uterus, postpartum haemorrhage; to replace hysterectomy with myomectomy, pelvic floor repair coupled with tubal recanalisation; hysterectomy, orchidectomy are paths of no return (unlike contraception which

can be reverted)with higher reduction of endogenous hormones,[0.4pg] associated with 500% increased diseases.

V. CONCLUSION

Contraception of any form with decreased endogenous hormones, iatrogenic destruction of germ cells results in 6 fold increase in obesity, [both life partners are affected] with a p value of <0.0005.

Contraception users, coupled with cholesterol deprived diet manifest 30 fold increase in morbid over obesity without secondary sexual dimorphism with a p value of <0.0005 since cholesterol is the basic moiety for steroid hormone synthesis including endogenous oestrogen: androgen.

Cholesterol deprived diet from childhood, due to decreased reproductive hormone synthesis results in obesity in children, adolescents.

Tight pelvic attires due to thermogenic destruction of extremely fragile germ cells, reduced hormones, lead to obesity including childhood.

Contraception reversal as a causal-effect phenomena slims obesity, reverts other diseases by restoring germ cells survival as autologous germ cells replant, endogenous hormones by-79.9% in addition to essential cholesterol, fatty acids rich diet.

Normal diet consumption, non contraception users did not exhibit obesity or increased diseases as in the era before contraception.

Key Points:

• Contraception increases obesity incidence 6 fold with a p value of <0.0005

• Contraception coupled with cholesterol deprived diet results in increase in over obesity 30 fold with a p value of <0.0005

• Cholesterol deprived diet, tight pelvic attires, result in childhood obesity.

• Reversal of contraception, slims obesity with added low density lipoprotein rich, essential fatty acids rich diet
Conflicts of Interests: None Declared

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Diseases/morbidity-contraception/hysterectomy.
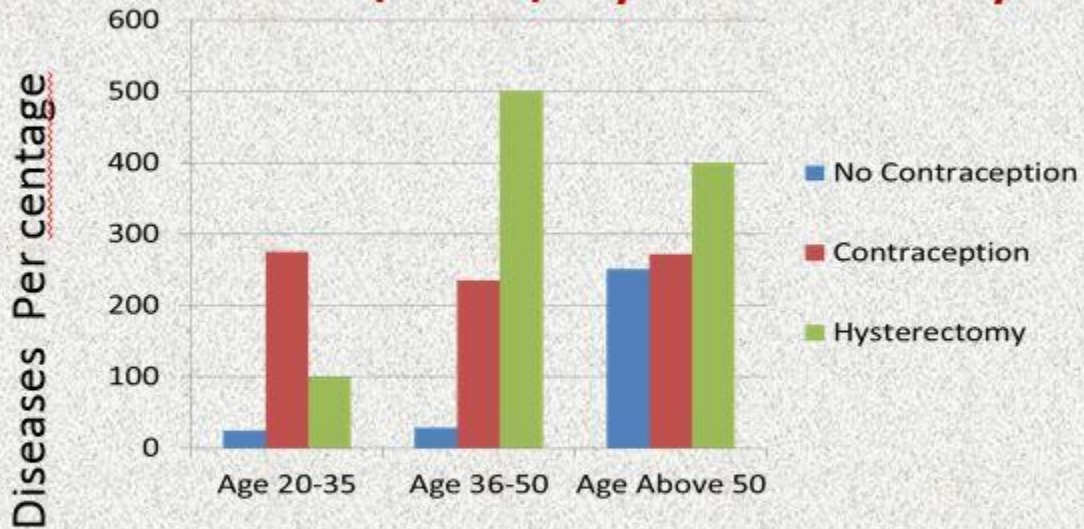
Tubal Recanalization – mandatory/essential - will return life factors – result in decreased diseases. Hysterectomy should be reserved only for PPH/Uterine Cancers. Hysterectomy to be replaced by tubal-recanalization, myomectomy, Pelvic Floor Repair.
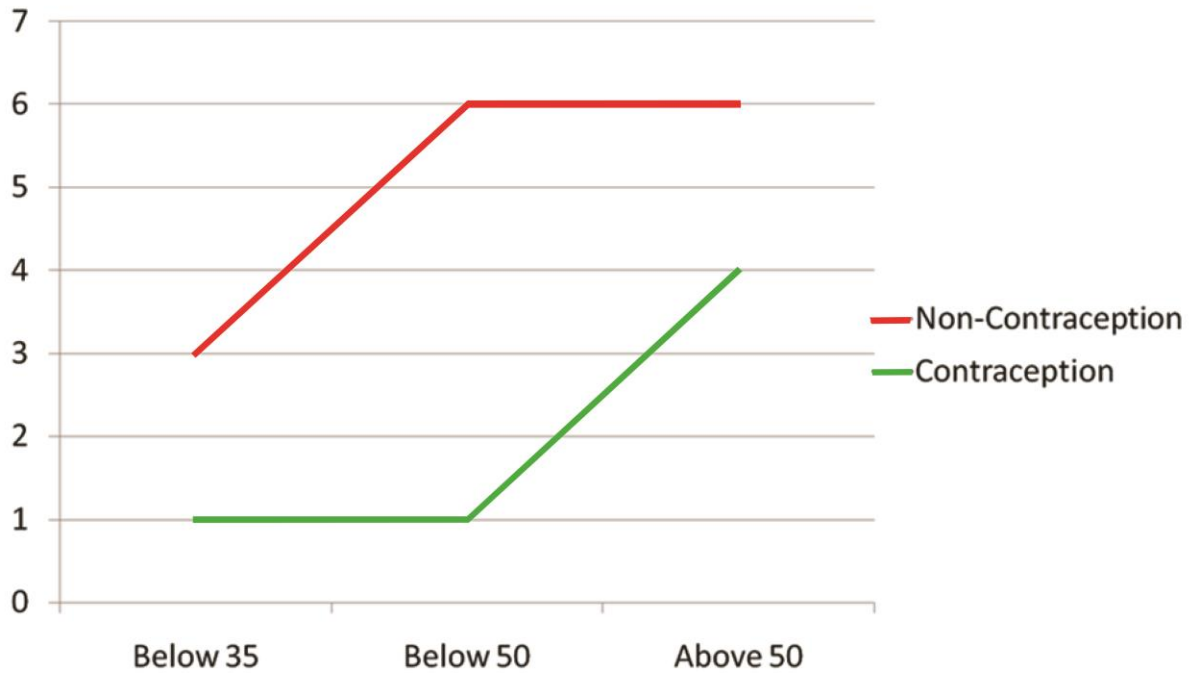
Cumulative distribution obesity across age.

Low Estrogen Level and contraception
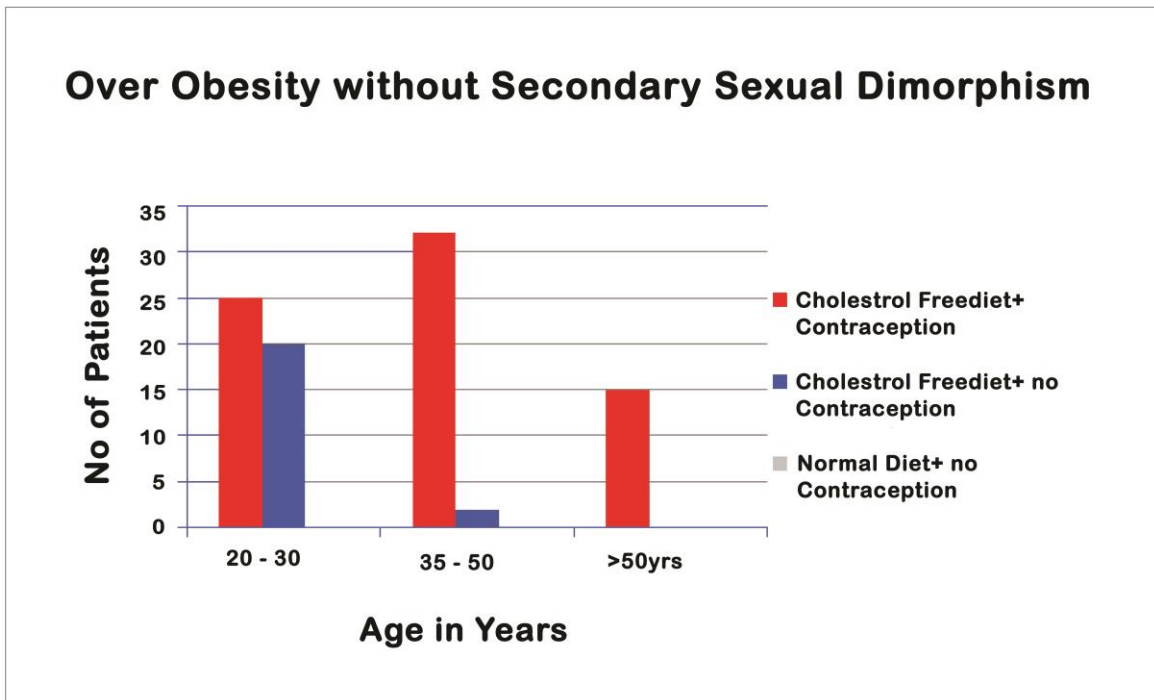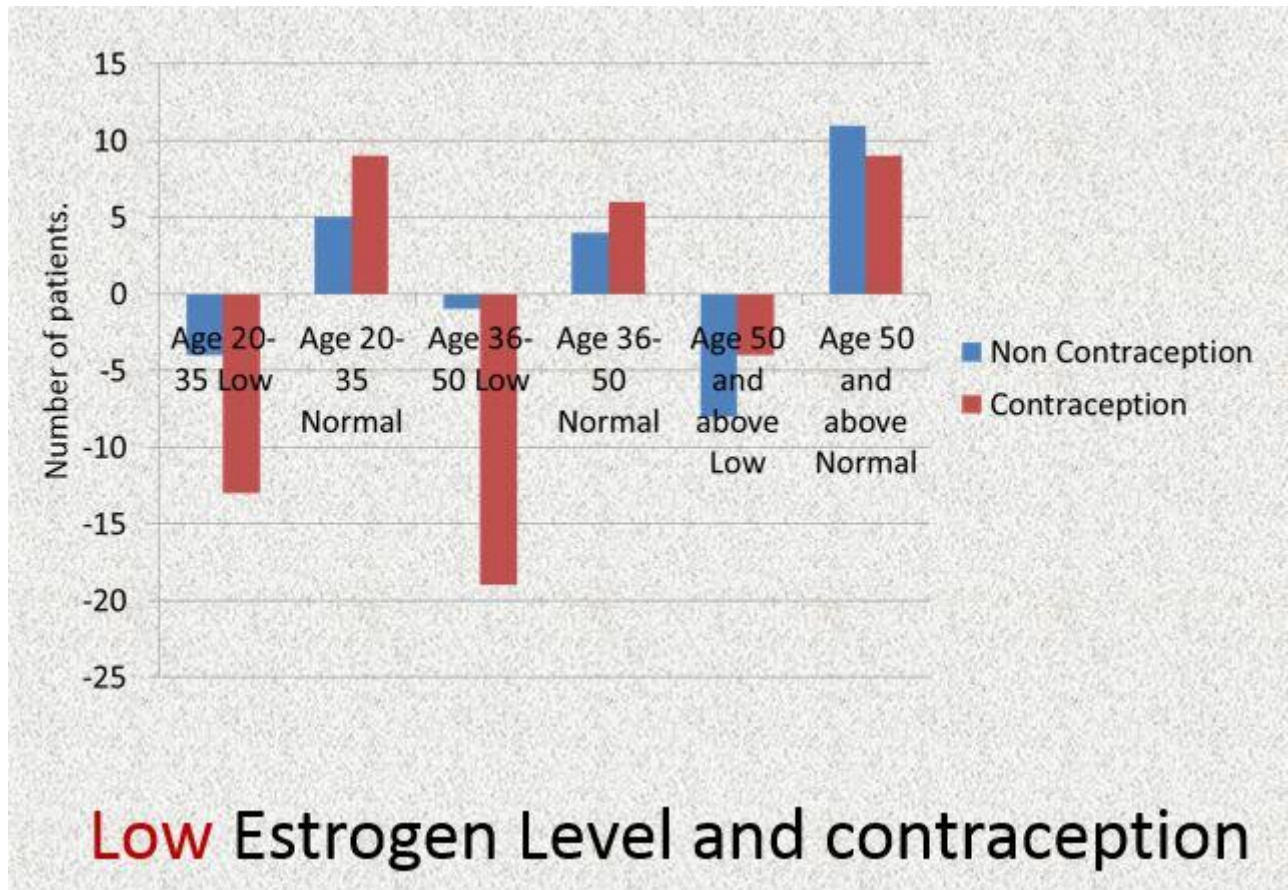
Basic Multicopter Control with Inertial Sensors

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Abstract- In the world of photography, surveillance of larger areas and military operations, the immediate machines that accommodate the Unmanned Aerial Vehicle (UAV) category are the autonomous aeroplane and helicopter. Helicopters have clear advantages over the aeroplanes. They can be able to hover and land/take off in limited spaces. The quad rotor is a helicopter that has four rotors which are fixed to a certain spin axis. The different spinning directions of the motors balance the torques on their associated axes, therefore eliminating the need for a tail rotor that a normal helicopter requires. As long as all four rotors rotate at the same speed, the quad rotor helicopter essentially hovers, this proving to be a less complex in mechanical structure. Researches are being done to improve the reliability and decrease the size of such vehicles. So, they can be used in Search and Rescue operations, surveillance, inspection, aerial photography and aerial mapping.

I. INTRODUCTION

Quadcopter is a flying vehicle with six degrees of freedom which uses four rotors to push air downwards and to create a thrust force for keeping the quadcopter on the air. The pilot or flight control unit will control the orientation and tile of the multicopter by reading the data from the sensors. Gyro, accelerometer, magnetometer or GPS can be used to sense the tile, orientation and position of the vehicle.

In the quadcopter, flight controller unit (FCU) is the heart of its control system. The (FCU) will control the different motors speeds with its different PWM outputs. The FCU will control the vehicle in the air by taking information from sensors such as barometer, magnetometer, accelerometer, gyro and GPS. Sometime radio remote control is used to control the vehicle. In the actual world the radio remote control is similar to ground control station and the FCU is similar to a pilot. Even when the information from the ground station is cutoff, the FCU can decide himself how the vehicle should be controlled. So we can say that is UAV.
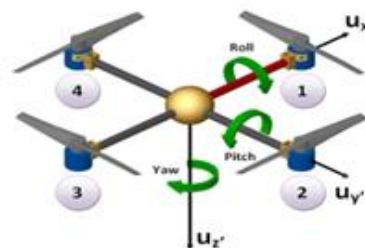
Figure 1. Yaw, pitch and roll rotations
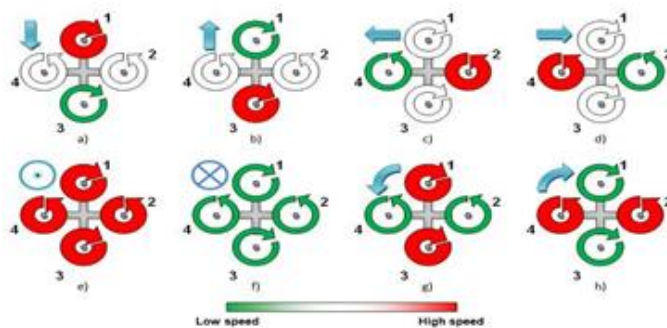
Figure 2. Multicopter's movements

Figure 3. Basic and simple multicopter control system

Overview of quadcopter control is described in this paper. In the basic control system of a quadcopter, a FCU, sensors and a radio remote control are included. In this system, if the FCU receives the command from the ground station, it can be able to place the vehicle at the exact position.

II.   CONTROL ARCHITECTURE

In designing the control system, control architecture plays as an important role and there are several issues, which have to be considered, such as efficiency, cross-coupling, responsiveness and complexity. There are several control systems. Among them, PID is one of the common used and powerful control systems because of its simplicity and reliability. PID algorithms will try to control the output of a system by minimizing the errors between the desired point and actual point. Proportional, integral and derivative are three terms which make up PID control and they are applied to each axis.
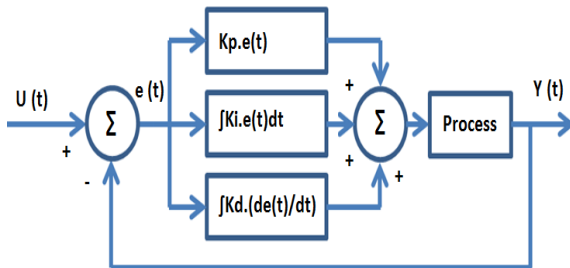
PID Controller
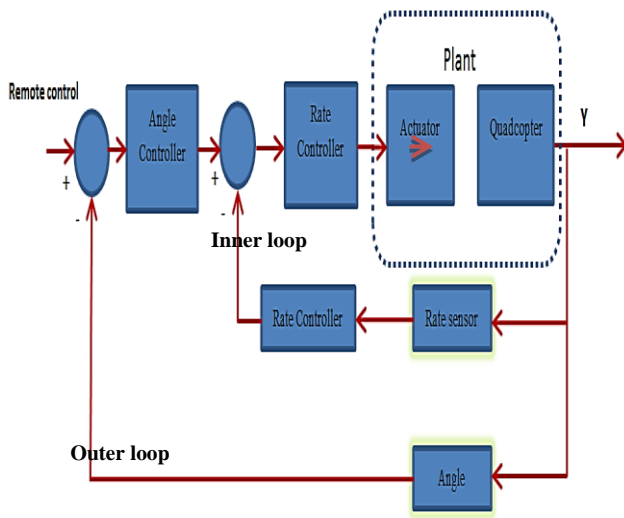
Overview PID Controller structure

There are two PID loops, inner loop and outer loop. The inner loop is for rate correction and the outer loop for angle errors correction. So, the quadcopter will approach to the desired angle by adjusting each rate of every axis.

III.   PID TUNING

Applying the PID algorithm may be easy, but the main challenge for PID control is tuning its constants (K_p, K_i, K_d). By tunning the constants we will ensure that the system behaves in a desired manner by reducing the errors as small as possible. There are several methods in which PID can be tuned. They are Ziegler

Nichols (Open and Closed loop) method, and Trial and Error method.

Tunning with trial and error method is very simple and easy for anyone and it can be done on the stand or string with the help of GUI before flying. After the PID tuning before flying, it is required to tune the PID controller while flying in the air. By mean of this, the quadcopter will be able to face or response the disturbances in the air.
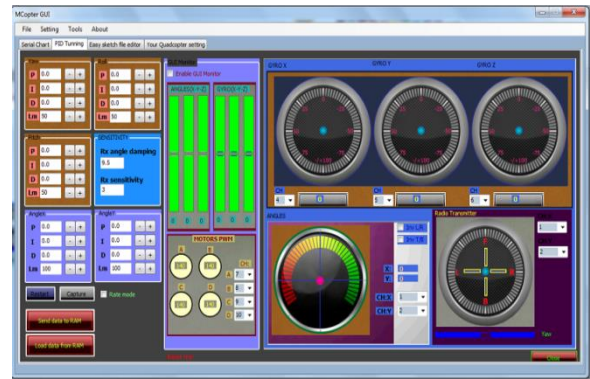
Tuning GUI for user

Testing on the string and the stand

IV.   SENSOR FILTERING AND ALTITUDE ESTIMATION

MPU6050 is chosen for sensing angles and rates due to low cost and its low power consumption and in which three axis MEMS accelerometer and gyro contained in a single chip.

Attitude estimation and sensor filtering are also important for a quadcopter because of the vibration effects produced by the great speed of four motors. For this purpose, a variety of sensor effects are used for estimation to get exact attitude and rate of the vehicle. This is called sensors fusion. Sensors fusion is a challenging technical barrier because it must take place in near-real time in order to be useful for stabilization. Hence, some considerations had to be taken into account when looking at various filtering methods to be used for sensor fusion. Simplicity and low computation complexity are the primary concern for choosing the algorithm.
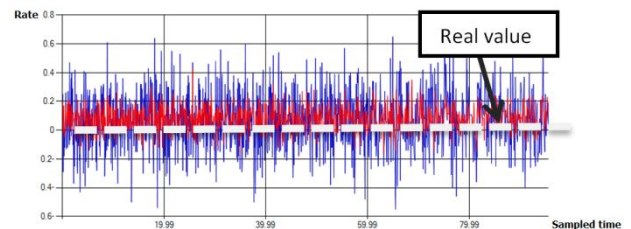
Noise effects due to motor speed

Figure-7 shows the noise produced by the grate speed of motors. The real values of rate should be at zero but it is vibrating between +/-0.6. This will cause difficulties to set D-gain because of its fast response. So, that noise should be removed and smooth before inputting to the PID controller.

The most common attitude estimation algorithms are Extended Kalman Filter, Non-linear and Linear Complementary filter and weighted average Infinite Impulse Response (IIR) filter. Sometime, median filter, low pass filter and high pass filter are also used to remove vibration effects.

V. KALMAN FILTER
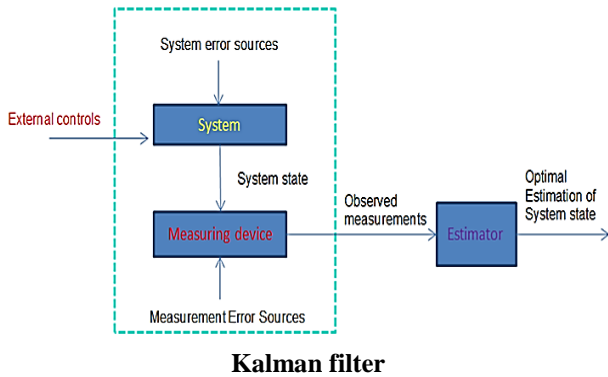
Kalman filter

The kalman filter works into two steps by prediction and Correction. From figure, let p and v be three-dimensional (3-D) position and velocity in earth-fixed frame, q the quaternion, and b the gyro bias. Let $R_{eb}(q)$ and $\Omega(q)$ be rotation matrix that converts body-fixed frame to earth-fixed frame and quaternion rates matrix, respectively, as a function of the unit quaternion. Let a stand for linear acceleration in body fixed frame and ω is the angular velocity in body-fixed frame. Then, the state equation in discrete time can be written as

$$x_k = \begin{bmatrix} p_k \\ v_k \\ q_k \\ b_k \end{bmatrix} = \begin{bmatrix} v_{k-1} \\ R_{eb}(q_{k-1}) \cdot a_{k-1} \\ \frac{1}{2}\Omega(q_{k-1}) \cdot \omega_{k-1} \\ w_{b,k-1} \end{bmatrix}. \tag{1}$$

In this equation, the gyro bias b is modeled with noise ω_b. The system input u consists of measurements of angular velocity ω_m and linear acceleration a_m:

$$u_k = \begin{bmatrix} \omega_{m,k} \\ a_{m,k} \end{bmatrix} = \begin{bmatrix} \omega_k - w_{\omega,k} + b_k \\ a_k - w_{a,k} - R_{eb}^T(q_k)[0\ 0g]^T \end{bmatrix}, \tag{2}$$

Where w_ω and w_a represent noise and g is gravitational acceleration. Substitution of (2) into (1) yields the following nonlinear model:

$$\begin{aligned} x_k &= f(x_{k-1}, u_{k-1}) + w_{k-1} \\ &= \begin{bmatrix} v_{k-1} \\ R_{eb}(q_{k-1})(a_{m,k-1} + w_{a,k-1}) + [0\ 0g]^T \\ \frac{1}{2}\Omega(q_{k-1})(\omega_{m,k-1} + w_{\omega,k-1} - b_{k-1}) \\ w_{b,k-1} \end{bmatrix}, \end{aligned} \tag{3}$$

Where $W_{k=}[w_{\omega,k}, w_{a,k}, w_{b,k}]^T$ is process noise. The nonlinear measurement model is (omit time index k for notational simplicity).

$$z_k = h(x_k) + v_k = \begin{bmatrix} p \\ v \\ m_b \\ h_b \end{bmatrix} = \begin{bmatrix} p \\ v \\ R_{eb}^T(q)m_e \\ -P_z \end{bmatrix}, \tag{4}$$

Where m_b is the measurement of the magnetic field of the earth m_e in body frame, h_b is the height measured by the barometric sensor reading P_z, and v_k is the measurement noise. The states are estimated by the standard EKF algorithm and measurements from accelerometers, gyroscopes and magnetometers are fused to estimate the states.

VI. LINEAR COMPLEMENTARY FILTER

Linear complementary filter on each axis of the accelerometer and gyroscope is shown in Figure-9. It is designed to fuse multiple independent noisy measurements of the same signal that have complementary spectral characteristics. Let y_u be the rate measurement of the angle Θ and y_x the angle measured by accelerometer. The complementary filter to estimate the angle Θ is given by

$$\dot{\hat{\theta}} = y_u + k_p(y_x - \hat{\theta}), \tag{5}$$

Where $\hat{\Theta}$ represents the estimate of Θ and k_p is a gain that determines crossover frequency. This complementary filter assumes that there is no steady-state estimation error. Nevertheless, in practice, the gyro bias changes over time. To compensate for this, an integrator is added to obtain the following:

$$\dot{\hat{\theta}} = y_u - \hat{b} + k_p(y_x - \hat{\theta}), \tag{6}$$

$$\dot{\hat{b}} = -k_I(y_x - \hat{\theta}). \tag{7}$$
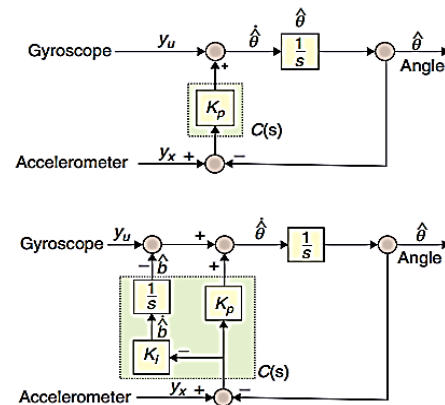
The two type of complementary filter(without bias compensation and with bias compensation)
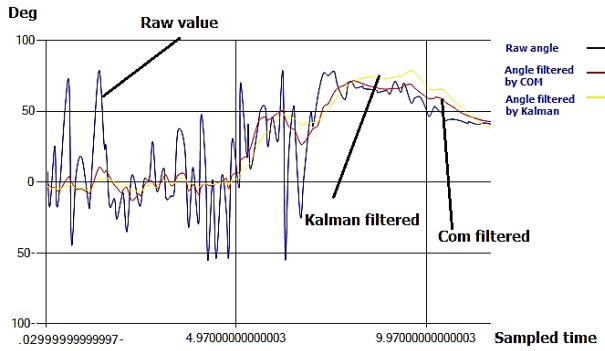
COM and Kalman filter comparasion graph

By this figure, the output results of complementary filter and kalman filter are similarly. So, complementary filter can also be choosen to reduce computation complexity.
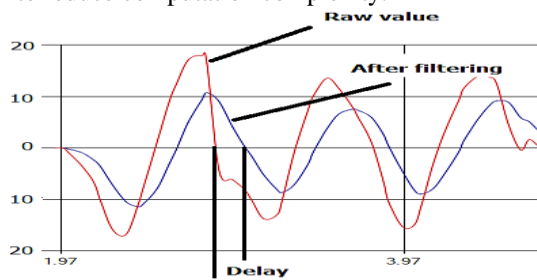
Delay due to filtering process

The next problem for filtering process is its delay. Figure-11 shows the raw value and filtered value. In which the value is smooth but it late with some delay due to its filtering process. So, it is need to be considered to reduce this delay as much as possible. If not the controller will react lately and it will produce lower frequency oscillation and never reach to the setpoint.

VII. PARTS REQUIREMENTS FOR BASIC UAV QUADCOPTER

The basic requirements for a basic quadcopter control system testing are shown in figure-12.
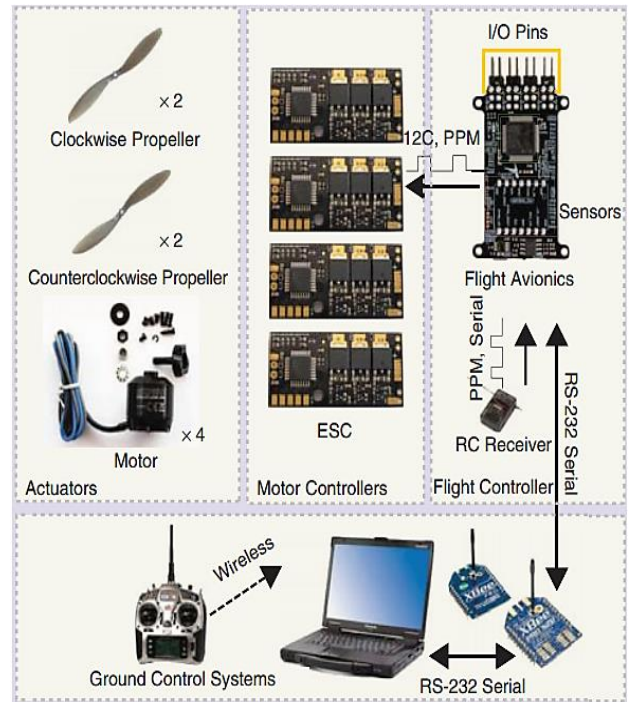
Figure 13. Parts requirements to built a simple multicopter

VIII. QUADCOPTER USING ARDUINO UNO AND MPU6050

Quadcopter project using MPU6050 sensor and Arduino Uno is shown in figure. This project includes GUI (for PID tunning and real time debugging), quadcopter and Radio control. The users can choice the controller mode (Rate mode or Angle correction mode). At rate mode; the controller will control the quadcopter with only inner loop and at angle correction mode; the controller will control the quadcopter with outer loop and inner loop combination.

Complete controller board

Quadcopter tunning GUI written iny visual basic

FCU assembled on the homemade aluminium and DJI frame
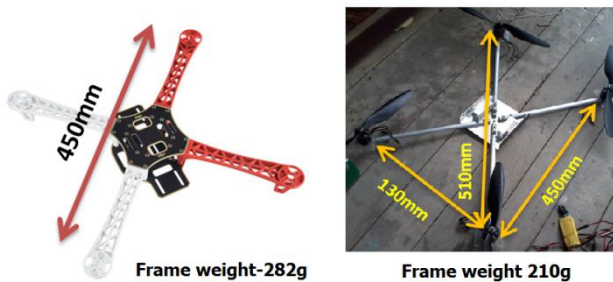
Flame Wheel 450 (F450) and aluminium frame

IX. CONCLUSION

Recently, there has been increasing interest in quadrotor Unmanned Aerial Vehicle. Exciting videos have been published on the Internet by many research groups and have attracted much attention from the public. This journal is proposed the overview of UAV platform and the basic of UAV system, so no GPS and other effective sensors are not included. The effective changes in hardware and software can give high stability and reliability in UAV system.

The stability of quadcopter will depend on the PID Tunning. It is need to be tuned the flight controller with each different body frame. Testing on the stand cannot give the correct PID gain because of its friction on each joint.

ACKNOWLEDGMENT

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Study of Morphological Variations of Suprascapular Notch in Human Dry Scapulae of South Indians.

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Abstract- The superior margin of the scapula is thin and sharp and is the shortest of the three. It is interrupted by the scapular notch, which lies very close to the root of the coracoid process. This notch is bridged by the superior transverse scapular ligament, thus converting it into a foramen. The shape of the suprascapular notch is one of the important predisposing factor for the suprascapular nerve entrapment. The present study was done by observing 112 human dried scapulae. Type IV was the most common type with 40 (35.71 %) scapulae, whereas type V was the least observed type with just two (1.79 %) scapulae. The reason for the different shape of suprascapular notch can be probably explained from the point of ossification of corocoid process and other bony parts in and around the suprascapular notch. Knowledge of suprascapular notch variations may be essential for surgeons performing SN decompression, especially by means of endoscopic techniques.

Index Terms- Corocoid process, Entrapment, Scapula, Suprascapular nerve, Suprascapular notch.

I. INTRODUCTION

Scapula also known as the shoulder blade is triangular in shape and is the fulcrum and basis of all the motions of the humerus. Its peculiar shape has always been a point of attraction to many Anatomists. The superior margin of the scapula is thin and sharp and is the shortest of the three. It is interrupted by the scapular notch, which lies very close to the root of the coracoid process. This notch is bridged by the superior transverse scapular ligament, thus converting it into a foramen. The suprascapular nerve, one among the two branches from the upper trunk of the brachial plexus passes through the suprascapular foramen and supplies supraspinatus descends lateral to the scapular spine in the spinoglenoid notch along with suprascapular vessels and enters the infraspinous fossa and then it supplies infraspinatus and gives a twig to the shoulder joint also[1].

Superior transverse scapular ligament sometimes get ossified and convert the notch in to complete foramen. Entrapment of the suprascapular nerve is seen whenever there is formation of complete suprascapular foramen. This suprascapular nerve entrapment syndrome was first described by Kopell and Thompson[2]. This disease is characterized by pain in the posterolateral region of the shoulder (characterized as a dull ache), atrophy of the infra- and supraspinatus muscles and weakness of the arm's external rotation and abduction[3].

The shape of the suprascapular notch is one of the important predisposing factor for the suprascapular nerve entrapment, this condition is more commonly seen in some athletes like volleyball players and baseball pitchers[4]. Hence, the study of variations in the shape of suprascapular notch become important.

Table 1: showing the classification of suprascapular notch into six types based on its shape by Rengachary[5] et al

Type of notch	Shape of the notch
Type I	A wide depression from the medial superior angle to the base of the spine.
Type II	A wide blunted V shaped notch along the superior border at the scapula.
Type III	A symmetrical U shape.
Type IV	A small V shaped notch with a shallow groove adjacent to it.
Type V	The partial ossification of the superior transverse scapular ligament.
Type VI	The complete ossification of the superior transverse scapular ligament converting the notch into a complete bony foramen.

II. MATERIALS AND METHODS

The present study was done by observing 112 human dried scapulae from department of Anatomy of DM- Wayanad Institute of Medical Sciences, Wayanad, Kerala. Scapulae with damaged superior border were not considered for the study. Scapulae were observed for the different shape of the suprascapular notch and for the ossification of the superior transverse scapular ligament.

III. RESULTS

Fig 1: Type I- A wide depression from the medial superior angle to the base of the spine.

Fig 2: Type II- A wide blunted V shaped notch along the superior border at the scapula.

Fig 3: Type III- A symmetrical U shape.

Fig 4: Type IV- A small V shaped notch with a shallow groove adjacent to it.

Fig 5: Type V- The partial ossification of the superior transverse scapular ligament.

Fig 6: Type VI- The complete ossification of the superior transverse scapular ligament converting the notch into a complete bony foramen.

Table2: Showing the different varieties of suprascapular notch- their number and percentage.

Type	Number of scapulae	Percentage
Type I	23	20.54 %
Type II	16	14.29 %
Type III	28	25 %
Type IV	40	35.71 %
Type V	2	1.79 %
Type VI	3	2.68 %

One hundred and twelve   scapulae were analysed. suprascapular notch was present in all the observed scapulae. The distribution of the various types of suprascapular notches is illustrated in Table 2. Type IV was the most common type with 40 (35.71 %) scapulae, whereas type V was the least observed type with just two (1.79 %) scapulae.

IV.   DISCUSSION

In comparison with previour workers like Natsis[6] K et al and Rengachary[5] et al, suprascapular notch type III was the most prevalent while type VI was the least prevalent. However in the present study reported the highest incidence of type IV suprascapular notch. A study by Rengachary SS[7] et al in 1979 observed that type III suprascapular notch has a small sized foramen, thus having a higher predisposition to suprascapular nerve entrapment neuropathy. The most important contributing factor for the nerve entrapment is presence of anomalous superior transverse scapular ligament, this is first reported by few workers like Alon M[8] et al, Bayramoglu A[4] et al, Cohen SB[9] et al and Ticker JB[10] et al. It would be useful to find out the type of suprascapular notch in patients presenting with suprascapular nerve entrapment neuropathy locally to help explain the possible association between the two.

Table 3: Frequency of various types of suprascapular notch (SSN) in different populations

Author	Population (N)	Type I	Type II	Type III	Type IV	Type V	Type VI
Natsis[6] et al., 2007	Greek (423)	6%	24%	40%	13%	11%	6%
Rengachary[12] et al., 1979	American (211)	8%	31%	48%	3%	6%	4%
S.R. Sinkeet[11] et	Kenyan (138)	22%	21%	29%	5%	18%	4%

al, 2010							
Present study, 2014	South Indians (112)	20.54%	14.29 %	25%	35.71%	1.79%	2.68%

One interesting finding in the present study is the comparatively high prevalence of suprascapular notch type IV (35.71 %) compared to previous workers observations (Table 3). This probably reflects racial and regional differences. The reason for the different shape of suprascapular notch can be probably explained from the point of ossification of corocoid process and other bony parts in and around the suprascapular notch. Odita[12] et al, reported that these appeared earlier in Nigerian infants than in Caucasians. Whether this will influence the type of notch formed is not clear, but this probably explain the regional and racial variations in the presence of suprascapular notch shape.

V. CONCLUSION

The study of variations of suprascapular notch and ossification of suprascapular ligament is important to understand suprascapular nerve entrapment syndrome. Hence, our study attempted to define the various varieties of the suprascapular notch. This study is useful for anatomists, orthopaedicians, radiologists and neurosurgeons for a better diagnosis and management of the entrapment syndrome. Knowledge of suprascapular notch variations may be essential for surgeons performing SN decompression, especially by means of endoscopic techniques.

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Composite Materials in Aerospace Applications

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Abstract- Fiber-reinforced polymer composite materials are fast gaining ground as preferred materials for construction of aircrafts and space crafts. In particular, their use as primary structural materials in recent years in several technology-demonstrator front-line aerospace projects world-wide has provided confidence leading to their acceptance as prime materials for aerospace vehicles. This paper gives a review of some of these developments with a discussion of the problems with the present generation composites and prospects for further developments. Although several applications in the aerospace vector are mentioned, the emphasis of the review is on applications of composites as structural materials where they have seen a significant growth in usage. A brief review of composites usage in aerospace sector is first given. The nature of composite materials behaviour and special problems in designing and working with them are then highlighted. The issues discussed relate to the impact damage and damage tolerance in general, environmental degradation and long-term durability.

Index Terms*- Composite materials; aerospace applications.*

I. INTRODUCTION

The range of materials can be classified into the categories: Metals, Polymers, Ceramics and inorganic glasses and composites. Metals lose their strength at elevated temperatures. High-Polymeric materials in general can withstand still lower temperatures. Ceramics outstrip metals and polymers in their favorable melting points, ability to withstand high temperatures, strength and thermal expansion properties, but due to their brittleness they are often unsatisfactory as structural materials. This lead to the exploration of composites. One may define a composite as material as a materials system which consists of a mixture or combination of two or more micro constituents mutually insoluble and differing in form and/or material composition. Examples of composites are steel reinforced concrete (metals + ceramics), vinyl-coated steel (metals + polymers), fiber reinforced plastics (ceramics + polymers).

Emergence of strong and stiff reinforcements like carbon fibre along with advances in polymer research to produce high performance resins as matrix materials have helped meet the challenges posed by the complex designs of modern aircraft. The large scale use of advanced composites in current programmes of development of military fighter aircraft, small and big civil transport aircraft, helicopters, satellites, launch vehicles and missiles all around the world is perhaps the most glowing example of the utilization of potential of such composite materials.

II. THE AEROSPACE STRUCTURES AND FEATURES

Important requirements of an aerospace structure and their effect on the design of the structure are presented in table 1.

Table 1. Features of aircraft structure.

Requirement	Applicability	Effect
• Light-weight	All Aerospace Programmes	▪ Semi-monocoque construction * Thin-walled-box or stiffened structures ▪ Use of low density materials: * Wood * Al-alloys * Composites ▪ High strength/weight, High stiffness/weight
• High reliability	All space programmes	▪ Strict quality control ▪ Extensive testing for reliable data ▪ Certification: Proof of design
• Passenger safety	Passenger vehicles	▪ Use of fire retardant materials ▪ Extensive testing: Crashworthiness
• Durability-Fatigue and corrosion Degradation: Vacuum Radiation Thermal	Aircraft Spacecraft	▪ Extensive fatigue analysis/testing * Al-alloys do not have a fatigue limit ▪ Corrosion prevention schemes ▪ Issues of damage and safe-life, life extension ▪ Extensive testing for required environment ▪ Thin materials with high integrity
• Aerodynamic performance	Aircraft Reusable spacecraft	▪ Highly complex loading ▪ Thin flexible wings and control surfaces * Deformed shape-Aero elasticity * Dynamics ▪ Complex contoured shapes * Manufacturability: N/C Machining; Moulding
• Multi-role or functionality	All Aerospace programmes	▪ Efficient design ▪ Use: composites with functional properties
• Fly-by-wire	Aircrafts, mostly for fighters but also some in passenger a/c	▪ Structure-control interactions * Aero-servo-elasticity ▪ Extensive use of computers and electronics * EMI shielding
• Stealth	Specific military aerospace applications	▪ Specific surface and shape of aircraft * Stealth coatings
• All-Weather operation	Aircraft	▪ Lightning protection, erosion resistance

Further, the structure has to meet the requirements of fuel sealing and provide access for easy maintenance of equipments. Passenger carriage requires safety standards to be followed and these put special demands of fire-retardance and crash-worthiness on the materials and design used. For spacecraft the space environment–vacuum, radiation and thermal cycling-has to be considered and specially developed materials are required for durability.

Two key developments in scientific-technological world have had a tremendous influence on the generation and satisfaction of the demands raised by the aerospace community: one, the advances in the computational power and the other, composites technology using fiber reinforced polymeric materials.

III.   USE OF COMPOSITES IN AEROSPACE STRUCTURE

It is to be realized that in order to meet the demands in table 1, it is necessary to have materials with a peculiar property-set. The use of composites has been motivated largely by such considerations.

The composites offer several of these features as given below:
☐Light-weight due to high specific strength and stiffness
☐Fatigue-resistance and corrosion resistance
☐Capability of high degree of optimization: tailoring the directional strength and stiffness
☐Capability to mould large complex shapes in small cycle time reducing part count and assembly times: Good for thin-walled or generously curved construction
☐Capability to maintain dimensional and alignment stability in space environment
☐Possibility of low dielectric loss in radar transparency
☐Possibility of achieving low radar cross-section

These composites also have some inherent weaknesses:
☐Laminated structure with weak interfaces: poor resistance to out-of-plane tensile loads
☐Susceptibility to impact-damage and strong possibility of internal damage going unnoticed
☐Moisture absorption and consequent degradation of high temperature performance
☐Multiplicity of possible manufacturing defects and variability in material properties.

Even after accepting these weaknesses, the projected benefits are significant and almost all aerospace programmes use significant amount of composites as highlighted in the figure below.
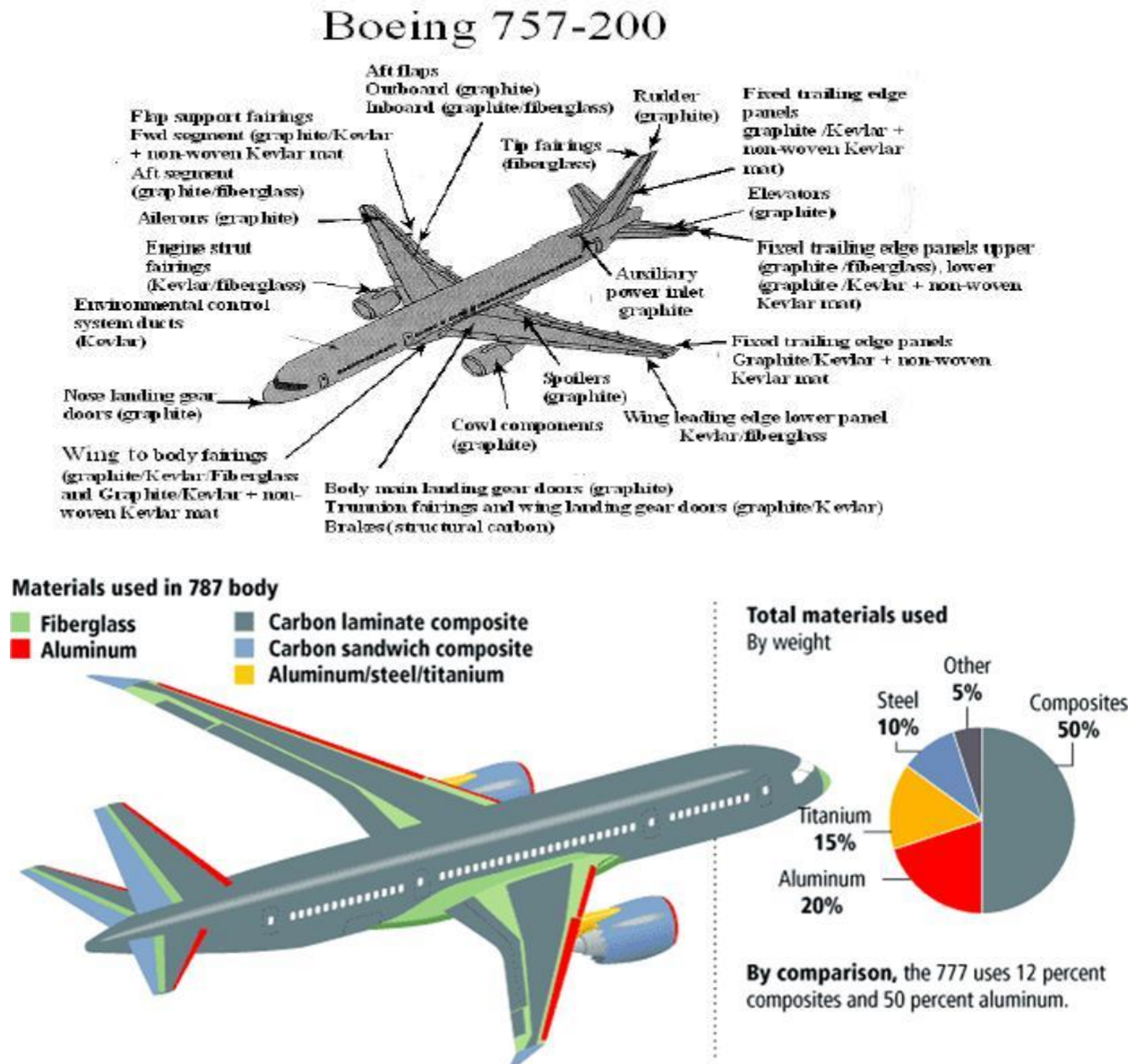
All this is, of course, not without its share of hassles. Challenges of using composites on such a large scale are many. The composites are not only new but also non-conventional: they are anisotropic, inhomogeneous, have different fabrication and working methods and also different controls for quality assurance. They have a complex material behavior under load requiring new and complicated analysis tools. Moreover, the behaviour is not always predictable by analysis and this makes reliance on several expensive and time consuming tests unavoidable.

The routes to meet these challenges have evolved around use of the advances in computer technology and analysis methods to implement schemes based on computer aided design, computer aided engineering, finite element methods of analysis and building computer interfaces amongst all aspects of development, namely, design, analysis and manufacturing. These should provide fast transfer of information including graphics and accurate analysis methods for a reasonable prediction of complex behavioural patterns of composites. It is only by harnessing the vast computational power for various purposes that the aircraft structural design of today can meet the challenges posed by the required performance.

IV. MATERIALS FOR AEROSPACE COMPOSITES

The materials systems which have been considered useful in aerospace sector are based on reinforcing fibers and matrix resins given in table 2 and 3, respectively. Most aerospace composites use prepregs as raw materials with autoclave moulding as a popular fabrication process. Filament winding is popular with

shell like components such as rocket motor casings for launch vehicles and missiles. Oven curing or room temperature curing is used mostly with glass fibre composites used in low speed small aircraft. It is common to use composite tooling where production rates are small or moderate; however, where large number of components are required, metallic conventional tooling is preferred. Resin injection moulding also finds use in special components such as radomes. Some of the popular systems are given in table 4 along with the types of components where they are used in a typical high-performance aircraft.

Table 2. Reinforcing fibers commonly use in aerospace applications.

Fibre	Density (g/cc)	Modulus (GPa)	Strength (GPa)	Application areas
Glass				
E-glass	2.55	65-75	2.2-2.6	Small passenger a/c parts, air-craft interiors, secondary parts; Radomes; rocket motor casings
S-glass	2.47	85-95	4.4-4.8	Highly loaded parts in small passenger a/c
Aramid				
Low modulus	1.44	80-85	2.7-2.8	Fairings; non-load bearing parts
Intermediate modulus	1.44	120-128	2.7-2.8	Radomes, some structural parts; rocket motor casings
High modulus	1.48	160-170	2.3-2.4	Highly loaded parts
Carbon				
Standard modulus (high strength)	1.77-1.80	220-240	3.0-3.5	Widely used for almost all types of parts in a/c, satellites, antenna dishes, missiles, etc.
Intermediate modulus	1.77-1.81	270-300	5.4-5.7	Primary structural parts in high performance fighters
High modulus	1.77-1.80	390-450	2.8-3.0 4.0-4.5	Space structures, control surfaces in a/c
Ultra-high strength	1.80-1.82	290-310	7.0-7.5	Primary structural parts in high performance fighters, spacecraft

Table 3. Polymeric matrices commonly used in aerospace sector.

Thermosets				Thermoplastics
Forms cross-linked networks in polymerization curing by heating				No chemical change
Epoxies	Phenolics	Polyester	Polyimides	PPS, PEEK
▪ Most popular ▪ 80% of total composite usage ▪ Moderately high temp. ▪ Comparatively expensive	▪ Cheaper ▪ Lower viscosity ▪ Easy to use ▪ High temp usage ▪ Difficult to get good quality composites	▪ Cheap ▪ Easy to use ▪ Popular for general applications at room temp	▪ High temp application 300^0C ▪ Difficult to process ▪ Brittle	▪ Good damage tolerance ▪ Difficult to process as high temp 300-400^0C is required
▪ Low shrinkage (2-3%) ▪ No release of volatile during curing	▪ More shrinkage ▪ Release of volatile during curing	▪ High shrinkage (7-8%)		
▪ Can be polymerized in several ways giving varieties of structures, morphology and wide range of properties	▪ Inherent stability for thermal oxidation ▪ Good fire and flame retardance ▪ Brittle than epoxies	▪ Good chemical resistance ▪ Wide range of properties but lower than epoxies ▪ Brittle ▪ Low T_g		
▪ Good storage stability to make prepregs	▪ Less storage stability-difficult to prepreg	▪ Difficult to prepreg		▪ Infinite storage life. But difficult to prepreg
▪ Absolute moisture (5-6%) causing swelling and degradation of high temp properties ▪ Also ultra violet degradation in long term	▪ Absorbs moisture but no significant effect of moisture in working service range	▪ Less sensitive to moisture than epoxies		▪ No moisture absorption

V. CONCERNS WITH COMPOSITE USAGE

The concern in use of composites arises mainly due to demands of high degree of reliability and safety of aerospace structures as against the complexity of composite behaviour and consequent difficulties in building prediction models. This creates an excessive reliance on testing at all stages; design and development, proving and certification, and in-service inspection and repairs. The costs of such testing are sometimes enormous and this had led to some skepticism in use of composites. Two major issues in this regard are briefly discussed below.

5.1(a) Simulation

In this study, the simulation was undertaken in framework of ABAQUS commercial finite element package. Finite element modeling of composites is depending on the purpose of the analysis. In ABAQUS, there are several   techniques for composite modeling such as microscopic modeling, macroscopic modeling, mixed modeling, discrete reinforcement modeling and sub modeling. However, the most common use in finite element simulations of composite material are layered shells,layered-solids, stacked solid elements and stacked or layered continuum shells.

The objective of ABAQUS analysis and simulation of unidirectional E-glass is to predict the mechanical properties and mechanical response of unidirectional E-glass such as tensile, compression and thermal response and then will be compared and verified with experimental results.

This option is for orthotropic materials and used specifically for plane stress, such as in laminated shell.
It requires specification of E1, E2, ☐12, G12, G13 and G23 where E1 represent the Longitudinal Modulus, E2 is Transverse Modulus, ☐12 is major Poisson's Ratio and G12, G13 and G23 are in-plane Shear Modulus.

Material	E_1 (GPa)	E_2 (GPa)	ν_{12}	ν_{23}	G_{12} (GPa)
E-glass 21xK43 Gevetex	53.48	17.7	0.278	0.4	5.83
Silenka E-glass 1200tex	45.6	16.2	0.278	0.4	5.83

It is typically unspecified that a unidirectional E-glass fiber or lamina can be treated as transversely isotropic. For transversely isotropic lamina, the independent elastic constant becomes five because E2= E3, G12 = G13 and ☐12 = ☐13.

5.1(b) Experimental

The experimental work is successfully done which consists of tensile test and thermal-stress test. This experiment required only simple rectangular-shape test specimen where it is prepared using hand lay up process. During the experiment, the surface of clean plate flat surface was waxed to facilitate easy removal of the laminate before apply mix of resin on the waxed surface. Then, cut the first fiber layer into required dimension and placed on the top of that and apply the resin again. Make even the resin using serrated roller and brush and removed all trapped air in resin and fiber. Repeat this step for the next layer until 6 layers. Finally, cover the layers with waxed flat surface and put load on the top of it to produce a better surface. Specimen was cured at room temperature for 24h in ambient condition.

Then, it was cut into the specimen dimension which is 25 mm x 250 mm.

The tensile test was undertaken using Material Test System (MTS) machine.

5.1(c) Impact damage and damage tolerance

The laminated structure of the composites and the fiber-matrix interfaces provide weak interfaces for delamination and debondingto take place. This is further aggravated by practical structural features such as discontinuous plies to create thickness changes and sharp bends required in stiffening members. of particular concern is the proneness exhibited for damage due to impact. The issue is not merely the reduction in strength (particularly in compression) but also that the damage is inside the material and not visible at the structure. This is particularly so where the impact is due to blunt objects at low to medium velocities. Common instances are dropping of tools, hail-stones, runway debris and impacts and jolts while handling (even before the assembly of the air craft). Such hidden damage can be extensive- both in terms of planar dimensions and through the thickness. The damage mostly occurs as delamination, but may sometimes be accompanied by fiber-breaks in back plies which are not visible from outside. In the shop, such damages can be found by ultra-sonic C-scan method and 'a barely visible impact damage' can cause a reduction in compressive strength by almost 60%. The fatigue resistance of carbon composites stands it in good stead, however, and no further significant reduction in strength or growth of damaged is observed under in-plane loads. The current philosophy to handle impact damage problem is as follows: (i) design the structure to have alternate load paths to have damage tolerance against impact of moderate severity. This is generally taken care by designing the structure as a framework of stiffening members or as boxes; (ii) lower the design allowable strength values to an extent where the 'barely visible impact damage (BVID)'can be sustained even at the highest load and for all the time with no degradation in performance; (iii) any damage that exceeds the BVID level (i.e. visible damage) may lower the intermediate performance and should be repaired immediately. The basic safety of aircraft with damage is ensured due to (i) and (iv) the structure may not cater to very severe impact.

There is, of course, a penalty in lowering the allowables but for the present systems, this is considered to be not too excessive in view of the similar reduction of allowables required for fastener holes. With improved processing to get large parts integral with stiffeners and other complex shapes and with availability of high strength fibres the limitations due to impact damage would be more perceptible and prohibitive.

Another consequence of the impact damage issue which the aeronautical community is, perhaps, not yet fully exposed to is in terms of the inspection intervals and defining levels of repairs etc. when the presently developed aircraft go in full service. Extensive studies and gathering of experience through testing is presently underway to tackle this problem.

5.2 Environmental degradation

The presently used epoxy resins absorb about 5-6% moisture by weight when fully saturated. This leads to about 1.5-1.8% moisture weight gain in carbon-epoxy composites with the usual 60% fiber volume fraction. In practice, under the normal operating conditions, the maximum equilibrium moisture gain in an aircraft component can be about 1.0-1.4%. This moisture gain can cause (a) swelling and dimensional changes, (b) lowering of the gas transition temperature (Tg) of the resin matrix, and (c) degradation of matrix dominated properties of composites such as shear and compression strengths.

The dimensional changes and weight gain by itself are generally not significant in many aircraft structures but may be of considerable significance where extreme precision is required such as in antennae panels and in aircraft structures is the degradation of the shear and compressive strength properties- particularly at high temperatures close to Tg which in itself is now reduced due to moisture absorption. The design of a structural component, therefore, generally proceeds by reducing allowables for moisture degradation.

This single issue of environmental degradation due to moisture absorption has made development of composite components for aerospace quite expensive and tedious. Moreover, associated with the already complex behaviour of composites particularly in the long run.

Apart from the moisture absorption, the other significant aspects relate to the UV degradation and radiation effects in the long term. These are particularly important in space structures. The current studies on the subject have provided some solutions to these problems even though the concern about long term behaviour exists.

Table 4. Typical composite material systems in aerospace.

Material system	Application area
• 175°C curing high strength-carbon-epoxy — Zero-bleed (neat resin content) UD prepregs — 5 HS or 8 HS bi-directional fabric prepreg — toughness, good out-life and shelf-life	Structural components of fighter aircraft and helicopters. e.g. wing skins, spars, fin, rudder, elevons, doors, etc.
• 175°C curing intermediate modulus carbon with epoxy + BMI / cynate-ester — Zero-bleed (neat resin content) UD prepregs — 5 HS or 8 HS bi-directional fabric prepreg — high toughness, good out-life and shelf-life — low environmental degradation	Frames, stiffeners, rotor blades
• 120°C curing HS-carbon-epoxy — Zero-bleed (neat resin content) UD prepregs — 5 HS or 8 HS bi-directional fabric prepreg — toughness, good out-life and shelf-life	Structural components of helicopters or transport aircraft. e.g. spars, fin, rudder, elevons, doors, etc. Frames, stiffeners
• Aramid fibre in low-loss polyester / cynate esters	Radome
• Cu-mesh epoxy prepreg	For Lightning Strike protection Wing-skin, others
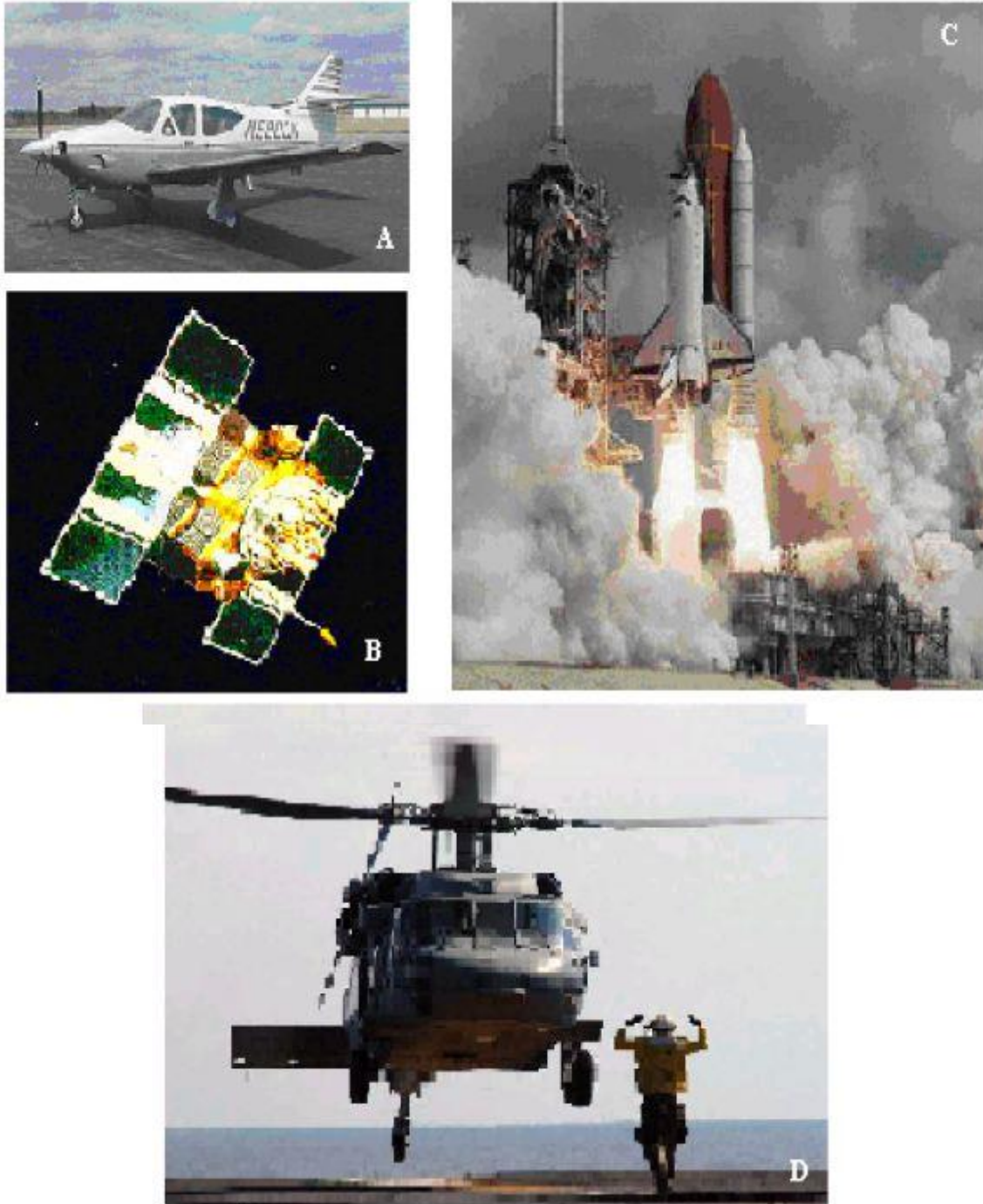
Some other aerospace applications are illustrated above:
Fig. A : Two Seater transport aircraft
Fig. B : Space launch vehicles (Space Shuttles)
Fig. C : Satellites
Fig. D : Advanced helicopters (Military & Civilian)

VI.   ADVANCES IN MATERIALS FOR COMPOSITES
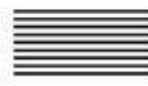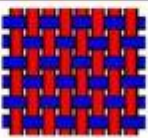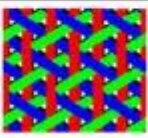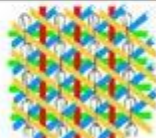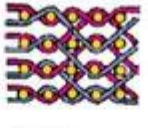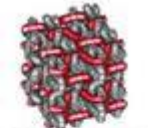
6.1 Reinforcements

The carbon fiber technology continues to improve harnessing the versatility of carbon fibre and new varieties in terms of better combinations of modulus and strength are becoming available. The developments seem to be in two directions: one, for aircraft applications, is aimed basically at higher strength (>5 GPa) with concurrent improvements in modulus to a moderate level (>300 GPa) and the other, for space applications, is aimed at high modulus (>500 GPa) with moderate strength (3.5 GPa). The higher failure strain for the

fiber is expected to result in composites with better damage tolerance. The developments in aramid fibers also aim at higher modulus with concurrent increase in strength. However, the major thrust in improving reinforcements for composites comes from the requirements of multidirectional weaving. Several processes (weaving, knitting, braiding) have been developed for this purpose and performs with multidirectional woven fibers have now been made. Simplification and cost reductions appear to be the major motives for further developments.

The higher properties of basic fibers (such as carbon) cannot, however, be fully exploited in the composite without concurrent developments in the matrix materials and the intermediate products such as prepregs or performs. It is to be noted here that the carbon fiber composites which use a carbon fiber with a strength of 3 GPa as reinforcement result in an allowable stress of only 0.3 GPa in a composite. Significant scope thus exists for translating high fiber properties into high performance of composites.

Dimension \ Axis	0 Non-axial	1 Mono-axial	2 Biaxial	3 Triaxial	4 Multi-axial
1D		Roving yarn			
2D	Chopped strand mat	Pre-impreg nation sheet	Plain weave	Triaxial weave knit /12/	Multi-axial weave, knit /13/
3D Linear element		3-D braid /14/	Multi-ply weave	Triaxial 3D-weave /15/	5-Direction construction
3D Plane element		Laminate type	H or I Beam /16/	Honeycomb type	Integral throat exit for nuclear missile /17/

6.2 Matrix Resins

A significant effort in improving composites is focused on improving matrix materials. The two major concerns mentioned earlier viz. impact damage tolerance and hygro thermal degradation, provide the main motivation for improvement. A major direction of improvement appears to be an improvement in the toughness, which should result in higher resistance in to delamination and against impact. High failure strain of matrix resin would help in translating the higher performance of the improved fiber to the composite. Higher resin shear modulus would help in achieving better transfer of load from fiber to resin and again to fiber and should therefore improve compression strength. For polymeric materials a possible figure of 5 GPashould be achievable as against the current resins with shear modulus of about 2 GPa. As far as hygro thermal degradation is considered, newer systems based on cynate ester look very promising and some of these have already found some application. Another route being investigated is the use of thermoplastic resins and their blends. Poly-ether-ether-ketone (PEEK) has been considered very promising, but the industry needs to resolve the problems associated with high temperature (> 350 0C) processing of a material. Current approaches to new resins appear to be directed towards producing polymeric systems which can be processed in the way composites industry is used to (such as autoclave curing up to 180 0C).

VII. CONCLUSIONS

Hence we can finally conclude that:
- Composite materials offer high fatigue and corrosion resistance.
- Composite materials have high strength to weight ratio.
- So they are best suited for various aerospace applications.

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Comparative efficiency of pretreatment methods on *Parthenium hysterophorus* L., as a potential feed stock

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Abstract- The efficiency of *Parthenium hysterophorus* L., as potential feed stock was investigated by using different pretreatment methods. *P.hysterophorus* L., being declared invasive weed, is an obnoxious flowering plant which is a big challenge to all attempts of control. Although several eradication measures have been undertaken in this regard for many years, not a single method is yet an option for the total eradication of *Parthenium.* Thus, the status of *Parthenium* management is visualized with respect to large-scale utilization. Therefore, in the present work, *Parthenium* is chosen to comparatively analyze its efficiency as a potential feed stock. Crop biomass mainly consists of cellulose, hemicelluloses and lignin, which act as limiting factor for being used as a potential feed stock. Thus, conversion of hemicelluloses present in the lignocellulosic biomass into xylose is one of the major steps in preparing the *Parthenium* as a potential feed stock. The objective of this work was to study the effect of pretreatments on the reduction of lignin and cellulose content which is an important factor when *Parthenium* is used as a potential feed stock. The experiments were carried out with four different pretreatment protocols which are acid, alkali, biological and water treatments at 4 g ml-1 concentration with uniform treatment period. A comparative graph obtained with total solids (TS), carbon (C), nitrogen (N), phosphorus (P), lignin and holocellulose parameters is explained in this paper.

Index Terms- Feedstock, Holocellulose, Lignin, *Parthenium hysterophorus* L, Pretreatment.

I. INTRODUCTION

Biomass has been defined to be "any material, excluding fossil fuel, which was a living organism that can be used as a fuel either directly or after conversion process" (ASTM 2002). The use of plant biomass as fuel for heat, light, food preparation has been a central to the evolution of our species (Gowlett, 2006). Although there are many forms of biomass derived fuels available today, it is still a challenge to meet the growing demand for sustainable energy systems. The plant biomass majorly consists polymers of cellulose, hemicellulose and lignin bound together in a complex structure which makes it difficult in being used as feedstock. This lignocellulosic biomass resists the bacterial degradation to a larger extent hence requiring a pretreatment process. The process by which the lignocellulosic biomass from its native form is converted into susceptible form that can be hydrolysed is referred as "pretreatment" in bioprocess engineering (Lynd et al., 2002). Thus the pretreatment protocol

plays an important role in converting the plant biomass as a potential feed stock. In this present study *Parthenium hysterophorus,* an upright annual herb of 30-150 cm of family Asteraceae is considered to be a potential feedstock to meet the growing sustainable energy demand. The efficiency of *P.hysterophorus* as a potential feedstock is being investigated by using different pretreatment methods. The aim of this study is to comparatively analyze, the efficiency of pretreatment protocol on *P.hysterophorus* in making it a potential feedstock.

II. MATERIALS AND METHODS

Processing of *Parthenium* for experiment:
Parthenium hysterophorus weed, used in this study was collected in Hesaraghatta, Bangalore. The plant when collected was in the flowering stage. The entire plant was carefully uprooted and was thoroughly washed under running tap water. Later the long stems along with other parts of the plant were cut into small pieces of 4-5inches in length. This was later Sun dried for 12 consecutive days. Then, the finally dried *Parthenium* material (DP) was milled to attain a final particle size of 3-5mm which was stored in closed container at room temperature until used.

Pretreatment 1: (PT1)
Dried *Parthenium* (DP) was pretreated with 6wt% NaOH solution at the rate of $4mlg^{-1}$ total solids (TS) at room temperature (RT) (28 ± 2°C) for 144hrs (6 days) with intermittent mixing. The initial pH at the beginning time of PT1 was found to be 10.5 which was then neutralized to pH 7.0 at the end of the treatment period. This pretreated sample was refrigerated for further analysis.

Pretreatment 2: (PT2)
DP was pretreated with 4wt% HCl solution at the rate of 4ml g^{-1} TS at RT (28 ± 2°C) for 144hrs (6 days) with intermittent mixing. The initial pH at the beginning time of PT2 was found to be 2.0 which was neutralized to pH 7.0 at the end of the treatment period. This pretreated sample was refrigerated for further analysis. For PT1 and PT2, Gunasheelan's (1995) method of pretreatment was slightly modified to suit the unsterilized *Parthenium* material.

Pretreatment 3: (PT3)
The DP was sterilized and then treated with sterile water at the rate of 4 ml g^{-1} TS at RT (28 ± 2°C) for 144 hrs (6 days) with intermittent mixing in an aseptic environment. The pH of this

treatment protocol had a static value of 6.8 throughout the treatment protocol.

Pretreatment 4: (PT4)

DP was pretreated with tap water at the rate of 4ml g^{-1} TS at RT (28 ± 2°C) for 144 hrs (6 days) with intermittent mixing so as to allow the native microorganisms of the plant biomass to act upon it. The pH remained static at 6.8, before and after the treatment protocol, therefore neutralization was not required.

Analytical methods:

All compositional analysis was done in quadruplicate and data were corrected to a 100% dry matter (DM) basis. Since there was only a single sample of plant biomass, statistical analysis of the compositional data was not possible. The untreated *Parthenium* (UT) and pretreated samples (PT1, PT2, PT3 & PT4) were tested for Total Organic Carbon (TOC) by (USP – Pg 257), TS, N_2, C:N, C:P, Lignin, by APHA Standard methods, 1985 and Holocellulose by Roger M. Rowell, 2012.

III. RESULT AND DISCUSSION

Characteristics of UT and PT *Parthenium* biomass:

All the pretreatment procedures namely PT1, PT2, PT3 & PT4 led to changes in the physico-chemical characteristics of the plant biomass. The reported results are the mean of four replicates with standard deviation (mean±SD). The probability levels used for statistical significance were $P < 0.05$ for the tests. Statistical analysis of the data were carried out with one way analysis of variance (ANOVA).

Table 1: Effect of pretreatments on C:N & C:P of Parthenium plant biomass (Data presented is mean of determinations from the four replicates; mean±SD; n=4)

Treatments	TOC	N_2	C:N	P	C:P
UT	25.33±0.27	1.69±0.27	14.99	0.23±0.05	110.13
PT1	10.60±0.54	0.36±0.06	29.44	0.11±0.02	96.36
PT2	8.17±0.38	0.39±0.02	20.94	0.05±0.01	163.40
PT3	5.56±0.32	0.06±0.00	92.67	0.06±0.00	92.60
PT4	6.65±0.56	0.37±0.07	17.97	0.05±0.01	133.0

Table 2: Effect of pretreatments on Lignocellulosic content of Parthenium plant biomass (Data presented is mean of determinations from the four replicates; mean±SD; n=4)

Treatments	Lignin	Holocellulose
UT	13.31±0.35	19.23±0.22
PT1	6.64±0.03	10.70±0.27
PT2	9.66±0.21	3.21±0.05
PT3	6.23±0.02	11.90±0.38
PT4	5.98±0.06	6.92±0.14

C/N ratio:
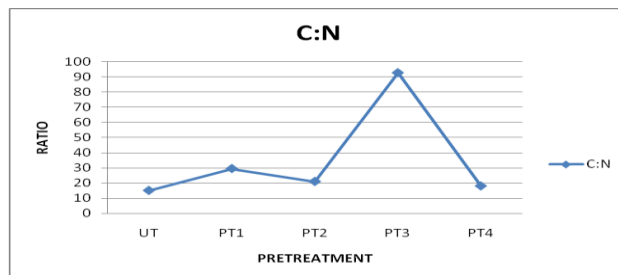
Fig: 1 Carbon Nitrogen ratio of PT *Parthenium* with that of UT *Parthenium*

Carbon and Nitrogen content present in the feedstock benefits by providing essential elements for the synthesis of Aminoacids, proteins and nucleic acid and also maintains neutral pH conditions essential for fermentative process by microorganisms. At the same time, presence of excess nitrogen in the feedstock might result in accumulation of toxic substance due to excess ammoia formation. The C/N ratio lower than 10:1 were found to be inhibitory in various decomposition patterns (Fry 1975; NAS 1977; BORDA 1980; UNEP 1981; Kimchie 1984; Marchaim 1989). A C/N ratio of 30 is often cited as optimal (Uri Marchain, 1992). In this study, various pretreatment protocols were attempted in order to bring the C/N ratio to the optimum thus making the *Parthenium* substrate, a potential feed stock. From the data obtained, (Table 1; Fig:1) in comparison to that of the UT, all the PT have shown significant change in the C/N ratio ($P < 0.05$) which is confined to the relative optimum range of C:N 25-30:1(Dioha. I. J. et al., 2013) of *Parthenium* hydrolysis. Though the PT4 does not fall in the favourable range it is still seems to get reduced better than the UT *Parthenium*. Also there is an astoned increase in C/N ratio of PT3, whose efficiency of decomposition can be well established with further processing of the plant biomass.

C/P ratio:
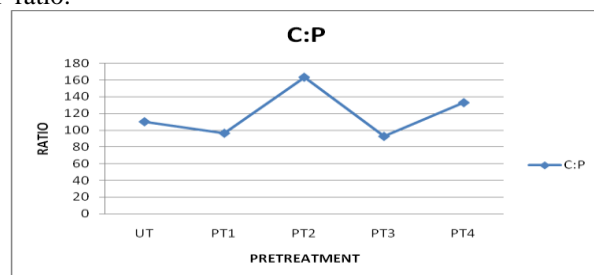
Fig: 2 Carbon Phosporus ratio of PT *Parthenium* with that of UT *Parthenium*

Nutritional value of C:N is essential for the bioprocess and metabolism, likewise C:P content is also important. During the decomposition, microorganisms assimilate and transiently store Phosphorus in their biomass, enabling active cycling of organic phosphate which is largely mediated by their metabolism. This net release of Phosphorus from decomposing depends on C/P ratio of the substrate. C/P ratio of plant tissue can vary subsequently. In this study the various pretreatments were monitored to determine the C/P ratio thus making the

Parthenium biomass a potential feedstock. From the tabulated C/P ratio (Table 1; Fig:2), all the pretreated *Parthenium* substrate including the untreated substrate fell in the optimum range for C/P ratio. Among the preliminary studies carried on the pretreatment protocols, PT2 is well capable of being used as feedstock for vermicomposting (Anoop. Y, et al., 2013) and all the other treatments were well suited for biofertilizer production, falling in between the optimum range of 75-150:1(Gregor. D. Z., et. al, 2012).

Lignin and Holocellulose:
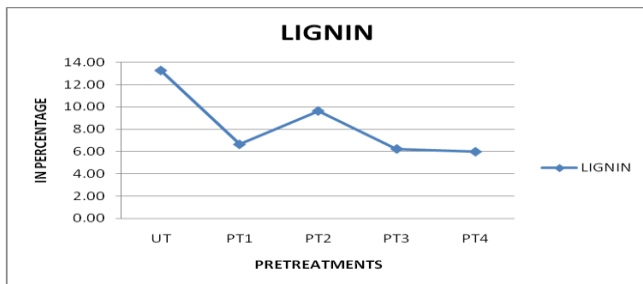
Fig: 3 Lignin (%) of PT *Parthenium* with that of UT *Parthenium*
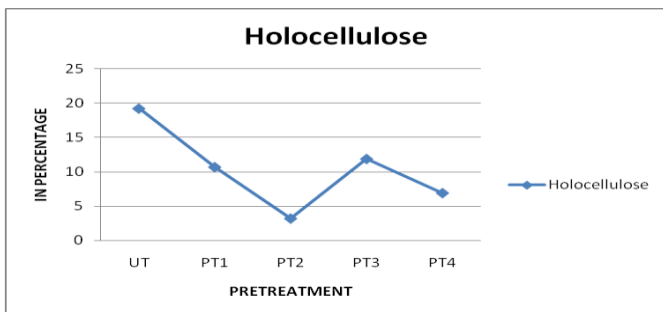
Fig: 4 Holocellulose (%) of PT *Parthenium* with that of UT *Parthenium*

Though there is abundance of organics in the weed biomass, much of it was not available to the microbes for better decomposition due to the presence of resistant and protective compounds like lignin and holocellulose. The breaking down of such compounds in original biomass by various pretreatment paves way for better utilization of the plant biomass as potential feedstock. In this study, there was a statistically significant ($P < 0.05$) reduction in the lignin and holocellulose percentage among the PT samples when compared to UT samples.

CONCLUSION

Parthenium hysterophorus a noxious weed has been a challenge for various prevention and eradication procedures, calling for an effective management method. Biomethanation being a sought after technique in weed management this paper has given an insight with various pretreatment protocols in making the *Parthenium* weed a potential feedstock. A conclusive single pretreatment protocol can be well established with further study on processing the biomass for the biomethanation process.

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Image Transmission with COFDM Using Trigonometric Transform

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Abstract- In this paper a new scheme is proposed for progressive image transmission over coded Orthogonal Frequency Division Multiplexing (OFDM) system with Low Density Parity Check Coding (LDPC). Trigonometric transforms are used in this scheme for improving the performance of the OFDM systems and reducing the PeakTo- Average Power Ratio (PAPR) of OFDM signal. It improves the error resilience ability and transmission efficiency for progressive image transmission over Additive White Gaussian Noise (A WGN) channel. The Set Partitioning In Hierarchical Trees (SPIHT) algorithm is used for source coding of the images to be transmitted. In the proposed scheme the transmit data sequence of the OFDM signal after Inverse Fast Fourier Transform (lFFT) is grouped into in-phase and in-quadrature components, then each component is transformed using either the Discrete Cosine Transform (DCT) or the Discrete Sine Transform (DST). The simulation results show that adding the DST to the system improves the visual quality of reconstructed images and reduces the PAPR of OFDM signal more than the DCT.

Index Terms- OFDM, PAPR, SPIHT, LDPC, Trigonometric transforms.

I. INTRODUCTION

OFDM modulation has been adopted by several wireless multimedia transmission standards, such as Digital Audio Broadcasting (DAB) and Digital Video Broadcasting (DVB-T), because it provides a high degree of immunity to multipath fading and impulsive noise. High spectral efficiency and efficient modulation and demodulation by IFFT/FFT are also advantages of OFDM In the frequenc selective ratransmission channel,all fading and Inter-Symbol Interference (lSI) result in severe losses of transmitted image quality. OFDM divides frequency-selective channel into several parallel nonfrequency selective narrow-band channels, and modulates signal into different frequencies. It can significantly improve the channel transmission performance without employing complex equalization schemes. It also has broad application prospect in wireless image and video Communications [1, 2]. There are still some challenging issues, which remain unresolved in the design of OFDM systems. One of the major problems is high PAPR of transmitted OFDM signals. Therefore, the OFDM receiver detection efficiency is very sensitive to the nonlinear devices used in its signal processing loop, such as Digital-to-Analog Converter (DAC) and High Power Amplifier (HP A), which may severely impair system performance

due to induced spectral regrowth and detection efficiency degradation. There are several developed techniques to reduce the PAPR in OFDM systems [3, 4] such as clipping [5], companding [6, 7], Partial Transmit Sequence (PTS) [8], Selected Mapping (SLM) [9] and coding [lop]. The clipping technique is the simplest one that can be used in OFDM systems, but it causes additional Clipping no which degrades the system performance. An alternative technique to mitigate the PAPR problem is based On signal transformations. This technique involves a signal transformation prior to amplification, then an inverse transformation at the receiver prior to demodulation. In [11] trigonometric transforms were suggested as alternatives for the FFT to reduce the PAPR. The authors in [11] concluded that OFDM systems with trigonometric transforms provide higher P APR reduction than the standard FFT based system. However modified the OFDM symbols before transmission using the PTS. Their results reveal that without PTS, the distribution of P APR is the same for that conventional one such that the reduction depends on PTS, which makes redundancy in the system.The SPHIT algorithm has been introduced by Said and Pearlman [12]. It is algorithm based on the wavelet transform, and restricts the necessity of random access to the whole image to small sub images. The principle of the SPIRT is partial ordering by magnitude with a set partitioning sorting algorithm, ordered bit plane transmission, and exploitation of self similarity across different scales of an image wavelet transform. The success of this algorithm in compression efficiency and simplicity makes it well known as a benchmark for embedded wavelet image coding. The SPIRT is used for image transmission over the OFDM system in several research works [13, 14] because the SPIRT has a good rate-distortion performance for still images with comparatively low complexity and it is scalable or completely embeddable. To improve the BER performance of the OFDM system, several error correcting codes have been applied to OFDM. LDPC codes have attracted much attention particularly in the field of coding theory. LDPC codes are a class of linear block codes which provide a reliable transmission for coding performance that is very close to the Shannon's limit and can outperform Turbo codes at long block length but with relatively low decoding complexity. LDPC has been adopted as the DVB-S2 standard. A (N, K) LDPC code can be represented by a very sparse parity-check matrix having M rows, N columns and code rate $R=KIN$, where $K=N-M$. It was originally invented by Gallager in 1963 [15] and rediscovered by Mackay and Neal recently [16]. The combination of the high spectral efficiency OFDM modulation technique and LDPC coding will be a good candidate for high speed broadband wireless applications. The BER performance of the Low Density Parity Check Coding-

Coded Orthogonal Frequency Division Multiplexing system (LDPC-COFDM) is influenced by the subhannels which have deep fad due to frequency selective fading. According to this combination, several algorithms were introduced into LDPC-COFDM system to improve the BER by adaptive bit loading and power allocation of each subcarrier [17], [18]. The paper concentrates on two targets reducing the PAPR of the OFDM signal and improving the quality of the reconstructed images. It considers the trigonometric transforms as a way for reducing the P APR by using the character of the DCT/DST energy focused in the low component. The data of OFDM signal is modulated by IFFT then using DCTIDST, which can reduce the PAPR. Compared with the means of SLM-OFDM and PTS-OFDM, OFDM system modified by DCT/DST maintain the system orthogonal properties, which will not result in additional noise and need not transmit side information. At the same time, the proposed method reduces the PAPR greatly and the system has character of low complexity hardware. The rest of this paper is organized as follows. Section 2, presents the SPIRT compression algorithm. The proposed system description with modification is explained in section 3. Section 4, introduces the simulation results. Finally, the conclusions followed by the relevant references are included in section 5.

II. THE SPIHT ALGORITHM

The SPHIT algorithm defines and partitions sets in the wavelet decomposed image using a special data structure called a spatial orientation tree. A spatial orientation tree is a group of wavelet coefficients organized in to a tree rooted in the lowest frequency (coarsest scale) subband with offspring in several generations along the same spatial orientation in the higher frequency sub bands. Fig., shows a spatial orientation tree and the parent children dependency defmed by the SPHIT algorithm across subbands in the wavelet image. The tree is defmed in such a way that each node has either no offspring (the leaves) or four offspring at the same spatial location in the next fmer subband level. The pixels in the lowest frequency subband-tree roots are grouped into blocks of 2x2 adjacent pixels, and in each block one of them; marked by star as shown in Fig. 1; has no descendants. SPIRT describes this collocation with one to four parent-children relationships,

Parent = (i,j)
children = [(2i,2j),(2i + 1,2j),(2i,2j + 1),(2i + 1,2j + 1)]

The SPHIT algorithm consists of three stages: initialization, sorting and refinement. It sorts the wavelet coefficients into three ordered lists: the list of insignificant sets (LIS), the List of Insignificant Pixels (LIP), and the List of Significant Pixels (LSP). At the initialization stage the SPIRT algorithm first defines a start threshold based on the maximum value in the wavelet pyramid, then sets the LSP as an empty list and puts the coordinates of all coefficients in the coarsest level of the wavelet pyramid (Le. the lowest frequency band; LL band) into the LIP and those which have descendants also into the LIS. In the sorting pass, the algorithm first sorts the elements of the LIP and then the sets with roots in the LIS. For each pixel in the LIP it performs a significance test against the current threshold and

outputs the test result to the output bit stream. All test results are encoded as either 0 or 1, depending on the test outcome, so that the SPHIT algorithm directly produces a binary bitstream. If a coefficient is significant, its sign is coded and its coordinate is moved to the LSP. During the sorting pass of LIS, the SPHIT encoder carries out the significance test for each set in the LIS and outputs the significance information. If a set is significant, it is partitioned into its offspring and leaves. Sorting and partitioning are carried out until all significant coefficients have been found and stored in theLSP.

After the sorting pass for all elements in the LIP and LIS, SPHIT does a refmement pass with the current threshold for all entries in the LSP, except those which have been moved to the LSP during the last sorting pass. Then the current threshold is divided by two and the sorting and refmement stages are continued until a predefined bit-budget is exhausted. Details of SPHIT algorithms are presented in [12].
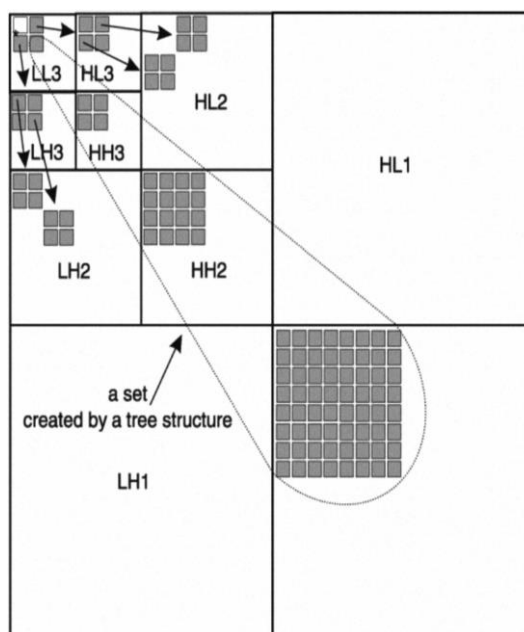
Fig. 1: Parent-children dependency and spatial orientation trees across wavelet subbands in SPIHT.

III. OFDM SYSTEM DESCRIPTIONS WITH PROPOSED MODIFICATION

The block diagram of the proposed LDPC-COFDM system is illustrated in Fig. 2. As will be shown in the next sections, the proposed modifications will be in the transform and replacement block. The SPIRT coder is chosenas the source coding technique due to its flexibility of code rate and simplicity of designing optimal system. The SPHIT divides the image stream into several layers according to the importance of progressive image stream. Then the image stream is converted to a binary format. Afterwards the information bits are LDPC encoded at the LDPC encoder. The OFDM considered in this paper utilizes N frequency tones (number of subcarriers) hence the baseband data is first converted into parallel data of N subchannels so that each bit of a codeword is on different subcarrier. The N subcarriers are

chosen to be orthogonal, then, the transmitted data of each parallel subchannel is modulated by Binary phase Shift Keying (BPSK) modulation because it provides high throughput and best performance when combined with the OFDM. Finally, the modulated data are fed into an IFFT circuit, such that the OFDM signal is generated. The resulting OFDM signal can be expressed as follows:

Where Xn is a discrete time sample

.

$$x(t) \cong x[n] = \frac{1}{\sqrt{N}} \sum_{n=0}^{N-1} X_n e^{j2\pi f_n t} \ , 0 \le t \le T$$
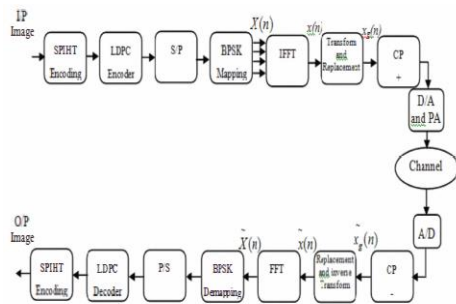
Fig. 2: The LDPC COFDM system model with trigonometric transforms
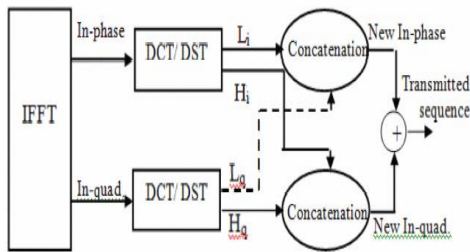
Fig. 3: The trigonometric transform and replacement process.

The output of IFFT is split into two components; in-phase and in-quadrature. Then, either the DCT or the DST is applied to both components, separately. The first half of samples of the in-phase component after the transform (Li) is concatenated with the firsts half of samples of the in-quadrature component after the transform (Lq) to form the new in-phase component. Similarly, the second half of samples of the in-phase component after the transform (Hi) is concatenated with the second half of samples of the in-quadrature component after the transform (Hq) to form the new in-quadrature component. Finally, the new components are added to produce the OFDM signal as shown in Fig. 3. This sequence after this process can be called xin) with the subscript d referring to the trigonometric transformation process. Each data block is padded with a cyclic prefix (CP) of a length longer than channel impulse response to mitigate the Inter-Block Interference (lBI). The continuous COFDM signal x/.J) is generated at the

output of the digital to analog (D/A) converter. According to [I], the PAPR of transmitted analog signal can be expressed as follows:

$$PAPR = \frac{\max \left| x_g(t) \right|^2}{E\left[\left| x_g(t) \right|^2 \right]}$$

where E[.] is the average power. Generally, the PAPR is considered for a single OFDM symbol, which has a time duration T. This duration comprises a number of samples equal to (Nf+Ng), where Ng is the guard interval length. At the receiver, the guard interval is removed and the time interval [O,T] is evaluated. The replacement and inverse transform are then applied to the received samples. Afterwards, the OFDM subchannel demodulation is implemented by using a (FFT) then the Parallel-to-Serial (P/S) conversion is implemented. This received OFDM symbols are demodulated at the demodulator. The demodulated bits are decoded with each LDPC encoded block and data bits are restored. These data are converted into image format, such that SPIHT decoder can be obtained.

IV.   SIMULATION RESULTS

In this section, simulation experiments are carried out to study the transmission of SPIHT coded images on LDPC COFDM modified by Trigonometric transforms over AWGN channel. The parameters used in the simulation are: the number of subcarriers of a LDPC coded OFDM system (N) is considered to be 256, Cyclic Prefix is 64, Rate of the SPIHT (r) = 0 to l. LDPC code of R = 1;2 is employed with sum-product decoding, where R denotes the code rate and a (512, 1024) parity check matrix is used. The maximum number of iterations in sum-product decoding is set to 10. The input image is 8 bits per pixel, grayscale test image, 'Cameraman' from MATLAB toolbox is utilized in the simulation has a resolution 256x256 pixels. The fidelity of it was measured by the Peak Signal-to-Noise Ratio, PSNR, which usually expressed in terms of the logarithmic scale. MSE is the mean squared error between the original and the reconstructed image, and Peak is the maximum possible magnitude for a pixel inside the image. The peak value is 255 for an 8 bits/pixel of original image. To verify the effectiveness of the proposed method; adding Trigonometric transforms to the OFDM system to reduce the P APR, the analysis is divided into two methods one with DCT and another with DST and compare them with COFDM and set SPIHT coder as source coding. The three transmission schemes were designed as follows:

- **Scheme I** : The system which consists of coded OFDM

- **Scheme II**: The system I with the DCT transforms for the transmitted signal.

- **Scheme III**: The system I with the DST transform for the transmitted signal.

Simulation were carried out respectively according to the above three schemes. Firstly, we present the simulation of the complementary cumulative distribution function (CCDF) curves for the proposed SPIHT LDPC COFDM with Trigonometric transforms. The CCDF is a useful statistical indication about the signal power distribution. It is defined as the probability that the signal is at or higher than a given amplitude PAPRo• Fig. 4 (a, b) shows the CCDFs of the PAPR for the three proposed schemes at different SPIHT rates: 0.5 and 1 respectively. Clearly, the PAPR performance of the proposed systems II and III outperforms the system I without each other. The figure reveals that system with the DST has a better reduction in the PAPR than that with the DCT nearly up to 0.25dB (Fig. 4(b)). It is also noted that the PAPR can be achieved by increasing the value of SPIHT rate as the data increased and the statistical distribution is clearer. On the other side, the effect of the SPIHT compression ratios on the PSNR of the received image results in the three schemes and compared them with the OFDM system without LDPC are shown in Fig.5. For the lower SNR values (5dB), the PSNR performance deteriorates for all schemes except that with the DST however at higher SNR values (lOdB or greater) all the schemes have the ideal performance which is equal to the output of SPHIT Compression. It can be noticed form this figure, for system III at low SNR and all systems at higher SNR, as the SPHIT rate increases the PSNR also increases. This is due to the fact of injecting more information about the image to the receiver and thus it will have more capability to reproduce a better reconstructed image. Finally, the impact of the number of subcarriers on the performance of the three schemes is studied and shown in Fig.6 at lower SPIRT rate $r = 0.2$ to save the bandwidth on the channel. It is clear that, the Scheme III provides a significant PAPR reduction, especially for a large number of subcarriers.
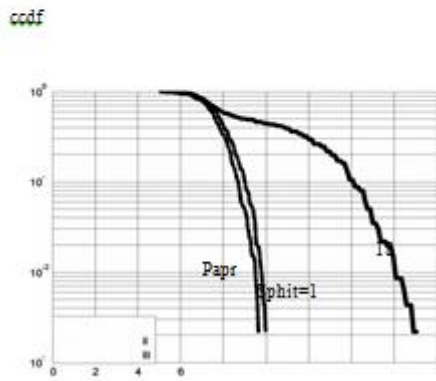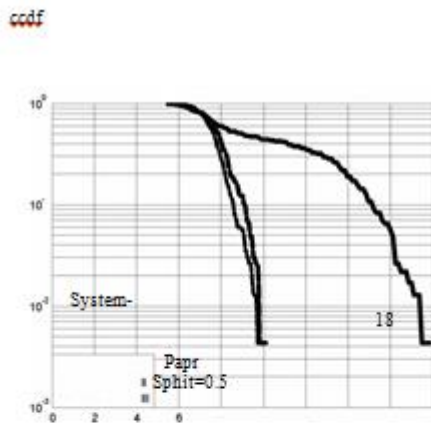
ccdf

ccdf

Fig. 4: CCDF of the PAPR for the LDPC
COFDM (system I), and that with DCT (system
II) and finally that with DCT

40
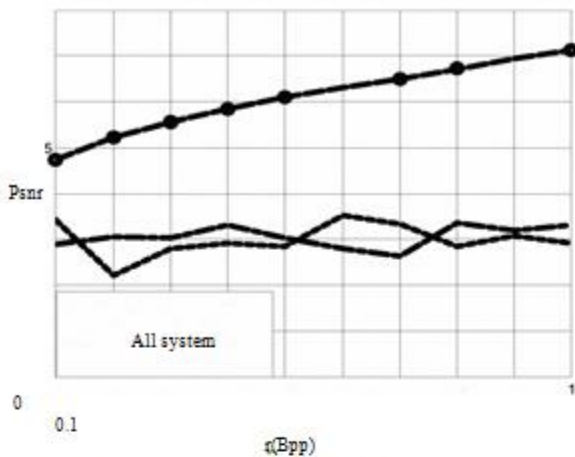
Fig. 5: The relation between the PSNR and the rate of SPIHT compression ratio on AWGN channel.
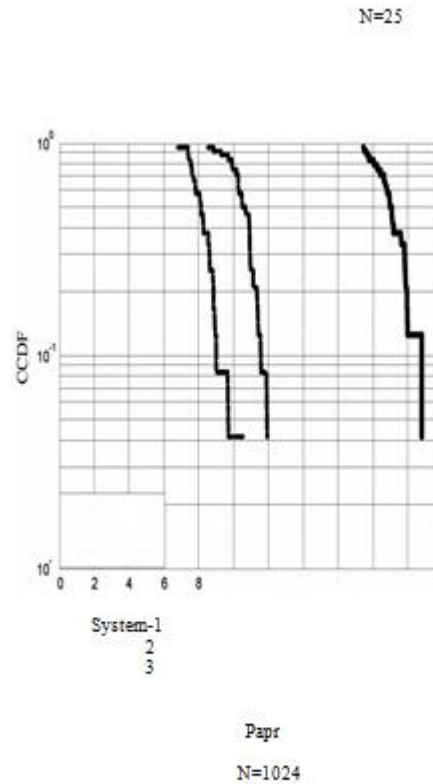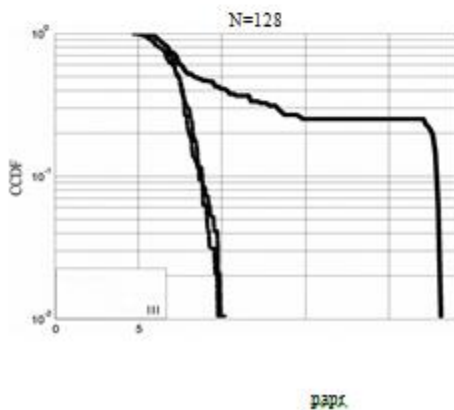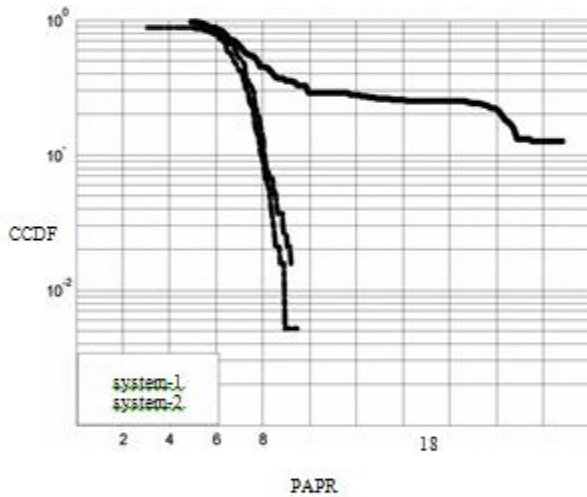
PAPR

papr

Fig. 6: CCDF of P APR for the proposed schemes for different numbers of subcarriers when SPIHT compression rate is set to 0.2.

V. CONCLUSION

In this paper, an efficient LDPC coded OFDM system with trigonometric transforms supporting image transmission using SPIHT compression technique is presented and studied. The effectiveness of the proposed system is investigated through simulations over AWGN channel. It is found that the proposed system must be designed carefully in order to achieve a reduction in the PAPR without degrading the PSNR performance. For LDPC COFDM with rate (R=O.5) and rate of SPHIT rate (r = 1) the OFDM signal can be reduced by nearly 7dB or 7.25dB by adding the DCT or DST respectively. We also showed the PSNR for the received image at different rates. This work shows the performance of the system model using 256x256 grayscale images.

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Analysis of Heavy Metals in Muscle Tissues of Tilapia Zilli of Gwale Pond, Kano State, Nigeria

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Abstract- Heavy metals such as nickel, copper, zinc and lead, generally are toxic substances that pose a great risk to living organisms in our environment due to their inevitable existence. The aim of this investigation is to investigate and assay the presence of such metals in muscle tissues of tilapia zilli of Gwale Pond in Gwale Local Government Area of Kano State, Nigeria. Muscle tissues of some fresh tilapia zilli were dissected, prepared and assayed by Alpha A4 atomic absorption spectrophotometer. The ranges of working standard concentrations were 0.001 ppm to 1 ppm .Study findings showed that the mean concentrations of nickel, copper, zinc and lead were 0.0120 ± 0.002 ppm, 0.0637 ± 0.0035 ppm, 0.0097 ± 0.0006 ppm and 0.0075 ± 0.0005 ppm Respectively. The 95% confidence intervals for nickel, copper, zinc and lead were calculated to be 0.0120 ± 0.005, 0.0035 ± 0.009, 0.0006 ± 0.001 and 0.0005 ± 0.001 respectively. The method was validated using triplicate analysis, recovery experiment and statistical analysis

Index Terms- Heavy metals, muscle tissue, tilapia zilli, gwale pond, atomic absorption spectrophotometer.

I. INTRODUCTION

Fish is said to be defined as a vertebrate adapted for a purely ·aquatic life propelling and balancing itself by means of fins and obtaining oxygen from the water for breathing purposes by means of gills [1]. The generic name of a group of cichlids endemic to Africa is Tilapia. The group consists of three aqua culturally important genera, Oreochromis, Sarotherodon and Tilapia zilli [2]. A wide variety of natural food organisms such as aquatic invertebrates, larval fish, plankton, some aquatic macrophtes, detritus and decomposing organic matter with heavy supplemental feeding are ingested by Tilapia [2]. Like other animals require common components of foods such as proteins, carbohydrates, fats, vitamins; minerals and water , Fishes also required such nutrients to enable them live comfortable life [3]. The most important food nutrient of interest is the mineral content of fish with respect to this research. There have been some difficulties in accessing the dietary requirements of minerals and other trace elements in fishes because of their ability to absorb elements directly from the water [4].

Heavy metals refer to any metallic chemical element that has relatively high atomic weight and toxic at low concentration. Air, soil, water, sediments and biota including aquatic organisms are reported to have been contaminated by heavy metals [4]. [4] found that the concentration of toxic heavy metals (Ni, Cu, Zn & Pb) in fish is affected by many biological factors, such as species, sex, age, feeding type), and environmental factors, such as the season of the year, pH value of water, temperature, dissolved oxygen and salinity. The elements enter the aquatic environment through weathering of the earth crust, human activities as well as industrial effluents [5]. Sources of heavy metals to the environment according to [6]. are mainly direct deposition from waste water from mining activities, domestic and industrial processes. For several decades, the increased effluents output has led to serious environmental pollution [7]. some prevailing conditions, heavy metals may accumulate to a toxic level [8] and suddenly result to ecological damage [5]. Nickel belongs to transition metals and has high metallic conductivity and ductility. It is paramagnetic, chiefly valuable for the alloys it forms, especially many super alloys particularly stainless steel. Copper is a chemical element with atomic number of 29. It is ductile with perfect electrical conductivity. Copper is required in the formation of elastin as well as collagen-making. It can also be used as an anti-germ surface that can add to the anti-bacterial and antimicrobial features of buildings such as hospitals [9]. Zinc is a trace element that is essential for human health. Lead is a chemical element with atomic number of 82. It is soft and malleable. It is used in building constructions, lead acid batteries, bullets and is part of solder, pewter, and fusible alloys.

Much work has been done with respect to the determination and analysis of heavy metals in varieties of fish species using spectrophotometers. It is crystal clear that researchers used different methods of anchoring fishes. Some uses nets where as some uses traps [10] and so on. Usually polyethylene bags are used for collecting anchored fishes to avoid sunlight interference. Storage temperatures differ from one region to another and from fresh waters, seas and marine fishes. Many researchers prefer ashing to wet digestion as ashing is more common, direct, easier and cheaper with automated electric furnace. The preference for instrumentation during the analysis depends on the availability and expertise of the researchers and the operators of the instruments since spectrophometer is a composite term which include ;flame atomic absorption, flame atomic emission, atomic absorption spectrometry , inductively coupled plasma etc. [10] determined seven heavy metals (Hg, Pb, Cd, Fe, Ni, Cu and Zn) in three fish species from coastal waters of Santa Cruz de Tenerife (Canary Islands) using atomic absorption spectrophometers. [11] used Scientific 210 VGP Atomic Absorption Spectrophotometer, to determine the concentrations of chromium, zinc and lead in muscle tissue of tilapia fish species from Dala and Gwale ponds in in Kano metropolis, Nigeria. A micro wave digestion was used by [12] during their

study on Determination of Some Metal Levels in Muscle Tissue of Nine Fish Species from Beyşehir Lake, Turkey. An Inductively Coupled Plasma-Optical Emission Spectroscopy (ICP-OES) was used by [13]. They all generated a remarkable result. A review of literature shows that both biological (species and feeding type) and the environmental factors affect the extent of contamination of fish muscle tissue with nickel, copper, zinc and lead. As a result, this study aimed at determining the level of heavy metals (Hg, Pb, Cd) in muscle tissues of three tilapia fish species anchored in Gwale Pond of Kano State, Nigeria and to evaluate their safety based on Food and Agricultural Organization [14] standard. As reported by [10] and [11], atomic absorption spectrophotometer was also used in this work.

II. STUDY AREA

Gwale is a Local Government Area in Kano State, Nigeria within Greater Kano city. Its headquarters are in the suburb of Gwale. It has an area of 18 km² and a population of 362,059 at the 2006 census. Its coordinates are 11°58′N8°30′E. Gwale Pond is located near its grave yard which is very close to Bayero University Kano old campus road. The main source of water for this pond is rain water. The pond also receives wastes and runoff water from nearby soils and waste deposits from human activities during rain fall.

III. EXPERIMENTAL

Sample Collection and Preparation

Three pieces of tilapia fish (tilapia zilli) were collected from Gwale pond of Gwale local government area of Kano State, Nigeria. The fishes were dissected and the muscle tissues extracted and dried at 110°C in an oven. After drying, the samples were made into fine powders. Alpha A4 atomic absorption spectrometry model was used for the measurement.

Reagents

The following reagents were used; pure compounds of nickel chloride ($NiCl_2$), hydrated copper nitrate (Cu $(NO_3)_2.3H_2O$), hydrated zinc nitrate (Zn $(NO_3)_2$. $6H_2O$), lead nitrate (Pb $(NO_3)_2$, HPLC grade nitric acid and deionized water.

Standards Preparation

2.20g of pure nickel solution was dissolved in 50ml of 1M HNO_3 solution in a 1L volumetric flask. After dissolution, the flask was made up to the mark with deionised water to form 1000ppm. (Mendham, 2002). Further dilutions were undergone and the following working standards were obtained (0.001, 0.002, 0.003, 0.004, 0.005, 0.006ppm up to 1ppm). A similar procedure to that described above for the preparation of standard solution of nickel was followed to prepare 0.001ppm – 1ppm of copper, zinc and lead solution respectively using their appropriate weights.

Procedure for Wet Digestion

1.00g of the muscle tissues of the fish sample was weighed in each case and transferred to a $100cm^3$ beaker. 5 cm^3 of nitric acid was added to the content and boiled for two minutes. 10 cm^3

of deionized water was added to the mixture and was made up to 100 cm^3 with the same deionized water. Blank experiment was carried out with deionized water instead of the sample involving all the reagent and procedures used for the actual digestion. Solutions were analyzed using atomic absorption spectrophometer.

IV. STATISTICAL ANALYSIS

Data were analyzed using application soft wares such as Microsoft excel and Microsoft word version 2007. Data were presented as mean and standard deviation.

V. RESULTS

As presented in table 1, the mean weight of tilapia fish samples used was 94.700+11.455 g and the ranges of their variable weights were 86.60-102.80 g. Also the mean length used for the fishes was 18.333+0.153 cm with variable lengths ranges between 18.2 -18.5 cm.

Table 1. Weights and lengths in triplicate of the Tilapia zilli before drying

Parameter	Pond	No. of fish	Weight (g)	Length (cm)
	Gwale	3		
Range			86.60-102.80	18.2-18.5
Mean and SD			94.700+11.455	18.333+0.153

The mean concentrations of the four heavy metals analyzed in muscle tissues of tilapia zilli were presented in table 2 as shown below.

Table 2. Mean, standard deviation, 95% confidence interval, LOD, LOQ and experimental error of triplicate analysis of muscle tissues of Tilapia zilli.

Heavy Metals (ppm)				
Replicates	**Nickel (Ni)**	**Copper (Cu)**	**Zinc (Zn)**	**Lead (Pb)**
1	0.01	0.0600	0.0100	0.0070
2	0.0120	0.0640	0.0090	0.0075
3	0.0140	0.0670	0.0100	0.0080
Mean	0.0120	0.0637	0.0097	0.0075
Std.Dev. (S)	0.0020	0.0035	0.0006	0.0005
CV (%)	16.67	5.49	6.19	6.67
LOD	0.006	0.011	0.002	0.002
LOQ	0.02	0.035	0.006	0.006
95% CI	0.0120 + 0.005	0.0035 +0.009	0.0006 +0.001	0.0005 +0.001

Error	0.008	-0.044	0.010	0.012

Key: SD = Standard Deviation; CV = Coefficient of Variation; LOD = Limit of Detection; LOQ = Limit of Quantitation; CI = Confidence Interval.

From table 2, the mean concentration of nickel, copper, zinc and lead were 0.0120±0.002 ppm, 0.0637± 0.0035 ppm, 0.0097±0.0006 ppm and 0.0075±0.0005 ppm respectively where as the ranges of their concentrations were 0.01-0.014 ppm, 0.06-0.067 ppm, 0.009-0.01 ppm and 0.007-0.008 ppm respectively. Figure 1, also illustrated the concentrations of nickel, copper, zinc and lead in ppm for each run and gives a systematic distributions of the individual concentrations in all the heavy metals analyzed.
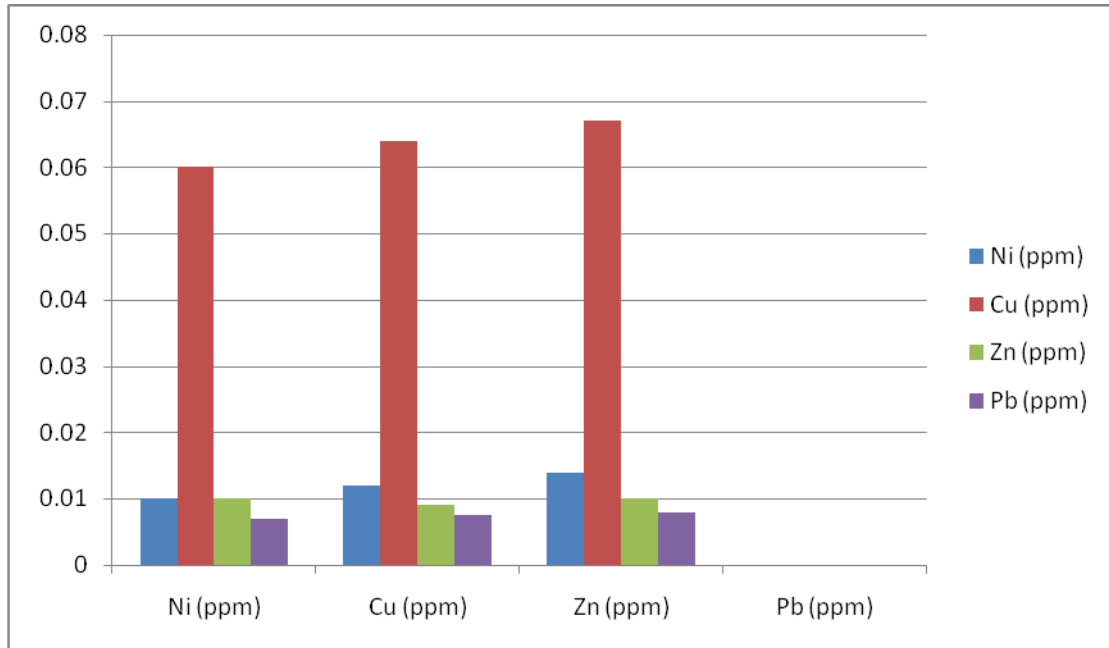
Figure 1. Graphical representation of the mean concentrations of the heavy metals metals in Tilapia zilli

Figure 2 also highlighted a graphical distribution of the heavy metals concentrations in the tilapia fish species and the extent of the absorption of all the heavy metals analyzed by the tilapia zilli may all be seen in the figure.
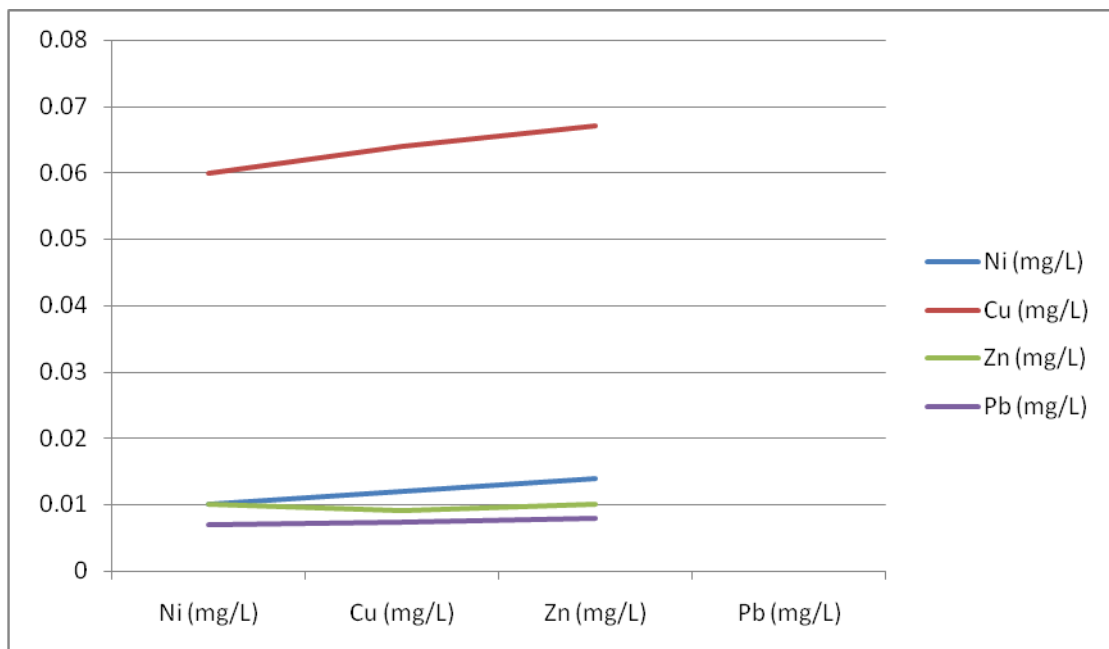
Figure 2: A line graph showing the mean concentrations of the heavy metals in Tilapia zilli

VI.   Discussion

In this study, the concentrations of nickel, copper, zinc and lead were assayed in muscle tissues of three tilapia zilli specie in Gwale Pond of Kano State, Nigeria, in order to investigate the extent of heavy metals contamination of this water and also to draw attention to the general public on the dangers that may evolve as a result of frequent utilization of the fish species evolved in this pond having highlighted the toxicological and health risk effects which might cause a great risk to human wellbeing. The measurement of each metal was done in triplicate for effective tabulation.

The concentration of nickel ranged from 0.01-0.014 ppm, with a mean of 0.0120 ppm. This shows that, the mean concentration of nickel was below [14] limit of 0.4 ppm. The mean concentration of copper was 0.0637 ppm and it ranges were 0.060-0.067 ppm. This shows that, the mean concentration of copper was below[14] limit of 1.5 ppm. The ranges of concentration of zinc were 0.0006-0.01 ppm where as its mean concentration was 0.0097 ppm. This shows that the mean concentration of zinc in tilapia zilli was far below the toxic level of 15 ppm [14]. The mean concentration of lead was calculated to be 0.0075 ppm where as its ranges were 0.007-0.008 ppm. This shows that the mean concentration of lead was less than the toxic limit of 1.5 ppm [14]. This method is validated using triplicate analysis and recovery experiment and statistical analysis as presented in table 1. From table 2, the limit of detections (LODs) of nickel, copper, zinc and lead were found to be 0.006, 0.011, 0.002 and 0.002 whereas the limit of quantitations (LOQs) were recorded as 0.02, 0.035, 0.006 and 0.006 respectively. Also the 95% confidence intervals for nickel, copper, zinc and lead were calculated to be 0.0120 ± 0.005, 0.0035 ± 0.009, 0.0006 ± 0.001 and 0.0005 ± 0.001 respectively. The experimental error generated was 0.008 for nickel, -0.044 for copper, 0.010 for zinc and 0.012 for lead.

In comparison with other studies, the mean concentration of zinc and lead were far below those reported from Asa river of Ilorin, Kwara State, Nigeria [15]. Similar work on similar fish species has been reported by (Ibrahim, S. and Kassim, J., 2012), but with lower mean concentrations of zinc metal (4.337 ± 1.732, 3.447 ± 1.296 mg/kg) and   lead (0.055 ± 0.023, 0.038 ± 0.037 mg/kg) both in Aisami Sewage Pond of Gwale and Dala Pond of Kano State, Nigeria. Figure 1 and 2, represents the graphical mean concentrations of the heavy heavy metals in the samples analyzed.

Consequently, copper metal has the highest mean concentration from the results where as lead metal has the lowest mean concentration as shown in figure 1 and 2.

VII.   Conclusions

The present study showed that there is a presence of contamination of nickel, copper, zinc and lead in Gwale Pond. The mean concentrations of nickel, copper, zinc and lead were 0.0120 ± 0.002 ppm, 0.0637 ± 0.0035 ppm, 0.0097 ± 0.0006 ppm and 0.0075 ± 0.0005 ppm respectively. However the mean concentrations of the heavy metals analyzed fell below the minimal risk level of 0.4 ppm nickel, 1.5 ppm copper, 15 ppm zinc and 1.5 ppm lead [14]. In the same vein, the 95% confidence intervals for nickel, copper, zinc and lead were calculated to be 0.0120 ± 0.005, 0.0035 ± 0.009, 0.0006 ± 0.001 and 0.0005 ± 0.001 respectively. The order of increasing mean concentrations of the four metals analyzed is given as; Pb<Zn<Ni<Cu.

Further study should also be carried out for other metals using the same and different techniques in order to have a remarkable database for heavy metals determination in both food stuffs and environmental products.

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Analysis of Vitamin A in Jordanian Local Fresh Milk Samples Using Liquid Chromatography Tandem-Mass Spectrometry, LC/MS/MS

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Abstract- An auspicious method for the quantitative determination of vitamin A (retinol) was augmented in seven different Jordanian local fresh milk samples using liquid chromatography tandem -mass spectrometry (LC/MS/MS). The compound was separated with C18 Thermo fisher gold (4.50 x100 mm x 5 Å) column through a flow rate of 1 mL/min with isocratic mobile phase. Vitamin A acetate was used as an internal standard .The method was validated using triplicate analyses, relative recovery experiment and statistical analysis. Liquid-liquid extraction was employed as a pre-concentration step with n-hexane -dichloromethane mixture (90%:10%) as an extraction solvent. The concentration range of the working standards was 0.0-1000.0 ng/mL. The correlation coefficient was found to be 0.9994. The limit 0f detection and limit of quantification were found to be 0.53 and 1.78 respectively. The 95% confidence interval was calculated to be $49.03_2 \pm 0.22$. This technique showed reasonable recovery of 98.08%, coefficient of variation of 0.36%, standard deviation of 0.178 and error of -48.032. The ranges of the calculated concentrations of the vitamin A were found to be from 6.47 ng/mL- 46.35 ng/mL.

Index Terms- Analysis, Vitamin A, Fresh Milk, LC/MS/MS.

I. INTRODUCTION

Most people think that the only important sources of vitamins are fruits and vegetables. However dairy products are also important sources of vitamins more importantly fat soluble vitamins. Dairy products comprise many types of nourishment that are important for good health and nutrition. In infants and children, milk and milk products possibly supply a substantial fraction of vitamin A.

A vitamin is an organic compound required by an organism as a vital nutrient in limited amounts [1]. Vitamins generally act as catalysts, reacting with proteins to create metabolically active enzymes that in turn produce thousands of significant chemical reactions throughout the body [2]. Fat soluble vitamins are substances which are vital to the human health and they assist the body various processes [3]. Vitamin A, Carotenoid, Provitamin A, Vitamins D, E and K are the main classes of fat soluble vitamins [4].

A group of nutritionally unsaturated hydrocarbons, which include retinol, retinal, retinoic acid, and several pro-vitamin A carotenoids, among which beta-carotene is the most important, is

termed vitamin A [5]. It has multiple functions: it is a significant tool for growth and development, for the maintenance of the immune system and good vision [6]. It is required by the retina of the eye in the form of retinal, which biologically joins with protein opsin to form rhodopsin, the light-absorbing molecule [7]. Treatment for Cancer, HIV, and Dermatological purposes have presently been established by pharmaceutics utilizing mega doses of naturally occurring retinoic acid derivatives [8]. Vitamins A, D, E, and K has been analyzed in breast milk, fortified and other foods [9], infant formula [10] and human blood serum by HPLC–MS/MS [11].

The major methods for the detection of fat soluble vitamins nowadays have been reported to be high performance liquid chromatographic ultraviolet/visible (HPLC–UV/Vis) and fluorescence (HPLC–Fl) detection [12] and gas chromatography [4]. Due to their chemical diversity and varying levels within samples, the compounds are usually determined individually. UPLC–UV/V technique however, was reported for the simultaneous determination of all *trans*-retinol, α-tocopherol and β-carotene in milk [13]. For quantification of a wide range of non-volatile compounds at the parts-per-million (mg/kg) and parts-per-billion (µg/kg) levels, high performance liquid chromatography–tandem mass spectrometry (HPLC–MS/MS) is broadly accepted as the point of reference [14]. Pharmaceutics utilizing mega doses of naturally occurring retinoic acid derivatives are currently in use for cancer, HIV, and dermatological purposes [8]. As reported by [4] that the major extraction methods are saponification/ solvent extraction, supercritical fluid extraction, and direct solvent extraction. In this work, direct solvent extraction was used.

This paper report the vitamin A (retinol) composition of 7 Jordanian commercially local fresh milk samples using liquid chromatography tandem mass spectrometry, LC/MS/MS. All the samples were bought within main Market and Sheikh Khalil Yoghurt Shops in Irbid, Republic of Jordan,

II. MATERIALS AND METHODS

Apparatus

A chromatographic system of model API 300 Applied Biosystem consisted of an Agilent stable-bond C18 Thermo gold column (4.50 x100 mm x 5 Å) with in-build detector was used. The guard and analytical columns were mounted in a thermo stated column compartment set at 30 °C. The peak areas were

integrated automatically by computer using Analyst software version 1.4 (AB Sciex) software program. Other apparatus used included a centrifuge, normal evaporator and vortex.

Chemicals used

Pure vitamin A and vitamin A acetate with analytical grade methanol, ethanol, hexane, dichloromethane, formic acid and acetonitrile , were purchased from Sigma –Aldrich Chemicals.

Procedure for high-performance liquid chromatography Chromatographic Conditions

Solutions and mobile phases were prepared at the time of use. The mobile phases used were methanol: acetonitrile: deionized water: formic acid (68:30:2:0.1 v/v/v/v) (pH 3.5). The analytical column used was C18 Thermo gold (4.50 x100 mm x 5 Å). All analysis was done under isocratic conditions at a flow-rate of 1.0 ml min^{-1} and at room temperature.

Standard Solutions

10 mg of pure vitamin A and vitamin A acetate standards were accurately weighed and transferred into two different 100-ml volumetric flasks. To each volumetric flask, 100 mL pure ethanol solution was added to form 100 mg/L stock solutions respectively. Further dilutions with two aliquots 100 µL from each of vitamin A and vitamin A acetate stock solutions in ethanol resulted in 100 ng/mL of vitamin A and vitamin A acetate solution respectively. Serial dilutions with 100 ng/mL of vitamin A acetate (internal standard) was done and the following working standard solutions (0-1000 ng/mL) were obtained.

Samples Preparation

1 g of each fresh milk samples was accurately weighed and transferred to a 10- mL plastic tube containing 1ml internal standard (vitamin A acetate) and 1mL of 39% ethanolic sodium hydroxide solution was added . The mixture was then heated in a water bath at 60°C for 40 minutes. Extraction was done by adding 4 mL hexane-dichloromethane mixture (90%:10%) and shaked vigorously for 1 minute to yield two different layers (organic and aqueous layer). The hexane- dichloromethane extracts was decanted, washed with a further 2 mL of two aliquots of water. The hexane- dichloromethane extracts was then taken and evaporated to dryness. The residue was reconstituted with (300µL) of mobile phase((methanol(68%): acetonitrile(30%): water(2%) formic acid (0.1%)) and filtered before taken to LC/MS/MS analysis.

Several volumes of hexanes were also used for the extraction but a mixture of hexane- dichloromethane (90:10) was found to be the best extraction solvent for this analysis. Increasing volume of the internal standard from 100 µL to 300µL made the analysis to be more feasible. Also increasing injection volume from 50 µL to 100 µL improved the analytical resolution. Substitution of potassium hydroxide with sodium hydroxide made the reaction to be selective as potassium hydroxide gave a poor impact during sample preparation.

Calibration and linearity

Calibration curves were constructed in the range 0.0–1000.0 ng/mL to incorporates the expected concentrations in measured samples. Curves were obtained by plotting the peak area of these pure vitamins against concentrations of these vitamins. Linear calibration curves were generated by linear regression analysis and achieved over the corresponding standard concentrations ranges.

Analytical recovery

Absolute recoveries of 5 different concentrations of vitamin A (0–1000.0 ng/mL) in fresh milk samples were verified by examining the samples as described above and comparing the peak areas of both vitamins with those acquired from direct injection of the compounds dissolved in the processed blank sample.

Precision and accuracy

The precision and accuracy of the examination was determined based on analysis of quality control samples. Dairy products quality control sample concentrations for vitamin A were 0.0–1000.0 ng/mL. Five replicate quality control samples at each concentration were analyzed and the means, standard deviations (SD) and coefficients of variation (C.V.) were calculated by standard methods.

III. STUDY FINDINGS

Linearity, LOD, and LOQ

Standard solution progressions with a range of concentration of 0.00 to 1000 ng/mL were prepared by diluting the stock solutions in ethanol. The standard solutions were injected in triplicate. Peak areas were plotted against the concentration of the analyte injected, and linear regression equation was acquired. The linear ranges were ~ 0.00–1000 ng/mL and the correlation coefficient was found to be 0.9994. The results obtained for LOD and LOQ are listed in Table 1. The LOD was found to be 0.53 ng/mL where as the LOQ was found to be 1.78 ng/mL.
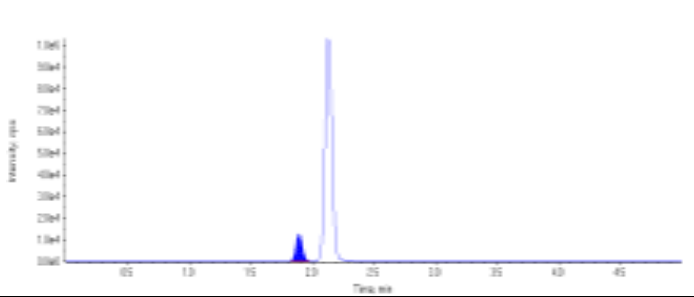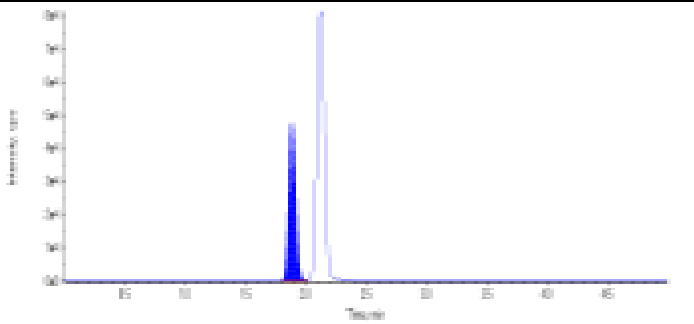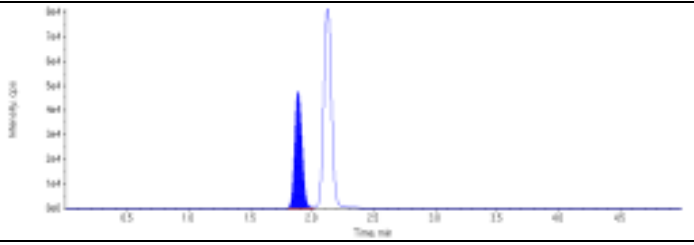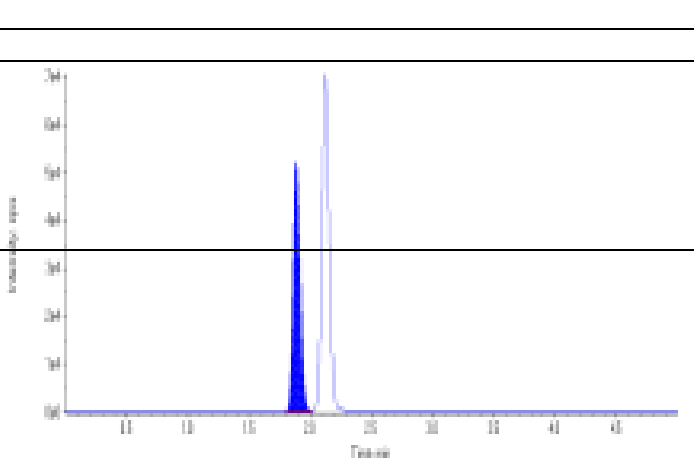
Table 1: Recoveries, CV, SD, LOD, LOQ, CV and Error Values Obtained from the Standard Addition Method in Local Fresh Milk Samples.

Recovery %	Amount found (ng/mL)	Amount added (ng/mL)	Conc. Of Vitamin A (ng/mL)	Replicate Samples
1	12.51	50	49.02	99.40
2	12.52	50	49.04	98.0
3	12.54	50	49.0	96.8
4	12.57	50	49.8	97.60
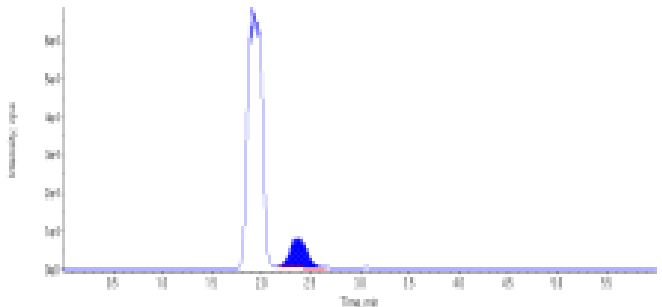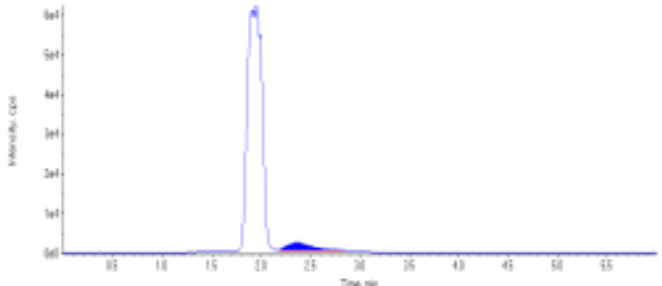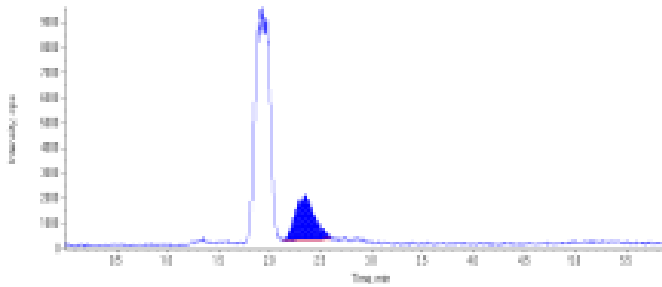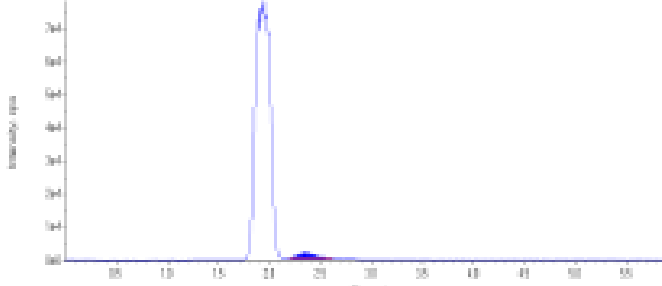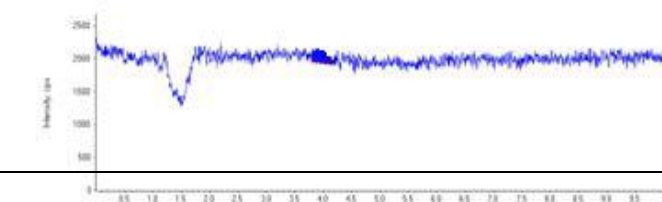
5	12.59	50	49.3	98.60
Average	12.546		49.032	98.080
SD	0.034		0.178	1.01
CV (%)	0.27		0.36	
LOD			0.53	
LOQ			1.78	
Error			-48.032	
95% CI			$49.03_2 \pm 0.22$	

Key: SD = Standard Deviation; CV = Coefficient of Variation; LOD = Limit of Detection; LOQ = Limit of Quantitation; CI = Confidence Interval.

Total ion chromatograms obtained from the LC/MS/MS is showed below. The peaks demonstrated sharp and symmetrical peak profiles.

STD1		
RT (Exp. RT):	*1.89 (1.89) min*	
Calculated Conc:	*44.0 ng/mL*	
Area:	*4.64e+004*	
Sample Type:	*(Standard)*	
STD2		
RT (Exp. RT):	*1.75 (1.76) min*	
Calculated Conc:	*20.8 ng/mL*	
Area:	*1.12e+004*	
Sample Type:	*(Standard)*	
STD3		
RT (Exp. RT):	*1.88 (1.89) min*	
Calculated Conc:	*210. ng/mL*	
Area:	*1.92e+005*	
Sample Type:	*(Standard)*	
STD4		
RT (Exp. RT):	*1.88 (1.89) min*	
Calculated Conc:	*267. ng/mL*	
Area:	*2.15e+005*	

Sample Type:	(Standard)	
STD5		
RT (Exp. RT):	1.88 (1.89) min	
Calculated Conc:	396. ng/mL	
Area:	2.65e+005	
Sample Type:	(Standard)	
STD6		
RT (Exp. RT):	1.89 (1.89) min	
Calculated Conc:	499. ng/mL	
Area:	2.90e+005	
Sample Type:	(Standard)	
STD7		
RT (Exp. RT):	1.88 (1.89) min	
Calculated Conc:	764. ng/mL	
Area:	3.28e+005	
Sample Type:	(Standard)	
STD8		
RT (Exp. RT):	1.89 (1.89) min	
Calculated Conc:	922. ng/mL	
Area:	2.85e+005	
Sample Type:	(Standard)	
SPL001		
RT (Exp. RT):	2.36 (2.36) min	
Calculated Conc:	45.6 ng/mL	
Area:	1.81e+004	
Sample Type:	(Unknown)	
SPL002		
RT (Exp. RT):	2.35 (1.89) min	
Calculated	7.02 ng/mL	

Conc:		
Area:	*3.19e+004*	
Sample Type:	*(Unknown)*	
SPL003		
RT (Exp. RT):	*2.39 (1.89) min*	
Calculated Conc:	*41.6 ng/mL*	
Area:	*9.32e+004*	
Sample Type:	*(Unknown)*	
SPL004		
RT (Exp. RT):	*2.34 (1.89) min*	
Calculated Conc:	*12.6 ng/mL*	
Area:	*3.70e+004*	
Sample Type:	(Unknown)	
SPL005		
RT (Exp. RT):	*2.34 (1.89) min*	
Calculated Conc:	*30 ng/mL*	
Area:	*2.22e+004*	
Sample Type:	*(Unknown)*	
SPL006		
RT (Exp. RT):	*2.38 (1.89) min*	
Calculated Conc:	*8.46 ng/mL*	
Area:	*2.33e+004*	
Sample Type:	*(Unknown)*	
SPL007		
RT (Exp. RT):	*2.31 (1.89) min*	
Calculated Conc:	*7.37 ng/mL*	
Area:	*2.60e+004*	
Sample Type:	*(Unknown)*	
De-Ionized		
RT (Exp. RT):	*1.89 (1. 89) min*	
Calculated Conc:	*0.00 ng/mL*	
Area:	0.00	

Sample Type:	(Unknown)	

Figure 1: Total ion chromatograms of the pure vitamin A and the samples

Recovery and accuracy

The areas under the peaks obtained were used to calculate the absolute recovery from standard working solutions with the peak-areas from standard samples. The analyses of the reproducible samples were done and the results shown in Table 2 demonstrated that the average recovery of vitamin A (retinol) was 98.08%. The reproducibility of the analytical method was excellent and the coefficient of variation was 0.36%.

In order to detect this vitamin, and to validate the applicability and reliability of this technique with real samples, the proposed analytical technique has been applied to the analysis of seven Jordanian local fresh milk samples. The results were listed in Table 2. The results showed a remarkable presence of vitamin A in all the commercial local fresh milk samples analyzed.

Analytical applications

Table 2: Concentrations of Vitamin A in the pure Vitamin and commercial local fresh milk samples

Sample Name	Sample Type	Area (cps)	RT (min)	Target [Conc]. (ng/mL)	Calculated Conc. (ng/mL)
STD001	Standard	4.640e+04	1.89	50.0	44.0
STD002	Standard	1.080e+05	1.76	50-100.	98.0
STD003	Standard	1.920e+05	1.88	100-250.	210
STD004	Standard	2.150e+05	1.88	250-300.	267
STD005	Standard	2.650e+05	1.88	300-400.	396
STD006	Standard	2.900e+05	1.89	400-500.	499
STD007	Standard	3.280e+05	1.88	500-750.	764
STD008	Standard	2.850e+05	1.89	750-1000.	922
SPL001	Unknown	1.81e+004	1.89	N/A	45.6
SPL002	Unknown	3.19e+004	1.89	N/A	7.02
SPL003	Unknown	9.32e+004	1.89	N/A	41.6
SPL004	Unknown	3.70e+004	1.89	N/A	12.6
SPL005	Unknown	2.22e+004	1.89	N/A	30
SPL006	Unknown	2.33e+004	1.89	N/A	8.46
SPL007	Unknown	2.60e+004	1.89	N/A	7.37
De-IONIZE	Unknown	0.00	1.89	N/A	0.00

Key: RT = Retention Time; STD = Standard; SPL = Sample; N/A = Not Applicable.

The distributions of average concentrations of vitamin A in the samples are shown in the figure below.
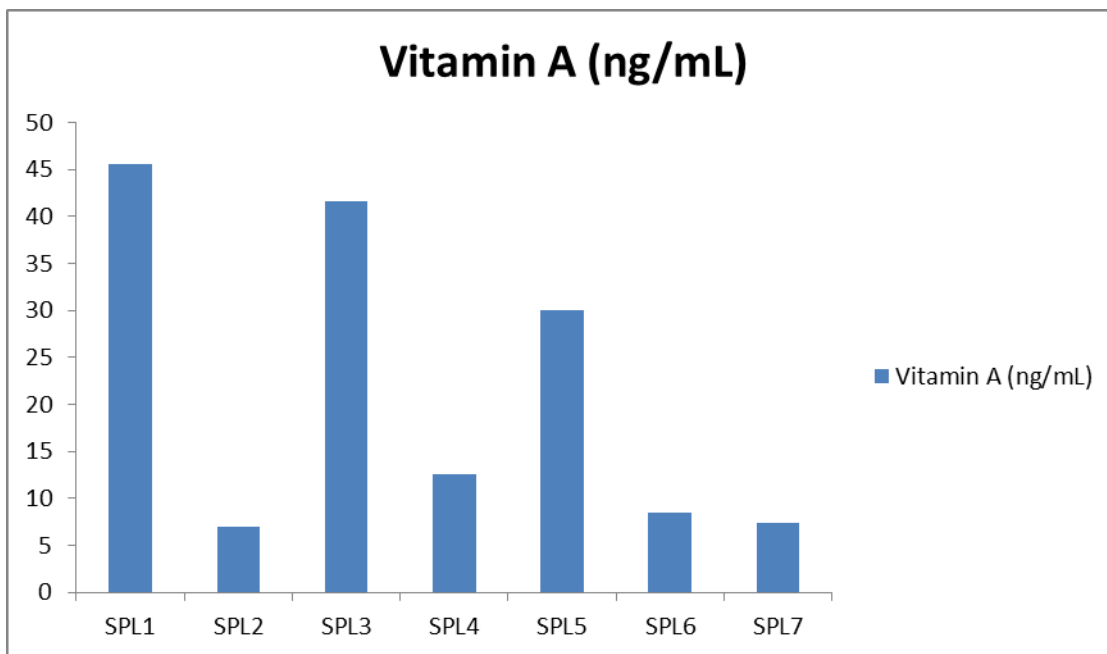
Figure 2. Graphical representations of the average calculated concentrations of vitamin A in the samples. The average concentrations are presented in ng/mL.

IV. DISCUSSION

Seven Jordanian local fresh milk samples were analyzed for vitamin A. The type of vitamin A determined in this study was retinol. During standards and samples preparations, vitamin A acetate was used as an internal standard which resulted in systematic peak separation and resolution as demonstrated in figure 1.

The working standard ranges used were 0.0-1000.0 ng/mL. The total ion chromatogram revealed symmetrical peak profiles for both standards and samples as observed in figure 1. The standard yielded very high concentrations of vitamin A due to the fact that pure vitamin A was used thus resulted in high values of the average calculated concentrations of 20.8-922 ng/mL, retention time ranges of 1.76-1.89 min and area of the chromatograms ranges between 1.12e+004 and 3.28e+005 as listed in table 2. During the measurements, all the local fresh milk samples have remarkable concentrations of the vitamin A. The calculated concentrations of the local fresh milk samples were in the range 7.02-45.6 ng/mL as presented in figure 1 and table 2. These lower concentrations in comparison to that of the standards may be due to the samples fortification, preservation and more especially harsh storage conditions. The blank samples used have zero concentration of vitamin A as shown in figure 1 and table 2.

The retention times for all the samples was 1.89 min where as their area of chromatograms ranges between 1.81e+004 and 9.32e+004 as presented in Table 2. From figure 1 and table 2, sample 1 have the highest concentration of 45.6 ng/mL where as sample 2 have the lowest calculated concentration of 7.02 ng/mL. However, the average calculated concentrations of vitamin A in the local fresh milk samples analyzed were below the United States Council for Responsible Nutrition, 2011 and

National Academy of Sciences, 1974 for the Reference Daily Intake of vitamin A of 400 μg/day for children and 900 μg/day for adults. Figure 2, also demonstrated clearly and graphically the distribution of individual sample concentration in the study.

In a related work in the simultaneous determination of vitamins A, E and β-carotene in bovine milk by high performance liquid chromatography–ion trap mass spectrometry (HPLC–MS^n), the vitamin A obtained at fragment ions m/z 213 and m/z 199 ranged between 36 μg/100mL and 59 μg/100mL [15] which is far less than the average calculated concentrations obtained in this work. In another for the determination of vitamin A and E in milk powder using supercritical fluid extraction for sample clean-up, they reported higher value of coefficient of variation of 4% and higher value of retention time of 15mins for vitamin A [3]. This implies that the present work is less susceptible to error and less time consuming owing to it lower value of CV of 0.36% and RT of 1.89 min. In compiling different extractions and chromatographic techniques for the determination of fat soluble vitamins, most of the methods used 2-50g of samples during the analyses [4], where as this work uses just 1g. Sodium hydroxide was used instead of the usual potassium hydroxide a factor which makes this work more unique compared to others. The technique used LC/MS/MS may be most promising due to its rapid chromatographic separation.

This present method was validated using repeatability studies, triplicate analyses, recovery experiments, proficiency study data and comparison with related literatures. The average recovery experiment obtained was reasonably found to be 98.08%, CV of 0.36%, SD of 0.178, LOD of 0.53, LOQ of 1.78 and error of -48.032 as showed in Table 1.

V. CONCLUSION

This work has reported the presence of remarkable concentration of vitamin A in all samples analyzed. The calculated concentrations of the Jordanian local fresh milk samples were in the range 7.02 - 45.6 ng/mL. However, the average calculated concentrations of vitamin A in the local fresh milk samples analyzed were below the United States Council for Responsible Nutrition, 2011 and National Academy of Sciences, 1974 for the Reference Daily Intake of vitamin A of 400 µg/day for children and 900 µg/day for adult. Further work should include solid phase extraction (SPE) instead of liquid liquid extraction (LLE) because SPE is more faster and its minimizes solvent lost.

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Cooperative and Collaborative Language Learning: An action Plan

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Abstract- The spread of World Englishes has generated a need for maximizing intelligibility in speech discourse. Yet in current pedagogy teaching pronunciation is a much neglected area. In the Sri Lankan context deviations from Standard Sri Lankan English pronunciation, especially in segmental phonology, results in impairing intelligibility even amongst the local interlocutors. Utilizing the limited technology available this study constructs a short term Action Plan based on the tenets of cooperative and collaborative learning to address two selected pronunciation deviations: the nondifferentiation between /ʃ/ and /s/ and confusion of /p/ and /f/ in 20 undergraduate users of learner English. The Action Plan informs practitioners of Teaching English as a Second Language on implementing short courses which benefit learners who deviate from inner circle pronunciation.

Index Terms- intelligibility, segmental phonology, cooperative and collaborative learning, Rapid Learning Centers

I. INTRODUCTION

Dooly (2008: 21)[1] states that 'in the cooperative model of learning, the teacher controls most of what is going on in the class, even if the students are working in groups. Collaborative learning, on the other hand, is aimed at getting the students to take almost full responsibility for working together, building knowledge together, changing and evolving together and of course, improving together'. Combining these two modes the Action Plan of this study investigates the outcome of the combination: Cooperative and Collaborative Learning. Thus it has two composites teacher controlled group work and collaborative language learning where the responsibility for learning shifts to the student. It is an interactive team process where the main stakeholders: the teacher and the students support and rely on each other to achieve the goals set down by a course. Thus the commitment to achieve the goal is a shared responsibility demanded from each stakeholder and learning moves away from the traditional teacher centered dissemination of knowledge.

Down the ages scholars (Bejarano, 1987[2]; Kreie et al., 2007[3]; McGroarty, 1993[4]; Sachs et al., 2003[5]) have stated that student participation in group work following cooperative methods weans them from depending on a teacher as the sole source of knowledge and understanding. Furthermore it grants the teacher an opportunity to provide the weaker students with one-on-one tutoring while the stronger students involve in cognitive rehearsal. Moreover these scholars concur that both cooperative and collaborative learning facilitate second language acquisition, improve learner retention and equal participation during group work hones individual accountability and positive interdependence.

II. RESEARCH ELABORATION

There are two main divisions in the dialectal taxonomy of Sri Lankan English (SLE) pronunciation: Standard Sri Lankan English (SSLE) and Other Varieties of SLE which are considered learner varieties. The diversity of these varieties of SLE is more robustly evidenced in the segmental more than the supra segmental. The target population undergraduates of a university in Sri Lanka fall under the latter speech community. Thus it is a dire necessity for these students, educated but a socially stigmatized group as pronunciation brands them as users of a non inner circle variety, to upgrade their pronunciation.

Furthermore pronunciation teaching has been a neglected area in our school ESL classrooms. Thus when these students enter the university, they find loud reading problematic, are hesitant and tend to proceed along a grapheme to phoneme conversion mode. They can form short sentences but non adherence to pronunciation norms in these two areas are so fossilized that very often the undergraduates do not perceive that they deviate from codified norms of SSLE.

1.1 Challenge to be resolved

Empirical investigation (Widyalankara, 2014) [6] provides evidence that the selected two features of this study given below have a high frequency of occurrence and impact on intelligibility of pronunciation in Sinhala/learner English bilinguals in Sri Lanka.
   a) Indiscriminate use of /ʃ/ and /s/
   b) Confusing /p/ and /f/

This is due to the influence of the language specific markedness constraint ranking of their L1 Sinhala where /f/ is an alien phoneme resulting in confusion between /p/ and /f/ and/or overuse of /f/. Sinhala is a diglossic language. The grapheme for /ʃ/ in Sinhala is habitually pronounced as /s/ in speech. Furthermore free variation between /ʃ/ and /s/ is permitted in Written Sinhala resulting in further confusion of the phonemes. Thus the weak bilingual transfers the indiscriminate use of /ʃ/ and /s/ to their English pronunciation. This issue needs resolving before these students graduate as the lack of intelligibility in their pronunciation will jeopardize opportunities in employment. But the following challenges within the existing ESL environment have to be addressed to fulfill this endeavor.
   a) Lack of collaborative work

b) Archaic assessment modes

My Action Plan moves the classroom to a learner centered environment with cooperative and collaborative Learning and continuous alternative assessment and portfolio construction. Furthermore it is structured, rigorous and explicitly targets pronunciation upgrading in the selected segmental areas.

III. COURSE DESCRIPTION/SETTING

3.1 *Course Title*: Pronunciation upgrading I

3.2 *Course Goals*: The course aims to improve the intelligibility of the students' pronunciation in two identified areas and at the end of the course students will be able to differentiate /ʃ/ from /s/ and /p/ from /f/ in production and perception.

3.3 *Age/number of students*: 20 undergraduates aged 22 yrs.

3.4 *Linguistic level of students*

The students are low-intermediate level ESL learners in the first year at the university, specially selected for this course on a voluntary basis, due to their identified pronunciation deviations from SSLE which is the inner circle variety in Sri Lanka.

3.5 *Number of class hours per week and duration of course*: This course a supplementary to the 1st year course *English for Communication*. The class meets every Friday at 10.00 -12.00 hrs. for the first semester of the academic year. As one semester at our university has 15 weeks of coursework the total # of contact hrs. = 2x15 = 30 hrs.

3.6 *Set up*

Classroom: Spacious, air conditioned classroom with white board and multimedia. A desk and chair for each student which could be arranged in circles for group activities.

Rapid learning Centres: Rapid learning stations will be housed in a very large, air conditioned separate room each station with a computer and 5 desk and chair sets arranged in a semi-circle in front. Video viewing with headphones and podcasting facilities are available. The Centre will be open throughout during working hours but access will be restricted to students, facilitator and other staff members and technicians. Students could move to the adjoining language lab when required with 30 computers and a teacher's console.

IV. MATERIAL AND TECHNOLOGY

4.1 *Material*

4.1.1 *Audiovisuals*

i. Sounds of American English- /p/ /f/, /s/, /ʃ/. Listen and watch manner and place of articulation in animated diagrams.
http://www.uiowa.edu/~acadtech/phonetics/english/frameset.htm

ii. English Pronunciation Lessons: How to pronounce /s/ and /ʃ/
http://www.youtube.com/watch?feature=player_detailpage&v=5PRUa3QS178
How to pronounce /p/ and /f/ in English
http://www.youtube.com/watch?feature=player_detailpage&v=AhdPywS1H1o

iii. Silent Letters /p/, /s/: podcasts
http://www.espressoenglish.net/silent-letters-in-english-from-a-to-z/

iv. PowerPoint for *click and pronounce* activity: One word/picture on each slide with the 4 phonemes in boxes given below. When the right phoneme is clicked a sound announces achievement. Words with target phonemes are randomly arranged.

Activity 1: 10 words + 10 pictures with one target phoneme in each

Activity 2: 10 words + 10 pictures with the phoneme in letter combinations/silent

Activity 3: 10 sets of minimal pairs words + 10 sets of pictures with minimal pairs words

4.1.2 *Audios with transcripts*

i. Minimal Pairs /s/ and /ʃ/
http://www.englishclub.com/pronunciation/minimal-pairs-s-sh.htm
Minimal Pairs /p/ and /f/
http://www.englishclub.com/pronunciation/minimal-pairs-f-p.htm

ii. Practice exercises with Audio 25 sets
Phrases, Sentences, Poetry**: /s/, /ʃ/, /p/, /f/**
http://www.eslgold.com/pronunciation/sound_p_f.html

iii. Tongue twisters
http://thinks.com/words/tonguetwisters.htm

4.1.3 *Handouts*

i. Four articulation-cards: Each has 30 words with one sound /s/, /ʃ/, /p/, /f/ at Initial, Medial ,Final positions
http://adventuresinspeechpathology.wordpress.com/free-resources/articulation-cards/

ii.

Silent Letter Words: podcast card
Silent P: corps, coup, pneumonia, psychology, receipt, cupboard
Silent S: aisle, island, debris, bourgeois
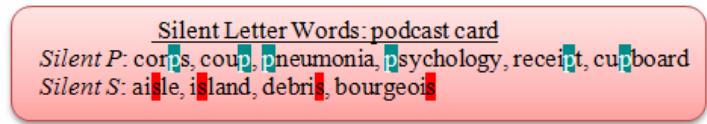
Figure 1: Silent Letter Words

iii.

Sound	Spelling	Examples
/s/ ස	s, c, ss, sc, st, ps, cc, se, ce, z (in SLE)	song, city, mess, scene, listen, psychology, flaccid,horse, juice, citizen
/ʃ/ ශ	sh, ti, ci, ssi, si, ss, ch, s, sci, ce,sc	shin, nation, special, mission, expansion, tissue, machine, sugar, conscience, ocean, crescendo
/f/ ෆ	f, ph, ff, gh, pph, u	fine, physical, off, laugh, sapphire, lieutenant

Figure 2: Sound to spelling correspondence card

Source: Adapted from http://en.wikipedia.org/wiki/English_orthography

4.1.4   *Assessments cards 1-6*: Listening Comprehension Quizzes- Listen and highlight the letter/s denoting the target phoneme and write the sound above it.

i.   1-4: 25 words with one target phoneme on each sheet
ii.   4-6: 25 Minimal Pairs /s/ and /ʃ/; /p/ and /f/

4.1.5   *Authentic texts*

i.   Ten selected short articles and five news clips with transcriptions

ii.   Aesop's Fables 10

The Boys and the Frogs

The sun was shining. It was a fine day. Some boys were playing around a pond full of flowers when they spotted a group of frogs hopping and swimming about in the shallow water. The boys began to shout and throw sharp rocks at the frogs, pushing each other.

Each fought to hit the most frogs.

They laughed off as many frogs were physically hurt. Sometimes the sharp rocks hit the frogs so hard that they shuddered and died. Finally one frog hopped upon a shiny stone.

"Please stop," he pleaded, "What may seem just fun to you is death to us."

Source: An adaptation of Aesop's Fables
http://www.storyit.com/Classics/Stories/boysandfrogs.htm

Figure 3: Aesop's Fables: 10, with adaptations to increase the # of words with target sounds

Phoneme count: /s/= 30; /ʃ/= 10; /p /= 13; /f/= 20. Calculating procedure: (# of correct phonemes articulations/phoneme count)/10

4.2 *Technology*:

Technology consisted of Rapid learning Centres and Language lab with 20 computers + headphones for personal use. Technical help provided. All audio/audiovisual material saved in the computers and personal copies given as take-home material.

i.   Rapid Learning Centre (RLC)

The RLC activities target collaborative work where students form 4 groups of 5 and will remain in the same group. A set of Color flag cards and Cue cards which indicate the target phoneme and its Sinhala grapheme equivalent will identify the target phoneme at each Rapid Learning Station (RLS). Initially the RLSs will be spaced out In the RLC so that no sound from one station disturbs another. Once each tier is completed the stations will be placed in a corner together and will be available for individual use outside class time. Students sign in/out times and RLSs used in a log book. If they log in 4 hours at a RLS the week after an assessment at each tier they can resit and improve their rating. This formative assessment will generate intrinsic motivation.

As I visit each station I would identify the weak students and spend a few minutes on Differentiated Instruction (DI) separately on the relevant target area (make them identify target phoneme, read the word/phrase aloud) and let them join the group again. As

the students are engaged in group work at the stations it provides   me with time for DI.

4.2.1. Tier I (2 hrs.): Each station will house videos/reading material/ facilities for other practice exercises. The students spend half hour at each station and rotate to the next station at a signal.
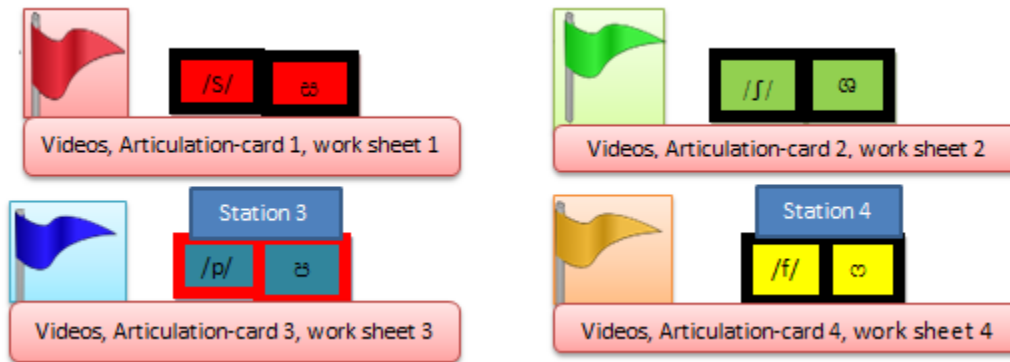
Figure 3: Tier I Rapid Learning Station

4.2.2 Tier II (2 hrs.): 2 sets of duplicate stations with podcasting facilities. The Ss spend one hour at station one and rotate to station two at a signal.
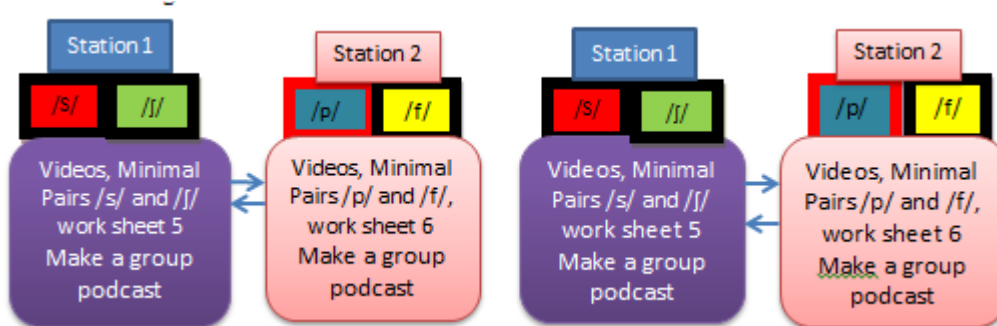
4.2.3 Tier III (4 hrs.): This station uses selected authentic texts where all four phonemes occur at random.
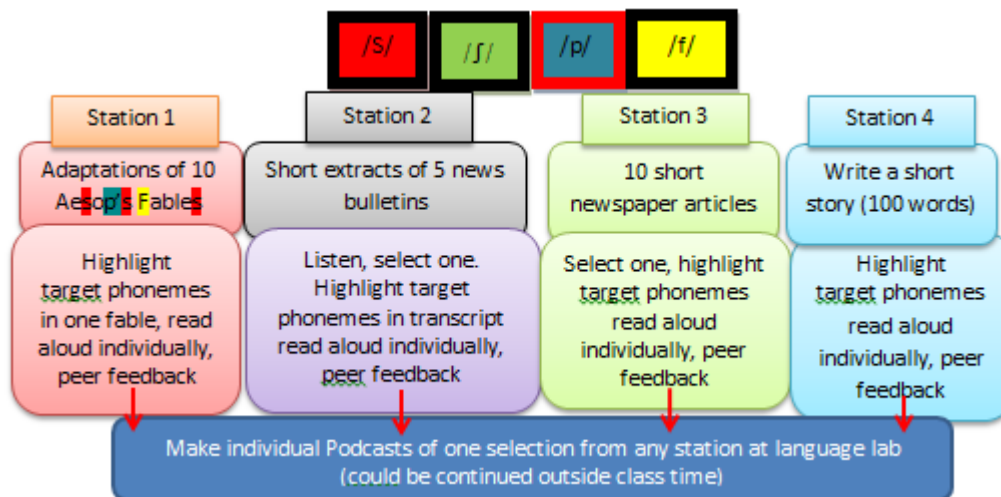
Figure 4: Tier II Rapid Learning Station

Moving away from the current summative assessment mode of this course uses a continuous and alternative assessment approach. As the course progresses a performance portfolio will accumulate 3 forms of performance information: a) Assessments 1-5; b) 3 Evaluation of Teamwork at RLSs c) 10 mentor diary cards + 5 mentor assessments on individual progress; d) and tabulation of individual hours spent on developing pronunciation efficacy at RLSs. One strategy in formative assessment is moving students forward in their learning by providing them with descriptive feedback as they learn. I intend to provide each student assessment feedback in a graphical format (other than the mentor comments) as illustrated below.
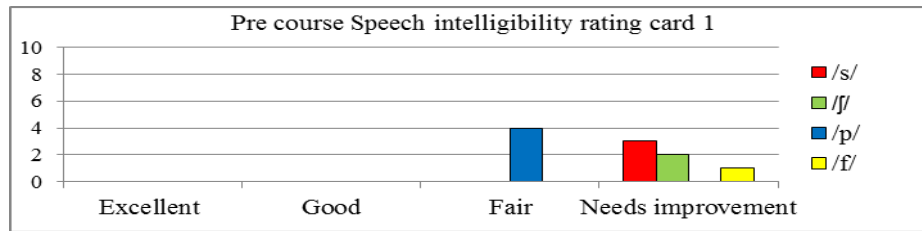
Figure 5: Pre course Speech intelligibility rating card 1

The feedback in the form of graphs intends to provide a dynamic depiction which will help individual learners to identify where their problems lie: what they are doing well and what needs improvement and stimulate them to target repair work.

V.   PLAN OF ACTION

A plethora of scholars such as Derwing et al (1998)[7]; Hahn, (2004)[8]; Lord (2005)[9] advocate that explicit instruction has strong, positive effects in the development of speech intelligibility in language learners. Thus my plan of action integrates explicit instruction on two targeted areas of pronunciation deviations from SSLE norms. The changes I plan to make will move the classroom from the traditional teacher centered, textbook and summative assessment based to a learner centered environment with cooperative and collaborative learning and use of authentic material + technology and DI.

5.1 *The Course Procedure*
5.1.1 *Pre course activities*
5.1.1.1 Students are informed of *Pronunciation upgrading I* through notices. Not only the teacher identified students during the Pre entry English course to the university but also the motivated can volunteer for this course.

5.1.1.2 Assessment I: Evaluating Pre course individual speech intelligibility level in target phonemes will be conducted with the Instruments Aesop's Fables: *The Boys and the Frogs* and the Rating and Reading sections in the Cumulative Evaluation Card (§10.1 Rubric 1). Time allocation: 15 mins. with 5 evaluators).

5.1.1.3 Mentor bank: I intend to introduce two types of collaborative work in this course: *In class* and *out of class*. The latter needs mentors. Thus notices will be put up to form a mentor bank of proficient SSLE user undergraduates. They will be volunteers either from university clubs who need to obtain certification on social responsibility or individuals who can put in 2 hrs. per week for 10 weeks (slots can be arranged according to Mentor- Student convenience) for pronunciation upgrading outside class hours.   The mentors should use tactful pronunciation correction and make brief weekly entries (5 sentences) in a Mentor Diary card and fill a speech intelligibility rating card (Rating + Free communication section in the Cumulative Evaluation Card § 10.1 Rubric 1) every other week. Students too will give feedback on mentor collaboration/rapport through a rubric which will contribute the rank of the certification awarded/discontinuation of the mentor.

5.1.2 *In-course activities*
5.1.2.1 (Week 1) Introduction to the course
This will be attended by students and mentors. The students will be given a portfolio with the Pre course Speech intelligibility rating card 1 which graphically indicates each S's current speech intelligibility status in the target phonemes. I will briefly recap the goal of the course, how it functions and expectations. Then Ss will analyze and cognize assessment procedures and criteria. Clear rules on students' responsibilities during collaborative work at RLSs and mentor interaction will be discussed and agreed upon. Each student/mentor is given a Cue & Color flag card set and directed on their use: show and the flag card first to trigger pronunciation deviations and if it fails show the relevant Cue card instead of pronouncing the target phoneme during peer correction. Thus through the Introduction I intend to prepare the students mentally, physically and emotionally for collaborative work and continuous assessment.

5.1.2.2 (Week 2)
First I will demonstrate the manner and place of articulation of the target phonemes using diagrams/hand gestures/sounds (snake hissing for /s/; shushing for /ʃ/) and create associations with L1 grapheme equivalents in the Cue cards. The students watch me and repeat single phoneme articulation in groups with peer correction. Each group writes 5 words for each phoneme and first read them in groups and then each student reads four words with the four phonemes aloud with peer correction. Next they are given *Sound to spelling correspondence* and *Silent letter* cards and further collaborative articulation practice directed in these areas follows. This creates awareness that multiple letters can denote one phoneme and some letters which normally denote a sound can be silent. Both features are not found in the L1 thus drawing a contrast with English is needed. Then students do the on-screen *Click and pronounce activity* 1 with peer correction which makes the students interpret and internalize Cue card & Colour flag card usage rules**.** This is followed by students creating/reading tongue twisters in groups. Thus prior to RLS Tier I activities the students connect colors/a grapheme in L1 with a target phoneme, practice the use of Cue & Colour flag cards developing kinesthetic/tactile connection with the phonemes.

5.1.2.3 (Week 3) RLS Tier I
At the station the students will re-create and demonstrate the manner/place of articulation of the 4 phonemes while they watch the videos. They will individually demonstrate their production to other group members. Students read *articulation cards* with peer correction. This will exhibit individual performance enabling me to identify students who need DI.

5.1.2.4 (Week 4) RLS Tier I

The students remain at the RLSs in Tier I. This week my first objective is to further enhance awareness on letter combinations and silent letters through *Click and pronounce* activity 2. Whether the students are able to execute pronunciation tasks, independent of help is examined through Assessment II: Listening Comprehension Quizzes 1- 4 at each RLS.

5.1.2.5 (Week 5): Reinforcing session

After each RLS Tier I plan to have a peer assessment/feedback/recap pronunciation Reinforcing session. During this session Assessment II will be peer evaluated using the Rating and Listening perception sections in the Cumulative Evaluation Card (§ see 10.1 Rubric 1). During Peer evaluation each member of a group will evaluate a set of 4 quizzes belonging to a student in a different group. As I am aware that this needs the collaboration of the teacher highlighted answer keys will be put on the screen to reconsider the peer marking and the set of quizzes are returned to the owner. Mentor feedback for weeks 2, 3, 4 and rating received for teamwork at RLS Tier I are given to individual students to be compiled in portfolios. Then the groups will discuss individual progress through mentor feedback + Ratings obtained for Assessment II + rating received for Evaluation of teamwork at RLS and suggest further RLS Tier I activity to members. I will identify need for DI. Students will debate on worth and relevance of mentor feedback. Reinforcing prior pronunciation *Click and pronounce* activity 1 and 2 will be repeated with Individual/group loud articulation.

5.1.2.6 (Week 6) RLS Tier II

My plan introduces minimal pairs at this stage upgrading the isolated phonemes to the main issue: confusing /p/ and /f/; /s/ and /ʃ/. Students will articulate the phoneme combinations in quick succession. *Click and pronounce* activity 3 follows. At each station students will write 10 other minimal pairs, 5 from each phoneme set, in groups. Once they have completed tasks at both stations each group member will read 2 minimal pairs, 1 from each phoneme set, while other groups do peer correction/note down innovative pairs.

5.1.2.7 (Week 7) RLS Tier II

Back at RLS Tier II the students will do Alternative Assessment III: produce group Podcasts. Each student will state name and read 5 minimal pairs from each set. Peer correction and rerecording is allowed.

5.1.2.8 (Week 8): Reinforcing session

Groups exchange of Podcasts and peer evaluation in groups. I will do my evaluation prior to the class and tally it with the peer evaluation to reach a final rating for each student. Rating and Reading intelligibility sections in the Cumulative Evaluation Card (§ see 10.1 Rubric 1) are utilized. Individual Evaluation of teamwork at RLS Tier II and mentor feedback for weeks 5, 6, 7 will be reviewed and given to students.

During reinforcing the students will discuss how rating obtained for Teamwork at RLS can be improved. Discuss individual progress at Assessment III. Listening perception rating graphical card for Assessment II is added to the portfolio.

Students will compare it with graphical card for Assessment I and perceive progress/need for further RLS activity. During reinforcing pronunciation Practice exercise v (Audio): 25 sets Phrases, Sentences and Poetry: /s/, /ʃ/, /p/, /f/ will upgrade pronunciation from word level preparing the students for reading/listening to authentic texts. A *Create a Poem and Read* session where students in groups use words with the target phonemes as far as possible follows. This is a pre activity for short story writing but I will tell the students the poetic license granted for poetry writing cannot be extended to short story writing.

5.1.2.9 (Week 9) RLS Tier III

During this session I plan to introduce selected authentic texts for reading/listening and one written activity. Each group creates a short story (word count = 100) and highlight and identify target phonemes. Peer correction is conducted during loud reading in groups/individually.

5.1.2.10 (Week 10) Language lab

Students move to the language lab and make individual Podcasts of one selection from any station in RLS Tier III.

5.1.2.11 (Week 11): Reinforcing session

During this session Graphical rating card III and IV of Assessment III/IV: Group/individual Podcasts and mentor feedback for weeks 8, 9, 10 will be given to students. Log book entries at the RLC will be given as # of hours spent on self-development at RLSs. Each student by now accumulates 4 graphical rating cards for speaking/listening, 3 rating cards for Teamwork at RLSs, 10 mentor diary cards + 5 mentor Rating cards and tabulation of individual hours spent on developing pronunciation efficacy at RLSs. Compilation of all feedback in individual portfolios will give clear evidence of motivation and progress. Students who evidence intrinsic motivation through further RLS activity and improved their rating will be commended. I will inform the students on the Cumulative assessment with Mini speeches to be held in week 13 and brain storm topics which interest them with key words in target phonemes (e.g. *Scholarship funding*). A shortlist is compiled and students draw lots to obtain their topics.

5.1.2.12 (Week 12): Students will practice Mini speeches with peer correction.

5.1.2.13 (Week 13): Cumulative assessment by same 5 assessors (pre-course assessment I)

Instrument: Cumulative Evaluation Card (§ see 10.1 Rubric 1)

Reading: The same passage given at pre-course assessment I: Aesop's Fables- *The Boys and the Frogs.*
Listening: A short news bulletin with transcript and fill in the blanks activity. Blanks indicate letter/s denoting target phonemes in transcript.
Speaking: Mini speeches

5.1.2.14 (Week 14)

Meeting with Mentors (1 hr.): Each mentor conducts a one-on-one discussion with the student mentored and gives feedback on Free Communication intelligibility through the 5 Mentor Rating cards and entries in 10 Mentor Diary cards. Analyze progress from pre to end of course (1 hr.): Students will finalize portfolios with graphical rating cards I-V, Formative assessment graphical rating cards, 5 Mentor speech intelligibility Rating cards, 10 Mentor Diary cards and 3 Cumulative assessment graphical rating cards. Comparing the pre-course with the final Speech Intelligibility rating Card in the Cumulative Evaluation where they read the same passage the students will be able to recognize and acknowledge upgrading of Intelligibility in the target areas.

5.1.4.15 (Week 15)

This week is set aside for having fun at a *class get together*. Each mentored student will award certificates of appreciation/ commitment to social responsibility to mentors. Each student will carry away their portfolios which indicate their progress over time along a collaborative continuous assessment process which differs from the summative assessment format followed at present. Furthermore there is no stress on passing/failing, what progress defines is the intrinsic motivation in each student.

VI. TIMELINE

Table 1: Timeline for the course

Week (2 hrs.)	Skill development	Activity to be trained/measured	Material
1	Listening/ speaking/ psychomotor	Recognize and Internalize Cue & Colour flag card usage	Cue cards & Colour flag cards
2	Listening/ speaking/ Reading/writing/psychomotor	Compare and contrast target phonemes. Formulate manner and place of articulation. Read/write Tongue twisters.	Sound to spelling correspondence and silent letter cards**.** Tongue twisters. *Click and pronounce* activity 1.
3 RLS Tier I	Listening/ speaking/ psychomotor	Develop precision in manner and place of articulation. Differentiate target sounds in uni-syllabic words. Peer correction.	Videos: /p/ and /f/; /s/ and /ʃ/ Articulation cards
4 RLS Tier I	Listening/ speaking/ psychomotor	Develop further awareness on phonemes represented by letter combinations and occurrence of Silent letters.	*Click and pronounce* activity 2. Assessment II: Listening Comprehension Quizzes 1-4.
5	Peer evaluation of Assessment II. Analyze ratings of Evaluation of teamwork at RLS Tier I and Mentor feedback for weeks 2, 3, 4. Compile individual portfolio.		
	Reinforcing prior pronunciation		
6 + 7 RLS Tier II	Listening/ speaking/ writing	Differentiates Minimal Pairs during slow moving to rapid loud articulation. Write Minimal Pairs.	Audios: Minimal Pairs; Read /listen Podcasts + Handout. *Click and pronounce* activity 3.
	Assessment III: Produce group Podcasts		
8	Peer + teacher evaluation of Podcasts. Analyze teamwork rating at RLS Tier II, mentor feedback for weeks 5, 6, 7 and Graphical rating card II for Assessment II. Compile individual portfolio.		
	Reinforcing: Listen/read Phrases, Sentences and Poetry + *Create a Poem and Read* session		
9 RLS Tier III	Extended Reading/ listening/ Writing	Examines and differentiates multiple target phonemes randomly occurring in authentic texts. Create a short story.	Adaptations of Aesop's Fables, news bulletins, newspaper articles
10	Assessment IV: individual Podcasts		
11	Reinforcing		
12	Practice Mini speeches		
13	Cumulative assessment		
14	Meeting with Mentors + Analyze progress from pre to end of course		
15	Class gets together +award ceremony		

VII.   BENEFITS

7.1   *Intrinsic motivation generation*

The main benefit gained will be the lowering of the affective filter (Krashen, 1981)[10] which is the complex, negative emotional and motivational factors that may interfere with the reception and processing of comprehensible input. Such factors include: anxiety, self-consciousness, alienation, and so forth (Freeman and Freeman, 2011)[11] In my course I will maintain low affective filters in the students through the following strategies:

7.1.1   The course requires the students to enroll on a voluntary basis.

7.1.2   As the group is small (n=20) I will be able to build a genuine rapport with each student. Findings of the empirical investigations by Sato (2012[12]) indicates that effective teacher talk at a personal level including supportive feedback builds mutual trust and respect which help the teacher to overcome many classroom issues. Extending the Mentor- student rapport is judged throughout the course and mentors could be replaced if needed.

7.1.3   The course fosters the belief that ability to adhere to pronunciation norms is a changeable, controllable aspect of pronunciation development (Schunk et al. 2010)[13].

7.2   *Course specific benefits*

7.2.1   Though the goal is pronunciation enhancement the lessons incorporate all four skills satisfying the 4 skills theory.

7.2.2   Most research shows clearly that in pronunciation deviation the problem is more likely to be reception - what you don't hear, you can't say. The RLS activities offer a variety of kinesthetic, visual, and aural devices and activities which allow clear practice in production and reception.

7.2.3   By using RLSs the students will be engaged in Collaborative and Collaborative learning with peer and teacher feedback while in groups. Group work gives students more opportunities to interact instead of a teacher-centered model which is the normal practice in the current environment. This classroom is more learner-centered and tends to take into consideration the learners' needs and interests. The aim is to secure intrinsic motivation that is needed to acquire the pronunciation norms in a more supportive and rewarding environment.

7.2.4   The goal of pronunciation instruction is not helping students to sound like native speakers but helping them to learn the core elements of a spoken variety so that they can be easily understood by others. Thus the students focus their attention on the development of pronunciation that is 'listener friendly'.

7.2.5   As DI is incorporated I can watch for plateaus in learning by watching the body language of the Ss and help to work past the difficult phases.

7.2.6   The continuous alternative assessments give each learner clear evidence of progress and concise feedback as to where their problems lie in target areas. This in turn will develop self-efficacy in learners and the habit of noticing problems they have.

7.2.7   Maintaining an organized, systematic individual performance portfolio will reflect a student's effort, progress, and achievement in the upgrading pronunciation in the target areas.

7.3   *Personal benefits*

Students develop a positive attitude towards pronunciation upgrading as they cognize that it is based on the strength of personal commitment and will organize and Internalize a personal value system which abandons the belief that they cannot escape from the stigmatized learner SLE user community.

7.4   *Social benefits*

Upward mobility in the pronunciation hierarchy: one step closer to SSLE.

VIII.   CHALLENGES

Hindrance factors that affect teaching and learning pronunciation have not only pedagogical but also include complex socio-psychological aspects such as identity (Norton, 2000[14], 2010[15]), attitude and beliefs (Ushioda, 2009[16]). This identifies multiple challenges.

8.1   Learners might initially feel self-conscious and negative about their weak pronunciation due to the social stigma associated with non-adherence to SSLE.

8.2   Pronunciation practice is limited to classroom environment. Outside the classroom students might fear to communicate with peers who belong to the prestigious SSLE user groups.

8.3   Tight timeline.

8.4   All ESL learners in Sri Lanka have a preference for traditional, teacher centered, uni-directional classrooms. They lack exposure and interest in collaborative learning.

8.5   In the students I expect to encounter deviation from SSLE pronunciation in areas other than the targeted phonemes. The tight timeline in my action plan does not allow addressing other areas of pronunciation which need attention.

IX.   SOLUTIONS TO CHALLENGES

According to Gilbert (2008)[17] challenges have to be turned into rewarding productive experiences during pronunciation teaching. Thus, in order to avert the above-mentioned challenges I advocate the following as solutions.

9.1 Firstly to effectively deal with the first challenge 8.1 will lower the affective filter by intrinsic motivation generation. Then at every possible moment I will praise noteworthy effort and concentrate less on students' ability. Teacher praise claim Hawkins & Heflin (2011)[18] can be a powerful motivator for students. A mode: Match the Method of Praise Delivery to Student Preferences (in front of a class/work group/ in a private conversation) will be used. Secondly my continuous assessment and descriptive feedback enable learners to see progressive improvement, which is invariably a great psychological boost. My framework for teaching will not only address the cognitive and psychomotor domains but also the affective domain where self-discovery that pronunciation can be improved leads to personal development.

9.2 Appointed mentor/s will communicate naturally and would use tactful pronunciation correction. The rapport created might develop into a friendship which may result in internalization to SSLE user community within the university.

9.3 There is rigid time-management at all RLSs. Thus they are well-organized due to full advanced preparation and are well-structured with clearly set progressive objectives. Flexibility is provided by out of class time accessibility to RLSs. Out of class mentoring, which is very beneficial, does not eat into class time

9.4 Though theoretically group work at RLSs foster collaborative learning further motivation is generated by individual feedback given as ratings for the teamwork at RLSs. Teamwork rating cards are compiled in Student Portfolios they are tools that demonstrate that collaborative learning not only aids progress and achievement but enhances knowledge sharing and develops a team spirit. After completing the course when students meet each other may reflect upon their experiences and accomplishments.

9.5 This course will follow a Serialist strategy based on the Zone of Proximal Development (Vygotsky, 1962)[19] and this is only Phase I. During this course I would identify students who need pronunciation upgrading in other areas and shortlist them. Phase II will prioritize and address the next deviation from SSLE norms which has the highest frequency of occurrence.

X. PLAN FOR ASSESSING SUCCESS OF CHANGE

Plan of assessment of success of change in pronunciation upgrading will be based along the continuous progress in each student reflected by the graphical rating cards. At the commencement of the course each student will possess Speech intelligibility rating card I of a pre course reading task indicating intelligibility rating of the target phonemes. As the students progress through the assessments they receive 3 rating cards for 3 assessments after each RLS activity. At the end the cumulative rating card indicates reading intelligibility, listening perception and speech intelligibility. Comparing the pre course rating with the final reading intelligibility rating of the target phonemes (the instrument is the same passage) gives a clear indication of advancement. 5 Mentor evaluation cards will rate free communication outside class and indicate progress. Another measurement of Success of Change is through student feedback. Rubric III: the student assessment of RLS activities and self-efficacy gained and Rubric IV: Self assessed pronunciation development informs me on how the students rate the contribution of RLS activities/ the course towards pronunciation upgrading in the target areas. In the *Please explain* sections of these rubrics students are encouraged to use English but to make them fill the section I would allow weak students to use their L1.

Furthermore as most assessments are peer/mentor evaluations all rubrics are simple, short and targeted. This makes assessment not only quick but the criteria will also be understandable to the students.

10.1 Rubric 1: Speech intelligibility/ Listening perception/ Free communication index (Adapted from Morley, 1994[20]: 76-77)

This card can be reconstructed as one card with Rating + Reading intelligibility sections to evaluate Reading, Rating + Listening perception sections to evaluate Listening, Rating + Speech intelligibility sections for mentor evaluations of free communication and assessing mini speeches.

Table 2: Rubric I- Cumulative Evaluation Card

Cumulative Evaluation Card			
Rating	Reading intelligibility	Listening perception	Speech intelligibility
Needs improvement (0-3 Points)	Cannot accurately differentiate between consonants. They are used in free variation.	Does not recognize the phonetic differences.	Inaccurate production interferes with the Intelligibility .
Fair (4-5 Points)	Shows some improvement in producing the consonant contrast accurately yet with a fair amount of errors.	Demonstrates a fair understanding of the phonetic differences.	Some amount of Intelligibility disruption due to mispronunciation.
Good (6-7 Points)	Demonstrates a great amount of accuracy in identifying the differentiation. Occasional errors.	Exhibits good perception of phonetic differences	The production of the consonant contrast causes little interference with communication.

Excellent (8-10 Points)	Production of the consonant contrast is accurate and intelligible.	Accurately differentiates between the phonemes .	The accurate pronunciation facilitates communication. Learner communicates what s/he intends to communicate.

10.2 Rubric II: Collaboration Assessment rubric used for teacher assessment/peer feedback.

Table 3: Evaluation of teamwork at RLSs

Name				Points
Exemplary	Good	Fair	Needs improvement	
(8-10 Points)	(6-7 Points)	(4-5 Points)	(0-3 Points)	
Always has a positive attitude about the task(s) and the work of others.	Usually has a positive attitude about the task(s) and the work of others.	Occasionally critical of the task(s) or the work of other members of the group.	Is often negative and critical of the task(s) or the work of other members of the group.	
Contributed equally to RLS activities .	Assisted group in the finished project.	Finished individual task but did not assist group during RLS activities.	Contributed little to the group effort during RLS activities.	
Performed all assigned duties and contributed to knowledge sharing. Always did the assigned work.	Performed nearly all duties assigned and contributed to knowledge sharing. Completed most of the assigned work.	Performed a few duties assigned and contributed a small amount of knowledge sharing. Completed some of the assigned work.	Did not perform any duties of assigned and did not contribute to knowledge sharing. Relied on others to do the work.	
Total Points				

Sources: Adapted from
http://www2.uwstout.edu/content/profdev/rubrics/secondaryteamworkrubric.html
http://people.richland.edu/fbrenner/syllabus/grouprubric.html

10.3 Rubric III: Student assessment of RLS activities and self-efficacy gained

Figure 6: Student assessment of RLS activities and self-efficacy gained

10.4 Rubric IV: Self assessed pronunciation development

Figure 7: Self assessed pronunciation development

In sum this action plan sets down a well-structured short module for pronunciation teaching with limited resources available in countries like Sri Lanka. It encourages teachers to move away from traditional teacher centered methods to Cooperative and Collaborative Language Learning.

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Women "Quest" for Empowerment in Sikkim's Society

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Abstract- The study analyses how over the years the status of women are changing where state as well as non state actors are playing significant role in empowering the role of women. Recent changes like *The Sikkim Panchayat* (Amendment) *Bill*, 2011 giving 50% reservation for women in Panchayat (grass root level) and initiating schemes like *Chief Minister Rural Housing Mission* (CMRHM) where house had been named after the women of the family. Success stories of non state actors in the form of *Self Help Group* like *Nayuma Women Cooperative Society* gives a positive trend in women empowerment. It critically examines the changes and challenges experienced by women community. An attempt has been made for suggestion and recommendation in empowering women of rural and urban areas giving them a platform of political and economical self reliance and their major say in decision making process bringing change in traditional ideas and strengthening the *social capital* (building trust and cooperation).

Index Terms- Gender Studies, Self Help Groups, Sikkim and Women Empowerment.

I. INTRODUCTION

The Himalayan state of Sikkim[12] became part of Indian Union in 1975 as a 22nd state. It has a total area of 7096 square kilometers which is the smallest compare to the other adjoining states of the Himalayas its has a total population of 6,10,577[13] persons out of which 47.09% consist of women population(Census; 2011).

Population wise it is clear that women are lesser in number compare to men, which also makes them to be in a minority group. Throughout the ages women group all over the world[14] has been widely been subjugated and excluded from political, social and economic sphere , in which Sikkim is no such exception. Empowerment means "to give strength and confidence" to realize an individual "potential and capabilities". Empowerment "implies the equal distribution of power between those who have more power and who have less power" (Ghatak; 2004). The term also denotes increased control over lives, bodies and environment that is in decision making, economic self reliance, legal rights to inheritance, equal treatment and protection against social discrimination (Kishore; 2004 in Dighe and Wadhwaniya; 2013).

Thus it becomes important to critically study the role of women, their status in Sikkimese society and also to analyze their quest towards empowerment with the aid of state intervention in one hand and themselves in the other. In which former provides a platform by being a facilitator for the latter.

In past Sikkim under monarchy had no schemes to empower the local women they had no roles to play in major decision making process, the old law gave no rights to women it was basically about the men and the king. However women played an active role in agricultural, household activities etc., along with male members and some cases contributed more than male members but were confined to private sphere when it came to public sphere in lowest level like village meetings.

II. POSITION OF SIKKIMESE WOMEN IN PAST: POLITICAL, SOCIAL AND ECONOMIC EXCLUSION

During the monarchial period most parts of state was controlled by the landlords (the Kazis) who "acted as a barons" (Basnet; 1974) in order to collect taxes[15] for king and rule with an iron grip where no women hold the post of landlords and neither in the kings ministry and the people had to suffer the atrocities in the form of forced labour (Sinha 2008) especially peasant women they were utilized for pleasure by the landlords with the aid of its henchmen. Socially they were exploited and legally they didn't have any right.

The old law of Sikkim also doesn't give any property inheritance[16] right to the women the customary law "permits women to get divorce from its men only after paying certain amount of money (zho) and if there was dispute over a child women are allowed to take the girl child only whereas father takes the son"[17] (White; 1928) the law clearly showed the gender biasness which separated the child in form of a son from his mother and a daughter from his father.

However in 1960's women were given chance with the support of Chogyal "King" Palden Thondup Namgyal along with his American Gyalmo "Queen" Hope Cooke who started to

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[12] Also known as "Myel Lang- the fairy place near Mount Kanchanjunga" in Lepcha language, "Denzong- the valley of rice" in Bhutia language and "Sukhim- the new house" in Limboo language.It became part of India in the year 1975, its capital is Gangtok. The land is rich of flora and fauna and one of the natural sanctuaries for varieties of living species situated in the foothills of the Himalayas. It consists of four districts i.e. North District headquarter Mangan, East District headquarter Gangtok, South District headquarter Namchi and West District headquarter Geyzing.

[13] About 75% of the population resides in rural areas.

[14] Europe (medieval period), Asia and Africa women being subjugated, exploited and excluded with the aid of religion, culture, customs and tradition (dowry, burkha, polyandry and attached with belief like emotional, weak etc)

[15] Sikkim was dived into 104 estates out of which 61 estates were leased out to Kazis, 15 exclusively belonged to King and 5 estates belong to the monasteries (GOS 1977: 13) in Chakrabarti (2010) A Critical review of Agrarian Reforms in Sikkim.

[16] Women were indirectly given movable and immovable items in the form of gifts also known as "pewa" depending on the status of the woman family

[17] Similarly when husband wants to leave his wife he has to give money according to the duration which he stayed with her wife (12 zho for 12 years) The Gazetteer of Sikhim.

promote the national identity of Sikkim[18] in international level in 1967, "which made the two Sikkimese women, Gayatri Devi Gurung and Chum Dorji Wangmo, travelled to Manila to attend a conference on women's leadership organized by the Associated Country of the Women World where they represented the Sikkim social welfare society where they displayed items like Sikkimese national flag, *thangka* (religious painting), booklets about Sikkimese history and society etc.," (Hiltz; 2003)

Such initiatives had a little impact on women community in general in the state but at the same time it promised to bring a positive improvement in future. However it was during such developments suddenly "Sikkim Durbar on 15th March 1969 initiated proclamation of scrapping Sikkimese citizenship from women who marries outsider (non-Sikkimese) not belonging to the state of Sikkim" (Basnet; 1974).

The first victim of the proclamation was Ruth Karthak Lepchani who was debarred from her ancient asset, simply due to reasons like she married an Indian male who belong to Muslim community, "she revolted against durbar politically by forming Sikkim Independent Front in 1966 and she was vocal about the cause for Lepchas" (Himalayan Observer in Basnet; 1974). Sikkim government alleged her of spreading rumours against the Chogyal of being biased and favouring only to the Bhutia community and oppressing the Lepchas the original inhabitants of Sikkim. She was later on forced to leave the kingdom and never in her life to return to her birthplace.

Politically she didn't get any chance to run her party, economically she was prohibited of any entitlement of her ancient properties and socially she was marginalized and separated from her ancestor place. The above incident clearly highlights that women were subjugated and excluded politically, economically and socially during the monarchy if any words went against the Durbar.

With the proclamation of the law it was issued for general public and from that day women had no rights over property inheritance legally, which was the major blow to the women community. It was social injustice in the form of gender inequality.

Documentary title "Sikkim" directed by Satyajit Ray highlighted women participation in the grass roots levels in rural and urban areas of the state in the form of manual labourers working for Border Road Organization (BRO) agency of Government of India, in building roads to reach the far flung places of north district (Lachen and Lachung) where, women fetch woods for cooking and water for the household, actively engaging in agricultural activities, existence of women vendors in the market also signified the women actively taking part in the economy of the state.

Illiteracy among women- In the sphere of education literacy among women was very low Paljor Namgyal Girls School was started by the Scotland Missionary to educate girls in 1968 "there were only 11 girls in metric who mostly belong to the Gangtok town and no such opportunities were available in villages" (Savatri Rai[19]; 2011) PNG school, Tashi Namgyal

Academy and Tadong school which were at town had plenty of student enrolled for primary education.

Poor education among the girl child "reasons for slow spread of education among girls in Sikkim are, as elsewhere, poverty, social customs, negative parental attitudes, poor accessibility to schools" this also reflects the period which didn't gave much emphasis to education esp. girls education and concentrated in primary activities (Lama[20]; 2001).

The enrollment of girl child in higher education was poor as many would drop out due to early marriage once if the girls get married she didn't have any chances to continue their studies as she would enter into early motherhood and in rarest cases the family of husband gave opportunities to their daughter in law to continue their studies.

Even if the husband family allowed their daughter in law to continue their schooling the society and the school environment would look at the married girl differently letting her to belief that it's better to stay at home rather than to attend school. The state also didn't have open school for such married girl where they could have easily continued their further studies.

The condition of women remained stagnant in early years (1975- early 1990's) it lacked on strengthening and empowering the role of women. In 1996 United Nations, Sustainable Development Department of Food and Agriculture Organization (FAO) did report on Gender in Development and Socio economic relations in Sikkim which found that the women condition in Sikkim was poor where higher education for boy child was preferred more than the girls, "the reasons for children not attending schools between 6-17 years specifically among girl child was required for household work, taking care of siblings and early marriage"[21] (Sikkim Development Report 2003).

Political participation among women was very low in political association, bureaucracy and there were no women association and NGO's. Sikkimese women never represented itself in International Seminar on women sensitization which also limited them to exchange ideas on women empowerment, due to the old law of Sikkim property inheritance for women was limited especially when she marries an outsider and "there was a notable gap between urban educated women and their rural counterparts, and the relative opportunities available to eachother" (Eckman; 1996)

III. CONTEMPORARY SCENARIO

State Intervention- In the latter half of 1990's series of women empowerment policies and scheme was initiated by the government to improve the status of women from the grass root level. Like "Small Family Scheme" which encourage women to delay the early marriage and continue their studies "Girls who are 13 years of age as on April 1, 1997, and who are not married, receive a fixed deposit certificate of Rs 2,000 from the State Bank of Sikkim in their names. The Scheme provides an incentive of Rs 2,000 if she marries after the completion of 21

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[18] Geographically and ethnically, Sikkim had a distinct identity. The traditions, customs and beliefs give a character different from that of India (Joshi; 2004)
[19] Subhadra Rai is the present chairperson of State Women Welfare Commission of Sikkim who strongly believes that the concept of women empowerment can only be achieved if there is inner belief on the notion "we are women"

[20] Professor Mahendra P. Lama wrote Sikkim Human Development Report 2001 the third state which published its human development report and Economic Survey 2006-2007 for the government of Sikkim.
[21] The report was based on Sikkim Development Report 2003 which was taken from NFHS survey 1998-99, 2000.

years, an additional incentive of Rs 500 if she marries at the age of 22 and if she marries at the age of 23, an additional incentive of Rs 1,000 is paid to her. So far this scheme has covered over 1,200 children" (Lama; 2001).

The enrollment of girl child in higher education surpasses the boys, the literacy rate of females has raised from 60.41% in 2001 to 76.43% in 2011 (Census of India; 2011) which shows 16% increase in the female literacy rate compared to male counterparts within the group[22] over the past decade which is one of the major leap forward for women striving for gender equality in the field of education.

One of the major sight to see in 2009 Sikkim election was "against 81.46% male voter turnout, Sikkim's women have posted an 82.77% turnout of the 31 territorial (excluding Sangha seat which comes under monastery) constituencies in Sikkim, female voter turnout was higher [in percentage points] than men in a staggering 23 constituencies" (Now; 2009) showing more political awareness to select their choice of government.

For the first time in the history of Sikkim women were included in the higher posts of Chief Secretary, Speaker of the Sikkim Legislative Assembly, Cabinet Ministers, Zilla Adhyaksha and the Chairperson of Public Service Commission and Sikkim Women's Commission[23] in the various parts of government portfolios.

Similarly by passing The Sikkim Panchayat (Amendment) Bill, 2011 it became the first north east state to raise the women reservation seat from 40 percent (2007) to 50 percent (2011) in the Panchayat Raj Institution where proportionate reservation are aimed to constitute women in the post of Sabhapati and Up-Sabhapati in Gram Panchayts and Adhaksya and Up- Adhaksya in Zilla Panchayats. Such initiative provides more opportunity for women belonging to the rural areas in political participation and decision making processes in the grassroots level which was previously male dominated arena.

Similar to that state initiative in empowering women socially is the Chief Minister Rural Housing Mission (CMRHM) were state aimed to transform all kutcha "unstable" houses to be made pucca "stable" houses under the "kutcha house free state mission 2013" were the scheme provided by giving priority to the female in the registration of household. Thus giving major share to the women of the family at the lowest level.

Sikkim Succession Bill 2008 is another such initiative by the state in empowering women socially, the Bill promised to give right to women to acquire or to inherent property though with some conditions[24], divorced women, only daughter of the family are entitle for property which was previously never given to the Sikkimese women. Such step provides some sort of gender equality in a society.

State intervention through Public Distribution System and Mahatma Gandhi National Rural Employment Guarantee

Scheme (PDMRE), through PDMRE they were able to have food and nutritional security of their families especially the children. As the availability of PDS ration made the women to save some of their earned money or invest in non food items etc., at the same time frequent visit to Fair Price Shops by female member made them more aware of the market price of essential food items. Secondly through this most of the women were able to form informal women groups in the villages this was due to MGNREGA.

The scheme provided money any delay in money meant problem for their families. So they formed one voice in social audit and raised their voice and complaint and put their grievances. And if asked question they gave answer in one voice about the development of programme as they were the ones who actively participated in the project. Such events also made them to form SHG's in making bags, pickle, soft toys etc.

The wages it helped them to buy household item, send children to schools and tuitions. They are able to visit to their relatives without depending on her husband money. Workers reported that wages in past which they got through these earnings was unavailable to fulfill their children needs. However through the wages of the scheme they were satisfied with their wages, which they get as it helped them.

In the domestic sphere though Sikkimese society is not known for women oppression in the form of dowry, sati, female infanticide etc. but there is widely presence of Domestic Violence and Violence against women by the study conducted by Society for Promotion of Art, Culture, Education and Environment Excellence (SPACE)[25] which emphasis "that 50 percent of women are battered by men and almost 4.8 percent by their in laws/relatives with the approval of their husband" (SPACE; 2002) and in their research strongly recommended for the constitution of body (Government and NGO's) which will ensure protection of women from domestic violence.

In order to prevent domestic violence against women The Sikkim State Commission for Women was constituted to help and support the women in distress and "to act on the violation of women rights". Since its formation "1015 cases were settled out of 1050 cases and 35 cases were referred to the courts". The major objective of Commission is to settle dispute between the families rather than to break the families and to make women aware of her legal rights (State Women Commission; 2011).

In the beginning there were only 13 cases but every year the cases started to increase[26] which also proves that women started to be more aware of their rights and also about the places where their grievances could be heard, in most of the cases the dispute were settled peacefully and if the cases were unsettled it was referred to courts where the Commission provided advocates for the women victim free of cost.

Rise of Civil Society- NGO in the form of Mamtalaya situated at Tadong, East Sikkim, actively participated in protecting women in distress and provided short stay home for 3-6 months which works as a rehabilitation centre and runs side by

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[22]Literacy rate of male 76.04 in 2001 and 87.30 in 2011 showing Male literacy rate has increased 11% (Provisional Census of Sikkim 2011)

[23] The Sikkim State Women Commission for Women was formed on 12th November 2001. It was first constituted on 22nd Nov 2002 with the chairperson Ms. Chandra K. Cintury.

[24] Sikkim Succession Bill 2008 tries to provide property inheritance rights to women with some conditions attached for e.g. If an intestate has left no heir to succeed to his or her property in accordance with the provisions of this Act, such property devolve on the government

[25] SPACE an NGO based on Gangtok underwent to study the presence of Violence against women and domestic violence in Sikkim in the year 2002.

[26] In 2003-04=103 cases, 2004-05, 159 cases, 2005-06= 100 cases, 2007-08= 162 cases, 2008-09= 110 cases, 2010-11= 101 cases, 2011-12= 65 cases which dealt with Matrimonial dispute, Dissertation, Custody of children, maintenance allowance and property dispute, Women Commission Report.

side with Sikkim State Commission for Women. Most of the cases are brought to the Commission through the Panchayats. Such body's provides a platform where women empowerment in social sphere is assured.

The formation of Nayuma Women's Cooperative Society (NWCS) was one of the major milestones in the empowerment of women in Sikkim. It became the first women cooperative in Sikkim which has women members belonging to the urban and rural areas. It is pro women society which aims to benefit the women of Sikkim by employing educated and uneducated women of urban and rural areas.

NWCS was formed in 2001 by Mrs. Tika Maya Chamling[27] who held the position of Managing Director but shortly she resigned and left society in the hands of young women entrepreneurs it has currently 30 members on the salaried bases. The society gives importance to local women and trains them for 2-3months in making traditional and indigenous products like thankas, bags, bakku and hanjju, different traditional community dress, soft toys, sweaters, etc.

Apart from handlooms NWCS also runs grocery store and café shop in Gangtok where they employ women and the store promotes items like home made pickels of dallae korsani, taaba (bamboo shoot pickle) achar, chicken pickle and buff pickle which are made by women Self Help Groups of south and east district of Sikkim.

One of its major achievements was at the National Cooperative Fair 2009 which was held at Jaipur, Rajasthan where for the first time Sikkim women cooperative society participated and was adjudged "First in the Pioneering Cooperative Societies Category leaving behind 164 Cooperative Societies of India" (Cooperative News Bulletin). It has participated in National Expo/ Fair of Women in places such as Goa, Assam etc.

It aims to be successful and wants to participate in International Expo and bring pride to the country and the state, wants to enroll more local women member and to provide better opportunity especially for uneducated and minimum qualified women to provide platform for a way forward and to establish more units in the state to empower the women.

In the survey when interviewed with the women worker in NWCS they stated that cooperatives provided them vast experience in the entrepreneurship, women from both from rural and urban areas were doing job, came to know more about public world and confident enough to i can head her own business.

Such positive attitude of women community in Sikkimese society promises better scope for social capital[28] in building mutual trust and cooperation in achieving common goals providing positive effect in the society. Further paving way for women community to their quest towards empowerment.

IV. CONCLUSION

Women of Sikkim over the years have changed significantly due to global flow of ideas and cultural interactions which is driven by communication, technological revolution and with flourishing tourism and cooperative society. At the same time there is strong initiative from the state government in bringing change in the grass roots levels to empower the women.

The real empowerment in true sense can only be seen when the expression of women community are manifested. In context of Sikkim every time when policies are frame for women their action is appraisable over the years the literacy rate among the girl child has improved, there is more political participation than their male counterpart, in the grass root there are various women Self Help Groups through which they are financially independent and saves money for themselves and for their children.

The Cooperative society in the form of SHG's which are the basic concept of western world are widely implemented by the state and accepted by the women community in general, where there is inclusion of indigenous knowledge in preserving and promoting traditional culture and heritage which shows strong and positive trend towards empowerment among the Sikkimese women.

SHG's which is building trust and cooperation with women community at one level by establishing strong norms and value within the groups which binds women morally and to work in groups/association at the same time strengthens them individually both in public and private sphere. It not only bring political and social awareness but also brings economical stability for an Individual women which in turn that economic Independence latter strengthens the society and the state.

The journey of women in the state of Sikkim has both highs and lows though they have not suffered as much as their counterparts in rest of India still gender inequality persist in the form of women property inheritance, domestic violence, a women cannot be pipon "village head" in north district of Sikkim where traditional system of governance "Zumsa" exist. It needs more responsible women cooperative society and caring Mamtalaya in rural parts of state and more state intervention in gender issue for empowerment of women. Lastly Sikkimese women are in progress to reach real empowerment which should come out from women itself helping in their quest of real empowerment.

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Effective Factors on Accounting Information System Alignment; a Step towards Organizational Performance Improvement

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Abstract- Managers need relevant and reliable information just in time in order to make appropriate decisions to achieve organizational goals and objectives. Financial information is one of the most important types of information. Thus sound Accounting Information System (AIS) is crucial to the firms. This study tries to find out factors affecting AIS effectiveness which is a prerequisite to improvements on organizational performance. The paper examines relationship between AIS effectiveness and Managerial Knowledge, Use of External and Internal Consultant as well as Firm's Size.

Data is collected through questionnaires from 37 manufacturing firms which are members of Iran Association of Detergent, Hygienic and Cosmetic Industries. T-test and Logistic Regression applied to data to test the hypothesis. Findings suggest AIS alignment is related to managerial knowledge, use of accounting and auditing firm's consultancy, internal IT employee's consultants and firm's size.

Index Terms- AIS effectiveness; AIS coordination; Managerial Knowledge; Firm's size, Firm's performance

I. INTRODUCTION

The concepts of Integration, Alignment and Effectiveness of information system are concerned by many academic researches. The relation between any of these concepts and the success level of IS, organization performance and organization success, are considered by different scholars. The above concepts are mostly discussed under Information Systems Portfolio available in organizations. These concepts could be considered for each sub-system like Management Information Systems (MIS) or Accounting Information Systems (AIS). The competitive condition of markets and technology advancements which made easy accessibilities to different markets increases the importance of information and Information Systems (IS). In competitive conditions using information especially financial information is a crucial factor so that on time accessibility to precise information is a competitive advantage. AIS is one of the most important ISs in an organization where its importance would be increased by the time. Technology advancement and emergence of new technologies increases capacities of ISs. On the other hands changes of market competitions makes the needs of new information. Alignment of ISs and information requirements of users is an important topic which has considerable influence on effectiveness of IS and firms' performance. Nevertheless the factors influencing this alignment

are not really identified yet. They are taken under in depth study in this article.

II. REVIEW OF LITERATURE

Effectiveness means to look at the extent of effect of works done to achieve the predetermined goals or objectives. In other words in effectiveness study, the extent of realized objectives is measured. The effectiveness of AISs is studied by different scholars and various indicators are used to measure that. AISs usage, User Satisfaction, Project Success, Service Success Economic Success are some of such indicators. A review of 180 empirical and theoretical researches is done and six dimensional variables to integrate the available indicators are suggested [1]. These dimensions are System Quality, Information Quality, System Usage, User Satisfaction, Individual and Organizational Impacts. The first Alignment Strategic Model was SAM (Strategic Alignment Model) is introduced by Henderson and Venkatraman (1993). SAM got four basic concepts of Organizational Strategy, IT Strategy, Organizational Infrastructure and Process, IT Infrastructure and Process (Fig. 1).Chan et. al. measured Organization Strategic Direction, IT Strategic Direction and Information Strategic Alignment (Fig. 2). They examined their impact on ISs effectiveness and organization performance. Chan et. al. suggested a) the best way to study these concepts is modeling them by holistic system approach method. b) IS strategic alignment is a good indicator to predict information systems effectiveness. c) Organization strategic system, ISs strategic alignment and IS effectiveness have an impact on organization performance. Dorociak also looked at impact of organization strategies cooperation and ISs on organization performance. He believes on positive relationship between IS strategy, organization strategy alignment and organization performance (Dorociak, john, 2007). The effort made by SMEs to implement, invest and improve their AIS is related to their economic and financial results, since firms not using AIS or only partly using it obtain losses. (Grande et. al. 2011). Benjamin and Levinson (1993) conclude that performance depends on how information systems resource is integrated with organizational, technical, and business resources. Chan, Huff, Barclay, and Copeland (1997) argue that the impact of information systems on performance may not be a direct one, but intermediated by other factors such as the alignment between information systems strategy and business strategy. Luftman, Lewis, and Oldach (1993) recognize that for companies to succeed in increasingly competitive, information intensive,

dynamic environment, the alignment of business strategy and the information systems strategy is a necessity. Six factors of 1) IT complexity, 2) Knowledge Management, 3) Management Contribution, 4) External Consultancy, 5) Internal Consultancy, 6) Organization Size are examined by Ismail and King. They found IT advances, extent of external and internal consultancy have an impact on IS cooperation. There is a low relation between management contributions and IS cooperation. There is almost similar knowledge management in every organization. There is a reverse relationship between organization sizes and IS cooperation (Ismail and King, 2007).

IS alignment and IS effectiveness are used in some of researches interchangeably whereas there are specific definition for each of them. IS effectiveness is the extent of accounting IS contribution to achieve organization objectives (Ismail, 2009). AIS alignment means AIS requirement and AIS capacity (Ismail and King, 2007). Researches reveals that IS alignment and its effectiveness has a strong correlation (Chan et. al. 1997) so these two concept could be used interchangeably or the result taken from alignment may be generalized on effectiveness too.

IT and business strategies alignment and its contribution to firm's improvement are a matter of debate for years among academicians. Various empirical researches in different economies shows firms interest to acquire this alignment but there seems to be few studies on factors affecting this alignment. There is no study done on alignment between AIS capacity and Information Requirement in Iran which might be Due to firm's information accessibility constrains or unavailability of enough literature.

The paper aims to identify factors affecting AIS alignment with user requirements which would result to firm's improvement.

"Fig. 2": SAM Model (Henderson and Venkatraman, 1993)
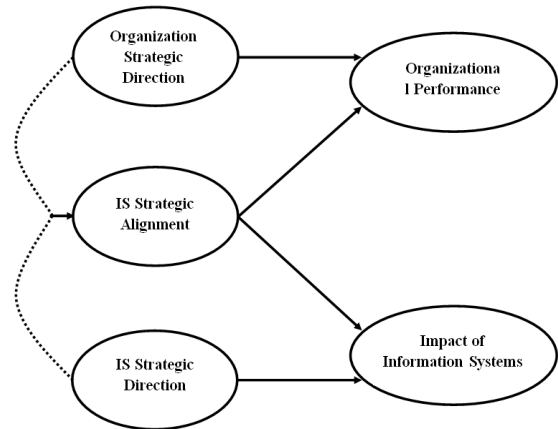
"Fig. 2": Chan Model (Chan et. al. 1993)

III. METHODOLOGY

The research looks at four hypotheses:

H1: Firms' managers with more IT and accounting knowledge, have more AIS alignment

H2: Firms using external consultants have more AIS alignment.

H3: Firms employ internal consultants have more AIS alignment.

H4: Larger firms get more AIS alignment.

The research has four independent and one depended variables. AIS alignment is dependent and Managerial Knowledge, External Consultant, Internal Consultant and Organization Size are four independent variables of the study. There are varieties of methods to assess the AIS alignment. Venkateramen (1989) introduced six approach to assess alignment while there are specific statistical model and theory to each of them (Ismail and King, 2007). Match Approach and Moderation Approach are the most common among them. The research includes SMEs as well so the Moderate Approach is selected. This approach is suggested by literate where SMEs are involved (Cragg and Tagliavini, 2005). In this method cooperation indicate synergy though it means reciprocity action of two factors. AIS cooperation is defined as reciprocity of two factors of AIS Requirements and AIC Capacity. Respondent are asked to rate their firm on any of above variables on nineteen accounting criteria which measures these variables. The criteria are rated on the basis of their importance and accessibilities in their own IS using five point Likert Scale questionnaire. The product of importance and accessibility is a number which indicates AIS cooperation. It is between one to 25 where the increase in this number show more IS alignment. Managerial Knowledge is assessed through; 1) Financial Accounting Techniques, 2) Managerial Accounting Techniques, 3) Data Processing Software Usage, 4) Spread Sheet, 5) Data Bases, 6) Accounting Applications, 7) Email, 8) Internet, 9) Computerized Production Management. The mean of respondent rates on their familiarity on above organizational main operation are considered as their managerial Knowledge. The firms are given one point in case they use any kind of external and one point for internal consultants. Numbers of employees is one of the most common criteria which is used to decides on the size of the firms
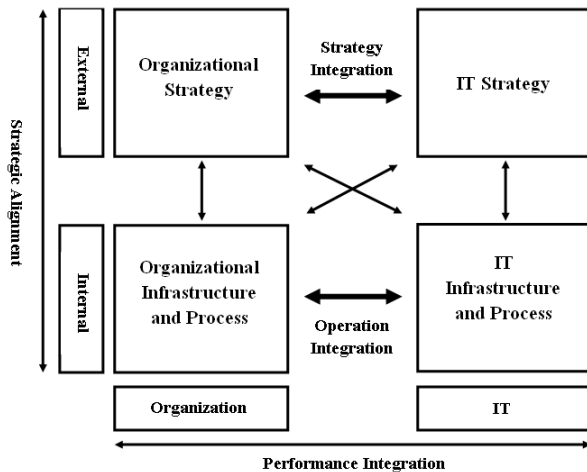
(Choe, Jong-Min, 1996). It is also a criterion used by Iran Labor Law and EU to classify large firms from SMEs. The research is done on firms who are member of Iran Association of Detergent, Hygienic and Cosmetic Industries. The total firms are 86 where the authors could analyze 37 questionnaires which are mostly filled by financial managers of the firms on personal meetings in time span of Jan-July 2009. The number of respondents is satisfactory on the basis of kakran formula. The Cronbach Alpha for the research' questioner is 0.83 which shows the high validity of the questionnaire.

IV. Data Analyzing

The Clustering method is used is used in the research. T-test is applied to each hypothesis and the variables relationship in every hypothesis is examined by Logistic Regression too. Firms are divided to two different groups by clustering analysis.
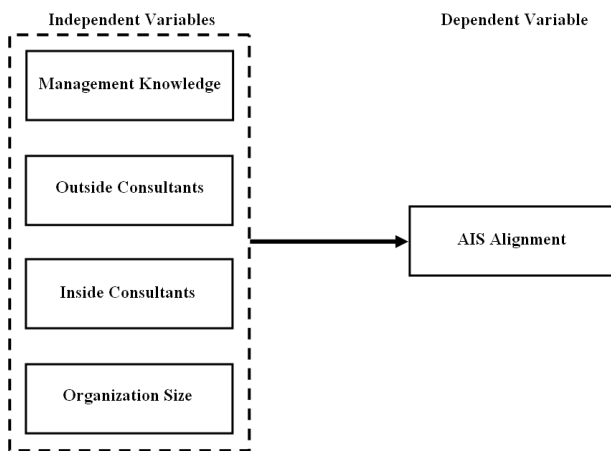
"Fig. 2": Research Variables

Ten firms have aligned system (aligned group) and 27 don't have aligned system (unaligned group). Table 1 shows mean of respondents rate on each of the information criterions. Table 2 illustrates managerial knowledge on the basis of nine main operations in firms. Consultant, Suppliers, Government Organizations and Accounting Institutions are considered as organization external consultants. Table 3 elaborates the benefited firms from them and related analysis. Accounting and IS personnel of firms are considered to be organization internal experts. Table 4 states how firms are adopting internal consultancy. Firm's employee numbers are considered as its size indicator (Table 5)

Table1: Information Criterions Rates

Criterion	Total Sample	Aligned Group	Unaligned Group
Report Frequency	18.46	22.0	17.15
Report Quickness	17.46	21.0	16.15
Temporary Report	16.00	21.5	13.96
Report Summaries at Firm Level	15.97	22.3	13.63

Automatic Receipt	15.84	20.2	14.22
Precise and Specific Goal	15.68	20.6	13.85
Sections Reports	14.97	21.2	12.67
Future Events	14.95	21.3	12.59
Production Non Financial Information	14.62	20.9	12.30
Report Summaries at Sections Level	14.11	21.3	11.44
Immediate Reports	14.03	19.1	12.15
Decision Models	14.00	19.6	11.93
Organizational Influences	13.49	18.6	11.59
Various Sections and Bodies Integration	13.22	16.0	12.19
Market Non Financial Information	12.57	17.9	10.59
Non Economic Information	10.89	19.2	7.81
Events Impacts on Future	9.76	17.5	6.89
If then Analysis	9.00	12.1	7.85
External Related Information	8.22	12.2	6.74

Table 2: Managerial Knowledge Results

Criterion	Total Sample	Aligned Group	Unaligned Group
Financial Accounting Techniques	4.24	4.5	4.15
Managerial Accounting Techniques	3.73	4.6	3.41
MS Word	3.41	3.8	3.26
MS Excel	3.65	4.10	3.48
MS Access	1.81	1.8	1.81
Accenting Applications	4.05	4.4	3.93
Computerized Production Management	2.16	2.2	2.15
Email	3.97	4.2	3.89
Search in Internet	3,84	4.5	3.59

Table 3: The Organization External Consultants Usage

Group	Consultants		Suppliers		Government Org.		Accounting Institutes	
	No.	*μ*	*No.*	*μ*	*No.*	*μ*	*No.*	*μ*
Aligned	9	90%	0	0%	0	0%	9	90%
Unaligned	27	100%	6	22%	0	0%	10	37%
Total	36	97%	6	16%	0	0%	19	51%

Table 4: The Organization Internal Consultants Usage

Group	Accounting Personnel		IS Personnel	
	No.	*μ*	*No.*	*μ*
Aligned	10	100%	9	90%
Unaligned	27	100%	6	22%
Total	37	100%	15	40.5%

Table 5: Firm's Size

Group	Employee No. Mean
Aligned	171.5
Unaligned	80.96
Total	106.11

V. FINDINGS

Hypothesis1:

T-test reveals at 95% confidential level, managerial knowledge mean got a meaningful difference in aligned and unaligned group where its value is more in the prior group. Though the assumption of same mean for groups is rejected and due to higher value of managerial knowledge in aligned group H1 is not rejected. The logistic regression analysis also shows a meaningful model as well as a positive relationship between system alignment and managerial knowledge at 95% of confidential level. The familiarity extent of managements with computerized production management and data base software (MS Access) are almost same for both group. Therefore they have uncertain impact on system alignment. On the other hand managements' familiarity with accounting techniques in aligned group is much higher than other one.

Hypothesis 2:

T-test analysis shows the t value equal to -1.146 and -1.96 for hypothesis rejection area. Therefore the assumption of the same mean for groups is not rejected and H2 is rejected. Few firms from unaligned group and none of aligned group member are benefited from supplier consultancy. Governmental organizations are not consulted by any firm. Accounting institute consultancies are used by aligned group member much more than other group. Chi Square method is used due to their considerable difference. The result shows a positive relation between accounting institute constancies and AIS alignment.

Hypothesis 3:

T-test results shows at 95% of confidential level, the mean of adopting internal consultants in aligned firms are meaningfully higher than unaligned firms so that the hypothesis is accepted. Logistic regression method also suggests a meaningful model at 95% confidential level with a positive relation between system alignment and internal consultants' usage.

Hypothesis 4:

T-test shows a meaningful higher mean for firm size in aligned than unaligned group at 95% confidential level. Therefore the hypothesis is not rejected. Logistic regression also reveals a meaningful model with a positive relation between firm size and system alignment at 95% confidential level.

Table 5: The Summary of Hypothesis Testing Results

Hypoth.#1	T test	t-value	Rejection Area (H0)	Result
		-4.42	-1.96	H1 is not rejected
	LR	R2	RCP	Regression Equation
		0.21	70.30%	In $(\theta_i/1-\theta_i)$=-10.33+2.51x
Hypoth.#2	T test	t-value	Rejection Area (H0)	Result
		-1.146	-1.96	H2 is not rejected
	LR	R2	RCP	Regression Equation
		0.025	73%	H2 is rejected
Hypoth.#3	T test	t-value	Rejection Area (H0)	Result
		-4.591	-1.96	H3 is not rejected
	LR	R2	RCP	Regression Equation
		0.331	81.10%	In $(\theta_i/1-\theta_i)$=-6.495+3.45x
Hypoth.#4	T test	t-value	Rejection Area (H0)	Result
		-2.717	-1.96	H4 is not rejected
	LR	R2	RCP	Regression Equation
		0.211	80.6%	In $(\theta_i/1-\theta_i)$=-2.744+0.015x

VI. CONCLUSIONS AND RECOMMENDATIONS

The research results state that AIS alignment is related with managerial knowledge in accounting and IT, Accounting institutions consultancy, IS personnel employment and Firm size. Therefore increase in accounting and IT managerial knowledge and employing full time IS personnel as well as using accounting institute consultancy is suggested to firms in order to promote their AIS effectiveness and cooperation which results to their performance improvement. Unfortunately none of the firms in the study benefited from government consultancy. It may be due to absence of suitable governmental consultancy agencies. The presence of governmental AIS specialized agencies that are able to offer consultancy to firms may have a desirable impact on their performance which needs to be considered by related authorities.

This research focused on a specific industry, it is suggested for future research to look at cross industries. The relationship between every individual criterion might be considered with AIS alignment. The researchers from other discipline may study the impact of factors on other organization systems like MIS alignment.

ACKNOWLEDGMENTS

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Brain-Activity-Filters: Efficient performance of Translation-Invariant (TI) Wavelets approach for Speech-Auditory Brainstem Responses of human subjects

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Abstract- This paper presents the design of different filtering techniques for the Neuro-Biomedical signals in single electrode EEG collected Brainstem Speech Evoked Potentials data of Audiology for the Signal-to-Noise Ratio performance evaluations. We have designed Yule-Walk multiband filter, Cascaded Yule-Walk-Comb-Peak filter; conventional Wavelet transform filters of Daubechies, Symlet, Coiflet Wavelets for these Auditory Brainstem Responses. In addition we have designed a Translation-Invariant (TI) Wavelet estimation filtering technique which is highly useful. In our research the idea of Cascaded Yule-Walk-Comb-Peak filter is giving us a considerable improvement in SNR over Yule-Walk filter; and the conventional wavelets are performing far better that too specifically Daubechies wavelets are performing better than all. The TI wavelets technique is performing exceptionally well and better than conventional wavelets.

Index Terms- Yule-Walk, Comb filter, Brainstem Speech Evoked Potentials, EEG, Wavelets, Translation Invariant wavelets.

I. INTRODUCTION

There is increasing interest in recording auditory brainstem responses to speech stimuli (speech ABR) as there is evidence that they are useful in the diagnosis of central auditory processing disorders, and in particular in some children with learning disabilities (Johnson et al., 2005). However, the frequency content of natural speech is neither concentrated in frequency nor in time, the recording of speech ABR of sufficient quality may require tens of minutes (Dajani et al., 2005). Even with a synthetic consonant-vowel stimulus, a recording time of several minutes was required (Russo et al., 2004). Speech ABR is believed to originate in neural activity that is phase-locked to the envelope or harmonics of the stimulus. As a result, the recorded responses are remarkably speech-like. In fact, speech ABR is quite intelligible if played back as a sound (Galbraith et al., 1995). As a result, methods used for Voice Activity Detection (VAD) may be useful for the detection of speech ABR (Ranganadh et al., 2012, 2013). Once the response is detected, then other noise suppression algorithms could in principle be applied to improve the Signal-to-Noise Ratio (SNR). We found the speech like response in these brainstem speech evoked potentials collected from single electrode EEG and also we detected Voice by using VAD algorithms including our own methodology of Signal-to-Noise Ratio Peak Valley Difference Detection Ratio, which confirmedly detected Voice amazingly all the times with higher SNRs (Ranganadh et al., 2012, Ranganadh et al., 2013). Collecting data and Noise reduction in biomedical signals collected from single electrode EEG for Brainstem Speech evoked potentials of Audiology is a highly advanced, huge and interesting area of research and relatively new. In our research we have collected data (Dajani et al., 2005; Johnson et al., 2005; Russo et al., 2004) from single electrode EEG signals, collected in an audiology lab of University of Ottawa. The major component evoked potential, reflects coordinated neural ensemble activity associated with an external event. Evoked potentials offer important information to study the neural basis of perception and behavior. In these signals in addition to evoked potential, potentials caused by background activity are also present. This background activity unrelated to any specific event "noise" to be suppressed and evoked potentials have to be extracted. In clinical and cognitive researches the extraction of evoked potentials is an essential task. To remove the background activity most widely used ensemble averaging process requires a large number of trials, which take more time for data acquisition and is more nuisance for the subjects. In addition to this, averaging process considers that "no variations at all in amplitude, latency or waveform of the evoked potentials across many trials, which is not valid in practice (W. Truccolo et al., 2003). If there is a violation in this consideration, dynamics of the cognitive process is lost.

So there are plenty of methods have come up to extract the evoked potentials, basing on the application, they work in their limitations to an extant with some tradeoffs. In our research to improve the Signal-to-Noise Ratio we have designed various Filtering techniques for the Auditory Brainstem Responses of Brainstem speech evoked potentials, which successfully improved Signal-to-Noise Ratio for extracting evoked potentials. Some times cascading of filters basing on their frequency and time domain properties can develop a filter which can improve the SNR of a signal. In this research we specifically concentrated are Yule-Walk filter, Cascaded Yule-Walk-Comb-Peak filter; Wavelet filters of Daubechies, Symlet, Coiflet Wavelets; then Translation Invariant Wavelets estimation filtering. In our research on our collected data cascaded Yule-Walk-Comb-Peak

filter is giving us a considerable improvement in SNR over Yule-Walk filter; and the wavelets are performing far better that too specifically Daubechies wavelets are performing the best. Ultimately Translation Invariant wavelets are working far better than Conventional Wavelets in suppressing noise for extracting Evoked potentials; and hence a better improvement in SNR.

The paper is organized in the following way: there is discussion in the design of the various filters in Section II, The Result Analysis is made in the Section III, and the section IV concludes the research.

II. FILTERING TECHNIQUES DESIGN

In these filtering techniques our goal is to remove the background noise and recover the signal of interest, by improving SNR by using various methods. In this research we have developed different procedures for SNR performances in the collected Neuro-biomedical Auditory signals from single electrode EEG for Brainstem Speech Evoked Potentials (Dajani et al., 2005; Johnson et al., 2005; Russo et al., 2004., M.S. John et al., 2000). We have concentrated at the frequencies of 100Hz, 200Hz up-to a maximum of 1000 Hz for the frequency components and harmonics as at higher frequency components the speech like tones are almost rare. We have considered 1024, 2048 samples from the data for performance evaluation purposes. For these data we have implemented several different filtering techniques such as Comb-Filters, Yule-Walk multiband filters, some cascaded filters such as Cascaded Yule-Walk-Comb-Peak filters; conventional Wavelets filters: Daubechies, Symlet, Coiflet Wavelets and Translation-Invariant (TI) Wavelet estimation filtering procedures.

IIR Yule-Walk Multiband Filter:

Yule-Walk (John L Semmlow et al., 2004) is an IIR filter with arbitrary magnitude specifications, and this IIR filter approximates an arbitrary magnitude response, it minimizes the error between the desired magnitude represented by a vector and the magnitude of the IIR filter in the least-squares sense. This filter can be highly useful for biomedical signals such as Audiological Biomedical signals (John L Semmlow et al., 2004). We can use different orders for the better approximation of the results.

IIR Comb Filter:

A comb filter can be used for increasing the energy of a signal at particular frequencies basing on notch or peak; and hence possibility of improving signals amplitudes in the time domain of the signal (Mikel et Gainza et al., 2005; Aileen Kelleher et al., 2005., Robert W. et al., 2008). Basing on their time domain and frequency domain properties Cascading of filters basing on the type of application some times gives plenty of innovative results.

We first implemented Comb filtering Comb-notch and also Comb-peak filters; Yule-Walk multiband filters. Here we implemented Cascading of Yule-Walk multiband filter with few more filters. But after Yule-Walk Filter we found that amplitude of the signal was suppressed keeping frequency same of the signal. To get a good response and to improve the signal amplitude, we would like to extend this IIR Yule-Walk filter

design to cascade it with a filter which can improve the amplitude of the signal and also to improve the signal to Noise Ratio. We selected IIR Comb-filter. For this we would like to utilize the properties of Comb filtering process to enhance its time-domain for the nearest approximation. So we cascaded Yule-Walk multiband filter with Comb-Peak filter which approximated the amplitude of signal in its time domain to the simulated original signal keeping the frequency. Then we observed the Signal-to-Noise Ratio for both cases of Yule-Walk multiband filter and the cascaded filter of Yule-Walk-Comb-Peak filter. It found to be there is a significant improvement in the SNR values in Cascaded filter. It's a good success. We found better improvements with different orders of the filters. We found that Yule-Walk-Comb-Peak filter is better smoothening and making the signal to the nearest approximation to the original simulated signal.

Conventional wavelets:
1. Possesses frequency-dependant windowing, which allows for arbitrary high resolution of the high-frequency signal components; unlike STFT.
2. A key advantage of wavelet techniques is the variety of wavelet functions available. So it allows us to choose the most appropriate one for the signal under investigation.

For the above reasons the wavelet transform has emerged over recent years as a powerful time-frequency analysis and signal-coding tool suitable for use in manipulation of complex non-stationary signals in biomedical signal processing such as in human auditory signal processing. Around 2 decades back Wavelet transforms were introduced for Evoked Potentials analysis of EEG (E.A. Bartnik et. al., 1992; O. Bertrand et. al., 1994; R.Q. Quiroga et. al., 1999). Recently, the wavelet transform was applied for EEG evoked potential extraction by choosing a few wavelet coefficients (R.Q. Quiroga et. al., 2003), requiring a priori knowledge of the time and frequency ranges of the Evoked Potential. But such knowledge is abundant in EEG. Wavelets offer higher temporal resolution at lower frequencies, so it suits well the 1/f spectral profile of evoked potentials. Wavelets filtering process includes three steps: 1. Wavelet decomposition 2. Nonlinear thresholding 3. Inverse wavelet reconstruction. Nonliner thresholding (I.M. Johnstone et. al., 1997) is used in the thresholding step for separating the signal from noise. The evoked potential will be wavelet decomposed with large wavelet coefficient, where as the ongoing background activity will be decomposed with small coefficients. So thresholding the wavelets coefficients can estimate the evoked potentials. Here we studied temporally correlated white Gaussian noise model, and we proposed level-dependant thresholding (R.R. Coifman et. al., 1995).

We have designed wavelet filters of different orders for these brainstem speech evoked potentials collected from single electrode EEG by using different functions of Daubechies, Symlet, Coiflet Wavelets. We found reasonably similar results for all the three wavelet functions even while observing the frequency spectra and also at the SNR performances of these wavelets. It means that the results are almost insensitive to which wavelet family we choose out of the three. But we found better

results with Daubechies wavelets than Symlet and Coiflet wavelet functions. In addition to conventional wavelets, we have developed the three steps of the algorithm using wavelet packets. Wavelet packet decomposition, thresholding and reconstruction found to be having more precision than wavelets.

As a result out of all we found that conventional wavelets are outperforming and giving excellent SNR performances.

Translation-Invariant (TI) Wavelet Filtering Estimator:

In addition to the conventional wavelet based filtering estimators we are considering the TI wavelet based estimator filtering technique. Here we are choosing translation invariant wavelet evoked potential estimator, in addition to conventional wavelets. In this filtering technique problems such as pseudo-Gibbs phenomenon near the discontinuities (R.R. Coifman et. al., 1995) can be overcome.

To do the process with TI wavelets evoked-potential estimation filtering the steps are
1. We shift the data.
2. Threshold the shifted data.
3. Unshift the thresholded data.
4. Then average the results for all shifting.

We did this process for each individual data sets. We considered shifting and unshifting the signal in the frequency domain and we did 1,2,3,4,5 shifts for each individual data set and averaged the results. We utilized two popular thresholding techniques: hard thresholding, soft thresholding. Soft thresholding sets the wavelet coefficients with the magnitude less than the threshold to zero, but it reduces the remaining coefficients in magnitude by the threshold also when compared to hard thresholding, soft thresholding does not contain noisy spikes, so we strongly considered soft thresholding and it provides smooth estimates.

We have implemented this TI wavelets algorithm on our brainstem speech evoked potential data for 5 human subjects. We have calculated local SNRs for each subject, Table 3, at those frequency components of interest where the evoked potentials are strongly found ie> 100 Hz, 200 Hz, and so on. TI is working with better SNR performances. Then we calculated overall SNR values for each subject and compared it with conventional wavelets. TI wavelets estimation filtering method is outperforming the conventional wavelet filters.

III. RESULT ANALYSIS

In this research we have done the design of Yule-Walk, Cascaded Yule-Walk-Comb, Wavelet transform filters of Daubechies, Symlet, Coiflets Wavelets and Translation Invariant (TI) Wavelets filtering for these Auditory Brainstem Responses. The results are represented in time domain analysis, spectral analysis. Finally the Signal-to-Noise Ratios performance analysis of the filters for 5 different human subjects is represented in tabular forms Table 1, Table 3 and Table 4.

There is one more table, Table 2 (Ranganadh et al., 2012, Ranganadh et al., 2013), which shows the results of different Voice Activity Detection processes. Our own process of Signal to Noise Ratio Peak Valley Difference Detection Ratio

(SNRPVD), proved to be performing excellently well than even the standard statistical techniques and giving a guarantee all the time. In this table we are showing for 12 subjects from Ranganadh et al., 2012; but there are 10 more subjects' results also given in Ranganadh et al., 2013. But here we are giving the results to make sure of the Voice Activity Detection, related and essential to the context of this paper, but not exactly related to this cause of the filters design topic of this paper.

From figures Fig 1 and Fig 2 it can be seen that the smoothening of the signal is better but amplitude of the signal has been suppressed to an extent. In figure 3 after designing cascaded Yule-Walk-Comb-Peak filter, it reduces the amplitude suppression in the time domain of the signal; and improves the closeness towards the original simulated signal in its amplitude; of-course in Fig 1, 2, 3 frequencies are same. In Table 1 it can be seen of the SNR performances.

The Figures Fig 4, 5, 6 are the frequency spectra of the signal after de-noising using wavelets Daubechies, Coieflets and Symlet wavlelets; up-to the lower frequencies of 500 Hz for the purpose of the space limitations and clarity of the picture at those corresponding frequency peaks of interest, where we are having the interest of Voice Activity Detection frequency harmonics ie> 100 Hz, 200 Hz, 300 Hz etc. They look similar but some differences in the Signal-to-Noise Ratios but similar SNR values, which represents that whichever is the wavelet family out of the three, filtering is almost insensitive. The Signal-to-Noise Ratios for 5 different human subjects of the wavelets can be seen from the tabular form Table 1. There is one more table Table 3 we have provided SNR values of the Local SNRs using TI wavelets estimator filtering procedure. In table 4 the results of SNR performances for overall SNR using TI Wavelets filtering estimator approach when compared to outperforming conventional Daubechies Wavelets. Here TI wavelets approach is far better performing than the conventional Daubechies wavelets. Fig 7 shows the exact spectral peaks at the frequency harmonics of interest.

Signal-Noise-Ratio:

As per the Table 1 we observed the SNR improvements from "Yule-Walk filter" to "Cascaded Yule-Walk-Comb-Peak" Filter. From the table we can clearly visualize that Yule-Walk filtering technique when it is cascaded with a Comb-Peak Filter, it is performing better than just with Yule-Walk Filtering for all the 5 subjects. Significant improvement in the Signal-to-Noise ratios and the time domain signals for these two techniques are proving that cascading is improving the signal to be freer from noise and showing significant SNR performance. The wavelet methods are clearly showing much more and far extant performance than first two methods in terms of SNR values and hence in terms of noise suppression. Out of the 3 wavelet methods Daubechies wavelets are performing the best. The idea of cascading approach of Yule-Walk and Comb-Peak-Filter providing us a good performance than Yule-Walk filtering approach. From the tables Table 3 and Table 4 it is clear that TI wavelets are working perfectly well at local frequency harmonics of interest and also outperforming than conventional wavelets in its SNR to suppress noise to extract evoked potentials. On a conclusive basis Wavelets are outperforming and that too Daubechies wavelets are performing

the best. It is clear that TI wavelets estimator filtering approach is exceptionally well even better than conventional Wavelets.

IV. CONCLUSION

In this research we have done the comparative study for the Signal-to-Noise Ratio performances on our own data of single electrode EEG ABR evoked potentials collected from 5 different human subjects by designing the filters: Yule-Walk multiband filter, Cascaded Yule-Walk-Comb-Peak filter; Wavelet transform filters of Daubechies, Symlet, Coiflets Wavelets; Translation Invariant (TI) Wavelets estimator filtering. We conclude that our idea of Cascaded Yule-Walk-Comb-Peak filter is giving better SNR performance than Yule-Walk multiband filter. It is also proved that cascading of filters basing on their time and frequency domain properties some times can give better performances.   We observed that conventional wavelets are performing excellently well and Daubechies wavelets are giving the highest performance in SNR than Symlet, Coiflets wavelets. Ultimately we found in our experiment of our data sets that Translation-Invariant (TI) Wavelet Estimator filtering approach is performing exceptionally well than all conventional wavelet filters family of filtering approaches; for the 5 human subjects. We conclude that conventional wavelets and TI wavelets estimator filtering approaches are highly successful in suppressing the background noise and highly useful in extracting the Evoked Potentials from our data collected from 5 human subjects in Audiology Lab.

ACKNOWLEGDEMENTS

NOTE

The result analysis of filtering methods is made for 5 different Human subjects; who are different from the VAD table Table 2 is for 12 different human subjects. Please make a note of this matter to avoid any confusion. This table is specifically provided is to prove that Voice Activity has been successfully and strongly detected in our experiments of Brainstem Speech Evoked Potentials in University of Ottawa Audiology LAB; and it is surely detected all the time (ie> for all subjects, and one more table for 10 more subjects from the table in Rangandh et. al., 2013) without any discrepancies; unlike the standard technique of Statistical VAD Methods, where it detects some times and some times not.

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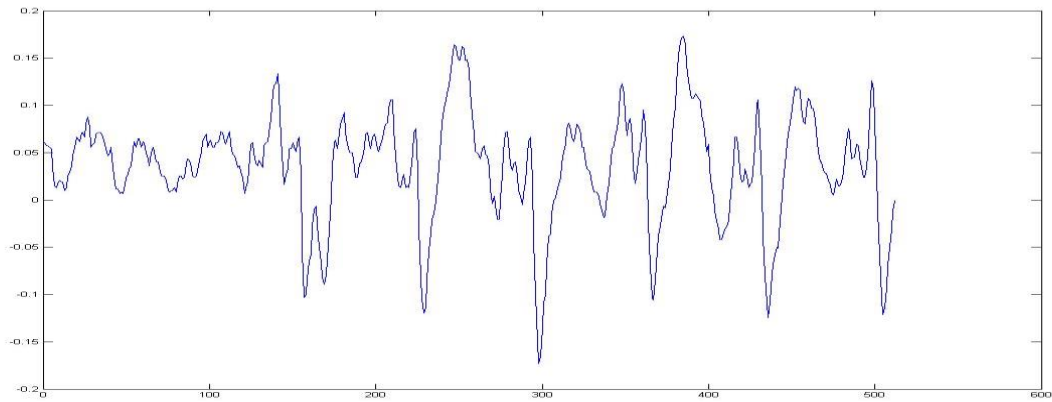
Fig 1 Given data time domain noisy signal, for Subject 1
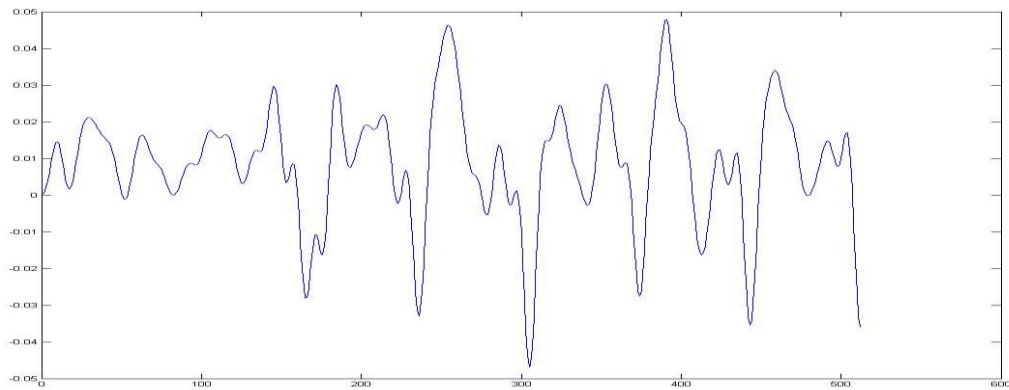
Fig 2 After Yule-Walk filtering time domain signal, for Subject 1
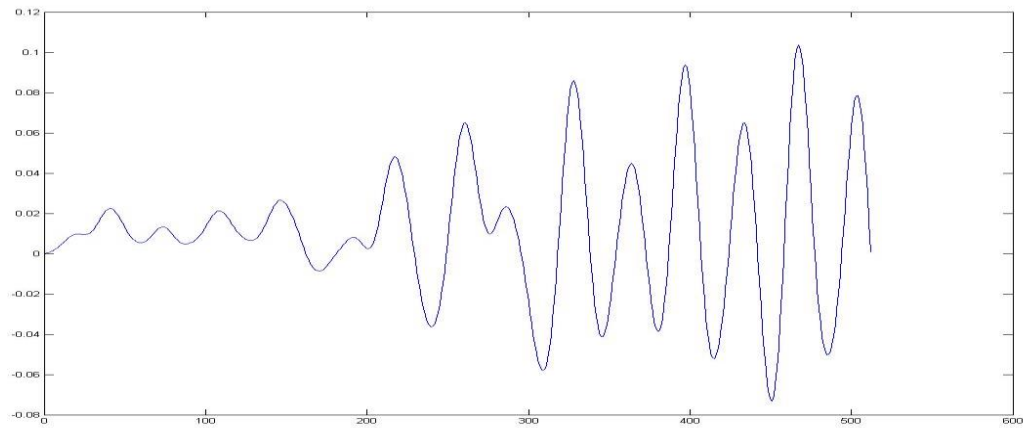
Fig 3 After Yule-walk-comb-peak filtering time domain signal, Subject 1, with better SNR
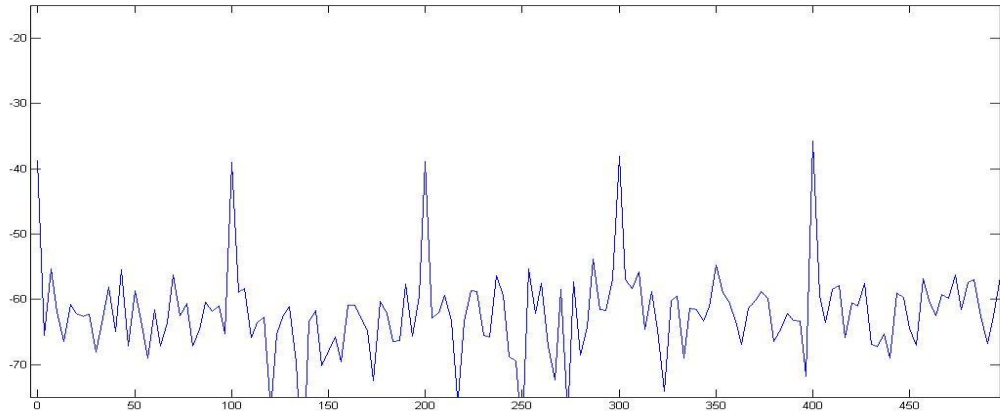
Fig 4 Daubechies Wavelets, Subject 1, spectral peaks
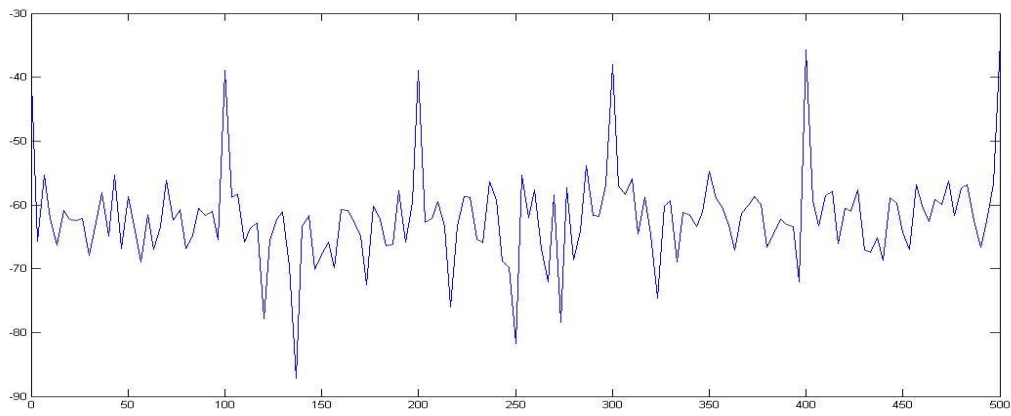
Fig 5 Symlet Wavelets, Subject 1, spectral peaks
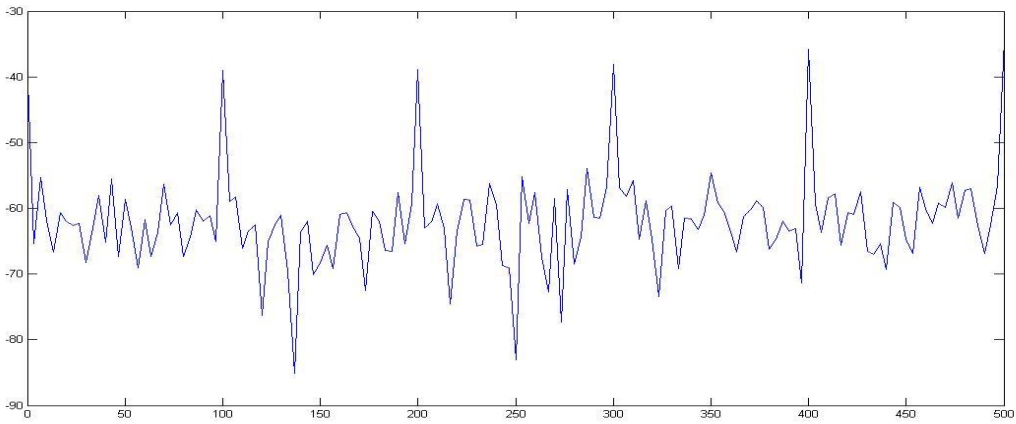
Fig 6 Coiflets Wavelets, Subject 1, spectral peaks
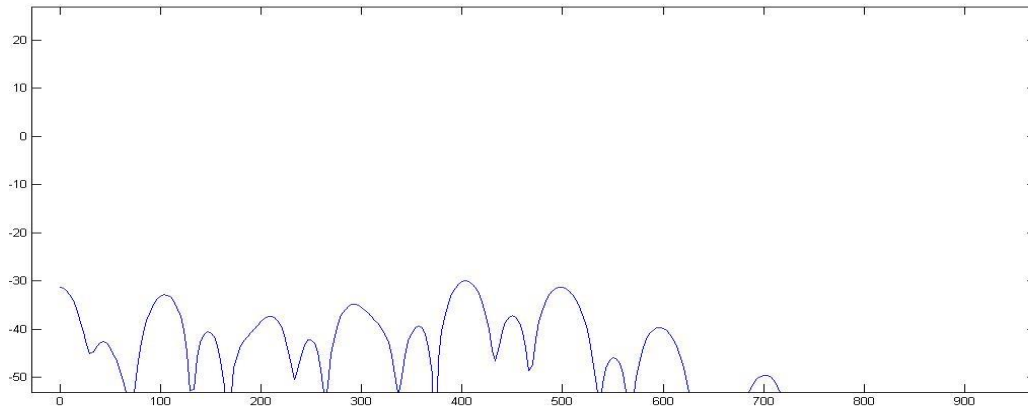
Fig 7 The frequency components in TI wavelets de-noising: the frequency components where the evoked responses concentrate strongly are the 100 Hz, 200 Hz, and so on. Which are our interested components of brainstem speech evoked potentials of our collected data.

Table 1 The SNR performance evaluation of Different filters for single electrode EEG collected Speech ABR for 5 different subjects

Subject S.No.	Signal-to-Noise-Ratio (dB)				
	IIR Yule-Walk Filter	Cascaded IIR "Yule-Walk Filter & Comb-Peak Filter"	Conventional Wavelet Filters		
			Daubechies	Symlet	Coiflets
1	2.6386	7.0123	14.8412	13.9801	13.9512
2	3.1428	8.5241	18.6278	18.0410	17.9801
3	2.8968	6.9842	20.8543	19.9941	19.6427
4	4.8211	8.9128	16.8428	16.1322	16.0329
5	5.2105	7.2129	19.3214	18.7211	18.6028

Table 2 VAD Results 12 different subjects: SNRPVD outperforming and giving surety all the time

Subject number	SNRPVD SNR cut-off (db)	ZCR SNR cut-off (db)	P-values Column 2 SNR cut-off (db)	P-values Column 4 SNR cut-off (db)
1	-16	-1	nothing	-6
2	-23	-21	-13	-12
3	-30	1000	-18	-17
4	-22	-21	-12	-10
5	-22	-10	-14	-12
6	-24	-21	-12	-11
7	-21	-1	-15	-14
8	-35	-14	-13	-16
9	-30	-18	2	-15
10	-31	-11	-13	-12
11	-31	-11	-14	-13
12	-27	-12	-17	-16

Table 3 Using Translation-Invariant Wavelets Local SNR performances at the brainstem speech evoked potential strong existence 100 Hz, 200 Hz and so on. It found to be far better performing.

Subject 1	100 Hz	200 Hz	300 Hz	400 Hz	500 Hz	600 Hz	700 Hz	800 Hz
Before Denoising	2.1786	1.3733	1.4964	2.456	0.783	2.2299	1.8593	1.3687
After Denoising	24.0411	23.297	26.8231	24.1522	27.8168	22.8498	28.6662	24.8747
Subject2								
Before	2.3972	1.7961	1.7346	1.3401	1.4194	1.5621	1.8229	2.024
After	25.9627	29.5527	30.1144	32.3335	21.9219	21.8193	24.294	25.2139
Subject3								
Before	1.9656	2.0873	0.5875	1.7476	2.1723	1.2665	1.515	1.3458
After	29.0608	28.4097	34.82	25.3336	29.4272	27.4171	26.0825	25.9617
Subject4								
Before	1.3198	1.6802	1.5015	1.3536	2.0328	1.2059	2.427	1.2451
After	22.7578	32.1224	29.909	39.3063	29.2954	31.2538	30.3914	25.0714
Subject5								
Before	1.74	2.1347	2.4966	2.042	0.959	0.46	1.625	1.0006
After	21.0816	29.7672	29.9777	22.0256	31.5719	23.6533	35.6878	27.548

Table 4 The Overall SNR performances of TI wavelets for the 5 subjects over conventional wavelets of Daubechies. TI is outperforming for our data sets of 5 human subjects.

SNO	SNR after denoising using Conventional Daubechies wavelets	SNR after denoising using TI wavelets
Subject 1	14.8412	28.3456
Subject 2	18.6278	30.4567
Subject 3	20.8543	34.2817
Subject 4	16.8428	32.2345
Subject 5	19.3214	37.06342

Survey of Different Approaches for Diagnosing Heart Diseases for Clinical Decision Support System

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Abstract- Clinical Decision Support System (CDSS) is a tool which helps doctors to make better and uniform decisions. There are many existing systems present which are used for diagnosing the diseases. For different types of diseases the existing CDSS systems changes with different algorithmic approaches. Every approach has its pros and cons. Selecting the positive aspect and overcoming the problems is the main motive.

This paper focuses on comparative study of existing CDSS systems namely Mycin, DeDombal, Quick Medical Record (QMR), Internist 1. Also the paper focuses on different algorithmic approaches for CDSS. It also give comparative study for algorithmic approaches of heart diseases.

Index Terms- CDSS, Patient health Information, Electronic Medical Record.

I. INTRODUCTION

Clinical Decision Support (CDS) systems provides clinicians, staff, patients and other individuals with knowledge and person specific information , intelligently filtered and presented at appropriate times, to enhance health and healthcare[2]. CDSS is a tool to assist user in taking clinical decisions of diagnosis. A typical user of CDSS is a physician, nurse or any other paramedical service provider. It gathers the patient health information (PHI) entered by the user in the system. Using pre-determined algorithms or rules, CDSS provides clinically relevant information and conclusions to the user. The rules used in the system can be configured by the administrator. Security of each patient's personal record must be provided[1].

II. DIFFERENT EXISTING SYSTEMS

Different CDS Systems that were developed from the early times have brought up to professional's attention in 1950's. De Dombal's system was developed at university of Leeds in the early 1970's by deDombals and his associates. They studied the diagnoses process and developed a computer-based decision aids using Bayesian probability theory [Musen, 2001]. INTERNIST-I was a broad-based computer-assisted diagnostic tool developed in the early 1970's at the University of Pittsburgh as an educational experiment [Miller et al., 1982; Pople, 1982]. MYCIN was a rule-based expert system designed to diagnose and recommend treatment for certain blood infections (antimicrobial selection for patients with bacteremia or meningitis) [Shortliffe, 1976].

Table 1: Existing Systems

Sr No.	Properties	MYCIN	De Dombal	Internist-1	DXplain	Quick Medical Reference (QMR)
1.	Developed By	Stanford University	University of Leeds	University of Pittsburgh	Laboratory of Massachusetts General Hospital	University of Pittsburgh
2.	Year	1970	1972	1970	1970	1970
3.	Diseases	blood infections	abdominal pain	knee replacement surgery	2,200 unique diseases	Abdomen Pain Severe, Blood Hepatitis
4.	Classification Approach	IF-THEN rules	Bayesian probability theory	Bayesian probability theory, Decision Tree	probabilistic algorithm	Basic Decision Tree

III.   ALGORITHMIC APPROACHES

There are many ways in which diagnosis of diseases can be done. In naïve bayes classifier technique, the probability of symptoms occurring and diseases is calculated. But at times it becomes calculating probability for each symptom and disease matching becomes tedious[3]. In fuzzy logic technique mainly machine learning is involved. By using weighted system for diagnosis of disease for each symptom can be done. Another way of diagnosing the disease is by using IF-THEN rules which is the simplest technique. In neural network approach incremental learning can be achieved. A Decision tree approach is a simple technique. It is a flowchart like structure where hierarchal design is created as well as cause effect relationship can be generated[4].

Table 2: Algorithmic Approach

Parameters	Naïve Bayes	Neural Network	IF THEN Rules	Decision Tree
Disease	Diabetes , Pneumonia, Abdominal Pain	Malaria	Almost for every Disease	Almost for every Disease
Existing Systems	De Dombal, Quick medical Record (QMR)		MYCIN	Internist-1 Quick Medical Record (QMR)
Evaluation	Complex	Complex	Simple	Simple
Time	More time consumed	More time consumed	Less time	Less time
Disadvantage	Multiple symptoms cannot handle	Users cannot use system effectively	Needs many rules to make decision	Selection of splitting attribute

IV.   HEART DISEASES

Heart is the vital organ of the body. Without heart the living organism cannot survive. The working of the heart is only to pump the blood in and out. This creates blood circulation in entire body. Blood circulation helps other organs to work efficiently into the body. There are no.of factors which affect heart to malfunction such as history of patient as well as hereditary , life style , poor diet, high blood pressure, obesity, percentage of cholesterol, high per tension, smoking and drugs habbits etc[7].

V.   DIFFERENT APPROACHES FOR DIAGNOSING HEART DISEASES

There is large amount of heart related data present, which is in unstructured format. Hence by analyzing the data and formatting it into structured manner helps for making the decision. For diagnosing the disease there are many ways in which heart related diseases can be diagnosed and treatment can be provided.

Different approaches have different aspects in diagnosing the diseases.   By using the Neural network approach the accuracy secured was around 80- 90% but the hidden layers description cannot be evaluated [5]. In fuzzy logic approach the weighted rules are generated initially and then the fuzzy rule decision is provided [5][6] and the accuracy obtained id around 79.05%. In naive bayes classification approach helps in predicting whether the patient is prone to heart disease or not and depicting the risk factor for heart attack [7]. The accuracy observed for naive bayes approach was around 90% [8]. Similarly by using Support vector machines concept the accuracy was achieved around 84.12%. While as by using decision tree approach the accuracy increased up to 96% [8].

Table 4 : Analysis of methods

Parameters	Neural Network	Fuzzy Logic	SVM	Naïve Bayes	Decision Tree
Example Algorithms	Back propagation	Thresholds and weights applied on IF – THEN rules	Maximum & optimal margins by Gaussian theorem	Posterior Probability – Bayes Theorem	C4.5 , CART, J48 using splitting attribute entropy,
Formula	Input Layer $w_{ij} = w_{ij} + \Delta w_{ij}$ Hidden Layer $w_{jk} = w_{jk} + \Delta w_{jk}$	Fuzzy Set $\mu: X \to [0,1]$	Margins Equations $\mathbf{w} \cdot \mathbf{x} - b = 1$ $\mathbf{w} \cdot \mathbf{x} - b = -1.$	$P(A|B) = \dfrac{P(B|A)\,P(A)}{P(B)}.$	Information Gain $i(t) = -\sum_j p(j|t) \log(p(j|t))$ Gini Index $i(t) = \sum_i p(j|t)(1 - p(j|t))$
Advantages	Minimizes error in each level	Specification is obtained	Large data set is analyzed	Minimum error occurs	No domain knowledge is required
Disadvantage	Very slow working	Comparison increases	Range should be precise else outliers are observed	Multiple symptoms cannot handle and dependency in attributes	Selection of splitting attribute & over fitting
Approximate Accuracy	80 - 90 %	78 – 85 %	85 – 90 %	90 – 95 %	94 – 96 %

I. CONCLUSION

Clinical Decision Support System for heart diseases is very effective tool for diagnosing the diseases Hence for implementation of such system compared to other approaches for diagnosing purpose Decision Tree technique will be an effective technique in classification. It is a simple tree like flowchart structure which helps in bifurcating the data in respective groups. The main goal of Decision Trees is in the intuitive representation that is easy to understand and comprehend.

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Implementation of E-Kanban System Design in Inventory Management

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Abstract- Inventory management is used to make decisions regarding the appropriate level of inventory. In practice, all inventories cannot be controlled with equal attention. In this paper the inventory level is decided based on part demand, cost, and supplier location, Share of business and status of receipt. Using ABC analysis the various parts are classified into A, B and C based on its cost. A suitable bin with its rack has to be selected based on the size of the part. Stores layout is designed based on the ABC classification, Bin selection and rack design with the available space constraint. The existing kanban system has to be modified into supplier e-kanban system by which the speed of information sharing between suppliers will be improved.

Index Terms- Inventory Management, Kanban system, Bar code, Supplier Reliability, Production.

I.   INTRODUCTION

Inventory or stock refers to the goods and materials that a business holds for the ultimate purpose of resale (or repair) [1]. Inventory management is a science primarily about specifying the shape and percentage of stocked goods. It is required at different locations within a facility or within many locations of a supply network to precede the regular and planned course of production and stock of materials.

Inventory management involves a retailer seeking to acquire and maintain a proper merchandise assortment while ordering, shipping, handling, and related costs are kept in check. It also involves systems and processes that identify inventory requirements, set targets, provide replenishment techniques, report actual and projected inventory status and handle all functions related to the tracking and management of material. It includes ABC analysis, lot tracking, cycle counting support, etc. The ABC Analysis is a business term used to define an inventory categorization technique often used in materials management. The ABC analysis suggests that inventories of an organization are not of equal value [2]. Thus, the inventory is grouped into three categories (A, B, and C) in order of their estimated importance.

II.   STORE AND STORE LAYOUT

Stores are an essential component of any supply chain. Their major roles includes buffering the material flow along the supply chain to accommodate variability caused by factors such as product seasonality and/or batching in production and transportation; consolidation of products from various suppliers for combined delivery to customers; and value-added-processing such as kitting, pricing, labelling, and product customization. Stores include Store Area, Store facilities, and Store location. Stores layout is very important because it is having direct impact on material handling time and material transport cost and time requirement for issue of material and thus directly on production cost. Store should be located as to reduce the cost in terms of money, labour and time. To do the particular storage Bins are used. Bin is defined as a finest physical location or bay/bucket where stock is stored. It is a container or space where goods are kept.

III.   KANBAN SYSTEM

Kanban is a signal for demand of specific product, in specific quantities, to be delivered to a specific process. Kanban is a critical element of the pull system. Each Kanban is sized differently to meet the replenishment requirements, and capabilities, of the upstream suppliers so that the downstream customer will always have adequate supply, and can meet fluctuating customer demand.

Kanban is a card with an inventory number that's attached to a part. Right before the part is installed; the Kanban card is detached and sent up the supply chain as a request for another part. A part is only manufactured (or ordered) if there is a kanban card for it. When the bin on the factory floor becomes empty, i.e., there is demand for parts, the empty bin and kanban cards are returned to the factory store. The factory store then replaces the bin on the factory floor with a full bin, which also contains a kanban card. The store then contacts the supplier's store and returns the now-empty bin with its kanban card. The supplier's inbound product bin with its kanban card is then delivered into the factory store completing the final step to the system. Thus the process will never run out of product and could be described as a loop, providing the exact amount required, with only one spare so there will never be an oversupply. This 'spare' bin allows for the uncertainty in supply, use and transport that are inherent in the system. The secret to a good kanban system is to calculate how many kanban cards are required for each product. Most factories using kanban use the coloured board system this consists of a board created especially for holding the kanban cards. Kanban cards are a key component of kanban that utilizes cards to signal the need to move materials within a manufacturing or production facility or move materials from an outside supplier to the production facility. The model of kanban material identification tag is shown in the table.1.

TABLE 1 KANBAN CARD

Material identification tag	
Supplier	
Part number/Code number	
Description/Specification	
Received Qty/ Weight	
Challan number	
Container number	

IV.   E-KANBAN SYSTEM

Instead of using a manual system (either fax or e-mail), an electronic signal sent to the supplier. There is no physical card. E-mail or other electronic notification is automatically generated and send to the supplier; the signal would specify the number of parts to be needed. The quantity will be based on the usage, which is usually tracked using a bar-coding system. Usually requires implementation of a custom system or customization of a standard ERP system [3]. It works well that need to manage many part numbers. The ideal Kanban system is an E-Kanban system. An electronic signal is used to indicate that a Kanban representing a specific quantity of parts has just been drawn or consumed. The signal goes directly to the upstream supplier, internal or external, where a new order is automatically processed for a replacement of the same item in the desired quantity, to be delivered within an agreed upon time span.

Electronic Kanban (sometimes referred to as e-Kanban) is a signalling system that uses a mix of technology to trigger the movement of materials within a manufacturing or production facility. Electronic Kanban differs from traditional Kanban in that it uses technology to replace traditional elements such as Kanban cards with barcodes and electronic messages [4]. A typical electronic Kanban system will see inventory marked with barcodes which are scanned at various stages of the manufacturing process to signal usage, messages are then relayed to internal/external stores to ensure restocking of products. E-Kanban systems can be integrated into enterprise resource planning (ERP) systems. Integrating E-Kanban systems into ERP systems allows for real-time demand signalling across the supply chain and improved visibility. Data pulled from E-Kanban systems [5] can be used to optimize inventory levels by better tracking supplier lead and replenishment times eliminates lost cards. Figure 1 represents that various activities involved in the inventory management system.
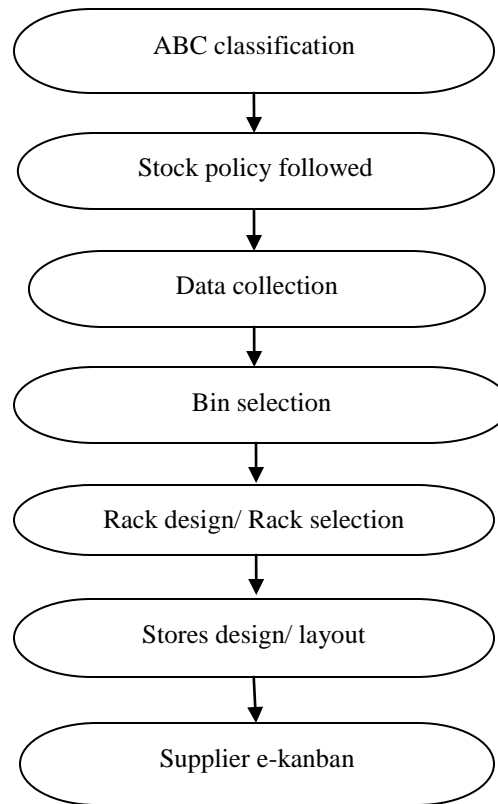
Fig.1 Inventory Management activities

A.   Daily quantity of child part
Daily quantity of the Customer is taken as primary consideration.

B.   Supplier location
It shows the location of the supplier (i.e. local, other State and International).There are plenty of suppliers and are categorized into three types:
Local – those who are located in and around the Company, *Other States* – the suppliers located outside, *International.*

C.   Supplier Location
Supplier location denotes the distance of the supplier from the company.

D.   Supplier Reliability
Reliability is simply defined as the ability of a company to consistently supply an acceptable product at the required time.

E.   Internal production lot size
The number of parts created during the use of a particular tooling setup.

V.   BAR WIDTH CONFIGURATION TABLE

The table 2 shows the bar configuration for each character in the Code 39 set. Note that the * character is used only for the start/stop character. It must be the first and last character

appearing in the complete barcode. Decoders do not usually transmit this character as part of the data string.

TABLE 2. BAR WIDTH CONFIGURATION

Bin Type and Number of Bin Calculation formula

$$N = \sum_{n=1}^{\infty} B_n \qquad \text{-------- } 1$$

Where,

$$\sum_{n}^{\infty} \square = B_1 + B_2 + B_3 + \ldots\ldots\ldots + B_{n=1}$$

$$\text{-------- } 2$$

N= Total number of bin type.
B=bin
n =1 to α

Number of bin required,

$$B_n = \frac{N_d * D_q}{B_q} \qquad \text{-------- } 3$$

Where,
B_n=Number of bin
N_d=Number of days in store
D_q=Daily quantity
B_q=Quantity per bin

VI. APPLICATION OF E-KANBAN SYSTEM

Electronic kanban systems or closely related kanban type systems have been developed during recent years. However, the scientific reports and descriptions of electronic kanban system or their implementation are rare.

Several articles describe the advantages of electronic signals over the cards [7]. Some articles notice that electronic kanbans are in use to some extent, but they do not include more detailed information of the principles and practices utilized. [9][10] Motor vehicle manufacturers have been the first companies reported to have electronic kanban systems in place. Rover used as early as 1986 an EDI based signalling system used to pull materials from the suppliers. General Motors was reported in 1990 to have bar-code based pull production system. [10] Toyota studied the possibilities of replacing the card based kanban with an electronic system in 1999. Toyota had a working interned based kanban solution in their factories in France and England in the year 2000 to pull materials from suppliers. [6] The suppliers attach a bar-code to each delivered container, which is used for batch identification. After the material is used the bar-code is removed from the container. However, the practice described above has some push control features. The orders or pull signals are sent based on the production schedule, not the realized production or system status. Ford has implemented a simple bar-code based pull production system called SMART. BMW is reported to have an electronic kanban system in place. ERP vendors such as SAP have included kanban functionality in their products. The SAP solution utilizes RFID tags attached to containers to automate batch identification and location tracking. The manufacturing decisions can be made based on accurate information of production batch status. Most of the electronic kanban systems described use RFID-codes or bar-codes in production batch identification. Bar-codes are applied more often to manage material flow between companies, because the containers are used for different batches. RFID tags are more applicable in inter-company situations because the same containers are used many times. The earlier mentioned Toyota example is limited only to pull the materials from the suppliers. Toyota still uses card-based kanbans in its own manufacturing operations [12].

VII. E-KANBAN BENEFITS

i. Reduces manual card handling and order-entry activities.
ii. Clarifies communication with suppliers.
iii. Enables real-time visibility of demand signals.
iv. Speeds analysis of supplier performance.
v. Allows efficient analysis and adjustment of Kanban quantities.
vi. An electronic kanban system has many advantages over the traditional kanban system. It is as simple as the traditional kanban, but signals are transferred faster.

VIII. CONCLUSION

The study suggests that the most of the original Kanban ideas should be followed while planning an electronic kanban system. However an electronic kanban system gives possibilities

to solve some of the limitations of existing kanban system, like the model mix change management and failure recovery. The support for continuous improvement should be built into system to achieve the effectiveness of original kanban ideas. This suggests that the process is more effective and efficient tool to be used for developing factory floor information systems. The context of use, number of systems user and the systems tight integration into factory operations management necessitates careful and multidisciplinary planning process.

ACKNOWLEDGEMENT

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Landslide Hazard Zonation of Sirumalai Hills using Remote Sensing and GIS

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Abstract- Landslides are among the major natural disasters or calamities in the world. In hilly terrains of India, including Himalayan mountains landslides have been a major and widely spread natural disasters that strike life and property almost perennially and occupy a position of major concern. The present study Micro level Landslide Hazard Zonation in Sirumalai Area of Dindigul District, Tamilnadu involves in generating complete spatial and non-spatial data collected from different sources .How ever the taluk level maps will act as a basic spatial data contributing many micro level features .The other sources are remote sensing data which will undergo digital image processing to build a themes on land use ,slope, geology ,lineament ,drainage etc. and these items will be vectorized to send it to GIS environment .GPS also act as a data source to some aspects which are not available. The Objectives of the study is to develop the spatial database for landslide analysis, generate the landslide inventory in the entire study area , Lineate the landslide hazard zonation map with Classes-Very high ,high ,moderate &low-classes using Remote sensing and GIS and then to provide the decision support tool for hazard managers and planners. Finally, in GIS the weightage will be allocated to each parameter by considering their contributions to the landslides and overlay analysis will be carried out. On executing this, the final result will help in prioritizing area prone for landslides with triggering parameter .The database will act as base data for future monitoring of landslide occurrences. This study will help in Detailed site-specific database on all parameters which cause land slides, Existing surface feature must be mapped for hazard assessment accuracy using Remote Sensing, GPS and the developmental plan can take place for example, establishment of new roads, electrical pillars etc. The Entire Database will be brought under GIS environment.

Index Terms- Land Slides, Hazard zonation, GI Technology

I. INTRODUCTION

Slope failure processes are the common sites in the hilly terrain. These are one major natural hazard which not only results in the loss of life and property but also can economic burden on the society. Hence, there is a necessity for better methods of landslide evaluation and its zonation. A natural hazard means the probability of occurrence within a specified period of time and within a given area of a potentially damaging phenomenon. Though hazard is a process and it is very difficult to map a process which has not yet occurred. However, hazard mapping may be defined as "the identification of those sites where there is a likelihood of hazardous events rather than hazard affected sites". Hazard mapping is stated to be undertaken with respect to 4 key properties, magnitude, location, frequency and time. Under the present study the main emphasis is given on the location of landslides.

Landslide Hazard Zonation may be defined as a technique of classifying an area into zones of relative degrees of potential hazards by ranking of various causative factors operative in a given area, based on their influence in initiation of landslides. It is therefore, the first task to identify various terrain factors which govern the stability of slope. Under the present study an attempt has been made to prepare a landslide hazard zonation map based on the systemization of data acquired from various geo-environmental thematic maps. From exhaustive literature survey and the field checks,

Following geo-environmental factors such as Land use, Drainage, Lineament, Slope are found which are playing a significant role in causing slope instability problems in the area. This paper is aimed at the landslide hazard zonation of Sirumalai hill, Tamil Nadu.

II. STUDY AREA

Sirumalai is a small hill station 20 Km away from Dindigul (Tamil Nadu) on the Natham Road. This region is an important tourist destination in South India. It has a wonderful cool hill climate with forest brook birds and animals. The youngsters can go for trekking and mountaineering adventures. Sirumalai is mentioned in the ancient ayurvedic texts along with Kolli hills as a valuable region with many rare medicinal plants. In fact the Siddi form of healing is said to have been developed by sages in these very hills a few thousand years back.

➢ Forests of Sirumalai Hills exhibit a considerable variation in their floristic composition and peculiar physiographic, topographic features in addition to altitude and biotic influence.
➢ The altitudinal range varies strikingly from the plains at Dindigul to 1380 m on the high peaks in Kaluguparai near Ooradi.
➢ Scrub forests are seen where the biotic interference is more in the foot hills. The soils are red and derived mainly from sand stones and are badly eroded and compacted by heavy grazing. The vegetation is with low density and the species attain a maximum height of 5-10 m.

The Sirumalai Hills are located in Dindigul District, Tamil Nadu, India running 10° 07' N - 10° 18' N longitude and 77° 55'

E - 78° 12' E longitude. They are an isolated, compact group of hills stretching about 6.5 km south of Madurai City. The hills are rectangular in outline, having 19.3 km of length towards north south and 12.8 km of width east-west, covering an area of 288.4 sq. km. The entire study area is divided in to 98 watersheds. Since the hill has dense vegetative cover; drainages are densely concentrated throughout the area. Most of the places, parallel drainage pattern is exists.

Due to this drainage pattern, silting is a common problem. But due to thick vegetative cover, soil erosion is arrested to a greater extent.

The Sirumalai Hills are composed of acid charnockites having characteristic bluish grey color and vary from coarse-grained to fine re-crystallized types. The charnockites carry inclusions of amphibolites and quartzite bands. The quartzite's at north eastern part carry sillimanite, magnetite and seriate. On the northern slopes hornblende biotitic gneisses are found .

The residual laterite soil derived from the charnockites is rich in minerals and supports the diversified vegetation. The surface soil is mixed with pebbles in the deciduous and the savanna belts. The soil is grayish yellow laterite clay in evergreen forest and is loamy blackish in the plantations. The later is rich in humus.

The maximum temperatures occur in the months of May (29.5 ^{o}C) and the minimum temperatures occur in the months of January (18.5 ^{o}C) respectively.

The annual rainfall is around 1100 mm, with approximately 69 rainy days in two seasons; the maximum rainfall is from the North-East monsoon (October-November). April-June is the hot summer season. The humidity is maximum in the rainy months (90%) and minimum in the summer months (65%).

The water level touched the total height of 21 feet in kodaganar dam. Inflow and discharge were 76,800 cusecs. Varadhamanadhi dam has 70.70 feet, which was above the total height of 66.47 feet. Inflow and discharge were 6,823 cusecs.

The forests of this hill may be broadly classified under the following types according to the revised survey of the forest types of India by Champion and Seth (1968).

a. Lateritic semi-evergreen forest
b. Southern moist mixed deciduous forest
c. Southern dry mixed deciduous forest
d. Secondary deciduous forest
e. Southern thorn forest
f. Southern Euphorbia Scrub
g. Riparian fringing Forest
h. Tropical dry evergreen forest

This forest is in the eastern and north eastern foot hill of Sirumalai.

III.   OBJECTIVES

The objectives of the study area:
1. To develop a spatial database for landslide analysis.
2. To generate a landslide inventory in the entire study area.

3. To delineate a Landslide Hazard Zonation Map with classes - very high, high, moderate and low - classes using remote sensing and GIS.
4. To provide a decision support tool for hazard managers and planners.

IV.   DATA SOURCES

We have used the data from the following sources

- Satellite Image of IRS – P6 LISS –IV.
- Survey of India topographic map sheets of 58 F/15, F/16, J/3, and J/4.
- Mines Department, Collectorate, Dindigul.
- National Information Centre, Public Works Department, Chennai.

V.   METHODOLOGY

The present study involves in generating complete spatial and non-spatial data collected from different sources. However village level maps will act as a basic spatial data contributing many micro level features. Other sources are Remote Sensing data which will undergo digital image processing to build themes on land use, slope, geology, lineament, drainage etc and these items will be vectorised to send it to GIS environment. GPS will also act as data source to some aspects which are not available.

Finally, in GIS, weight age will be allocated to each parameter by considering their contributions to the landslides and overlay analysis will be carried out. On executing this, the final result will help in prioritizing area prone for landslides with triggering parameter. This database will act as base data for future monitoring of landslide occurrences. The flowchart of the methodology is given in Flow chart No.1.

Flow Chart No.1

on the rate and kind of change in the use of land resources is essential for proper planning, management and regularizing the use of these resources. To overcome the problems associated with food and environment, Planners must have the knowledge about the existing land use and the trends of change over time.

Land use is a key concept in the town planning profession. A major objective of planning exercise is to determine how much space and what kind of facilities a community will need for activities, in order to perform its functions. An inventory of land uses will show the type and amount of space used by the urban activities system. Land use map was prepared using IRS P6 LISS-IV declassified into ten classes and the areal extent of each class the land use map of the study area is shown in the table 1.

Different types of forests are the major land use categories in Sirumalai area. Deciduous open forest is found mostly in fringe areas. Coffee plantation is commonly occurring as patches in fairly sloppy areas. Semi ever green forest, both dense and open category, is found in relatively small areas / patches.

The main land use in the study area is shown in the fig. 1. Deciduous (Fairly Dense Forest) (both wet land and dry land), which occupies around 99.95 sq. km., constituting 34.5 % of the total area. Another 15.1% of the area is occupied by Scrub forest, which is nearly 43.11 sq. km. Deciduous (Dense Forest) occupied 40.39 sq. km., constituting 14.1% of the total study area followed by Deciduous (Open Forest) occupied by 37.67 sq. km and 13.1 %. Degraded Forest and Plantation area is equally covered area of 27.5 sq. km., and contributing 9.5 % of the total study area. The remaining classes namely Fallow land, Land with Scrub, Semi Ever Green (Dense Forest) and Semi Evergreen (Open Forest) together occupy 12.3 sq. km and represent 4.2 % of the total area.

5.1 LAND USE

Land use refers to "man's activities on land, which are directly related to the land". Land cover denotes "the vegetation and artificial constructions covering the land surface".

Assessment of use and misuse of land is the prerequisite to plan the utilization of resources. Land utilization survey mapping is the obvious requirement to make such estimates. Information

Table 1
Land use

S.No	LAND USE CLASS			Class
1	Deciduous (Dense Forest)	40.4	14.1	Low
2	Deciduous (Fairly Dense Forest)	99.9	34.5	Low
3	Deciduous (Open Forest)	37.7	13.1	High
4	Degraded Forest	27.5	9.5	High
5	Fallow Land	1.2	0.4	Medium
6	Land with Scrub	1.5	0.5	Medium
7	Plantation	27.5	9.5	Medium
8	Scrub Forest	43.1	15.1	High
9	Semi Evergreen (Dense Forest)	0.7	0.2	High

10	Semi Evergreen (Open Forest)	8.9	3.1	High

Drainage

Drainage density appears to be the most important, promising and useful variable in morph metric analysis of drainage networks, as it is related to the dynamic nature of the stream segments and the area. Values of drainage density depict the stages of geomorphic development of concerned area. Lower values indicate old stage and higher values indicate early mature to youth stage of geomorphic development. Generally, low drainage density is found in regions of highly resistant or highly permeable subsoil materials, under dense vegetation cover and low relief. And high drainage density is favored in regions of weak or impermeable surface materials, sparse vegetation and mountain relief.

The idea of drainage density was introduced by Horton (1945,) subsequently followed by Gardiner (1971), Gregory and Gardiner (1975) and others. The drainage density may be defined as the ration between the total channels lengths cumulated for all orders within a basin to the basin area. It is obtained with the help of following formula:

Drainage Density (Dd) = Stream Length / Basin Area

The drainage map in 1:50000 scales were prepared by using Survey of India topographic map sheet. For preparing the drainage density map, 1 cm x 1 cm grid was prepared (which is equivalent to 0.5 sq. km. on the ground) and the drainage map (Fig. 2) is superimposed over the grid to measure the length of drainage in each grid and the drainage density is shown in the table 2.
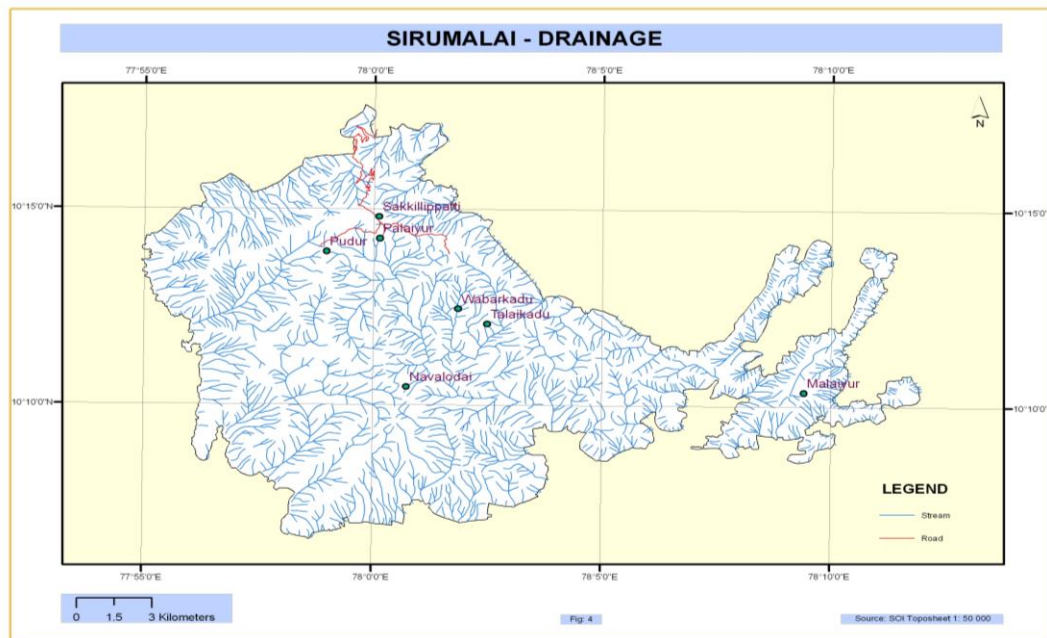
TABLE 2
Drainage Density

S. No	Drainage Density (Km. & sq.km)	Area in sq.Km	Area in %	Class
1	< 0.5	35.1	12.2	High
2	0.5 – 2.5	19.1	6.6	Medium
3	>2.5	234.2	81.2	Low

The characteristic of drainage indicates that increase in drainage density choices are more for landslides and vice versa. Ground water potentiality in the high drainage density area is less due to high draining ability leading to the poor infiltration capacity. Drainage density is high in edges of the study area occupied 35.1 sq. km., and constitutes 12.2 %, most of the lows drainage density is found middle of the study area occupied 19 sq.km and 6.6 % and other areas are covered by medium drainage density covered 234.2 sq. km and 81.2 % of the total study area.

5.3 LINEAMENTS

Lineaments representing the faults, fractures, shear zones, etc., are the most obvious structural interpretations on the satellite imagery. They control the occurrence and movements of ground water in hard rock terrain.

They occur in parallel sets in different directions indicating different episodes of tectonic disturbances. They appear as linear to curvilinear lines on the satellite and are often marked by the presence of moisture, alignment of vegetation, straight streams / river courses, alignment of tanks / ponds, etc. These lineaments can be further sub-divided into faults, fractures, shear zones and thrusts based on the image characters and geological evidences.

Lineaments are special types of patterns used to describe linear features, which are visible as long, narrow, relatively straight tonal alignments in satellite imagery. The lineaments may be a joint, fracture, and dyke system or straight courses of streams. The usefulness of satellite data in identifying linear features is usually the zones of localization of ground water. For the preparation of lineament map in the study area, IRS P6 LISS-IV has been used.

Lineament density map was prepared by measuring the length of lineaments in each one sq. km. grid. From the analysis, it could be identified that the lineament density is low in most of the areas followed by medium density and then by high density. High lineament density is seen as small patches, which are distributed mainly along the foothills of the study area (Fig 3). The lineament density is classified according to the landslide zonation, and it is shown in Table 3.
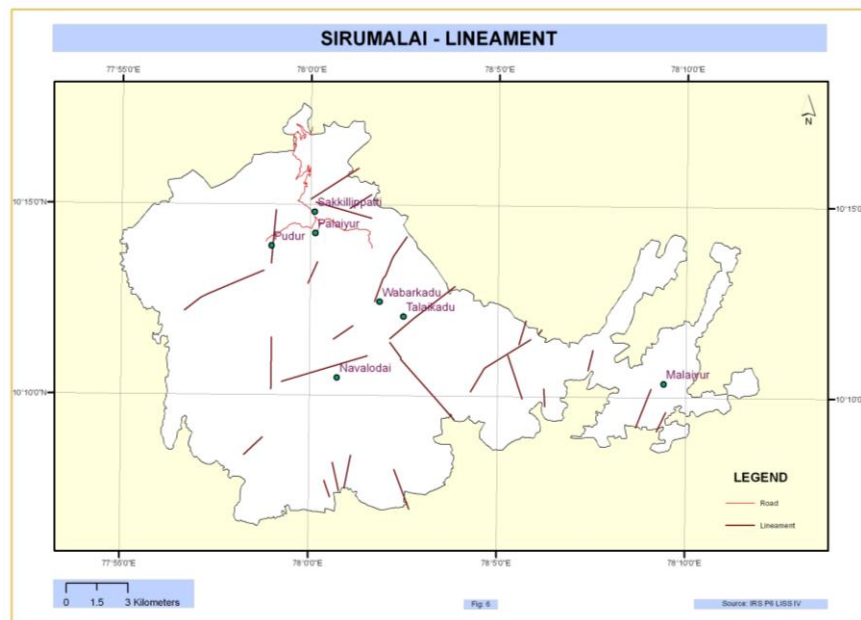
Table .3
Lineament Density

S.No	Lineament Density (in km/ sq. km.)	Area in sq. km.	Class
1	> 3	3.0	High
2	1.5 - 3	211.7	Medium
3	<1.5	73.7	Low

Using lineament data, the lineament frequency contours were drawn. This was done by counting the total number of lineaments per 0.25 sq. km, plotting them in the respective grid centres and contouring them. Over such lineament frequency contours varied from 1 to 6 in the area. The number of landslides falling in >3, 1.5 – 3, and <1.5 lineament frequency classes and landslide incidence. The table has shown that the maximum number of landslides have fallen in between 1.5 – 3 lineament.

CONTOUR & SLOPE

Slope is a very important parameter in any landslide hazard zonation mapping. Different slope categories are derived based on 1: 50,000 scale topographic maps at 20 meter contour interval. With the help of spot height map, the slope map has been prepared and it is shown in the figure 4. If the slope is higher then there is a chance of occurrence of landslide. In the study area the slope varies from 0° to 60°. The entire slope map is divided into four categories as follows: 45° - 60° - "very steeply sloping", 30°-45° - "steeply sloping", 15°-30° - "moderatel y sloping" and 0°-15° - "gently sloping".

Most of the study area occupies Moderately Steep to Steep Slope and Very Steep Slope category.

Fig. 9
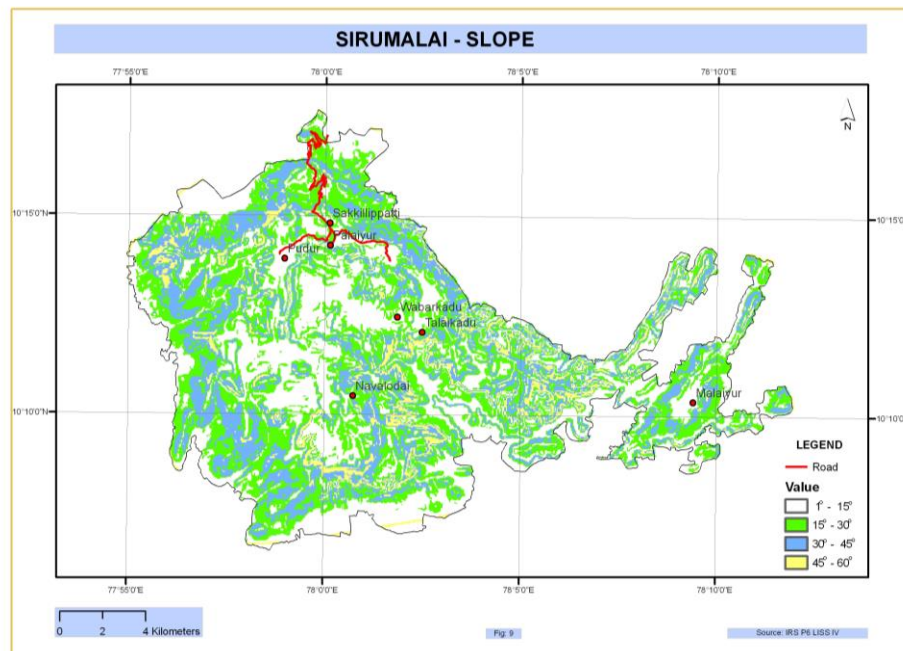
VI.   GLOBAL POSITIONING SYSTEM (GPS)

GPS is a useful tool for detecting the locations of first stage disaster. It can detect land movement and aid in determining the boundary of the landslide area. Monitors can be placed anywhere one can access, and the monitors are relatively easy to operate. There are some significant disadvantages involved in using GPS, however. Several of these disadvantages are

precision which is affected by the number of observable satellites present, the obstruction of the observation point, and the monitoring of installed GPS receivers which have been placed out in the field. By using GPS the locations of land slides occurred zones are shown in the figure 5.

Fig.6
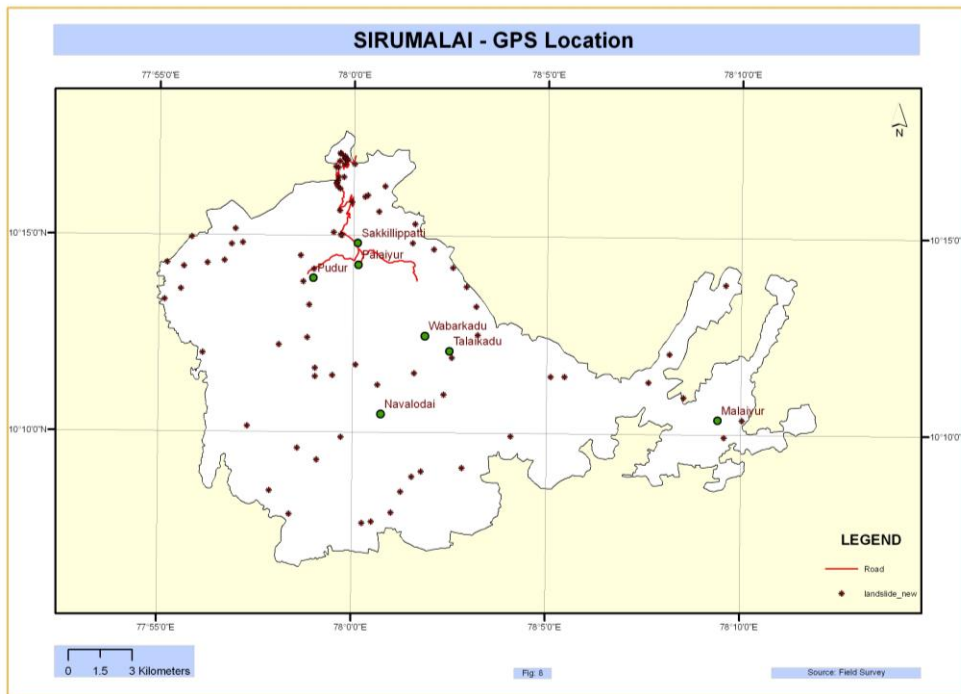
VII. DIGITAL ELEVATION MODEL

The term digital elevation model or DEM is frequently used to refer to any digital representation of the topographic surface. However, most often it is used to refer specifically to a raster or regular grid of spot heights. The map for the digital elevation model is prepared from the contour map and it is shown in the figure 6. Using the ERDAS imagine, Digital Elevation Model is created.
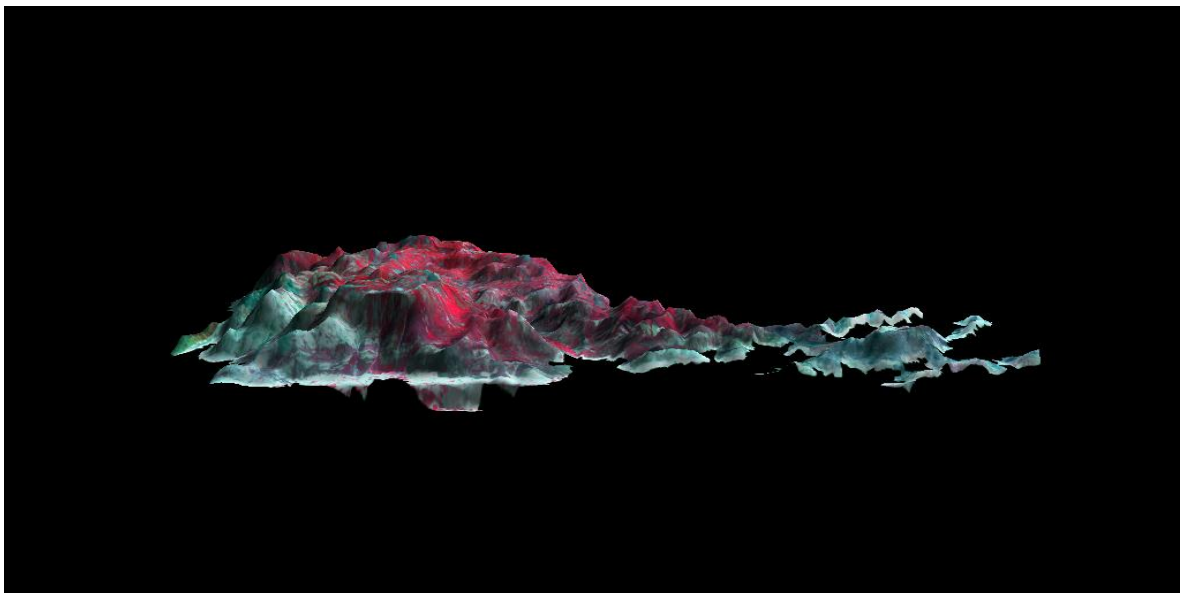
VIII.   LANDSLIDE HAZARD ZONATION

The term landslide comprises almost all varieties of mass movements on slopes, including some, such as rock-falls, topples and debris flows, that involve little or no true sliding.

In this report the term "zonation" applies in a general sense to division of the land surface into areas and the ranking of these areas according to degrees of actual or potential hazard from landslides or other mass movements on slopes. It does not necessarily imply legal restriction or regulation by zoning ordinances or laws.

Many hundreds of maps of landslides or of their deposits, old or new and active, have been made throughout the world, and to a certain degree they often indicate areas susceptible to future problems. But emphasis is placed here on the far fewer number of studies that go farther and attempt to assign degrees of hazard to mapped areas.

GIS software was used for integrating different thematic maps and assigning their combined effect. These thematic maps were quantified by giving them a relative score. In this process the different thematic maps which were carrying out the rasterization. The cross match of each parameter was carried out with the existing landslide map.and finally the score for each class of the theme was calculated using the formula.

$Z = Xn/Xy$ X/Y
Where, Z Score of the class
Xn Area occupied by landslides in a particular class
Yn Area occupied by that class
X Total are of the landslides
Y = Total area

IX.   RESULT

Integration of grid cells overlay is utilized for the present study (deGraff   and

Ronesburg, 1980). Here all the controlling parameters are combined by giving equal weightages for all the themes and the final map is reclassified into threee zones. i.e. low, medium and high hazardous zones.

When the weighted % is taken into consideration using the formula,

Weighted % = Landslide area / Total Area
        -------------------------------   x 100
                S (Landslide area particular class / Total area of the   particular class)

It is found that high and very high hazardous zones are covering approximately 27%, the moderate is covering 70% and the low hazardous zones are covering <3% of the area. The approach of landslide hazard zonation should have more significant to the classification of the area in the term of vulnerability to landslide hazard rather than merely mapping. The study has brought out the use of GIS and Remote Sensing techniques as a tool for the prognosis of landslide.

By integrating the all the four parameters Land use, Drainage, Lineament and Slope the Landslide Hazard Zonation map has been divided in to three zones and it is shown in the fig 7. The areal extent of each class is shown in the Table 4.

Table 4.

S.No	Landslide Hazardous Zonation Class	Area (in Sq.km)
1	High	128.45
2	Medium	103.23
3	Low	56.64

The central and western part of the study area is occupied by the high landslide zonation class and covered by 56.64 sq. km., the medium class is occupied by eastern and spread over the western part of the study area and covered by 103.23 sq. km.,. The low class area is occupied by north, south and some parts of eastern side and covered by 128.45 sq. km.,.

X.   CONCLUSION

Based on the hazard zonation and risk assessment prediction, some of the area needs much more careful consideration taken of their especially the areas where lives and properties are involve very high risk areas cover 56.64 sq. km; the most important of them are listed below:
  i.   Sloping areas at the road slope.
 ii.   Some areas, especially the area located at the edge of urban area unit which is normally either bounded by hill slope or where building is done on the constructed earth fill slope.
iii.   Some areas of slope along the main road which are parallel to the Stream network.

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The Existential Condition of Man as Depicted in Naguib Mahfouz's Story "Zaabalawi"

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Abstract- The present paper attempts at presenting the individual's contest that is futile because ignorance misleads him from the path. The research paper aims at highlighting the element of crisis mankind undergoes in Mahfouz's short story, "Zaabalawi". In this paper, I will examine whether there are any related points of similarities and dissimilarities between Mahfouz's short story "Zaabalawi" and Samuel Beckett's Waiting For Godot. What attracts our attention to discuss this issue is the word "existential" that is the key word in the title of this paper. A few studies have been carried on Mahfouz's affinity with other writers as Kafka, Conrad and George Eliot. A striking kind of such studies is Al-Sarayrah's study of the affinity between William Faulkner, Albert Camus and Naguib Mahfouz. Al-Sarayrah concludes "Camus and Mahfouz share the view that the human condition is illogical and purposeless; in their created worlds, the fictional characters live unsatisfying lives"(Al-Sarayrah 11) Mahfouz's point of view comes close to the view of the existentialist Camus that there is no definite rational justification for the absurd things in this world.

In this study, I will investigate the way through which Mahfouz provides the readers with panoramic portrait of man doing his duty, that is, his quest for inner relief, truth, existence full of meaning. Through my reading, I assume that there is an affinity of thematic relation between Mahfouz's "Zaabalawi" and Samuel Beckett's Waiting for Godot. Both the writers are concerned with the existential predicament of the individual and they reveal man's suffering and his incompetence to accomplish a meaningful existence.

Index Terms- absurdity, affinity, existential condition, harmony, illness, pursuit, savior

I. INTRODUCTION

Naguib Mahfouz (1911- 2006), the prolific and celebrated Egyptian novelist and short story writer and Nobel laureate, whose contribution has gained world-wide recognition as: "without Mahfouz the turbulent of history of twentieth -century Egypt would never be known"(The Norton Anthology of World Literature 2527). Needless to say, Mahfouz's short stories are remarkable for the issues they deal with. Mahfouz's literary work during the 1960s, inaugurated by The Thief and the Dogs (1961), represents a new phase in which, as Sabry Hafez says, we find "a new blend of realism, mysticism, and existentialism, mixed with social criticism and contemplative and analytical elements."(qtd. in Farley 33)

" Zaabalawi" is regarded as one of the best short stories of Mahfouz and "it is also one of his personal favorites"(Elad:632). Published in 1961 and, again, in 1963 in a collection of short stories titled Dunya Allah (The World of God), "Zaabalawi" regarded as one of the most widely known stories of Mahfouz, has been "included in the last edition of the Norton Anthology of World Literature, which is probably the most widely used anthology of world literature in the English- speaking world, [it was also included] in at least one other world literature anthology."(Shankman 172)

II. DISCUSSION

Naguib Mahfouz's story " Zaabalawi" is a highly philosophical piece of writing and one can find in it elements of the existential philosophy of Jean- Paul Sartre and the absurdist philosophy as propounded by Albert Camus in his The Myth of Sisyphus. But we must first closely follow this story to understand its philosophical contents. The story has a folktale structure, which is significant. Then the narrator or persona is unnamed, which also is significant. He is Every Man, that is, all of us. He is afflicted with a disease which no doctor can cure. This is something alarming, a matter of concern for all of us, simply because the persona represents all of mankind. But what is the disease? This is also unnamed. It is as well that the writer does not name the disease because if he told us about it, many or rather most of us would not take him seriously, we might even deride the writer for naming it. Mankind has lived with this disease for a long time now and may continue to live with it for some time more. Of course man's future, in fact, his very existence, has nothing to write home about unless he finds a cure for it, but this seems to be a tall order. Man is a very perverse creature and his perversity will be his death.

The persona, while he was a child, used to hear a song in which the aid of one Zaabalawi was invoked for remedying the sorry condition of the world. The following two lines were part of the song:
 Oh what's become of the world, Zaabalawi?

They 've turned it upside down and taken away its taste (Zaabalawi 803). These two lines are the clue to the meaning of the whole story. The composer asks of Zaabalawi why the condition of the world is so bad. He also says that " they" have turned the world upside down and taken its taste away. Who are "They"? Obviously , the people – we all – have turned it upside down, and so it has lost all its taste. Zaabalawi was a saint, a miracle man and, according to some, a charlatan. The persona

thinks that Zaabalawi will cure him of his incurable ailment, just as the two tramps in Samuel Beckett's play Waiting for Godot think that Godot the savior will redeem them. But Zaabalawi is as elusive a figure as Godot is, and so the persona will never be able to get hold of him. The whole pursuit is a futile one. But let us see what experiences the persona undergoes in his pursuit. But first let us see what is his illness and what condition he finds himself in. To use his own words: " I became afflicted with that illness for which no one possesses a remedy" (Zaabalawi 804) and that having " tried everything in vain… was overcome with despair" (Zaabalawi 804). This is the true awareness of the Absurd. In such a condition the sufferer commits either suicide or overcoming despair, seeks a remedy for his illness. But it must be remembered that there is no savior, neither Godot nor Zaabalawi. The persona in Mahfouz 's story suffers from a delusion just as Vladimir and Estragon do. His idea of Zaabalawi curing his illness will never materialize. However, we shall see what efforts he makes to find this saint-cum-miracle man-cum – charlatan.

First, the persona goes to Sheikh Qamar, a prosperous lawyer in a posh area of Cairo practicing in "the religious courts." The irony in the expression "religious courts" is obvious. His office is expensively furnished –leather-upholstered chairs, lush and costly carpet on the floor. The Lawyer himsely is wearing a lounge suit and smoking a cigar and seems to be satisfied with " both himself and with his worldly possessions" (Zaabalawi 804). His clients are rich as the persona finds a very " beautiful woman with a most intoxicating kind of perfume" (Zaabalawi 804) leaving the lawyer's office as he enters it. When the persona introduces himself and makes known to the lawyer the purpose of his visit, the lawyer looks at him with " a languor" in his eyes" and it appears as if he wanted to show the door to the persona just because the persona did not turn out to be a rich client. He, however, tells the persona that Zaabalawi used to be regarded as " a man of miracles" and he used to live " in the Birgawi Residence in al-Azhar". The lawyer seemed to have no interest in him because, like most rich men, he did not feel anything like a spiritual hunger in himself.

The poor persona goes to the Birgawi Residence , but he finds the big house in ruins. He finds that "time had so eaten at the building that nothing was left of it save an antiquated façade and a courtyard that, despite supposedly being in charge of a caretaker, was being used as a rubbish dump" (Zaabalawi 805).This description of the erstwhile residence of Zaabalawi has symbolic significance. More symbolic is the insignificant man there, "a mere prologue to a man, using the covered entrance [to the house] as a place for the sale of old books on theology and mysticism" (Zaabalawi 805). The place is decaying and the seller of books on theology and mysticism is also in the same condition. And Zaabalawi has vanished from such a place. The seller of books has only a faint memory of the saint of God. So when the persona asks him whether Zaabalawi lives there, he exclaims "Zaabalawi! Good heaven, what a time ago that was!" He says that Zaabalawi lived there when the house was habitable and asks the persona himself, "where, though, is Zaabalawi today?" (Zaabalawi 805) Disappointed, the persona returns, but not before making enquiries as to the present whereabouts of the saint or miracle man. Some go nostalgic about the times when they personally had known him and some make fun of him, call

him "charlatan" and ask the persona to put himself in the hands of a doctor. To their advice, the persona says to himself "as though I had not already done so."

The condition of the persona worsens, his pains grow severe so that he feels that he cannot "hold out much longer." In this condition he hits upon the idea of consulting the local sheikh. He goes to the sheikh, who has an office that looks like a shop. The persona introduces himself to him and wants to know the whereabouts of Zaabalawi. The sheikh gazes at the persona with great astonishment at being reminded of Zaabalawi, whom he has not seen for many years, but says that Zaabalawi is still alive. However, he has not the vaguest idea where this saint of God is to be found. But he can see that the persona's condition is serious. And what he does to help the persona is strange. He quickly draws a full plan of the district on a sheet of paper showing all the streets, alleyways, market- places, residential areas, police stations. Giving it to the persona, he says that he should scour the whole district to find that miracle man. He also tells the persona that being too much "preoccupied with the cares of the world", he has "not given much thought to the whereabouts of Zaabalawi" The poor persona goes about seeking the saint. At last a small shopkeeper who irons clothes tells him to go the calligrapher Hassanein as Zaabalawi and he used to be friends.

Here one needs to pause and ponder over the three interviews (fruitless) the persona has had. The lawyer knows how to have briefs for rich clients and earn heavy fees; the seller of the books on theology and mysticism is only a prologue to a man; and the sheikh of the district lives on his wits. These people and legions of people who belong to their types do not know that the world, having been turned upside down, has lost its taste. They have no awareness of the rot that set in long ago in human culture. They are part of this rottenness. Such people are not awake to the rotten existential condition of man. In Waiting for Godot, Estragon is sleeping and Vladimir, his companion-tramp, soliloquizes. Part of his soliloquy runs thus: " At me too someone is looking, of me too, someone is saying, he is sleeping, he knows nothing, let him sleep on"(123). The life of most people, from birth to death, is a long sleep. There are only exceptions like the persona here. But even such exceptions do not know how to stand the world on its feet. They think that some savior will set things to rights. But this is mere delusion.

However, the persona's search for Zaabalawi is not over. The next two persons he visits one after another are artists. The first one of these is Hassanein the calligrapher who receives the persona "with unaffected gentleness". He tells the persona certain things which are of great significance. He says Zaabalawi is a real man of mystery. He adds "He 'd visit you so often that people would imagine that he was your nearest and dearest, then would disappear as though he 'd never existed." He also says, "He was so constantly with me … that I felt him to be a part of everything I drew. " (Zaabalawi 807) But Hassanein also is not able to tell the persona about the present whereabouts of Zaabalawi. When the persona speaks of his dire need for the saint, adding "and no one knows better than you of the ailments in respect of which he is sought"; The artist replies, " Yes , yes . May God restore you to health"(Zaabalawi 807)

Then the persona goes to another artist-- "Sheikh Gad, the well-known composer". He also played on " his famous lute", in

which, the persona tells us , were concealed "the most beautiful melodies of our ages." Sheikh Gad also receives the persona with " understanding and kindness". He also tells the persona:

Whenever I was overcome by weariness or my inspiration failed me, he would punch me playfully in the chest and joke with me, and I would bubble over with melodies…(Zaabalawi 808)

One very significant remark that Sheikh Gad makes in response to the persona's question, whether those who seek Zaabaalwi suffer as he does, is this: "Such suffering is part of the cure" (Zaabalawi 808). As far as we can see, it is only the persona who is suffering from an incurable ailment. The question that arises is why he alone of all the people is suffering. Because his being is seeking something that others do not feel the need of. He will not find Zaabalawi, because whoever he might have been in the past, now he is not physically to be found anywhere. The sufferer, that is, humanity (because the unnamed seeker in the story represents us all, or at least a universal, though inarticulate urge in us) has to find the cure himself.

One significant thing about the persona's interview with the two artists is that they, at their best, worked at their art under the direct guidance of Zaabalawi. The calligrapher says to the persona "It was due to him that I made my most beautiful drawings" (Zaabalawi 807). And Sheikh Gad, referring to his best musical rendering of a poem says to him this: "I composed the music of this poem in a single night"(Zaabalawi 808) and that "Zaabalawi was my guest for the whole of that night." The opening bars of this composition were:
I make lavish mention, even though I blame myself of those I love, For the stories of the beloved are my wine (Zaabalawi 808) .

Truth and love are the vital elements of art. That is why the two artists in the story have had, till recently, Zaabalawi's loving guidance. And so both of them give the persona hopes of his meeting Zaabalawi. The persona will not, of course, meet Zaabalawi in person because, as the musician tells him,

Today, though the world has changed, and after having enjoyed a position attained only by potentates, he is now pursued by the police on a charge of false pretenses. (Zaabalawi 808)

The world has changed – It has been turned upside down and lost its taste, that is, lost truth and love. The great Russian novelist Mikhail Sholokhov says in his masterpiece And Quiet Flows The Don: "What the people want is Truth, but it is being buried every day and earth heaped over it. They say it's been a corpse a long time already." Truth and Love are, however, alive in real works of art. Without these two elements art will not be art. To resurrect them and make them the guiding principles of ordinary life of man the persona will have to make herculean efforts. Their suffering alone one day, if ever, find the cure, or man will be as dead as the Dado.

The persona's last interview is with a hardened drinker called Hagg Wanas in a bar in Cairo. He has, when the persona comes to him, " two bottles in front of him , one empty, the other two-thirds empty". It is difficult to believe a hardened drinker like Wanas. He tells the persona that he can talk to him only when the persona gets as much drunk as he himself is. But the persona, having had three glasses of wine, loses his memory, and after the fourth glass, the future vanishes and the world begins to turn round about him. He then goes into deep sleep while still sitting on his chair in the bar . He sees a strangely fascinating dream. In that dream, he tells us, there was an extraordinary sense of harmony between me and my inner self, and between the two of us and the world, everything being in its rightful place, without discord or distortion."(Zaabalawi 810)

But this dream lasted only for a short while and when he wakes up, he says "consciousness struck at me like a policeman's fist…" Here we have the true clue to the persona's ailment. He wants to live in a world he sees in his dream. In the dream his unconscious self found, howsoever brief, fulfillment in a transcendent world; when the dream broke and he regained consciousness of the real, everyday work, it struck him like a policeman's fist. We know what a policeman's fist is or can be. The world of dream, in which there was harmony between him and his inner self, and between the two selves of his and the world and in which there was no discord or distortion, should have been the real world. But the real world of man's existence has been turned upside down by man himself and its taste has been taken away. It is not the fault of the world. It is man's own perversity that has made the world unlivable. The world of the persona's dream must become the real world if the human species is to get rid of his existential disease. This change or transformation or metamorphosis has to be brought about by man himself. If he fails to do it, he will looks in fact, he really looks, like a huge insect into which the hero in Kafka's long short story " The Metamorphosis" is metamorphosed and finally dies. No Zaabalawi will come to his rescue, just as no Godot will ever come to redeem Vladimir and Estragon.

Naguib Mahfouz's story ends with these words spoken by the persona to his inner self: "Yes, I have to find Zaabaalwi! " If he perseveres in his resolve, one day will find Zaabaalwi within himself and then he will be able to realize himself, find the real harmony between his outer and inner selves and between the two of them and the world. We all of us have to attain this kind of harmony. Only then can this world be really livable.

In writing his story, Naguib Mahfouz seems to have been inspired by Samuel Beckett's Waiting for Godot. "Zaabalawi" stands on its own merits and the product of a particular culture, which is different from the Western culture. But irrespective of cultural differences, man's existential condition today throughout the world is alarming. Mahfouz's concern, like Beckett's, is for this alarming condition of man's existence.

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Adolescence and Reproductive Behaviour: A study of Meitei-Pangals of Manipur

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Abstract- Reproductive health and behaviour of adolescents is an increasingly important component for the healthy nation. Adolescence, the second decade of life is a period when young people acquire new capacities for progress with physical growth, physiological and psychological change, the development of secondary sexual characteristics and reproductive maturation. Young people worldwide, however, face social, economic and health challenges that were unimaginable. Adolescence is, therefore, considered as a phase rather than a fixed age group; with physical, psychological, social and cultural dimensions. Programmes that can provide information, ensure access to services, and develop life skills are crucial to the future of this population. This paper will explore the existing practices or information on sexual and reproductive behaviour among adolescent girls' of Meitei-Pangals in Imphal East, Manipur; in relation with the knowledge and attitudes, socio-economic and cultural factors operating within, as well as their perception and awareness level pertaining to the health care services.

Index Terms- Adolescence, Reproductive Behaviour, Meitei-Pangal

I.   INTRODUCTION

Adolescence is a phase of transition through which young people acquire new capacities for progress with rapid physical growth, physiological and psychological changes, the development of secondary sexual characteristics and reproductive maturation. World Health Organisation uses to define "adolescence" as 10-19 years old, "youth" as 15-24 years old, and "young people" as 10-24 years old. Here, adolescence is defined as a transition phase through which a child becomes an adult. However, adolescence- the second phase of life which begins with the onset of puberty- is a crucial transition into adulthood. So, adolescence is considered as a phase with fixed age group, physical-psychological-social-cultural dimensions.

Adolescents constitute the healthiest group in the population, having the lowest mortality and morbidity compared with other population age groups. In a country like India, where discussion about sexuality and reproductive behaviour is almost absent, adolescents are not prepared mentally or psychologically to cope with those changes occur in adolescence (Gupta, 2003). In case of women, their adolescence is the period of pre-womanhood. In a women's lifetime her health status during any phase of life impinges upon the next phase. If their general health, reproductive health, the cultural and societal attitudes are taken care of, there will be less effort needed at the stage of womanhood. This approach insights the health of the girl child right from the birth, adolescent group through the reproductive years and into menopause and geriatric health. Therefore, one should not separate adolescents' health from the overall development of a girl to the womanhood.

Reproductive and sexual health include fertility, pregnancy, power within sexual relationships, access to and use of reproductive health services, sexually transmitted infection (STI) incidence, maternal health and HIV/AIDS (ICPD, 1994). Reproductive health, therefore, implies that people are able to have a satisfying and safe sex life and they have the capability to reproduce and the freedom to decide if, when and how often to do so. It also includes sexual health, the purpose of which is the enhancement of life and personal relations. Reproductive health thus affects the lives of women and men from conception to birth, through adolescence to old age, and includes the attainment and maintenances of good health and, at the same time, prevention and treatment of ill health.

The paper is meant to study the existing practices and information on sexual and reproductive behaviour among adolescent girls of Meitei-Pangal in Imphal East District of Manipur. It will explore the knowledge and attitudes, the socio-economic and cultural factors operating for their sexual and reproductive health along with the perception and awareness level pertaining to sexual and reproductive health care services.

The study is purely empirical. In order to carry in-depth study, simple random sampling through interview-schedule along with informal discussion is used. 100 adolescent girls and 100 adolescent mothers, within the age group of 15-24 years of age, have been taken for the study. The study has been conducted during May-June'2013. This is mainly exploratory and also takes the help of the descriptive designs.

Socio-economic profile of Meitei-Pangal adolescent girls

Meitei-Pangals: the Muslim inhabitants of Manipur had a total population of 202355 persons constituting 8.22% of the total state population (2440423 persons)[Socio-Economic Survey of Meitei-Pangals, 2004]. According to Socio-Economic Survey of Meitei-Pangals (2004), Imphal East had accommodated for 74709 persons with 36.91 % female population (37058 females). The survey showed sex-ratio of Meitei-Pangal of Imphal East as 984, literacy rate as 54.77, singulate mean age at marriage as 22.5 years. Further, as the overall economic conditions of Meitei-Pangal is not good, the same of the women group is also, obviously, not good. This, directly or indirectly, impacts their socio-economic conditions also.

A women's decision to seek health care could be affected by the influence of her partner or other family members; social norms; her education; her status in society; the distance she lives from the clinic, how sick she is; her previous experiences with

the health system and how she expects be treated by health care providers, her level of decision making power in the household, her access to credit, land and income (Lule et al, 2005). According to Garro (1998), there are four key criteria relevant for treatment choice: (1) gravity of the illness, (2) whether an appropriate home remedy is known for the illness, (3) faith or confidence in the effectiveness of home remedies for a given illness, and (4) expense of treatment and the availability of resources. He provides two general principles which enable us to understand their choice: (1) for non-severe illnesses, actions are cost-oriented. People start with less costly treatments (home treatment) and only opt for more costly alternatives if the first treatments fail or if they do not know the treatment for the problem; (2) for illnesses considered serious, illness costs are secondary, and treatment selection primarily depends on "probability of cure", and normally persons opt for a physician. In short, numerous factors contribute to poor access to health care, delay in identifying and reaching medical facilities, and delay in receiving adequate and appropriate treatment (Thadeus and Maine, 1994).

Table no. 1:
Information of socio-economic profile of the respondents' family

Variable	Percentage
1. Education	
Literate	35%
Illiterate	65%
total	**100%**
2. Income Sources	
Agriculture	70%
Business	25%
Govt. Services	5%
total	**100%**
3. Housing	
Pakka	10%
Kuccha	90%
total	**100%**
4. Sources of Drinking Water	
River or rivulet	85%
Pond	15%
Tape-water	Nil
total	**100%**

From Table 1, it is obvious that the basic socio-economic conditions of the population under study are not good. Most of them are illiterate (65%), they depend on agricultural income which is comparatively very low. They live in kuccha houses (90%) and most of them belonging to unhygienic and not sanitized surroundings. For instance, they depend on river/rivulet water for household uses and as potable.

Awareness and perception towards sexual and reproductive health among Meitei-Pangal adolescent girls

A study of Indian Council of Medical Research (ICMR) in 1992, showed that knowledge and awareness about puberty, menstruation, physical changes in the body, reproduction, contraception, pregnancy, childbearing, reproductive tract infections, sexually transmitted infections (STIs), and HIV were low among the girls, especially in younger adolescents (ages 10–14). Younger adolescents had little knowledge about the sex organs and most girls had not been informed about menarche prior to its onset. However, older adolescents (ages 15–19) had better knowledge and more aware than younger adolescent girls of the physical and physiological changes that take place in the body.

Table no 2:
Awareness and perception level among respondents

Variables	Respondents		
	Yes	No	Total
Knowledge about Nutritional Care	20%	80%	100%
Knowledge about Reproductive Health	10%	90%	100%
Knowledge about Changes in:			
1.Physical	60%	40%	100%
2.Emotional	20%	80%	100%
3.Psychological	---	no knowledge	0%
Attitudes towards Sex	2%	98% (never talk)	100%
Premarital Sex	2%	98%	100%
Knowledge about STI and RTI	5%	95%	100%
Need to have Sex Education	5%	95%	100%
Aware about the Available Health Care Services	10%	90%	100%

Majority of girl respondents have not even heard of RTI/STD but have heard about HIV/AIDS through media like radio, TV, and NGOs etc. it can be seen from Table 2 that almost all the adolescent mothers (95%) do not have knowledge about RTIs and STIs, and importance of reproductive health. They do not much care about the correct diet. All these are related either with the lack of knowledge about the physical and physiological (80%) and psychological (no knowledge at all) occur in their adolescence, or lack of aware about the available health care services, or both.

The most common health complaints mentioned by the girls were general health problems like fever, skin problem etc. than the reproductive health problems like itching, white discharge, irregular menstruation and dysmenorrhea. It was also seen that for the treatment of their general illness rely on homemade medicine or self-medication. Most of the girls do not reveal their reproductive health problem even to their mothers thus it remains within self. Looking at the health care needs of the girls, it has been identified that the safe and supportive environment are not there within the family, schools, hospitals and society at large. There is no safety in the society because of the social violence and conflicting situations in Manipur. Very often they are unable to understand the emotional turmoil also.

Adolescence is shrouded in myths and misconceptions about sexual health and sexuality. In Indian culture, talking about sex is taboo. Consequently, little information is provided to adolescents about sexual health. Instead, young people learn more about sexual and reproductive health from uninformed sources, which results in the perpetuation of myths and misconceptions about puberty, menstruation, secondary sex characteristics, physiological and body changes, masturbation, night emissions, sexual intercourse, and STIs. Ramasubban and Jejeebhoy (2000) revealed that the most likely sources of information are peers, who may not be fully informed, or the media, which tends to focus on sexual and gender stereotypes or extremes. Young people indeed recognise the inadequacies of the media as appropriate sources of information.

Tineshowri (2010) finds female adolescents continue to be victims of social humiliation with social evils and practices. They are deprived in their understanding; perception and awareness level as the focus are much more given to HIV/AIDS, family planning programme. According to Pokra (1994), health services were essentially responsibility of individual and community. There is a gap between people and the system regarding understanding, acceptance and world view.

Table no. 3:
Received information and preferred sources to obtain knowledge of pubertal changes

Sources	Received Information	Preferred Sources
Friends	40%	75%
TVs/Radios	30%	10%
Mothers	10%	5%
Sister	10%	5%
Relatives	5%	3%
Others	5%	2%
total	**100%**	**100%**

In India, half of all young women are sexually active by the time they are 18, and almost one in five are sexually active by the time they are 15 (Gupta, S.D., 2003). Despite the rising age at marriage and laws prohibiting marriage before 18 years for women and before 21 years for men, the majority of women marry as adolescents. Jejeebhoy et.al, (2003) revealed that after marriage adolescents face huge constraints on the autonomy of the marital home. It further adds that sexual negotiation among young married women in India highlights young women's lack of decision making authority in matters relating to sex. Adolescents are significantly less likely to be counselled about contraceptive use and are subsequently less likely than older women to adopt a contraceptive (Ganatra and Hirve, 2003).

Table 4 shows that 80% women in the age group of 15-18 years and 85% were pregnant or mothers of one or more child. The married female adolescent is also prone to unplanned and mistimed pregnancy resulting from low contraceptive use. A mere percentage of around 10% use it, so most of the married women have their child within the year. One important reason is women under 20 years of age hardly visit basic antenatal check-ups; 80% do not go for it. An interesting thing is that they have heard about HIV/AIDS awareness (70%), but they do not aware much about the use of condoms and others which could prevent them from HIV/AIDS.

Table no. 4:
Information regarding reproductive behaviour

Variables	Percentage
Marriage:	
1. Married by 15-18	80%
2. Married by19- 21	20%
total	**100%**
Pregnancy and child birth:	
Girls aged (15-19) who were already mothers or pregnant	85%
Contraceptive use:	
1. Married young women aged 15-24 practising contraception by self or husband	10%
2. Married women 15-24 practising modern contraception by self or husband	5%
Maternal health seeking:	
1. Women below 20 who received any antenatal check-up	20%
2. Women below 20 who delivered at a health facility	70%
Awareness of HIV/AIDS:	
1. Who have heard	70%
2. Who know the consistent condom use can reduce the chance of getting HIV/AID	20%

Among the young married women of Meitei-Pangal high rates of teenage pregnancy, high-risk of STIs/RTIs, and poor nutritional status are the main reproductive and sexual health problems. Teenage pregnancy alone is counted in huge for such poor health outcomes among adolescents. Further, adolescent pregnant mothers who are often poorly nourished have a high obstetric risk for premature delivery, low birth-weight delivery of

child, prolonged and obstructed labour, and severe intra-partum and post-partum haemorrhage (Verma and Das, 1997). In broad sense, early pregnancy is importantly associated with neo-natal mortality, and infant and child mortality. The NFHS-2 results show that mothers who are younger than 20 years old at the time of first birth were associated with a 1.7 times higher neonatal mortality rate and a 1.6 times greater infant mortality rate than were mothers giving birth between ages 20–29 (IIPS.2000).

Needs and concerns of Meitei-Pangal adolescent girls and their sexual and reproductive health

The study has explored the issues to provide not only the reproductive and sexual health but also the whole other factors that are associated with adolescents health that have not been seen by policy makers and programmes in the study area. The study has also made an effort to understand the complexity of adolescent girls' health problems and their association with social, cultural, and economic factors.

All the adolescents under the study have experienced restriction. Many of the girls respond that there is not much safe and supportive environment for them starting from family, schools, and hospitals and at large in the society. They are often neglected and restricted by the parents and society in their mobility, mixing up with friends; parents often neglect girls' participation in decision making. In short, they find that they are being neglected their potentials and abilities.

During the transition to adulthood, lack of knowledge and awareness about reproductive organs, physiological changes, or sexuality can promote psychosocial stress. This is particularly so for girls, who also face gender discrimination. Adolescent girls experience psychosocial stress. Girls felt that they were a burden on their families and had poorer self-image while their counterparts felt superior. The majority of them have no knowledge of menstruation. In most cases, their friends are the main source of information. Most girls perceive menstruation as disgusting and as a curse. Adolescent girls are also at higher risk of psychosocial stress because of gender discrimination.

The widening gap in communication between adolescents and their parents has been, in general. They have poor skills to communicate, negotiate and assert. Adolescent females are more susceptible to infections due to biological structure; lower status within gender relationship; lack of financial power. Girls also face mental and emotional problems related to too early sexual initiation. For unmarried mothers, there is social stigma, leading to horrifying consequences. Nutritional intake among adolescents especially girls is still a matter of concern. Several families do not yet recognize food intake needs of a girl. Girls are not served adequate nutritious food in comparison to male members, siblings in the family etc.

II. CONCLUSION

Adolescence represents a resource for the future whose potential can either be wasted or nurtured in a positive manner. Reproductive ill health is one of the major causes of morbidity and mortality in young people. In a conservative society like Meitei-Pangal, where reproductive and sexual health related issues are consider taboo for discussion, young people are hindered from actively seeking counsel for their needs. Low rates

of educational attainment, limited sex education activities and inhibited attitudes towards sex greatly contribute to the continuing ignorance on sex and reproduction. Seeking abortions to avoid social condemnation and being ostracised is therefore common among both married as well as unmarried adolescent girls. Even though programs and policies directed towards improvement of adolescent reproductive health exist, there is a paucity of Adolescent Friendly Health Services (AFHS), the expansion of which is still in the nascent stage. Moreover, very few programs have been able to differentiate between the special reproductive health needs of married and unmarried adolescents The empirical findings, as discussed above, earnestly emphasise the need look into and to discuss the various intermingling aspects related to reproductive behaviour. The problems related to reproductive are generally studied from medical perspective but as there are studies from cultural and socio economic perspective. So it is necessary to implement the programme and policy which have a proper link between members of the society.

Moreover most of the studies are relying on the school going girls and the programmes like sex education etc the question arise what about the girls who never enrolled in the schools, who will give counselling and awareness to them about their sexual and reproductive, is radio, TV sufficient for them or there should be some alternative means so that we can educate and make aware of their health. Building positive relationships with adolescents; opening channels of communication (two-way) with adolescents on their needs and concerns especially with regard to difficult subjects like Reproductive and Sexual Health.

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Mobile Equipment Identifier: Future of CDMA Mobile Identification

Transition to 56 bit Mobile Equipment Identifier from 32 bit Electronic Serial Number

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Abstract- During the invent of Code Division Multiple Access (CDMA) mobile phones, no one could ever imagine a day would arise, when more than a billion mobile phones would be manufactured and used worldwide over a short span of time. Each mobile phone is required to have a unique serial number burned into its chips in order to prevent fraud. Without a unique number, the phone can't be sold. So initially in order to identify phones on a network, engineers developed a 32-bit code called the Electronic Serial Number (ESN). This code was used for billing and to make sure the right call went to the right phone. But 32 bits only allowed 4 billion unique numbers; engineers probably didn't forecasted ESN to be a long-term solution. If ESNs ran out and there was no standard to replace them, manufacturers would literally have to shut down production of CDMA phones. Certainly a technology was required which could provide a long term solution to the current problem and bring about a change before ESNs were exhausted. Thus came the role of Mobile Equipment Identifier (MEID). This paper aims to present the need, role, future, issues and challenges CDMA phones face due to 32 bit ESN and how 56 bit MEID is going to rectify it.

Index Terms- CD, CDMA, ESN, GHA, GSM, IME , MEID, RUIMs, SIM, SMS, TDMA.

I. INTRODUCTION

CDMA wireless subscribers around the world are using a smart card in the back of their R-UIM-enabled CDMA handsets. These CDMA smart cards, called Removable User Identity Modules (R-UIMs) are used to hold and protect all of the subscriber's data necessary to receive wireless services. Subscribers remove R-UIMs from one phone and insert them into another without loss of subscription data or phone book. This portability makes it easy for users to change phones while keeping the same operator. So we have a concept of identification in the name of ESN and MEID. A mobile Equipment Identifier (MEID) is a globally unique number identifying a physical piece of CDMA mobile station equipment. It is basically an ID unique for each CDMA mobile phone in the world.

NEED FOR MEID

CDMA Management

General question may arise in the minds of the readers that why MEID is required when already we have ESN for identification in CDMA handsets. Answer is migration from 32 bit ESN, which is on the verge of exhaustion to 56 bit MEID so as to accommodate future subscriber growth through a larger identifier.

However, as technology advanced from analog to Time Division Multiple Access (TDMA) or CDMA and then CDMA2000, the networks continued to use ESNs to identify phones. It made sense to use them in order to maintain compatibility with older networks, since many carriers upgraded their systems piece by piece. We still have dual- or tri-mode phones today. Once they upgraded to digital networks, carriers also started using ESNs to secure phone calls and eventually prevent fraud.

Unfortunately, the rapid growth of TDMA and CDMA have nearly exhausted the supply of ESNs. In addition, early on in cell phone history, large blocks of serial numbers were distributed to manufacturers rather liberally, speeding the depletion of a limited supply.

GSM Management

The fact that it only took 20 years to use 4 billion serial numbers is even more amazing when you consider that Global System for Mobile communications (GSM) phones don't use ESNs. Since GSM was launched as an all-digital system with no need for backward compatibility, they use a different numbering system called International Mobile Station Equipment Identity (IMEI). Probably since GSM came along later, and could learn from the mistakes of ESN, IMEI is almost twice as long, providing a significantly higher limit of unique codes.

So before the ESNs get exhausted, manufacturers and carriers will need to be ready for ESN's successor, Mobile Equipment Identifier (MEID).

TECHNICAL BREAK-UP

As depicted in Figure1, Mobile Station Equipment Identifier is a 56-bit number assigned by the mobile station manufacturer, uniquely identifying the mobile station equipment.
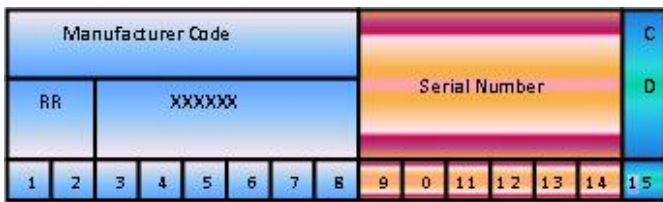
Figure1: MEID (14 Hexadecimal Digits, 56 bits)

RR- Regional Code.A0-FF are assigned by the global hexadecimal MEID administrator (GHA).Other codes are reserved for use as IMEI'S.RR=99 IS reserved for MEID's that can also be used as IMEI's

XXXXXX-6 hexadecimal digit code assigned by the administrator to a manufacturer for a line of phones.

Serial Number – Assigned by manufacturer to identify an individual device.

CD - Checksum Digit. Not transmitted.

Each mobile station is assigned either a single unique 32-bit binary serial number (ESN) or a single unique 56-bit binary serial number (MEID) that cannot be changed by the subscriber without rendering the mobile station inoperative.

The mobile station shall be configured with a 56-bit MEID. MEID is used to uniquely identify the mobile station in a wireless system. The mobile station shall store a 32-bit pseudo-ESN value, derived from MEID[2].

CHALLENGES AND SOLUTION

Switching Challenges

First, the industry requires a way to let MEID phones work on old networks that use ESN. This is critical for manufacturers that will run out of ESNs before networks are ready to use MEID. The phones will be programmed with an MEID which they will use to generate a temporary ESN called pseudoESN (pESN).

PseudoESN

PseudoESN (pESN) is a 32 bit number derived from MEID and is used in place of ESN. The mobile station shall use the following procedure to derive pseudo-ESN from MEID. The upper 8 bits of pseudo-ESN shall be

set to 0x80. The lower 24 bits of pseudo-ESN shall be the 24 least significant bits of the SHA-1 digest of the MEID.

For the 56-bit MEID ➔ FF 00 00 01 12 34 56,

Pseudo-ESN calculated is   ➔   80 07 37

The problem is that the pESN will not be unique. There is a chance that more than one phone with the same pseudoESN is on the same network. There would be no way for the network to tell them apart. If this happens the 2 phones would probably get each other's SMS messages, at the least, or cancel out each others' service preventing both phones from working, in a worst case scenario. Engineers are working to minimize these problems before pESNs handsets are rolled out.

Solution

 To genuinely solve this problem, the industry needs to come up with a way to recognize MEIDs on current networks. This effort is known as "MEID on CDMA2000"[1]. It consists of two parts. The first is getting handset manufacturers to comply with a little trick. In addition to ESNs, every handset has an additional set of codes that tell the network what the phone is capable of. One of those codes has previously gone unused and has always been set to "off". Manufacturers would set this code to "on" for all handsets with an MEID[4].

Base stations would then need to be upgraded to query phones entering a cell for this code, which they never cared about before. If a phone responded with the code "on", then the cell would address all traffic to the phone using MEID, if it was still "off," the cell would continue to use an ESN. This would assure that every phone on a network would have a unique identifier, and thus avoid mixing up transmissions (which the network types call data collisions). MEID-equipped handsets will need to be able to generate a pseudoESN as well as comply with MEID for CDMA2000 in order to be compatible with CDMA networks for the foreseeable future.

CONCLUSION

CDMA has proved to be a promising technology for 3G networks. As described in this paper, MEID is the next mandatory change in telecommunications domain. World's leading providers of smart cards are currently offering R-UIM based MEID services to CDMA operators around the globe. This whitepaper would prove to be an eye opener to the new techies, digging versatile subjects in Subscriber Identity Module(SIM) or Mobile domain.This Whitepaper is intended only for knowledge purpose and contains confidential information. Unless stated to the contrary, any opinions or comments are personal to the writer and do not represent the official view of the company / organization.

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Prevalence of gestational diabetes mellitus at tertiary care center

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Abstract-
Introduction :
Gestational diabetes mellitus (GDM) is defined as carbohydrate intolerance of varying degree of severity with onset or first recognition during pregnancy.

Aims and objective :
To find out prevalence of GDM in population.

Materials and methods :
Pregnant women(n=232) of 24-28 weeks gestational age attending obs-gynec opd in 2013 underwent 75gm oral glucose tolerance test (OGTT) irrespective of their fasting state. Women with a history of diabetes were excluded from this study. Blood samples were drawn at 2 h for estimating plasma glucose. The plasma glucose was estimated by GOD-POD method and the prevalence of GDM was computed based on DIPSI criteria.

Result:
Among the 232 women screened 32(13.79%) had GDM and among risk factors, higher BMI was significantly associated with GDM. There was no statistically significant difference among age, gestational weeks and gravida of the women in the normal glucose tolerant and GDM groups ($P > 0.05$).

Conclusion:
Due to high prevalence, screening is essential for all Indian pregnant women even in non high risk group. A short term intensive care gives a long term pay off in the primary prevention of obesity, IGT and diabetes in the offspring and helps to avert future diabetes and cardiovascular disease in women.

Index Terms- complication, Glucose challenge test, Gestational diabetes mellitus, oral glucose tolerance test, pregnancy.

I. INTRODUCTION

Gestational Diabetes Mellitus (GDM) is defined as carbohydrate intolerance of varying degree of severity with onset or first recognition during pregnancy, irrespective of the treatment with diet or insulin. The prevalence of diabetes is increasing globally and these numbers include women with GDM. The importance of GDM is that two generations are at risk of developing diabetes in the future. Women with a history of GDM are at increased risk of future diabetes, predominately type 2 diabetes and cardiovascular disease and their children have increased risk for obesity and diabetes. This fact should alert the physicians about the necessity to devote special attention to this segment of population especially in developing countries. A random survey was performed for the first time in 2002 to determine the prevalence of GDM in our country. Of the total number of pregnant women (n=3674) screened, 16.55% were found to have GDM. So we initiated a hospital based survey to ascertain the prevalence of GDM in our population in 2013.

II. AIMS AND OBJECTIVE

- To find out prevalence of GDM in population.
- To screen every pregnant woman irrespective of their fasting state.
- To prevent future complications.

III. MATERIALS AND METHODS

We conducted a prospective screening for GDM in all pregnant women of 24-28 gestational weeks who are attending their antenatal clinic at civil hospital ahmedabad during September 2013 to December 2013(n=232). They underwent 75gm oral glucose tolerance test (OGTT) irrespective of fasting state. Women with a history of diabetes were excluded. Blood samples were drawn at 2 hr for estimating plasma glucose. Glucose was estimated by glucose oxidase peroxidise (GOD-POD) method in the central laboratory and diagnosis of GDM was based on Diabetes In Pregnancy Study group India (DIPSI) criteria. DIPSI recommends 2-h plasma glucose >=140mg/dl with 75gm oral glucose load to diagnose GDM. Details of age, BMI, family history of diabetes and history of previous pregnancies were obtained. The body mass index (BMI) of the subjects was calculated from the pre pregnancy weight and expressed in kg/m2. Informed consent was taken from all the patients. To compare the mean values of GDM and non-GDM groups, Z test was used and two tailed p value < 0.05 was considered statistically significant.

IV. RESULT

Out of 232 women screened at antenatal visit, 32 were diagnosed with GDM and prevalence of GDM was 13.79% (Figure 1).

Characteristics of the women screened with their mean, standard deviation(SD), z test and p value are given in Table 1.
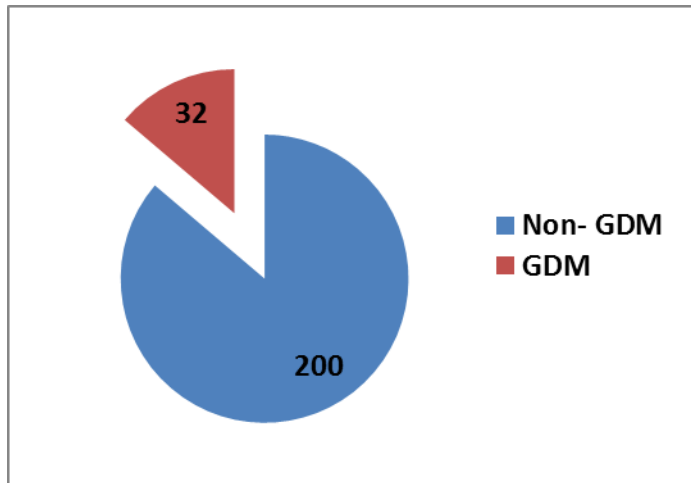
Figure 1 : Prevalence of GDM

Table 1 : Characteristics of women with mean, SD, Z test value and p value

| Parameters | GDM group

N=32
Mean +/- SD | Non-GDM group
N=200
Mean +/- SD | Z test value | P value |
|---|---|---|---|---|
| Gestational weeks | 26.5 +/- 1.77 | 26 +/- 1.48 | 1.51 | 0.12 |
| Age (years) | 24.37 +/- 2.44 | 24.96+/-3.04 | 1.22 | 0.22 |
| Gravida | 2.62 +/- 1.06 | 2.6 +/- 1.06 | 0.09 | 0.92 |
| BMI(kg/m2) | 24.63 +/- 2.51 | 20.26+/-3.67 | 8.50 | <0.0001 |

In our study for BMI in GDM and non-GDM groups p value is <0.05 which is statistically significant which is suggestive of higher prevalence of GDM in women with higher BMI than in non-GDM group.

For gestational weeks, age and gravida p value is not <0.05. So statistically there is no significant difference between two groups and their characteristics.

V. DISCUSSION

GDM occurs when body cannot make enough insulin to meet the rising amounts that woman needs during pregnancy or body cannot use the insulin efficiently. It occurs when the woman's beta cell function is not able to overcome the antagonism created by the anti-insulin hormones of pregnancy and the increased fuel consumption required to provide for the growing fetomaternal unit. In this study, we preferred to perform universal screening as selective screening based on risk factors scored poorly in predicting GDM. Universal screening for GDM detects more cases and improves maternal and offspring prognosis compared to selective screening. It appears to be the most reliable and desired method for the detection of GDM, particularly in those populations with high risk for GDM. For universal screening, the test should be simple and cost effective. The two step procedure of screening with 50g Glucose challenge test (GCT) and then diagnosing GDM based on Oral Glucose Tolerance Test (OGTT) is not feasible in our country, because the pregnant women may have to visit the antenatal clinic twice and at least 3-5 blood samples have to be drawn. One step screening by DIPSI criteria is easy to perform besides being economical. Established risk factors for GDM are advanced maternal age, obesity and family history of diabetes. In our study, data confirmed that increased BMI is a risk factor for GDM. Of all the independent risk factors for GDM, BMI emerged as a modifiable risk factor. They are the ideal group to be targeted for lifestyle modification or pharmacologic intervention in order to delay or postpone the onset of overt diabetes. Hence an important public health priority in the prevention of diabetes is to address maternal health both during ante and post partum period. GDM provides a unique model in which treatment for a medical condition(GDM) acts as prevention for another condition(future diabetes in the mother) and also acts as prevention for condition in another person(future diabetes in the new born child). Lifestyle changes, dietary changes and physical activity lead to modest weight reduction and decrease prevalence of GDM. Small steps can lower diabetes risk and the chance of having a successful pregnancy is about the same as a non-diabetic woman when blood sugars are kept at the normal level.

VI. CONCLUSION

GDM can adversely affect both the mother and the baby and should be taken seriously. Due to high prevalence, screening must be done for all Indian pregnant women even in non high risk group.

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In vitro evaluation of fungicides and two species of Trichoderma against Phomopsis vexans causing fruit rot of brinjal (Solanum melongena L.).

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Abstract- Fruit rot of brinjal caused by *Phomopsis vexans* is an important disease of eggplant inflicting heavy losses. The present investigation was carried out to test the efficacy of fungicides and two species of *Trichoderma* inhibiting the pathogen *in vitro*. Fungicides viz. Carbendazim (Bavistin 50% wp), Captaf (Captan-50 wp), Copperoxychloride (Blitox -50wp), Mancozeb (Dithane-75) and Ridomil MZ -72 were tested by poisoned food technique against brinjal fruit pathogen (*Phomopsis vexans*) in PDA medium. All the fungicides were significantly proved effective. Among them, Carbendazim at 0.1% showed complete inhibition of the mycelial growth of the pathogen. Among the two species of *Trichoderma* tested, *T. viride* was found to be most effective with 84% inhibition followed by *T.harzianum* 78.22 % inhibition respectively over control after 7th days of incubation.

Index Terms- Brinjal, Phomopsis vexans, Fungicide, Trichoderma.

I. INTRODUCTION

Eggplant or brinjal (*Solanum melongena* L.) is one of the most important solanaceous vegetable crops and is grown worldwide. India is considered to be the centre of origin of cultivated brinjal [1] from where it spreads to other parts of the world [2]. The brinjal fruit contains carbohydrates, protein, moisture etc and minerals like calcium, magnesium and iron. In India, brinjal is cultivated throughout the year in all the parts except high altitudes as a summer crop and occupied 0.56 m ha with 9.3 MT productions [3]. In Assam, brinjal is cultivated in 16,480 ha area and the production was 26,0054 MT in the year 2012-2013. The low productivity is due to the many biotic and abiotic stresses, insect and diseases attack play an important role in reducing the yield throughout the world.

This crop is suffered by many diseases caused by various microbes. Among them, *Phomopsis* fruit rot of eggplant caused by the fungus *Phomopsis vexans* (Sacc. Syd.) 'Harter' is a serious disease which attacks all above ground parts of the plant [4]. It is mentionable damaging to the crop and is a threat particularly in kharif season and late crop in winter season. It has been reported that *Phomopsis vexans* reduces yield and marketable value of the crop nearly 20-30% [5, 6]. Certain protective fungicides although hazardous to environment are still used for the control of fungal diseases [7, 8]. Therefore, the experiment was undertaken to find out the effective fungicides and with two species of *Trichoderma* in controlling *Phomopsis* fruit rot of eggplant.

II. MATERIALS AND METHODS

The fungus *Phomopsis vexans* was isolated from the infected brinjal fruits collected from different fields of Goalpara district (Assam) following tissue segmentation method. The pure culture was maintained on potato dextrose agar slants at 4 ± 1^0C. Five fungicides and with two species of *Trichoderma* were evaluated for their inhibiting efficacy against *Phomopsis vexans* under *in vitro* condition.

In vitro effect of different fungicides

The comparative toxicity of fungicides on the growth of the fungus under *in vitro* condition was evaluated by poisoned food technique [9]. Fungicides like Carbendazim (Bavistin 50 wp), Captaf (Captan -50 wp), Copper oxychloride (Blitox-50 wp), Mancozeb (Dithane M-45), and Ridomil MZ-72 at different concentration (0.1, 0.15 and 0.2 percent) were used for *in vitro* assay. The fungicides were incorporated into the sterilized PDA medium. The sterilized petriplates containing amended medium were inoculated with 7 mm disc of freshly prepared culture of the test fungus and incubated at 28 ± 1°C for 7 days. The efficacy of fungicides was expressed as percent of radial growth over control, which was calculated by using the formula [10].

$$I = \frac{C-T}{C} \times 100$$

Where,
I= Percent inhibition over control
C= Radial growth in control
T= Radial growth in treatments.

In vitro antagonism of the two species of *Trichoderma*

In vitro antagonism of the two species of *Trichoderma* against *Phomopsis vexans* was tested by dual culture technique on PDA medium [11]. Control was maintained without pathogen. All the plates were incubated at room temperature (28 ± 1°C). Each experiment was replicated three times. Observation on mycelial growth of the pathogen was recorded after 7 days of incubation. The percent inhibition over control was calculated.

III. RESULTS AND DISCUSSION

The results revealed (table 1) that all the fungicides having different concentration significantly inhibited the mycelial growth of *Phomopsis vexans*. It was observed that fungicides tested, Carbendazim was found most effective at the lower concentration. It caused complete reduction of mycelial growth

i.e. 100 percent (@ 0.1%); while Captan at higher concentration (@ 0.2%) caused highest reduction of mycelial growth 85.2 percent followed by Copper oxychloride 84 percent, Mancozeb 70.4 percent and Ridomil 67.1 percent at the same concentration over control. The findings of the present investigation are well supported by the findings of [12, 13, 14] who reported that Bavistin (Carbendazim) at lowest concentrations completely inhibited the mycelial growth of *Phomopsis vexans*. Islam *et al*. [15] also reported Bavistin as effective fungicide against *P.vexans.*

Table 1: *In vitro* evaluation of fungicides against *Phomopsis vexans.*

SL. No.	Fungicides	Percent inhibition of mycelia growth			
		Concentration (%)			Mean
		0.10	*0.15*	*0.20*	
1.	Carbendazim	100	100	100	100
2.	Captan	83.4	85	85.2	84.5
3.	Copper oxychloride	81.1	82	84	82.3
4.	Mancozeb	60.3	69.3	70.4	66.7
5.	Ridomil	53.4	59.4	67.1	59.9

Effect of two species of *Trichoderma* on mycelial growth of *Phomopsis vexans*.

Antagonistic fungi viz. *Trichoderma harzianum* and *T.viride* were isolated from the soil samples of brinjal rhizosphere. The identification was confirmed according to the identification key [16] based on the branching of conidiophores, shape of phialides, emergence and shape of phialospores. The two fungal cultures isolated from soil were found to have inhibitory effect on the mycelial growth of the pathogen (table 2) and data showed that degree of inhibition was maximum with *T. viride* (84%) followed by *T.harzianum* (78.22 %) after 7th days of incubation. *T.viride* was found highly effective in comparison to *T.harzianum*. The present findings are found in agreement with the works of Jadeja [17].

Table 2: Effect of two species of Trichoderma on mycelia growth of Phomopsis vexan.

SL. No.	Treatments	% inhibition of mycelial growth
1.	*Trichoderma viride*	84 %
2.	*T. harzianum*	78.22 %

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Financing of Solar Energy Generation by Regional Rural Bank

(A Case Study of Aryawart Gramin Bank in Uttar Pradesh)

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Abstract- Regional Rural Banks are the banking financial intermediaries working especially for the development of rural sector of Indian economy. The main aim of establishing these institutions was to facilitate the rural people with core banking functions in general and loaning to those landless and marginal farmers, artisans, field workers etc.who could not access to other sources of organised financial system. RRBs not only work for providing finances but also cater additional responsibilities of developing rural areas through various development programmes like rural employment schemes, women entrepreneurship, rural infrastructural development, SHGs etc. This paper highlights the role of Aryavart Gramin Bank in lending to priority sector and their achievements so far. A special emphasis has been given to the study of solar homes lightening system(SHLS,) provided by Aryavart Gramin Bank through micro finance to the rural people of Uttar Pradesh for solar home lights, for which they were honoured with "ASHDEN INTERNATIONAL AWARD" in 2008 and "INDIA POWER AWARD" in 2009. The proposed study is exploratory and descriptive in nature and based upon the analysis of secondary data.

Index Terms- SHGs, SHLS, RRBs, AGB

I. INTRODUCTION

Rural financial institution builds sound social and institutional infrastructure that can meet educational, health, drinking water, transport, communication and energy needs of rural household. A regional rural bank not only deals with providing loans and other banking facilities to rural poor but also caters additional needs of micro-finance. "Micro-finance refers to provision of small scale savings, credit, insurance and any other financial services to those who cannot access them from financial institution." Due to issue of risk and cost associated with servicing the larger no. of small low input capital business, the formal sector lending to micro-enterprise is low. Regional rural bank offers a variety of potential advantage for financing micro-enterprise like commercial outlook and relatively sophisticated skills. Apart from acting as a credit provider, the bank acts as a change agent by helping people in acquiring the basic knowledge of business, policy environment etc.

Aryavart Gramin Bank which is one of the leading banks among the RRBs of Uttar Pradesh has sanctioned total of 100273.83 lakhs loan by the end of financial year 2011-12 for priority sectors and the total outstanding amount of the bank has

been Rs 163538.05 lakhs as on end of financial year 2011-12. Solar home lightening system which is one of the constituent of priority sector lending by Aryavart bank has issued loan of Rs 12883 lakhs up to financial year 2011-12, for the rural electrification purpose which is the second highest lending for this project by any other rural bank till the 2012.

II. OBJECTIVES OF THE STUDY

- To review the role of regional rural banks in priority sector lending.
- To review the role of Aryavart Gramin Bank in priority sector lending.
- To focus on the scope of solar energy in India.
- To highlight the role of Aryavart Gramin Bank in promoting the rural electrification through solar energy.
- To assess the future prospects of financing for solar energy by RRBs

III. REVIEW OF LITERATURE

At the moment, solar energy and distributed generation is the best space for rural energy in India. A large part of the country receives good insulation for over 300 days. One of the chief advantages of solar energy is its ability to be customised for individual household needs – generation can be tailored to closely match the demand and financial constraints of the household. Installation does not require much time and maintenance, requirements are minimal. As aspirations and affordability rise, modules can be added, allowing greater loads and consumption. The range of applications, and the institutional mechanisms that have evolved to disseminate them, have made solar-based applications flexible as well as affordable. As a stop-gap measure, solar lanterns as a stop-gap measure, solar lanterns are perfect substitutes for kerosene lanterns. If we consider the negative implications on health, the poor quality of light and the cost of subsidised kerosene over the lifetime of a solar lantern, we can very easily see how it fares better on a head-to-head basis. For the 28 million households that will remain un-electrified at the end of RGGVY, the total kerosene subsidy for lighting requirements is estimated to be about Rs 170 billion over 15 years (less than the lifetime of a typical solar lantern). For the sake of comparison, providing solar lanterns with a 2.5W LED bulb and costing around Rs 1,600(Chaurey and Kandpal 2009),

with a 90% subsidy, would cost the government Rs 40 billion.6 Solar home systems can come in multiple sizes and are amenable to configuration customisation in terms of panel wattage, battery capacity and number of lights and applications can be supported. Government backing is required especially to provide access to poorer households for whom Affordability is a major barrier; even the down-payment requirements for loans, after factoring in capital subsidies, were found to be out of reach for many rural homes (Wong forthcoming).Further, quality and maintenance have been major issues with many donor-based programmes, where systems were given away for free or with very high subsidies, and this has also been the case in India (Chaurey et al 2004; van der Vleuten et al 2007).

The solar services industry in India is perhaps unique in leveraging the formal financial infrastructure. Sri Lanka and Bangladesh have relied on microfinance (World Bank 2008). In Latin America (Rogers 2006) and in certain regions in Africa (Gustavsson and Ellegard 2004), the leasing approach or micro-leasing, as it is called, has been prominent. Under this approach, the service provider has an energy service contract with the customer over the period of a few years. The customer pays a monthly fee while the service provider provides maintenance and continues to own the system.

IV. RESEARCH METHODOLOGY

The present study appraises the growth and performance of regional rural bank in priority sector lending. The concept of this paper was generated after an interview with the various officials of Aryavart Gramin Bank in Lucknow and around areas. This study is exploratory as well as descriptive in nature and made the use of secondary data by studying the websites of Aryavart Gramin Bank and furthers the financial report and review of financial statement of Aryavart Gramin Bank 2011-12 has been used for the statistical data and various schemes of the banks and their growth so far. The growth rate for solar home lightening system has been calculated by using simple growth rate formulae.

V. ARYAVART GRAMIN BANK

The **Aryavart Gramin Bank** (*AGB*) was established by Government of India Notification F. No. 1/4/2006-RRB dated 3rd October 2006, as a result of the amalgamation of three smaller Regional Rural banks namely Avadh Gramin Bank, Barabanki Gramin Bank and Farrukhabad Gramin Bank. It currently has 333 branches in rural areas of Uttar Pradesh, covering 7 districts with 254 rural branches. It functions under Regional Rural Banks' Act 1976 and is sponsored by Bank of India. As on 30th may 2012, *AGB* has registered Rs. 38.66 lakhs saving bank accounts with Rs. 4353.94 crore of deposits. There are total Rs. 5.47 lakhs loan accounts with a loan amount of Rs 2440.65 Crore.

One of the major focus of Aryavart Gramin Bank was to promote priority sector lending in the rural areas of Uttar Pradesh which brought about many key developments in the rural arenas, and the project of solar home lightening system was first time introduced by Aryavart Bank which was appraised by

Government of India as well as worldwide for which they were given ASHDEN INTERNATIONAL AWARD In 2008.

CONCEPTUAL FRAMEWORK AND WORKING OF SOLAR HOME LIGHTENING SYSTEM (SHLS) FINANCING SOLAR HOME LIGHT SYSTEM:

The bank's journey to improve living standard and welfare of the people residing in rural, semi urban and the urban area beset with frequent power cut through its innovative scheme of financing small product of solar home lightening system with mission of "ghar ghar mein ujala". Impressed with the bank effort, the Govt. of India, Ministry of New and Renewable Energy has launched new schemes in the name of "**capital subsidy-cum-refinance scheme**" under "**Jawaharlal Nehru national mission (JLNNSM).** As many as 33679 solar projects have been financed till 2012 by AGB.

AGB started working on this concept to bring light in the lives of 14.86 million villagers residing in 8542 villages in its area of operation covering 6 districts (area 20396 sq km) in the state of Uttar Pradesh. Out of these villages, 2504 villages have no electricity at all and in electrified villages also the electric supply was erratic and hardly for seven hours in 24 hours, thus leaving the households in acute darkness. The life comes to a standstill after sunset in these villages.

To achieve the objective of bringing lights to these villages a financing scheme in the name of "ghar ghar me ujala saur urja se" meaning "every home to be lightened upon with the help of solar power" was developed and was started in the year 2006. *AGB* has tied up with TATA BP solar for supplying the SHLS to the customers. **TATA BP SOLAR** is a joint venture between Tata power co. limited, a pioneer in the power sector in India and BP SOLAR one of the largest solar companies in the world. Their model "Venus solar home lightening system" being cost effective was chosen as the product for the home loans. The bank had won international ASHDEN award in 2008 and two national award namely "India power award in 2009" presented by ministry of power, govt of India in November 2009 and by Bharti vikas trust, Udupi for excellent work done by the bank for promotion of solar energy by introducing its innovative scheme.

The effort made by the bank were continued to be recognised at various national and international levels. In the year 2011-12 bank received $65,117 USD as revenues of carbon credit. So total carbon credit revenues earned during the last two years is Rs 68.00 lakhs. This could be possible due to continuous follow up with micro energy credit corporation, USA and their kind support to relax certain norms and making agreement practically feasible with an amending agreement signed on 22.09.2010. **Aryavart Gramin Bank is the first bank in the country to receive such carbon credit on behalf of its customer on voluntary emission reduction (VER) basis.** The ministry of New and Renewable Energy, GOI has released Rs 23.83 lakhs including Rs 5.00 lakhs for cash award to top three branches of the bank under their incentive scheme for promoting solar energy for the year 2009-10.

Many rural areas of Uttar Pradesh have no grid electricity and even where the grid is available there is frequent power cuts. The 2008 ASHDEN award to Aryavart Gramin Bank highlights the significant contribution which the banking sector can make in bringing the solar photovoltaic (PV) electricity to rural

households. The major contribution of *AGB* in rural electrification was as follows:

- Bank finances two standard solar homes system: 35 WP of PV with two fluorescent lights and a socket and 70 WP with four lights and sockets.
- System cost us$ 340 and us$ 680 respectively, including installation and one year of service.
- Solar loan were provided only to existing *AGB* customer with a track record of reliable credit repayment.
- Customer makes a 20% down payment and loan for remaining 80% is paid back over five years. The repayment cost was relatively less than the cost of kerosene used for lightening.
- *AGB* branches promote SHGs by holding credit camps in villages, where speaker demonstrate the system and explain how the financing works. 1000 or more customers may sign up for solar loan at each camp.
- It is benefitting around 1, 00,000 people in the satrik, town of Barabanki itself.
- Students can study longer with solar lightening and neighbours can socialise more.
- Rural families can work in evening and earn more, which is particularly useful to women.
- *AGB* branches also use PV- powered back up power during main power cuts.
- Solar home lightening system has brought about reduction in carbon emission in an environment, thus reducing the pollution at larger level.

SHARE OF ARYAVART GRAMIN BANK IN TOTAL RRBs WITH REGARD TO FINANCING TO SHLS

S.NO.	CATEGORIES	RRBs	ARYAVART GRAMIN BANK	% SHARE OF *AGB* OF TOTAL RRBs
1.	TOTAL VILLAGE FINANCED	20508	1500	7.31%
2.	NO. OF BORROWERS	152014	32414	21.32%
3.	LOAN ISSUED	54162 (LAKHS)	12883 (LAKHS)	23.78%
4.	LOAN OUTSTANDING	22515.97(LAKHS)	3207.18 (LAKHS)	14.24%

SOURCE: KEY STATISTICS OF RRBs

Out of 82 RRBs in India only 33 RRBs deal with solar home lightening system and Aryavart Gramin Bank has been the key player in this system. In the last 5 years it has financed 1500 villages in single state, where the electric grid was not available. Its total share in the no. of borrowers as well as in loan issued has been remarkable with alone contributing more than 20% share. If all the RRBs of India undergo the financing of SHLS at the rate at which 33 banks are operating, around 50959 villages all over

India can be financed, thus eliminating the problem of electrification to a large extent. Looking at the mounting pressure of electricity demand and increasing significance of this sector, Government of India has also provided various incentives schemes to different rural banks which are working in this arena to promote the rural electrification through solar energy.

SUPPORT AND SUBSIDY TO ARYAVART GRAMIN BANK BY GOVERNMENT OF INDIA

When the scheme of solar electrification was launched there was no such financial or other support available from the government, but now the ministry of new and renewable energy (MNRE) govt. of India, has come out with an incentive scheme, giving incentives to banks and micro finance institution to support installation of solar homes lightening system and other small solar system through loans. This incentive is given to those bank and MFIs who have financed more than 3000 system. The amount of incentive is based on performance of banks and MFIs. *AGB* has been included in the group set up by MNRE, New Delhi to finalize the modalities to take the initiative for financing solar lightening system through banks.

FINANCING SOLAR HOME LIGHTENING SYSTEM BY *AGB*

S.NO	YEARS	NO. OF SOLAR HOME LIGTENING SYSTEM	GROWTH %
1	2006-07	134	-
2	2007-08	4404	31.86
3	2008-09	16130	119.37
4	2009-10	24684	183.20
5	2010-11	31287	232.48
6	2011-12	33679	250.33

Source: website of Aryavart Gramin Bank as on 01.05.2013

As per the reports of Aryavart Gramin Bank, till September 2012, 33679 solar home lightening systems have been sanctioned in various districts. Over a period of six years, the no. of SHLS financed by AGB has amazingly increased by around 250 times.

- Assuming that there is an average consumption of 8 litres of kerosene per month, it will result in annual saving of 32, 33,184 litres of kerosene.
- Assuming that there is an average of 5 family members in a family, *AGB* has benefited around 1, 68,395 villagers in one district alone.
- With capacity of 35 watt per SHLS, *AGB* have generated installed capacity of 1.1 megawatt.
- Most of all, it had led to carbon emission reduction up to 41419.84 tonnes for an average of 2 years.

VI. CHALLENGES FACED

With every success and achievement there comes a challenge and problems, of which main are given below:

- Lack of awareness and publicity regarding this system among the public.
- Lack of fully skilled personnel in the banks.
- In ensuring security of advance.
- Creating demand for solar home lightening system.
- After sale service and repair.
- Maintaining the system.
- Low repaying capacity of most of the villagers.

VII.   ACHIEVEMENTS

To begin with, the bank has covered 10 villages namely:

- Badri Purwa, Jhabaria, Gondwa And Bannai Of Hardoi District.
- Ambaur, Khanpur, Shivrajpur, Ranjeetpur, Pataunja and Satrik of Barabanki district, wherein 100% households have been financed with SHLS.

- The bank also plans to popularise already devised two or more schemes namely "financing for purchase of solar water heating system" and " financing for purchase of solar power packs" from 2012 itself.
- The bank has an ambitious plan to provide SHLs to the villages where either grid power is not available or power supply is erratic.

VIII.   FINDINGS

- Aryavart Gramin Bank is one of the leading banks among all RRBs of Uttar Pradesh.
- It has issued loan up to Rs. 100273.83 lakhs for priority sector lending.
- A total of Rs 12883 lakhs has been issued so far for solar home lightening system by the end of financial year 2011-12.
- There have been a total of 32414 borrowers of *AGB* for SHLS itself.
- *AGB* has received carbon revenues up to Rs 68 lakhs in the last two years.
- Govt. of India has released Rs. 23.83 lakhs, including Rs 5 lakhs for cash award to *AGB* as incentives for promoting solar lights.
- It can be projected that around 51000 villages across the nation can be covered for financing for solar system if all 82 RRBs take initiative at the rate of financing by 33 RRBs for the same. Thus in the near future it may become a better alternative of electricity supply by Govt. Agencies.
- It has also led to the reduction in carbon level from those areas where solar system is being used.

IX.   SUGGESTIONS AND CONCLUSION

There has been a higher level of growth in installation of solar home lightening system over the years. Aryavart Gramin Bank has made significant contribution in the solar home lightening system and has also successfully planted the solar energy in the rural areas of in an around Lucknow district. AGB has helped generating women empowerment as now more and more women are using their skills of embroidery and other handmade activities even after the evening in the dark hours as they have solar lightenings in their home, children of these areas are now in a better position to focus in their studies as they have facility of solar lights, furthermore it is also helping in keeping our environment clean. In this era when our country is faced with huge problem of depletion of natural resources, and increase in the pollution level, solar home lightening system can be proved as the economic saviour both in the terms of saving environment and its resources.

The expansion of this system and growth trends can further be continued if all RRBs of India starts taking initiative for financing SHLS. Government of India is also taking interest in providing SHLS, where the grid is not available. It is providing the subsidy for these solar projects. But many parts of our rural economy are still in dark, people are unaware about SHLS and even if they are aware they are afraid to go to banks for the loaning process. For the proper implementation of SHLS, more of awareness programme should be launched by the Government and after sale services should be properly implemented and regular training should be provided to the consumers regarding its usage and keeping. Further government should direct all the regional rural banks to implement this solar home lightening system for rural electrification where grid power supply is not available. While looking at the trends of expansion SHLS during last one decade, we can visualise a rosy picture of our rural economy with respect to energy in the next 10 years to come.

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Human health risk assessment of heavy metals via dietary intake of vegetables grown in wastewater irrigated area of Rewa, India

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   Abstract- In India, farmers are blindly using untreated industrial waste water for crops and vegetable production especially in peri-urban areas. Nowadays, increasing attention has focused on heavy metal concentrations of vegetables all over the world. Heavy metals have positive and negative roles in human life. Intake of vegetables is an important path of heavy metal toxicity to human being. The use of industrial waste water for irrigation exposes humans at various health risks. This is because heavy metals are not easily biodegradable and consequently can be accumulated in human vital organs. This situation cause varying degree of illness based on acute and chronic exposures. The present study was conducted to assess the risk to human health by heavy metals (Fe, Zn, Cu, Pb, Cd, Mn and Cr) through the intake of locally grown vegetables in Rewa city (M.P.) India, where, soils contaminated with heavy metals were mainly due to waste water irrigation from Cement Plants (Bela and Naubasta) and may be possible atmospheric deposition. The higher standard deviation reveals higher variation as in the heavy metal distributions from the point source of emission to the adjacent areas. In present study a value of intake of heavy metals in human diet was calculated to estimate the risk to human health. From the results the hazardous quotient (HQ) of all studied heavy metals indicated that all vegetables were safe with no risk to human health except for Pb (>1.0 to near 1.0) contamination in Spinach, Cauliflower and Radish had potential for human health risk due to consumption of these vegetables grown in the area having long term uses of untreated waste water for irrigation. Children are at somewhat higher risk than adults. However, DIR (<1.0) & HI (within1.0 to near 5.0) for all studied vegetables was found to be safe i.e. free of risks, it is therefore indicated that there is a relative absence of health risks associated with the ingestion of contaminated vegetables.

   Index Terms- Average Daily Dose, Daily Intake Rate, Hazardous Quotient, Health Risk (Hazardous) Index, Heavy Metals

I. INTRODUCTION

Heavy metals contamination is a major problem of our environment and they are also one of the major contaminating agents of our food supply. This problem is receiving more and more attention all over the world, in general and in developing countries in particular. The tradition of growing vegetables within and at the edge of industrial area of the cities is very old. It is revealed that most of these cultivated lands are contaminated with heavy metals contributed through industrial waste water irrigation. These contaminated soils have resulted in the growth of contaminated vegetables. Heavy metals in soil reduce the yield of vegetables because of disturbing the metabolic processes of plants (Abdulla and Igbal, 1991). The probability risk assessment technique has been adopted by a number of researchers (Solomon *et al.*, 1996; Giesy *et al*., 1999; Cardwell *et al*., 1999; Hall *et al*., 1999, 2000; Wang *et al.*, 2002) to fully utilize available exposure and toxicity data. However, these methods are only applied to quantify the magnitude of health risks of carcinogenic pollutants, but not for quantifying non cancer risks. Current non cancer risk assessment methods do not provide quantitative estimates on the probability of experiencing non cancer effects from contaminant exposures. These are typically based on the hazard quotient (HQ), which is a ratio of determined dose of a pollutant to the dose level (a Reference Dose or R_fD_O). If the ratio is less than 1, there will not be any obvious risk. Conversely, an exposed population of concern will experience health risks if the dose is equal to or greater than the R_fD_O. The method for the determination of THQ was provided in the U.S. EPA Region III risk-based concentration table (US EPA, 2000a). It was further assumed that the ingested dose is equal to the absorbed pollutant dose as stated in the U.S. EPA guidance (US EPA, 1989). Although the HQ-based risk assessment method does not provide a quantitative estimate on the probability of an exposed population experiencing a reverse health effect, it indeed provides an indication of the risk level due to pollutant exposure. This risk estimation method has recently been used by Chien *et al.,* (2002) and proved to be valid and useful. This non cancer risk assessment method was also applied in this study. The U.S. EPA is developing approaches for quantitative estimates of health risks for non carcinogenic effects. Similar techniques used in cancer risks (i.e., dose–response data and linear low dose extrapolation) are being applied for these purposes, but are not yet widely use (US EPA, 2000b). The suburban area of Rewa City, India, are polluted by various heavy metals (Tiwari *et al.,* 2011), but information on the health risks of these metals is quite limited. The main objective of this study is to estimate the health risks of heavy metals, such asFe, Zn, Cu, Pb, Cd, Mn, and Cr, via consumption of vegetables to the general public in Rewa(M.P.), India, near industrial areas using the hazard quotient (HQ) estimates.

II. MATERIALS AND METHODS

General description of the experimental Sites

Rewa is a city in the northern-eastern parts of the state of Madhya Pradesh, India. It is the administrative centre of Rewa District and Rewa Division. The cities lie about 420 km. (261 mi) north east of the state capital Bhopal, Madhya Pradesh and 130 km. (81 mi) south of the city of Allahabad, Uttar Pradesh. It is situated at 24.53^0 North latitude and 81.3^0 East longitudes and covers an area of 6,240 km^2 (2,410 sq mi) (sources: WGS 84 coordinate reference system). It has an elevation of 304 m. (997 ft) above mean sea level. Time zone offset: IST, UTC+5:30 hours. Rewa has a humid subtropical climate with cold, misty winter, a hot summers and a humid monsoon season. The climate of Rewa city sometimes changes to extremes. In summer, the temperature is vary from the lowest of 30^0C (86^0 F) to the maximum of more than 40^0 C (104^0F). Usually first monsoon shower comes in between end of June to early July. The average rainfall is 980 mm (39 inches) per year. The average temperature is around 25^0C (77^0 F) and the humidity is quite high. Experimental sites of different irrigation sources J.P. Cement Plants Bela (WWI-Bela), Naubasta (WWI- Naubasta) (waste water irrigated sites) &, Bhiti (control) village (clean water irrigated site) were selected. Cultivated land of these two industrial areas (Bela & Naubasta) received waste water discharge from industries, manufacturing cement while third site of rural area (Bhiti) received clean (ground) water from deep bore well. Thus all sites of varying irrigation sources were selected and the sampling of water, soils and vegetables of the surrounding areas were carried out to estimate intake of heavy metals by local inhabitants.

Water, soil and vegetables sampling and analyses

Water and soil samples collected randomly from different location. Samples of seven different kinds of vegetables; leafy vegetables included Spinach (SP) (*Betavulgaris L. CV.* All green), and Cabbage (CA) (*Brassica oleracea L. Var. Capatuta*). Inflorescence vegetable included Cauliflower (CF)(*Brassica oleracea L. Var. botrytis*), Fruit vegetables included Lady's Finger (LF) (*Abelmoschus esculentus L.*), Brinjal (BR)(*Solanum melongena L.*), Tomato (TO) (*Lycopersicon esculentum L.*) and Root vegetable included Radish (RA) (*Raphanus sativus L.*) were taken from the same experimental sites where waters and soils samples were taken. Only edible parts of different vegetables were randomly taken from each site. The detailed of the vegetable samples collected from the experimental sites are given in Table 1. All samples were labeled and brought to the laboratory for analysis. Concentrations of Fe, Zn, Cu, Pb, Cd, Mn and Cr in the filtrate of digested soil, water and different kind of vegetables samples were estimated by using an Atomic Absorption Spectrophotometer (AAS, Perkin Elmer analyst 400). The instrument was fitted with specific lamp of particular metal. The instrument was calibrated using manually prepared standard solution of respective heavy metals as well as drift blanks. Standard stock solutions of 1000 ppm for all the metals were obtained from Sisco Research Laboratories Pvt. Ltd., India. These solutions were diluted for desired concentrations to calibrate the instrument. Acetylene gas was used as the fuel and air as the support. An oxidizing flame was used in all cases.

Table 1. **Description of vegetable samples analyzed**

Common Name	Designation	Scientific Name	Edible Parts
Spinach	SP	*Betavulgaris L. CV.*	Leaf
Cabbage	CA	*Brassica oleracea L. Var. Capatuta*	Leaf
Cauliflower	CF	*Brassica oleracea L. Var. botrytis*	Inflorescence
Lady's Finger	LF	*Abelmoschus esculentus L.*	Fruit
Brinjal	BR	*Solanum melongena L.*	Fruit
Tomato	TO	*Lycopersicon esculentum L.*	Fruit
Radish	RA	*Raphanus sativus L.*	Root

Quality Control Analysis

Quality control measures were taken to assess contamination and reliability of data. For this Blank samples (zero metal concentration) were analyzed after seven samples. Concentrations were calculated on a dry weight basis. All analysis was replicated three times. The accuracy and precision of metal analysis were checked against NIST (National institute of standard and Technology)-SRM (Standard Reference Material) 1570 for every heavy metal.

Health risk calculation
Daily Intake Rate (DIR)

For the Daily Intake Rate (DIR), the average metal content in each vegetable was calculated and multiplied by the respective consumption rate. Daily Intake Rate (DIR) was determined by the following equation (Arora *et al.,* 2008; Sajjad *et al.,* 2009):

$$\mathbf{DIR} = \mathbf{C}_{\text{(Metal conc.)}} \times \mathbf{C}_{\text{(Factor)}} \times \mathbf{D}_{\text{(Vegetable intake)}} \tag{1}$$

Where,

C $_{(Metal\ conc.)}$ = Heavy metal concentration in vegetables (mg/kg); C $_{(Factor)}$ = conversion factor (0.085); D $_{(Vegetable\ intake)}$ = Daily Intake of Vegetable (kg person^{-1}day^{-1} FW).

The conversion factor of 0.085 is set to convert fresh vegetable weight to dry weight based on Eqn. (Rattan *et al*., 2005; USDA, 2007).

$$IRdw = IRww \left[\frac{100-W}{100}\right] \tag{2}$$

Where, *IRdw* = dry-weight intake rate; *IRww* = wet-weight intake rate & *W* = percent water content.

Average Daily Dose (ADD: mg kg^{-1} day)

The average daily vegetable intake rate (ADD) was calculated by conducting a survey where 100 people having average body weight of 60 kg were asked for their daily intake of particular vegetable from the experimental area (Wang *et al.,* 2005; Sajjad Khan *et al.,* 2009). Where,

the average daily intake for adults and children were set to 0.345Kg and 0.232 kg person^{-1}day^{-1} (expressed as fresh weight), respectively while the average adult and child body weights were set to 60 and 32.7 kg, respectively in this study ;based on Eqn.(EPA 1989d, 2010e):

$$ADD = \frac{C \times IR \times FI \times EF \times ED}{BW \times AT} \tag{3}$$

Where,

C = Contaminant concentration in vegetable (mg kg-1); IR = Ingestion rate per unit time or event (kg day-1); FI = Fraction ingested from contaminated source (unit less); EF = Exposure frequency (days/year); ED = Exposure duration (70 years; lifetime; by convention) is the length of time that a receptor is exposed via a specific exposure pathway; BW = Body weight; AT =Pathway specific period of exposure for no carcinogenic effects (i.e., ED×365days/year), and 70 year lifetime for carcinogenic effects (i.e., 70 years×365 days/year).Upper tolerable daily intake limit (safe limits) for both adults and children through the consumption of vegetables were presented in Table 2.

Table 2.Upper tolerable daily intake limit for both adults and children

Upper tolerable daily intake (mg day^{-1})	
Heavy Metals	**Integrated Risk Information System (US EPA 2009)**
Fe	45E-00
Zn	40E-00
Cu	10E-00
Pb	2.40E-01
Cd	6.40E-02
Mn	11E-00
Cr	1.05 E-02

Hazardous Quotient (HQ)

Hazardous Quotient (HQ) for the locals (consumers) through the consumption of contaminated vegetables was assessed by the ratio of Daily Intake Rate (DIR) to the oral reference dose (R$_f$D$_o$) for each metal (USEPA 2013). If the value of HQ is less than 1, then the exposed local population (consumers) is said to be safe, if HQ is equal to or higher than 1, is considered as not safe for human health, therefore potential health risk occurred, and related interventions and protective measurements should be taken (US-EPA, 2013). An estimate of risk to human health (HQ) through consumption of vegetables grown in metal contaminated soil was calculated by the following equation:

$$HQ = \frac{DIR}{R_f D_0} \tag{4}$$

Where,

R$_f$D$_o$ is the oral reference dose. R$_f$D$_o$ is an estimate of a daily oral exposure for the human population, which does not cause deleterious effects during a lifetime (US-EPA, 2009). Table 3 showed the values of oral reference doses (R$_f$D$_O$) for some heavy metals by IRIS, 2013; DEFRA, 2005 and FAO/WHO, 2013.

Table 3: Oral reference doses (R_fD_O) mg kg^{-1} day^{-1} for heavy metals

	R_fD_O(mg kg^{-1} day^{-1})	
Heavy Metals	Integrated Risk Information System (US EPA 2013)	FAO/WHO (Codex Alimentarious Commission, 2013)
Fe		7.00 E-01
Zn	-	3.00E-01
Cu	-	4.00E-02
Pb	1.00E-03	4.00E-03
Cd	-	1.00E-03
Mn	-	1.4E-02
Cr	1.5E-00	1.5E-00

Hazardous Index (HI)
To estimate the risk to human health through more than one HM, the hazard index (HI) has been developed (US EPA, 1989). The hazard index is the sum of the hazard quotients for all HMs, which was calculated by the Eqn. (Guerra *et al.*, 2010).

$$HI = \sum HQ = HQ_{Fe} + HQ_{Zn} + HQ_{Cu} + HQ_{Pb} + HQ_{Cd} + HQ_{Mn} + HQ_{Cr} \qquad (5)$$

It assumes that the magnitude of the adverse effect will be proportional to the sum of multiple metal exposures. It also assumes similar working mechanisms that linearly affect the target organ.

Statistical analysis
The recorded data were subjected to two-way analysis of variance (ANOVA) to assess the influence of different variables on the concentrations of heavy metals in the vegetables tested. Statistical significance of means was computed using Pair Samples t-test, with a significance level of $P < 0.001$ (Steel and Torrie, 1980). Statistical analysis of data was done by SPSS 17.

III. RESULTS AND DISCUSSION

Level of heavy metals in water, soil & vegetables
The present study had generated data on heavy metals (Fe, Zn, Cu, Pb, Cd, Mn and Cr) in water, soil and different kind of vegetables (edible parts) from waste water irrigated sites of Rewa, India and associated risk assessment for consumer's exposure to heavy metals. Pb, Cd, Mn and Cr concentration in waste waters; Cd concentration in waste water irrigated soils and Pb, Cd and Cr concentration in all tested vegetables from WWI sites were above the national and international permissible limits. These accumulated heavy metals from Waste Water Irrigated area of Rewa (J.P.Cement Plant of Bela &Naubasta) had affected soil and water for a long time. People living in the contaminated area are at greater risk for health issues than individuals in the reference area. Children are at somewhat higher risk than adults. Heavy metal concentrations were several fold higher in all the collected samples from waste water irrigated sites compared to clean water irrigated ones.

HUMAN HEALTH RISK ASSESSMENT

Estimation of Daily Intake Rate
Daily vegetable consumption was obtained through a formal survey conducted in the urban areas of Rewa to estimate the average consumption of fresh vegetables including Spinach, Cabbage, Lady's Finger, Cauliflower, Brinjal, Tomato and Radish and also may be other vegetables per person per day for both adults and children (Table 4). This Fresh Weight of different kind of vegetables then converted into Dry Weight of vegetables by multiplying with Conversion Factor (0.085). The degree of toxicity of heavy metal to human being depends upon their daily intake (Singh, Sharma, Agrawal and Marshall 2010). DIR as a function of body weight and intake. The DIR estimated for both Bela & Naubasta sites shown in table 4 but did not show for control site because it showed negligible values. In both sites of Bela & Naubasta, the estimated Daily Intakes of heavy metals for both adults and children through the consumption of vegetables in this study was less than tolerable daily intake limit set by the US-EPA, IRIS (2013) (see Table 2 & 4). Radwan and Salama (2006) & Khan *et al.,* (2008) had also observed no risk due to consumption of vegetables grown under waste water irrigated areas. Singh (2010); Sharma (2010); and Zheng *et al.,* 2007 (except for Cd), Khan *et al.,* (2008); and Guerra *et al.,* (2010) also found lower values than tolerable daily intake limits. On the other hand Sridhara Chary *et al.,* (2008) recorded higher DIR values for heavy metals than tolerable daily intake limits. In present study the highest DIR value in vegetables were for Fe (3.48E-02) for children at

Bela site while lowest was for Cd (4.15E-04) for adults at Naubasta site. The highest daily intake of Fe was estimated as 0.034 mg/kg per day which represents approximately 4.97% of R_fD_o value of 0.700 mg/kg per day for 0.232 kg for children. This higher DIR of Fe was lower than 0.329 mg/kg per day, reported by Santos *et al.*, 2004 and 0.248 mg/kg per day, reported by Biego *et al.*, 1998. While the lowest DIR of Cd was estimated to 0.000415 mg/kg per day which represent approximately 41.5% of R_fD_o value of 0.001g/kg per day for a 0.345Kg for adults. However The DIR of Fe and Cd were lower than tolerable daily intake (Table 2). This lower DIR of Cd was lower than that reported in literature, which ranged between 0.008 mg/kg and 0.052 mg/kg per day by Santos *et al.*, (2004) & Tripathi *et al.*, (1997).

Table 4: DIR for individual heavy metals caused by the consumption of vegetables

| | VEGETABLES | INDIVIDUALS DIR (mg person $^{-1}$ day $^{-1}$) | | | | | | | | | | | | |
| | | Fe | | Zn | | Cu | | Pb | | Cd | | Mn | | Cr | |
		Adults	Children	Adults	Children	Adults	Children	Adults	Children	Adults	Children	Adults	Children	Adults	Children
FOR BELA SITE	SP	3.02 E-02	3.48 E-02	1.5 E-02	1.75 E-02	9.71 E-03	1.16 E-02	2.17 E-03	2.50 E-03	5.29 E-04	6.09 E-04	7.91 E-03	9.09 E-03	2.15 E-03	2.47 E-03
	CA	2.70 E-02	3.17 E-02	1.75 E-02	2.01 E-02	9.04 E-03	1.04 E-02	1.94 E-03	2.23 E-03	6.81 E-04	7.83 E-04	6.24 E-03	7.18 E-03	2.10 E-03	2.42 E-03
	CF	2.59 E-02	2.98 E-02	1.32 E-02	1.52 E-02	8.50 E-03	9.78 E-03	1.72 E-03	1.98 E-03	4.93 E-04	5.66 E-04	5.51 E-03	6.33 E-03	1.29 E-03	1.48 E-03
	BR	2.09 E-02	2.41 E-02	1.36 E-02	1.57 E-02	8.48 E-03	9.75 E-03	1.51 E-03	1.74 E-03	4.61 E-04	5.30 E-04	4.31 E-03	4.95 E-03	1.33 E-03	1.53 E-03
	LF	2.41 E-02	2.77 E-02	1.23 E-02	1.41 E-02	8.01 E-03	9.20 E-03	1.58 E-03	1.82 E-03	4.77 E-04	5.48 E-04	4.57 E-03	5.26 E-03	1.91 E-03	2.20 E-03
	TO	2.65 E-02	3.05 E-02	1.38 E-02	1.59 E-02	9.16 E-03	1.05 E-02	1.70 E-03	1.95 E-03	5.19 E-04	5.54 E-04	6.44 E-03	7.41 E-03	2.04 E-03	2.35 E-03
	RA	2.78 E-02	3.20 E-02	1.60 E-02	1.84 E-02	9.67 E-03	1.11 E-02	1.80 E-03	2.08 E-03	5.29 E-04	6.09 E-04	5.70 E-03	6.55 E-03	1.84 E-03	2.10 E-03
FOR NAUBASTA SITE	SP	2.14 E-02	2.47 E-02	1.91 E-02	2.19 E-02	7.54 E-03	8.67 E-03	3.93 E-03	4.52 E-03	3.97 E-04	4.52 E-04	8.30 E-03	9.55 E-03	2.75 E-03	3.16 E-03
	CA	2.02 E-02	2.32 E-02	1.77 E-02	2.03 E-02	6.42 E-03	7.38 E-03	3.57 E-03	4.11 E-03	5.77 E-04	6.63 E-04	8.22 E-03	9.44 E-03	2.47 E-03	2.84 E-03
	CF	1.81 E-02	2.08 E-02	1.78 E-02	2.05 E-02	5.60 E-03	6.44 E-03	2.82 E-03	3.20 E-03	3.82 E-04	4.44 E-04	7.41 E-03	8.52 E-03	2.49 E-03	2.86 E-03
	BR	1.84 E-02	2.12 E-02	1.56 E-02	1.80 E-02	7.32 E-03	8.42 E-03	1.52 E-03	1.74 E-03	4.72 E-04	5.42 E-04	6.70 E-03	7.71 E-03	2.19 E-03	2.52 E-03
	LF	1.91 E-02	2.20 E-02	1.71 E-02	1.97 E-02	7.05 E-03	8.10 E-03	2.13 E-03	2.45 E-03	3.20 E-04	3.67 E-04	5.51 E-03	6.34 E-03	2.27 E-03	2.61 E-03
	TO	1.91 E-02	2.20 E-02	1.85 E-02	2.12 E-02	6.14 E-03	7.06 E-03	1.82 E-03	2.09 E-03	3.77 E-04	4.34 E-04	7.21 E-03	8.29 E-03	2.62 E-03	4.48 E-03
	RA	1.96 E-02	2.25 E-02	1.82 E-02	2.10 E-02	7.13 E-03	8.20 E-03	3.54 E-03	4.07 E-03	3.82 E-04	4.40 E-04	7.94 E-03	9.13 E-03	2.03 E-03	2.39 E-03

Estimation of Hazard Quotient (HQ)

HQ values were calculated on the basis of the oral reference dose. Oral reference doses (R_fD_o) for heavy metals are presented in table 3 (US-EPA, IRIS and FAO/WHO 2013). From the result, in all sites, the HQ values of all heavy metals, in all vegetables were all below the one (1) (except for Pb in Spinach, Cabbage and Radish at Naubasta site) for both adults and children (Table 5). When HQ exceed one (1), there is concern for health effect (Huang *et al.*, 2008). HQ was more than 1 for Pb in Spinach 1.12 E-00 (for adults) and 1.29E-00 (for children); In Cabbage 1.02 E-00 (for adults) and 1.17 E-00 (for children) and In Radish 1.01 E-00 (for adults) and 1.16 E-00 (for children) at Naubasta site (Table 5). Sridhara Chary *et al.*, (2008) also found HQ in Spinach as high as 5.3 E-00. This high HQ for Pb observed in Spinach, Cabbage and Radish had greatest potential to pose health risk to the consumer. The results indicated that those living around the Cement Plant of Naubasta area of Rewa were probably exposed to some potential health risk through the intake of Pb via consuming locally grown Spinach, Cabbage and Radish but for remains vegetables it was found to be nearly free of risk. Even though there was no apparent risk when each metal was analysed individually, the potential risk could be multiplied when considering all heavy metals. Although HQ was higher for Pb in SP, CA and RA neither population suffered from ingestion of vegetables contaminated with heavy metals. Higher HQ for Pb were also

reported by Zheng *et al.,* (2007) in vegetables collected from waste water irrigated area of Huludao Zinc Plant in Huludao city, China; & In vegetables from Pb and Sb smelter in Nanning, China reported by Cui *et al.,* 2004. In the present study, all heavy metals (except for Pb at Naubasta site)were least responsible for causing risk to the local population as the value of HQ was below 1 for all the vegetables from waste water irrigated area of Rewa (M.P.), India.

Table 5: HQ for individual heavy metals caused by the consumption of vegetables

	VEGETABLES	Fe		Zn		Cu		Pb		Cd		Mn		Cr	
		Adults	Children	Adults	Children	Adults	Children	Adults	Children	Adults	Children	Adults	Children	Adults	Children
FOR BELA SITE	SP	0.432 E-01	0.497 E-01	0.507 E-01	0.583 E-01	0.242 E-00	0.279 E-00	0.622 E-00	0.715 E-00	0.529 E-00	0.609 E-00	0.565 E-00	0.649 E-00	0.143 E-02	0.164 E-02
	CA	0.394 E-01	0.452 E-01	0.585 E-01	0.672 E-01	0.226 E-00	0.260 E-00	0.554 E-00	0.637 E-00	0.681 E-00	0.783 E-00	0.446 E-00	0.513 E-00	0.140 E-02	0.161 E-02
	CF	0.370 E-01	0.426 E-01	0.441 E-01	0.507 E-01	0.212 E-00	0.244 E-00	0.493 E-00	0.566 E-00	0.493 E-00	0.566 E-00	0.393 E-00	0.452 E-00	0.860 E-03	0.989 E-03
	BR	0.427 E-01	0.344 E-01	0.456 E-01	0.524 E-01	0.212 E-00	0.243 E-00	0.433 E-00	0.497 E-00	0.416 E-00	0.530 E-00	0.308 E-00	0.354 E-00	0.891 E-03	0.102 E-02
	LF	0.344 E-01	0.396 E-01	0.410 E-01	0.471 E-01	0.200 E-00	0.230 E-00	0.454 E-00	0.522 E-00	0.477 E-00	0.548 E-00	0.327 E-00	0.376 E-00	0.127 E-02	0.146 E-02
	TO	0.379 E-01	0.436 E-01	0.981 E-01	0.531 E-01	0.229 E-00	0.263 E-00	0.487 E-00	0.559 E-00	0.519 E-00	0.554 E-00	0.460 E-00	0.529 E-00	0.136 E-02	0.156 E-02
	RA	0.398 E-01	0.457 E-01	0.536 E-01	0.616 E-01	0.241 E-00	0.278 E-00	0.517 E-00	0.594 E-00	0.529 E-00	0.609 E-00	0.407 E-00	0.468 E-00	0.122 E-02	0.140 E-02
FOR NAUBASTA SITE	SP	0.307 E-01	0.353 E-01	0.637 E-01	0.732 E-01	0.188 E-00	0.216 E-00	1.12 E-00	1.29 E-00	0.393 E-00	0.452 E-00	0.593 E-00	0.682 E-00	0.183 E-02	0.211 E-02
	CA	0.289 E-01	0.332 E-01	0.590 E-01	0.678 E-01	0.160 E-00	0.184 E-00	1.02 E-00	1.17 E-00	0.382 E-00	0.663 E-00	0.587 E-00	0.674 E-00	0.164 E-02	0.189 E-02
	CF	0.258 E-01	0.297 E-01	0.596 E-01	0.685 E-01	0.140 E-00	0.161 E-00	0.807 E-00	0.928 E-00	0.382 E-00	0.440 E-00	0.529 E-00	0.608 E-00	0.166 E-02	0.190 E-02
	BR	0.264 E-01	0.303 E-01	0.522 E-01	0.600 E-01	0.183 E-00	0.210 E-00	0.434 E-00	0.499 E-00	0.472 E-00	0.542 E-00	0.479 E-00	0.550 E-00	0.146 E-02	0.168 E-02
	LF	0.274 E-01	0.315 E-01	0.572 E-01	0.657 E-01	0.176 E-00	0.202 E-00	0.610 E-00	0.701 E-00	0.320 E-00	0.367 E-00	0.394 E-00	0.453 E-00	0.151 E-02	0.174 E-02
	TO	0.273 E-01	0.314 E-01	0.617 E-01	0.709 E-01	0.153 E-00	0.176 E-00	0.521 E-00	0.599 E-00	0.377 E-00	0.434 E-00	0.515 E-00	0.592 E-00	0.174 E-02	0.298 E-02
	RA	0.280 E-01	0.322 E-01	0.609 E-01	0.700 E-01	0.178 E-00	0.205 E-00	1.01 E-00	1.16 E-00	0.382 E-00	0.440 E-00	0.567 E-00	0.652 E-00	0.135 E-02	0.155 E-02

Estimation of Hazard Index (HI)

An Index of Risk called Hazard Index (HI) for residents of ingesting these metals by consuming vegetables grown around waste water irrigated areas were calculated by summation of HQ of all heavy metals for each vegetable (Fig. 1& 2).In present study the highest HI of heavy metals was found in Cabbage (2.80E-00; 20%) for children at WWI-Naubasta site whereas lowest was in Brinjal and Lady's Finger (1.50 E-00; 12%) for adults at WWI-Bela site whereas negligible (<0.00 E-00) values were found for CWI site. Although HI was higher in Cabbage for children, neither population suffered from ingestion of Cabbage contaminated with heavy metals. HI values of Heavy metals for all vegetables were between 1 to 5 (one to five) by US-EPA, IRIS, indicated that there was no risk from the intake of these vegetables. Huang *et al.,* (2008) and Wang *et al.,* (2005) were also recorded minimum contribution of heavy metals to aggregated risk via consumption of vegetables in Kunshan and Tianjin,China.
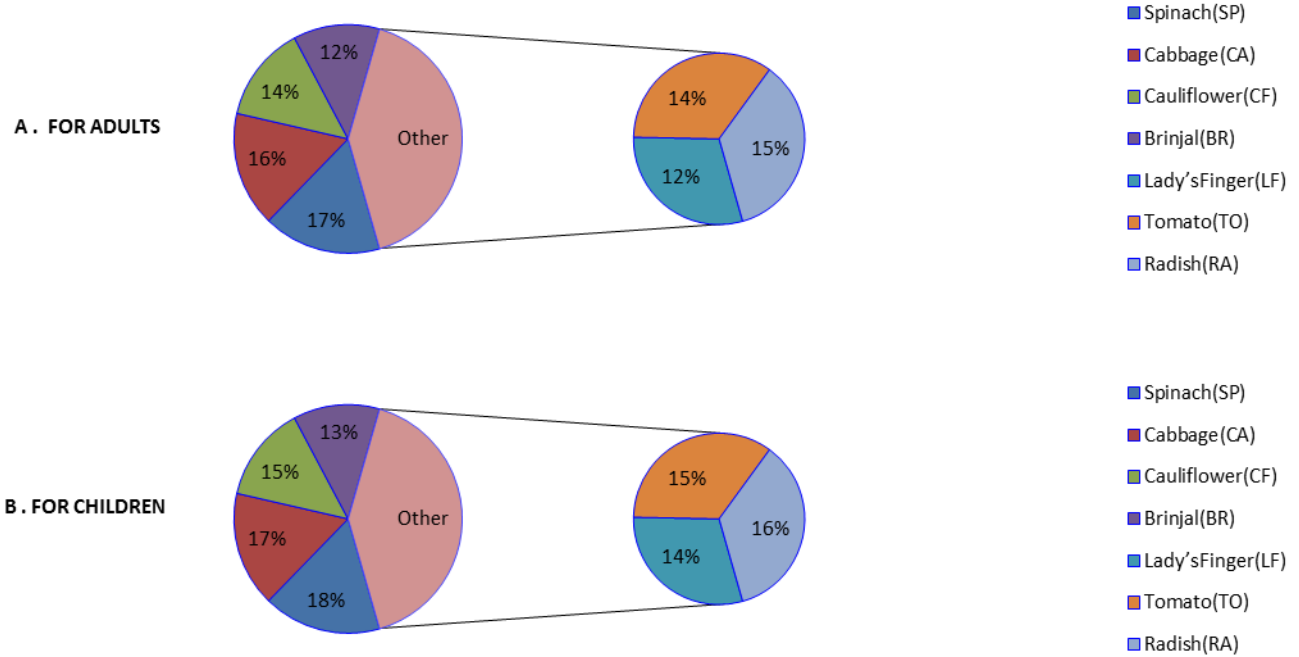
Fig.1: Hazard Index (HI) for individuals through consumption of different vegetables collected from Bela
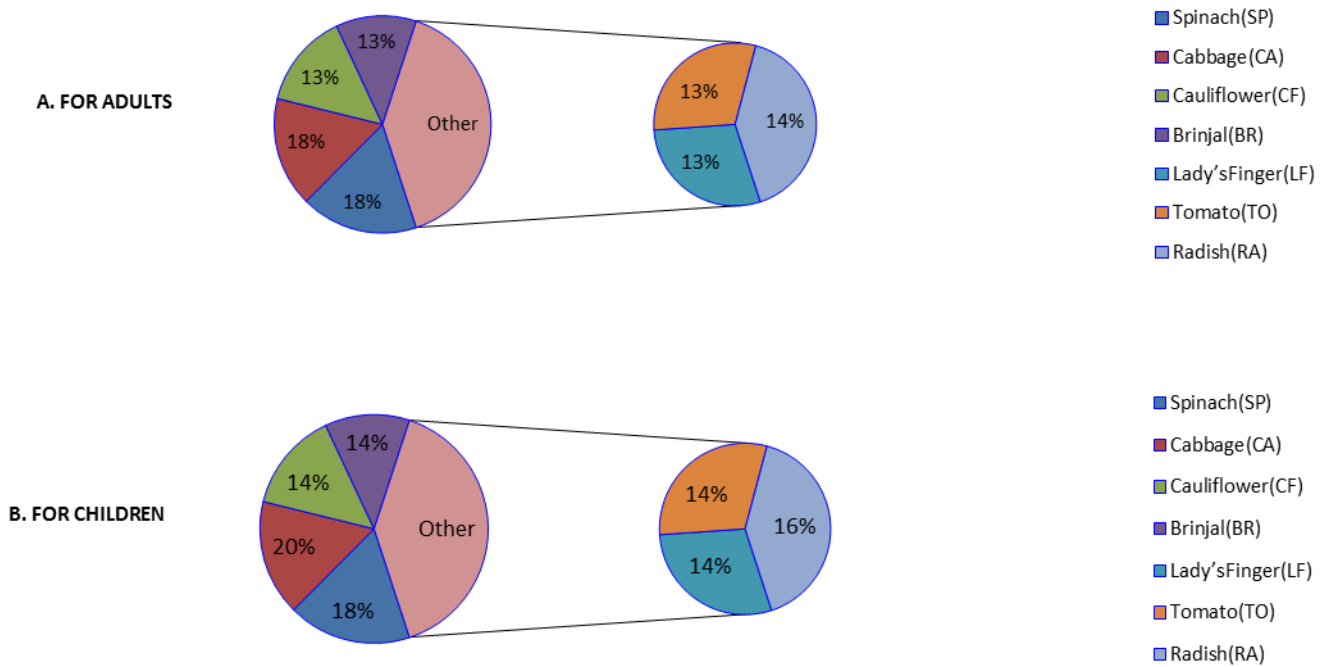
Fig.2: Hazard Index (HI) for individuals through consumption of different vegetables collected from Naubasta

IV.   CONCLUSION

The present study was carried out around sub urban area of Rewa city, a small sized city of india, where irrigation of vegetables with waste water was a very common practice. Knowledge on the contamination of vegetables with heavy metals from waste water irrigation (WWI) sites of Rewa is not yet established. The present study had generated data on heavy metals in water, soil and different kind of vegetables (edible parts) from waste water irrigated sites of Rewa, India and associated risk assessment for consumer's exposure to heavy metals. The finding of this study regarding DIR, HQ and HI showed that the consumption of vegetables grown in waste water irrigated soils was nearly free of risks (except for Pb in Spinach, Cabbage and Radish at Naubasta site). Consumption of these vegetables with elevated levels of heavy metals may lead to high level of body accumulation causing related health disorders. But the situation could however change in the future depending on the dietary pattern of the community and the volume of contaminants added to the ecosystems. Thus regular monitoring of heavy metal contamination in the vegetables grown at waste water irrigated area is necessary and consumption of contaminated vegetables should be avoided in order to reduce the health risk caused by taking the contaminated vegetables. The waste water treatment technology should involve steps to remove heavy metals causing risk to human health.

Recommendations

- Taking the health risks in diet as a result of high level of heavy metals in vegetables, the maximum allowable levels of these metals in vegetables should not exceed levels that reflect good agriculture practices. Farmers should be educated on the problems associated with excessive usage of fertilizers and other chemicals, as well as irrigating the vegetables with waste water and the need to grow vegetables with safe levels of heavy metals. The data generated must be used as baseline wastewater quality framework to serve as a basis for monitoring irrigation water quality in urban areas of Rewa to ensure safety.

- The high HQ of Pb suggested that the consumption of Spinach grown in waste water irrigated site of Naubasta is not free of risks. Responsible agencies should carry out public health education within the consumption area to sensitive the general public on the potential effects of indiscriminate disposal of waste and the potential health hazards associated with the consumption of vegetables cultivated with wastewater. Measures must be taken to reduce heavy metal pollution and nutrient loading of irrigation water and soils to protect the safety of both farmers and consumers.

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Implementation of Three Level Inverter with Single Z-Source Network in MATLAB

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   Abstract- The Z-Source concept has many advantages and can be applied for any type of power conversion. Both boosting and modulation index can be controlled in inverter operation itself, by inserting proper shoot through states. This paper presents procedure for implementing, space vector modulated REC Z-source inverter in MATLAB SIMULINK by inserting shoot through states. It also explains a clear procedure of selection of shoot through states at required time and presents an overall tabular column of the sequence of switching states for three level space vector modulation. The proposed techniques are demonstrated in MATLAB and have achieved good performance results.

 Index Terms- MATLAB SIMULINK, REC Z-Source inverter, Space vector modulation (SVM)

I. INTRODUCTION

Multi-level inverters have many advantages which include synthesizing voltage waveforms with low harmonic content. Three common topologies in multilevel inverter are Cascaded inverter, the diode clamped, capacitor clamped inverter. Diode clamped inverter is also known as neutral point clamped (NPC) inverter. This type of inverter will not have possibility to get output voltage greater than supply dc source, there is a need to boost the output voltage for high voltage applications this increases complexity. Z-Source concept has good flexibility and can be applied for all types of power conversions like ac-to-dc, dc-to-ac, dc-to-dc, ac-to-ac Power conversions .When z-source concept is applied to neutral point clamped inverter the circuit become bulky, complex and require two z-sources. Moreover it is expensive and requires complex modulator. For low complexity NPC inverter is designed with single z source network and is called as reduced element count (REC) Z-Source NPC inverter. It has many applications in grid connected distributed generation.

II. OPERATION OF REC Z-SOURCE NPC INVERTER

The operation of the single z source NPC inverter is represented by P, O, N states. P denotes upper two switches are ON in a phase leg. N denotes lower two switches are ON in a phase leg. And O denotes middle two switches are ON. These are the active states .Along with these states zero states are also present .These zero states are called as shoot through states they are

    1. UST (upper shoot through)
    2. LST (lower shoot through)
    3. FST (full shoot through)

FST state occurs when all four switches are ON in a phase leg. UST state occurs when all upper three switches in a leg are ON. LST occur when all lower three switches are ON. These states will do the short circuit in such a way that the inductor gets charged, and the voltage is added to the supply voltage in this way the boosting is achieved. The amount of boosting depends upon the time for which shoot through states are implemented in the inverter operation.
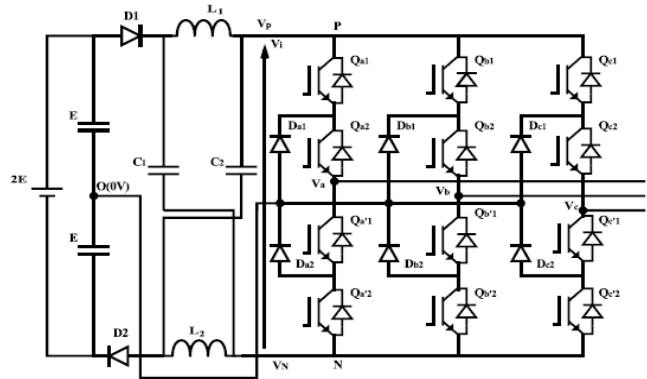
Fig1: REC Z-source NPC inverter

State type	ON switches	ON Diodes	Vo	Switching states
NST	Qx1,Qx2	D1,D2	+Vi/2	P
NST	Qx2,Qx1	D1,D2,{Dx1 or Dx2}	0	O
NST	Qx'1,Qx'2	D1,D2	-Vi/2	N
FST	Qx1,Qx2,Qx'1,Qx'2	------	0	FST
UST	Qx1,Qx2,Qx'1	Dx2,D1	0	UST
LST	Qx2,Qx'1,Qx'2	Dx2,D2	0	LST

Table 1: Behavior of Switches for different shoot through states

A.Insertion of Shoot through States

In traditional three levels NPC inverter only switching transitions are made from P state to O state, N state to O state, O state to N state, and O state to P state. But P state to N state, N state to P

state are to be avoided because of more switching Transitions occurring and consequently losses.
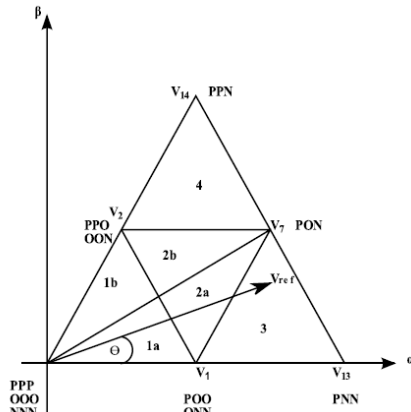
Fig2: space vector diagram for sector-1

From the fig.2 it can be observed that the reference vector rotates in all the sectors In the modified space vector modulation technique main aim is to control both boosting, modulation in the inverter operation itself by inserting shoot through states in between active states .The insertion of shoot through states for triangle3, triangle4 f or sector1 are explained and other states are tabulated in Table 7

UST states	LST States
UNN	PLO
UON	POL
OUN	PPL
NUN	LPO
NUO	OPL
NOU	LPP
NNU	LOP
UNO	OLP
ONU	PLP

Table 2: Possible shoot through states

B. Switching Sequence and Insertion of Shoot-Through States

To insert shoot through its important to know when and where UST, LST are implemented. Upper shoot through state is implemented in between P state to O state or O state to P state. If LST is implemented, more switching losses occur by more transitions. Likewise lower shoot through state is inserted in between O to N transition or N to O transition.

In triangle 3 The first state is ONN (V_1), and the next state is PNN (V_{13}) but the boosting can be done in between zero state and P state in first leg by inserting UST. After PON (V_7) the POO (V_1) state should be implemented, but the boosting can be done in third leg by inserting LST shoot through state in third leg. Next the same states are operated reverse and finally end in ONN state it is clearly shown in Table 3

ONN	PNN	PON	POO		PON	PNN	ONN	
ONN	UNN	PNN	PON	POL	POO	POL	PON	PNN	UNN	ONN

Table 3: Modified switching sequence for triangle 3

In triangle 4 The first state is OON (V_2), and the next state is PON (V_7), but the boosting can be done in first leg by inserting UST. Then again after PPN the next state is PPO, there is a chance to boost in third leg by inserting LST .After implementing PPO the same states must be operated in reverse manner it is clearly shown in Table4.

OON	PON	PPN	PPO		PPN	PON	OON	
OON	UON	PON	PPN	PPL	PPO	PPL	PPN	PON	UNN	ONN

Table 4: Modified switching Sequence for triangle4

III.MATLAB SIMULATION PROCEDURE

A. Determining the sector:

Angle is calculated by converting Three phase voltages to Two phase voltages (magnitude and angle)and then the sector in which the command vector V* is located, is determined as shown in the Table5;

ANGLE	0 to 60	60 to 120	120 to 180	-180 to 120	-120 to 60	-60 to 0
SECTOR	1	2	3	4	5	6

Table5: Sector determination

B. Determining the region in the sector:

As shown in Fig 3 by calculating m_1 and m_2 vectors from the below given equations, the resultant m_n vector can be found.

$$a = m_2 = \frac{b}{\sin(\frac{\pi}{3})} = \frac{2}{\sqrt{3}}b = \frac{2}{\sqrt{3}}m_n.\sin\alpha$$

$$m_1 = m_n.\cos\alpha - \left[\frac{2}{\sqrt{3}}.m_n.\sin\alpha\right]\cos(\pi/3)$$

$$m_1 = m_n\left(\cos\alpha - \frac{\sin\alpha}{\sqrt{3}}\right)$$

If m1,

m2 and (m1+m2) < 0.5, then V* is in Region 1,
If m1 > 0.5, then V* is in Region 2,
If m2 > 0.5, then V* is in Region 3,
If m1 and m2< 0.5 and (m1+m2) > 0.5, then V* is in Region 4
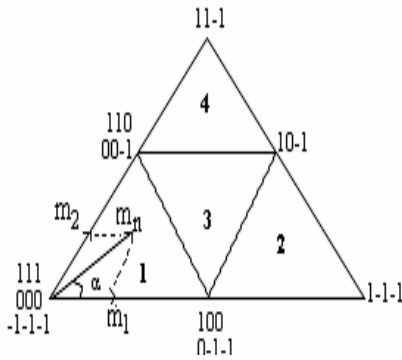
Fig 3: m_n vector in sector1

C. Calculating the switching times, Ta, Tb, and Tc:

Ta, Tb, and Tc switching times for Sector 1 is given in Table6

The duration time for the vectors will give information about the duty cycle for each switch in every sub region of the sectors. The switching states in every sub region are operated in clock wise and anti-clock wise directions

	Region I	Region II
T_a	$1.1*m*T_s*\sin((\pi/3)-\alpha)$	$T_s(1-1.1*m*\sin(\alpha+\pi/3))$
T_b	$T_s/2(1-(2*1.1*\sin(\alpha+\pi/3)))$	$1.1*T_s*m*\sin\alpha$
T_c	$1.1*T_s*\sin\alpha$	$T_s/2((2*1.1*m*\sin(\pi/3-\alpha))-1)$
	Region III	**Region IV**
T_a	$T_s/2(1-2*1.1*m*\sin\alpha)$	$T_s/2(2*1.1*m*\sin(\alpha)-1)$
T_b	$T_s/2(2*1.1*m*\sin(\pi/3+\alpha)-1)$	$1.1*m*T_s*\sin((\pi/3)-\alpha)$
T_c	$T_s/2(1+2*1.1*m*\sin(\alpha-\pi/3))$	$T_s(1-(1.1*m*\sin(\alpha+\pi/3)))$

Table 6: Switching times for each sub region

This is to achieve minimum switching transitions, low power loss and smooth controlling. After getting the timings based on the boosting factor required, insert shoot through states between the voltage vectors and divide timings among them.

D. Finding the switching states:

By considering the switching transition of only one device at any time; the switching orders with shoot through states are tabulated for all sectors

Region 2(A)

SECTOR1	ONN	**UNN**	OON	PON	**POL**	POO	**POL**	PON	OON	**UNN**	ONN
SECTOR2	PPO	**PPL**	OPO	OPN	**OUN**	OON	**OUN**	OPN	OPO	**PPL**	PPO
SECTOR3	NON	**NUN**	NOO	NPO	**LPO**	OPO	**LPO**	NOP	NOO	**NUN**	NON
SECTOR4	OPP	**LPP**	OOP	NOP	**NOU**	NOO	**NOU**	NOP	OOP	**LPP**	OPP
SECTOR5	NNO	**NNU**	ONO	ONP	**OLP**	OOP	**OLP**	ONP	ONO	**NNU**	NNO
SECTOR6	POP	**PLP**	POU	PNO	**UNO**	ONO	**UNO**	PNO	POO	**PLP**	POP

Region 2(B)

SECTOR1	PPO	**PPL**	POO	PON	**UON**	OON	**UON**	PON	POO	**PPL**	PPO
SECTOR2	NON	**NUN**	OON	OPN	**OPL**	OPO	**OPL**	OPN	OON	**NUN**	NON
SECTOR3	OPP	**LPP**	OPO	NPO	**NUO**	NOO	**NUO**	NPO	OPO	**LPT**	OPP
SECTOR4	NNO	**NNU**	NOO	NOP	**LOP**	OOP	**LOP**	NOP	NOO	**NNU**	NNO
SECTOR5	POP	**PLP**	OOP	ONP	**ONU**	ONO	**ONU**	ONP	OOP	**PLP**	POP
SECTOR6	ONN	**UNN**	ONO	PNO	**PLO**	POO	**PLO**	PNO	ONO	**UNN**	ONN

Region 3

SECTOR1	ONN	**UNN**	PNN	PON	**POL**	POO	**POL**	PON	PNN	**UNN**	ONN
SECTOR2	PPO	**PPL**	PPN	OPN	**OUN**	OON	**OUN**	OPN	PPN	**PPL**	PPO
SECTOR3	NON	**NUN**	NPN	NPO	**LPO**	OPO	**LPO**	NPO	NPN	**NUN**	NON
SECTOR4	OPP	**LPP**	NPP	NOP	**NOU**	OPO	**NOU**	NOP	NPP	**LPP**	OPP

| SECTOR5 | NNP | **NNU** | NNP | ONP | **OLP** | OOP | **OLP** | ONP | NNP | **NNU** | NNO |
| SECTOR6 | POP | **PLP** | PNP | PNO | **UNO** | ONO | **UNO** | PON | PNP | **PLP** | POP |

<center>**Region 4**</center>

SECTOR1	OON	**UON**	PON	PPN	**PPL**	PPO	**PPL**	PPN	PON	**UON**	OON
SECTOR2	OPO	**OPL**	OPN	NPN	**OUN**	NON	**OUN**	NPN	OPN	**OPL**	OPO
SECTOR3	NOO	**NUO**	NPO	NPP	**LPP**	OPP	**LPP**	NPP	NPO	**NUO**	NOO
SECTOR4	OOP	**LOP**	NOP	NNP	**NNU**	NNO	**NNU**	NNP	NOP	**LOP**	OOP
SECTOR5	ONO	**ONU**	ONP	PNP	**PLP**	POP	**PLP**	PNP	ONP	**ONU**	ONO
SECTOR6	ONO	**ONU**	ONP	PNP	**PLP**	POP	**PLP**	PNP	ONP	**ONU**	ONO

<center>Table 7: Sequence of switching states in all the sectors</center>

IV. MATLAB RESULTS

Simulation block diagram for REC Z-source inverter
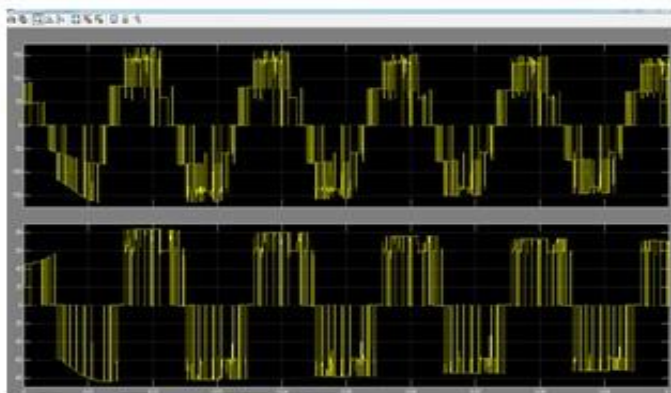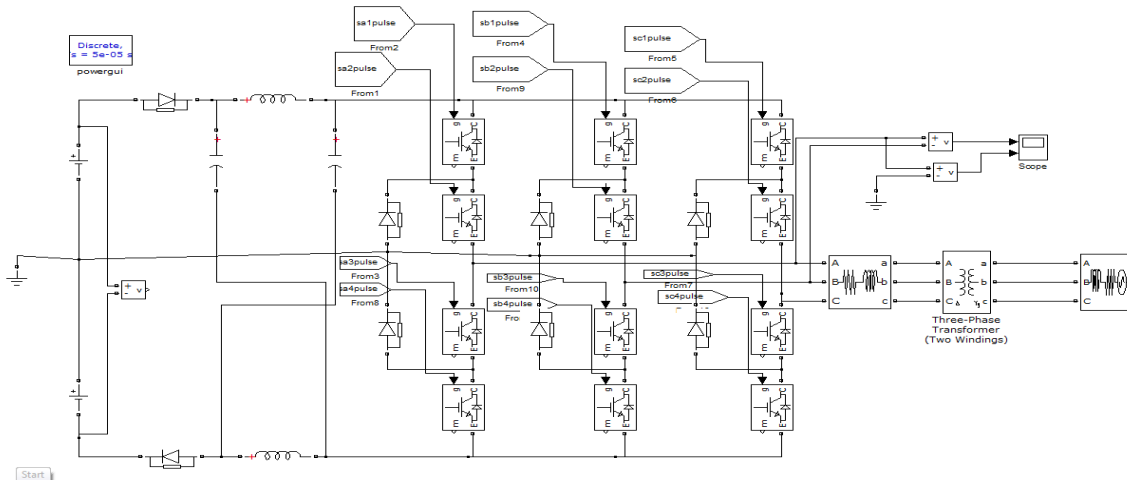
<center>Fig4: Output voltages (L-L)</center>
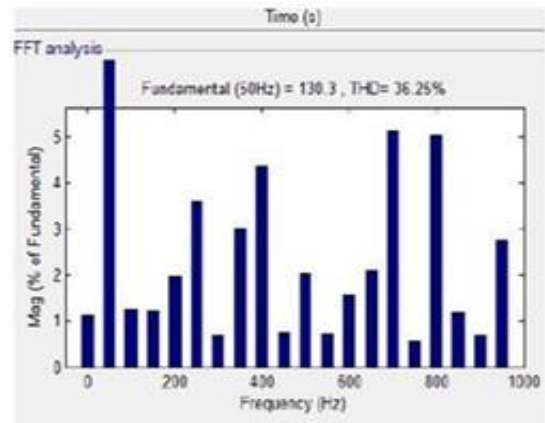
<center>Fig5: FFT analysis</center>

As per the mat lab simulation done on REC Z-Source inverter, good performance results are obtained .The output voltages are .

not affected by low frequency harmonics and a Total Harmonic Distortion of 36.25% is observed from Fig5

V .CONCLUSION

In this paper, a Matlab Procedure for modified SVM for an REC Z-source NPC inverter is presented. Using carefully inserting UST and LST states to the traditional NPC inverter switching sequence, the REC Z-Source NPC inverter functions with the correct volt–second average and voltage boosting capability regardless of the angular position of the reference vector. The insertion of the shoot through states was such that the number of device commutations was kept at a minimum of six per sampling period, similar to that needed by a traditional NPC inverter. The presented concepts have been verified in simulations.

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Real Time Position Tracking System Using Google Maps API V3

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Abstract - *Vehicle Sensor Networks (VSN) are emerging as a new tool for effectively monitoring the physical world, especially in urban areas where a high concentration of vehicles equipped with on board sensors is expected. A vehicle tracking system combines the installation of an electronic device in a vehicle, or fleet of vehicles, with purpose-designed computer software at least at one operational base to enable the owner or a third party to track the vehicle's location, collecting data in the process from the field and deliver it to the base of operation.*

Index Terms - Tracking system, Google Maps, ARM Controller, GPS, GPRS

I. INTRODUCTION

Several types of vehicle tracking devices exist. Typically they are classified as "passive" and "active". "Passive" devices store GPS location, speed, heading and sometimes a trigger event such as key on/off, door open/closed. Once a vehicle returns to a predetermined point, the device is removed and the data is downloaded on a computer for evaluation. Passive systems include auto download type that transfer data via wireless download. "Active" devices also collect the same information but usually transmit the data in real-time via cellular or satellite network to a computer or data-center for evaluation.

II. EXISTING SYSTEMS AND ITS LIMITATIONS

Modern vehicle tracking systems commonly use GPS or GLONASS technology for locating vehicle. However, these systems that are developed and designed by the vehicle developer are not available to the general public. Also, these systems are designed using a proprietary software and hardware. Due to the high cost of these systems, urban transit agencies cannot afford the systems. To overcome such problems we have proposed a system designed using open source software and hardware, keeping the cost of the system to a bare minimum.

III. PROPOSED SYSTEM

To tackle the above issues, we propose to build a mobile real time GPS tracker with integrated Google Maps API V3. In the proposed system, the GPS chip outputs the positioning information which is transferred over a GPRS link to the mobile operator's GGSN (Gateway GPRS Support Node) and then to a remote server over a TCP connection. The TCP server stores the incoming positional data. When a user click on the tracking page, the page serves up an HTML page with an embedded JavaScript code. The JavaScript would run in the user's browser and has instructions to retrieve the positional information from an XML file. It then integrates this information into Google Maps through Google Maps API V3 which displays the position on a map. Since the positional Information is retrieved every second and the maps are updated at the same frequency, a real time GPS tracking effect is achieved. The general concept is described in figure below.
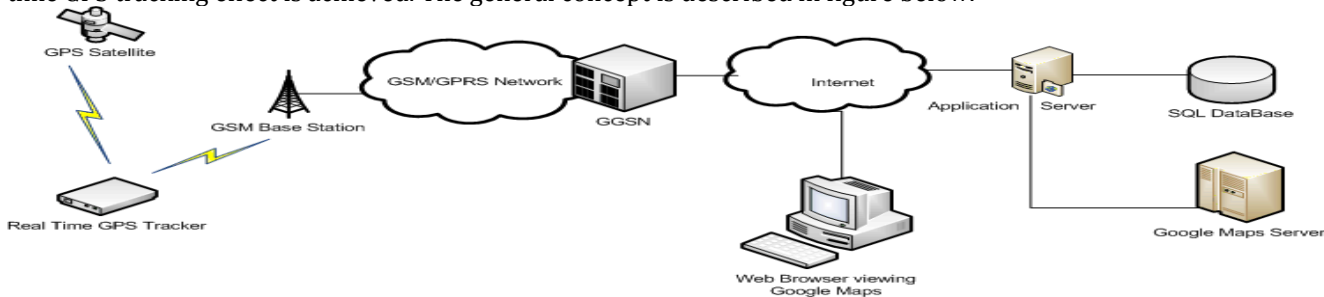
This system represents a significantly novel deployment scenario, considerably different from more traditional tracking systems.

IV. COMMUNICATION SERVICES USED

A detailed review of literature on Mobile GPS tracking systems and applications is explained below.

A. Global Positioning System, GPS:

Global Positioning System (GPS) is becoming widely used for tracking and monitoring vehicles. May systems have been created to provide such services, which make them popular and needed more than ever before.

B. General Packet Radio Service, GPRS:

With the development of the modern traffics, it becomes more important to locate the vehicle running on highway. The system we have proposed is based on GSM network. The center and client can communicate with each other based on short message service and general packet radio service. The client is designed in 8-bit microprocessor to send global positioning system (GPS) information by SMS or GPRS.

C. Global System for Mobile Communication, GSM:

Our proposed system uses an existing GSM cellular network. A software based system is proposed that sends specialized requests to the GSM cellular networks to call any particular vehicle ID. The vehicle ID is actually a particular SIM kept in a special kit inside the vehicle that is capable of receiving a phone call automatically. As soon as the call is established, the particular cell information is available to the BSC, which is then passed to the software. Based on the information collected, the software will initiate forced handover of the call to another suitable cell and then receive the information of that cell too. Upon completion of two consecutive forced handovers, i.e., receiving cell information of the vehicle ID from three different cells and sending them to the software, it will automatically disconnect the call. The software will analyze the cell info and extract three timing advances data along with the GPS location of the individual cells. An algorithm has been developed for this system, which then calculates the exact location of the vehicle.

D. Google Maps API:

The Google Maps is a web mapping service application and technology provided by Google, that powers many map-based services, including the Google Maps website, Google Ride Finder, Google Transit, and maps embedded on third-party websites via the Google Maps API. The Google Maps JavaScript API lets you embed Google Maps in your own web pages. By using the Google Maps API, it is possible to embed Google Maps site into an external website, on to which site specific data can be overlaid. Version 3 of this API is specially designed to be faster and more applicable to mobile devices, as well as traditional desktop browser applications.

V. BLOCK DIAGRAM AND WORKING

A detailed review of the Block Diagram and Working of the proposed system is described below.

1. Block Diagram:
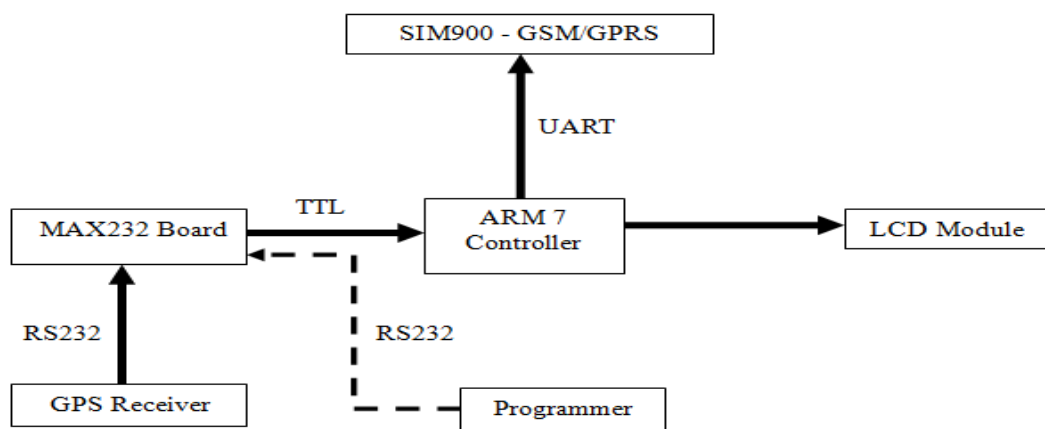
2. Working:

Figure above gives the block diagram of the system. ARM7TDMI controller is the main controller of the system.

- Controller is programmed to initialize ports used by buzzer and LCD panel.
- LCD panel displays relevant information.
- Controller initializes SIM900 module by printing AT commands at UART.
- Controller reads data given by GPS receiver from its serial pin, this is raw data and needs processing before it can be understood.
- The GPS data is calibrated by controller to provide NS EW longitude and latitude.

- This data along with xml format code is passed on to sim900 which pushes data to remote-server using GPRS via GGSN interface.
- RS232 is the standard format of data sent by GPS; this data is not compatible with controller, and hence the voltage levels need to be converted. MAX232 chip is utilized for this.
- The controller can also be re-programmed by serial-port programming.

VI. HARDWARE MODULES

1. Microcontroller

   The microcontroller will be from ARM7TDMI family and it will monitor all the operations.AMR7TDMI allows 16 bit thumb mode instructions with enhanced debug and on chip multiplier with low power consumption and low cost making it most appropriate for this system.

2. GSM/GPS Module

   In our system we propose SIM900 module. It is a quad-band GSM/GPRS engine that works on frequencies GSM 850MHz, EGSM 900MHz, DCS 1800MHz and PCS 1900MHZ.It is designed with power saving techniques that the current consumption is as low as 4.5mA in SLEEP mode. Its physical interface to the mobile application is a 68-pin SMT pad, which provides all hardware interfaces between the module and the customer's boards.

3. GPS Module

   The GPS module Proposed is EM-406A. It is a compact, high performance, low power consumption GPS engine board. It is based on the SiRF star III. The SiRF Star III LP Single GPS chipset enables the receiver to track up to 20 satellites at a time, and can perform extremely fast TTFF (Time to First Fix) in weak signal environments.

4. MAX232

   MAX232 converts signals from signal from RS-232 serial port to signals suitable for use in TTL compatible digital logic circuits and vice-versa. In the proposed we use it convert TTL commands of micro-controller to RS232 protocol used by the GPS module and used for communication between computer and micro-controller while programming.

5. Voltage Stabilizer

   Logic circuits require 5V stable Vcc and anything above that may burn the chip and circuit inside it. Hence, IC 7805 is required to provide stable voltage to logic circuits. 7805 does not require additional components to provide a constant, regulated source of power, making them easy to use, as well as economical. They have a built-in protection against a circuit drawing too much power and additional protection against overheating and shot-circuits, making them quite robust in most applications.

VII. FEATURES

The most prominent of the proposed system are:

1. Open Source

   All the hardware components are open source and all the programming languages required are also open source. This means the system can be modified further as per requirements.

2. Low Cost

   The hardware used in the system is cheaply available and the programming languages and softwares used are free to use, thus making the system cost efficient.

3. Availability

   The hardware components, software and programming languages used are easily available and are easy to understand making the system understandable to beginners.

VIII. SOFTWARE AND PROGRAMMING LANGUAGES USED

Software used:
1. Keil for Embedded C Programming.

2. Hyper Terminal to check communication between micro-controller and computer while programming.

Programming languages used are:
1. Embedded C
2. Python Script
3. PHP Script
4. JavaScript
5. XML
6. Google Maps API

IX. APPLICATION AND FUTURE SCOPE

The above proposed system can have a large number of application and a huge future scope. Some of the applications are:
1. Sensors can be interfaced with the micro-controller to monitor amount of CO_2, humidity in a particular area, and temperature, etc.
2. Can be used for stolen vehicle recovery.
3. Can be used for fleet management.
4. Can be used in field service management.
5. Can be used for Logistic tracking.

Mentioned above are few of the many applications of the system.

X. COCNLUSION

GPS tracking of vehicles is not very new, but the system highlights the improvements in end user experience. End user experience is of prime importance, and display of GPS coordinates of a vehicle on a dedicated website enhances it. It allows a fair access to all users. Not only that, the system can be scaled further to display more information about the vehicle by adding various sensors. Addition of sensors doesn't require change of any hardware components, and effect on power requirement is negligible. This system can be provided as a premium service to consumer, which will help it, make sustainable. Alternatively releasing its code open-source under GNU-GPL V3 will allow developers to build further on this project by predicting highly localized observational parameters like environmental pollution, local weather and humidity point, etc. Finally this system provides a low cost solution to localized data acquisition which is highly scalable.

ACKNOWLEDGEMENT

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Analysis of Aquifer System and Impact of Snowmelt Water on Groundwater Quality of Shallow and Deeper Aquifers: A Comparative Study in Upper Ganga Basin for Stretch between Muzaffarnagar to Rishikesh

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Abstract- Ganga river originating from Gangotri in Himalayas has got very strategic location from water resource point of view. It receives water in three different seasons first from July to October called monsoon season, second from April to June called snow-melt season and third occurs occasionally in January, February, March where the scanty rainfall occurs due to western disturbances. It is occupied by number of watersheds which are generally active in monsoon season.

This study analyses hierarchy of micro-watersheds which are developed as microwatershed-1 from glacial melt to Gangtori, microwatershed 2 from Gangotri to Rishikesh and micro watershed-3 from Rishikesh to Muzaffarnagar with their correlation to shallow and deeper aquifers with their physical characteristics like pH, TDS, EC etc. Since the glacial melt has got lower pH, electrical conductivity, TDS and temperature and also global warming further reduces these values which has been reflected from the various groundwater structures such as handpumps, shallow and deep tubewells from the microwatershed-3 surveyed during the course of study Groundwater in the study area was found to be varying from alkaline to acidic due to inter-mixing of glacial melt water. The groundwater characteristics of acidic and alkaline found to be varying and mostly occupied by shallow and deeper aquifers, whereas the shallow aquifers are acidic at places and deeper aquifers are alkaline in nature.

I. INTRODUCTION

India is divided into three physiographic units these are extra Peninsular India i.e Himalayan region, Indo-gangetic plains and Peninsular India i.e. central and Southern parts. There are direct impacts of precipitation on activities of extra-peninsular India to the rivers in Indus and Ganges system. The Upper Ganga basin is one of the larger part of the extra peninsular India. The study area was selected in parts of Upper Ganga basin in a closed loop manner in sub-basin of upper Ganga region starting from Muzaffarnagar, Deoband, Roorkee, Haridwar and Rishikesh with its peak topography as Dehradoon, and from Dehradoon to Saharanpur, Shyamli to Muzaffarnagar via Bopa Road.

The Upper Ganga basin is occupied by a number of watersheds which are generally active in the monsoon season however major watersheds feed Ganag river and micro-watersheds feed groundwater.

The study area is a mixture of geomorphological and hydro-geo-morphological units such as plain topography covering hills and valleys from upland plain to plain land and low-land areas. Slight variations in soil type were found in the study area. The area in general has non-reactive lithological conditions owing to sandy formation where geo-chemistry is very much conducive to maintain water quality without any chemical reaction and as such no salinity on percolated water felt by geology of area.

The study area was chosen in such a way so as to form a close loop of watershed with varying morphometric condition in order to develop the mini-microshed of glacial melt water for analyzing the aquifer system and studying the impact of snowmelt water on groundwater quality of shallow and deep aquifers for a stretch between Muzaffarnagar to Rishikesh.

Since the lithological conditions are non-reactive in nature therefore it may be analyzed that the recharging through the glacial melt water is the only source on the change of groundwater quality. In order to verify this we have taken a long stretch of the investigation which is about 80 km in non-glacial melt water areas. In which we found that the groundwater is alkaline in nature which is found to be natural. In this way precisely we can say that the global warming has got its impact on shallow aquifers only due to recharging by snow-melt water as a result the shallow aquifers are acidic in nature at places and form unnatural character of groundwater, however deeper aquifers are unaffected and contain the natural groundwater with alkaline character.

It was found that there are drastic changes in the hydro-geochemical environment and the quality of groundwater varying from alkaline to acidic environment due to inter-mixing of glacial melt water which may further be acidified due to gradual increase in global warming. In this respect relationship have been developed among the key factors of hydro geochemical fecies and the impact assessment of groundwater quality in the lower part of Upper Ganga basin from Rishikesh to Muzaffarnagar.

II. OBJECTIVE & SCOPE

In order to make a comparison between shallow and deep aquifers taking four parameters i.e pH, TDS, EC and temperature into consideration qualitative mapping of area was done based on:

- Analysis of groundwater pH in study area

- Analysis of groundwater TDS in study area
- Analysis of Electrical Conductivity in study area
- Analysis of groundwater and atmospheric temperature in study area

Based on the comparison of above stated parameters in shallow and deep aquifers the impact of snow-melt water was ascertained with conformity to global warming.

III.   DESCRIPTION OF SITE

The focus of present study is in parts of Upper Ganga Basin which receives water in three different seasons:

- January to March where scanty rainfall occurs due to western disturbances
- April to June called snow-melt season
- July to October called monsoon season

It is occupied by a number of watersheds which are generally active in monsoon. This upper Ganga basin in Gangotri glacier area can further be divided into three micro-watersheds:

- Micro-watershed 1 in upper regions of Gangotri
- Micro-watershed 2 from Gangotri to Rishikesh
- Micro-watershed 3 from Rishikesh to Muzaffarnagar.

Micro-watershed 3 from Rishikesh to Muzaffarnagar is taken as study area. The selected area has got three components which are very strategic from the hydro-geological point of view because there is a probability of change in hydro-geochemistry due to the leaching activity of rocks and also due to the melting of glaciers and recharging of groundwater.

The hydro-geochemistry has already been saturated because of the age of the rocks and groundwater quality there is only probability to change in physical parameters of shallow and deep aquifers due to enormous melting of glacial water in case of global warming. hence the following three components will have justification for comparison of shallow and deep aquifers especially from global warming point of view

- presence of acidic water in microshed and mini micro shed due to glacial melt water
    - The presence of inactive lithological units (i.e. granite, schist and gniess)
    - The alkaline formation of groundwater in downstream direction (i.e clay, silt and sandy formation)

A total of 51 locations were identified in the study area based on the survey conducted corresponding to their geography, hydro-meteorology and hydro-geology in a **closed loop manner,** starting from Modinagar with a common distance of 10 kms sampling was done. The distance was reduced to 5 km where there was a change in lithology. From location 1 to 17 sampling distance was 10 kms, location 18 to 24 the distance was 5 kms, location 25 to 27 distance was 10 kms, location 28 to 33 the distance was 5 kms and from location 34 to 51 it was again 10 kms.

IV.   METHODS AND MATERIALS

The methodology adopted for accomplishing the above study comprised of identifying the sampling stations in the study area and collecting data pertaining to parameters of interest in such a way that data for four seasons of year is available. The depth of identified structures varied from 6-100 m. The hydraulic structures upto 25m depth were assumed to be part of shallow aquifers and those deeper than 25 m were considered to be part of deeper aquifers.

Primary data was collected from study area in such a way that data pertaining to rainy season, post-monsoon, snow-freezing, snow-melting, following rainy season, following post-monsoon etc is available.
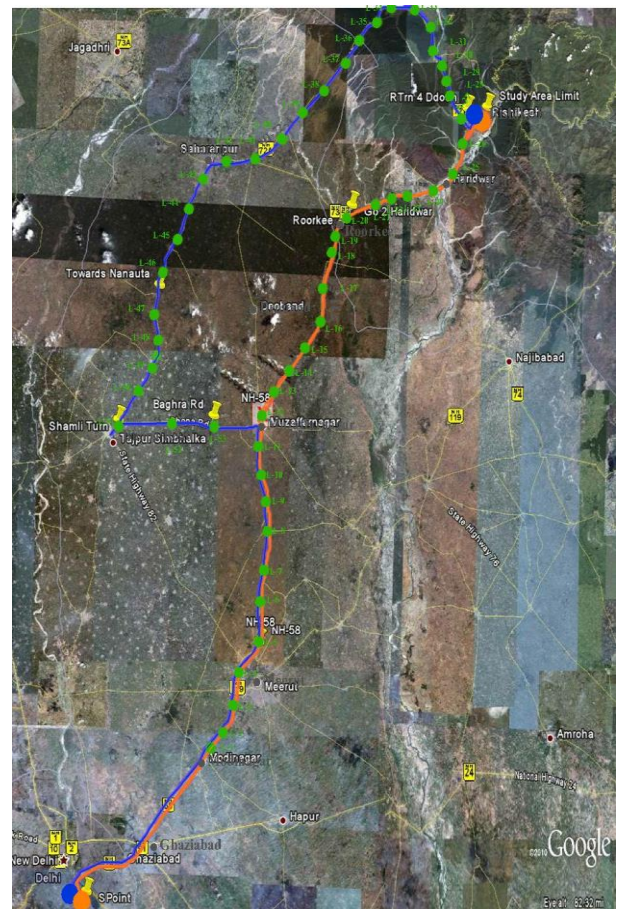
Fig.1, Location of Study Area in Upper Ganga Basin

V.   INTERPRETATION OF RESULTS

Hydro-geomorphological study was carried out for the study area in order to understand the topography and physiography of the study area to work out the areas of recharge and discharge with hydro-geo-morphological undulations to establish the hydro-geological regime of the study area.
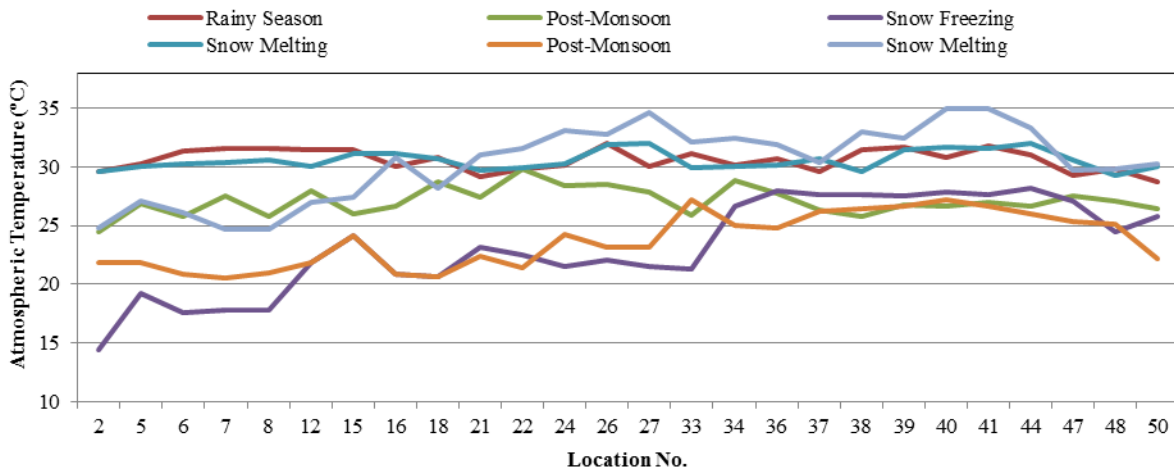
Fig.2: Atmospheric Temperature Variation in Shallow Aquifer
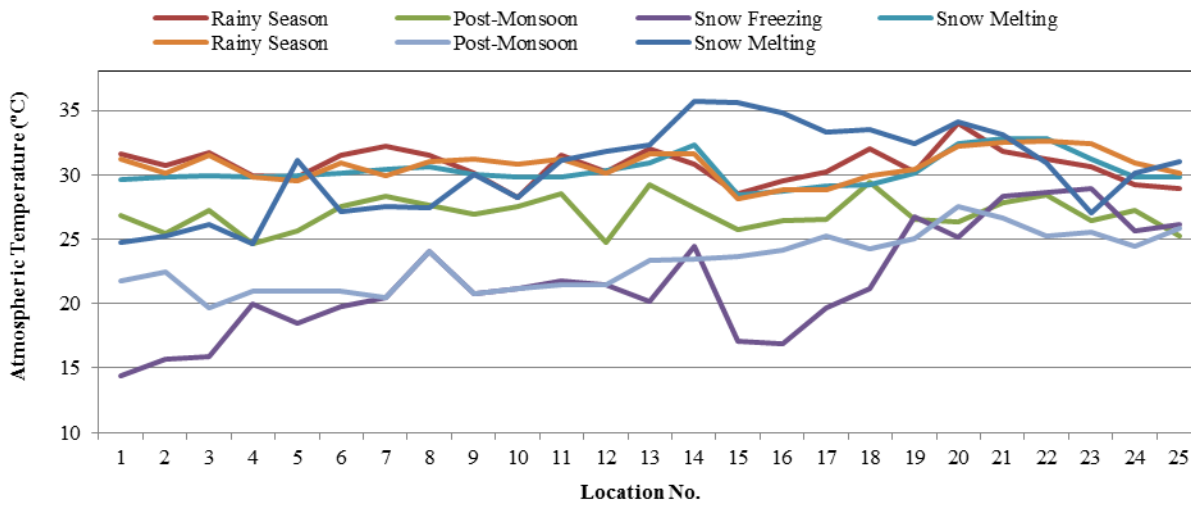
Fig. 3: Atmospheric Temperature Variation in Deeper Aquifer
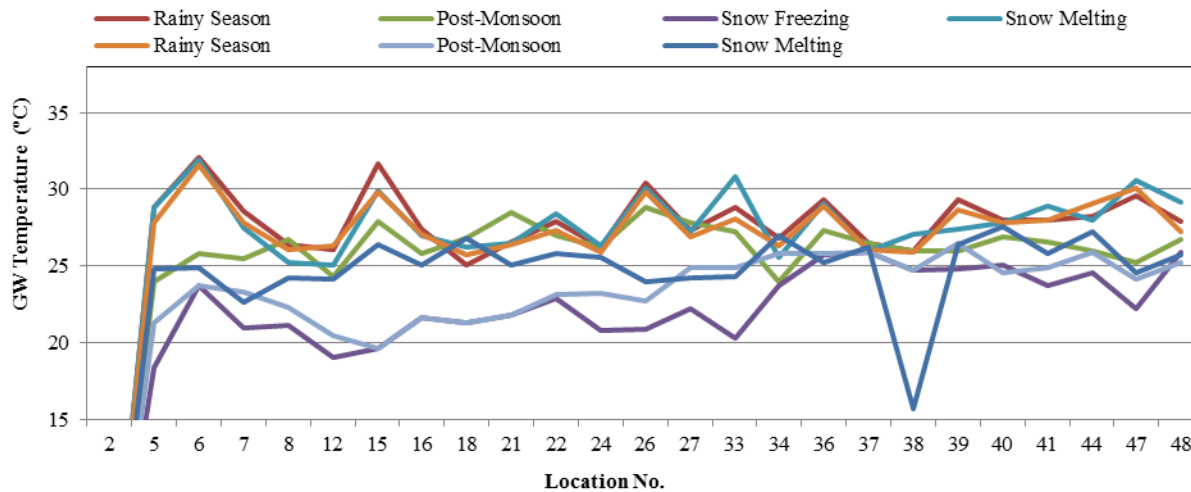
Fig.4: Groundwater Temperature Variation in Shallow Aquifer
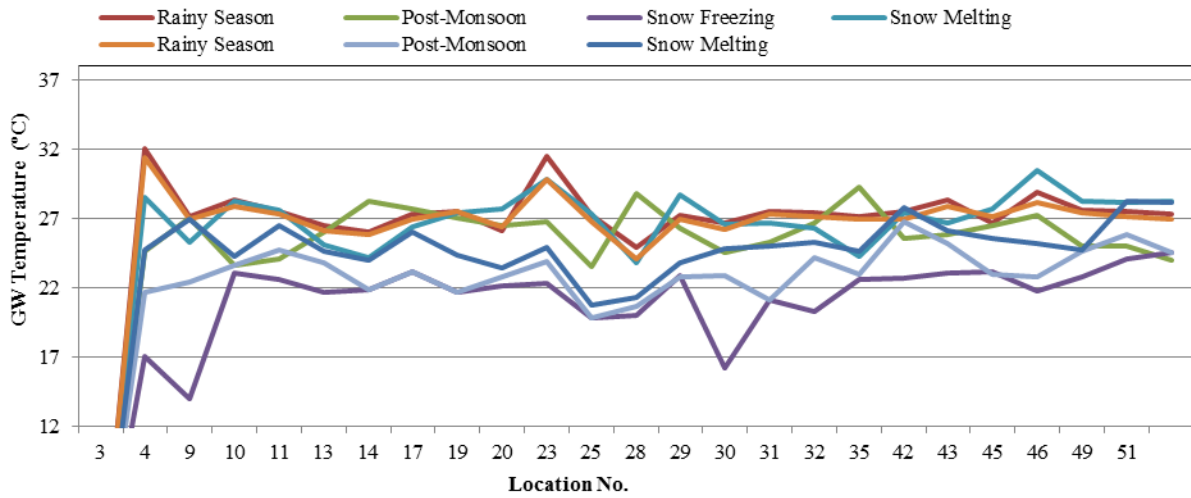
Fig.5: Groundwater Temperature Variation in Deeper Aquifer
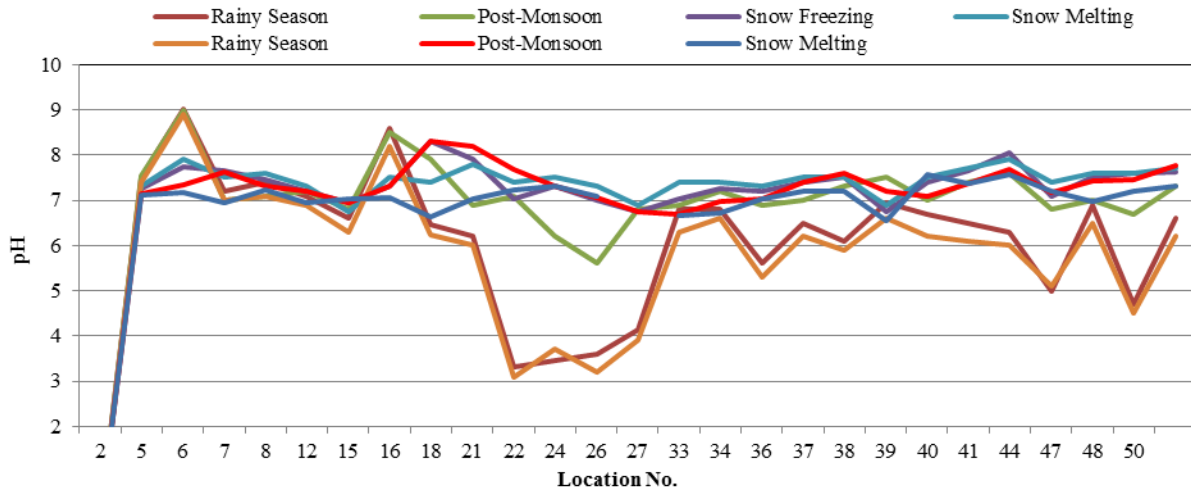
Fig.6: pH Variation in Shallow Aquifer
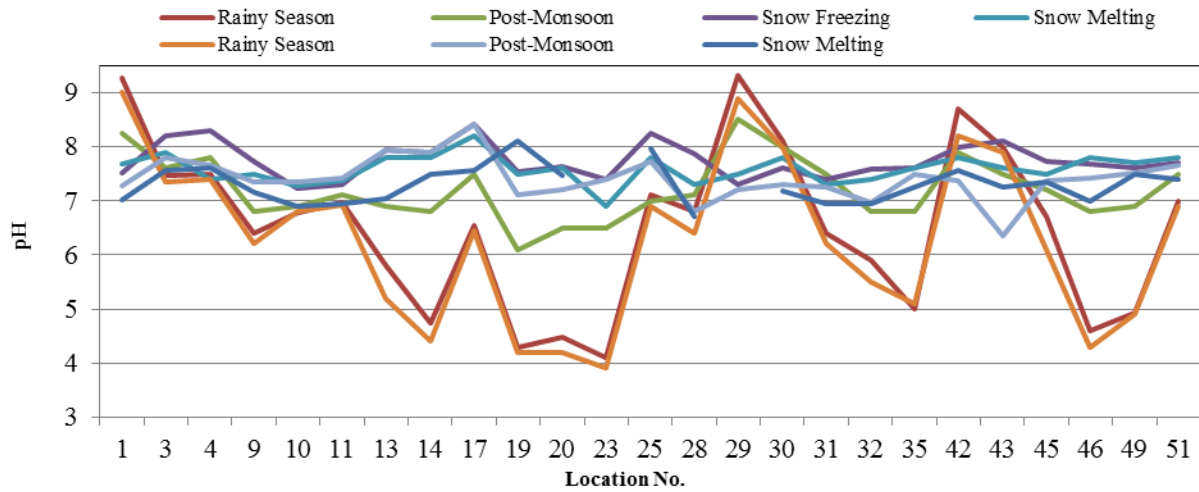
Fig. 7: pH Variation in Deeper Aquifer
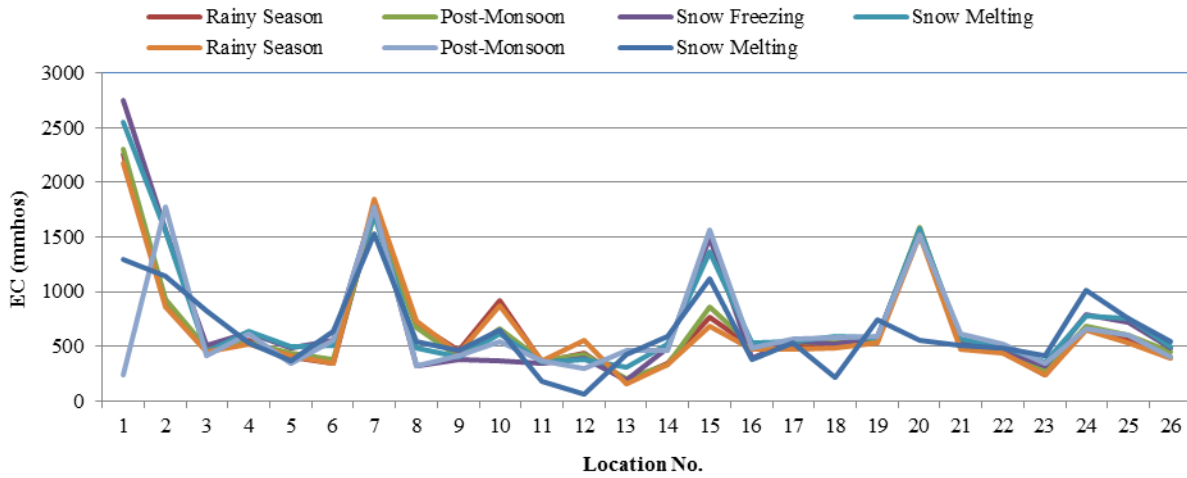
Fig.8: Electrical Conductivity Variation in Shallow Aquifer
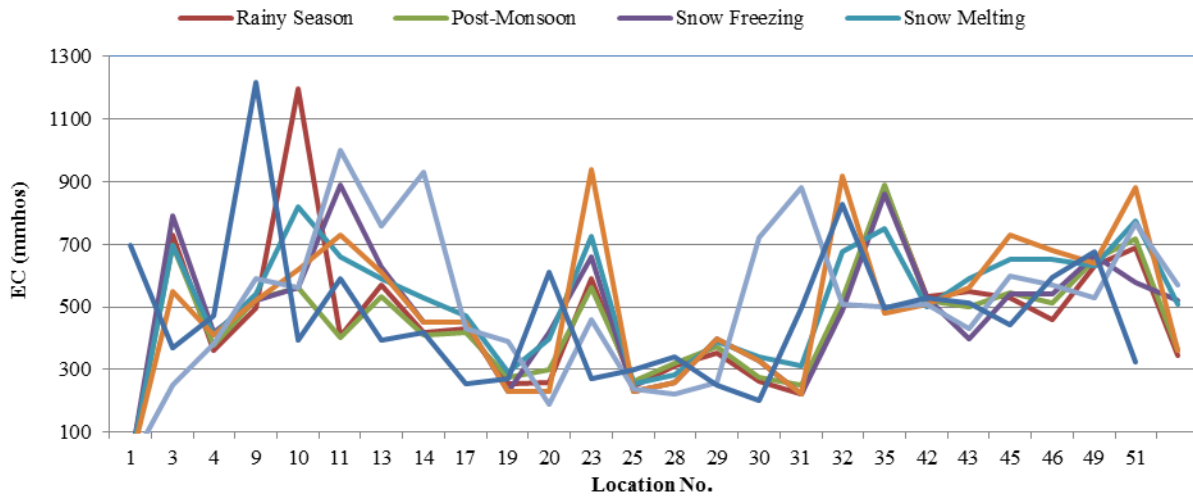
Fig.9: Electrical Conductivity Variation in Deeper Aquifer
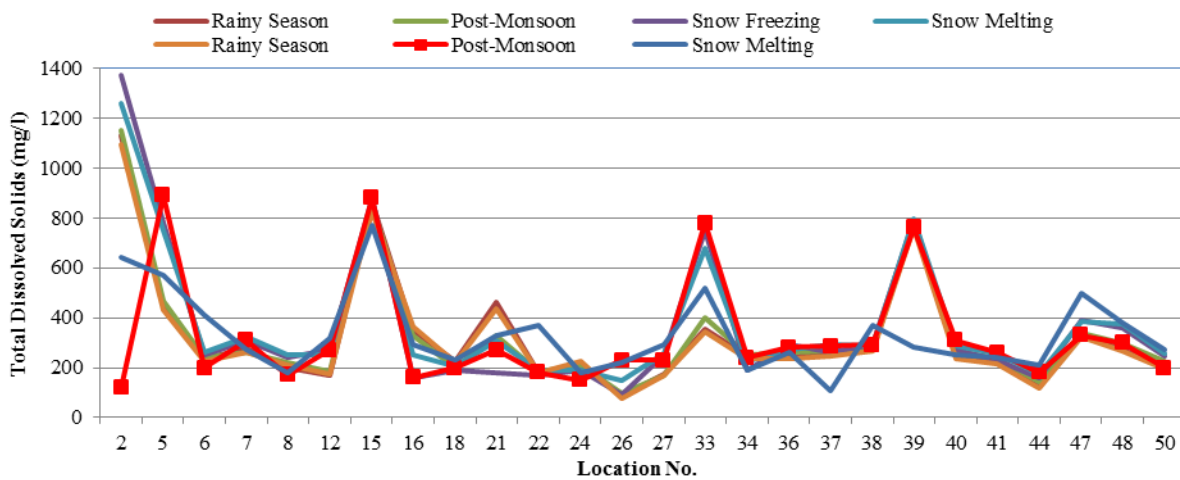
Fig.10: TDS Variation in Shallow Aquifer
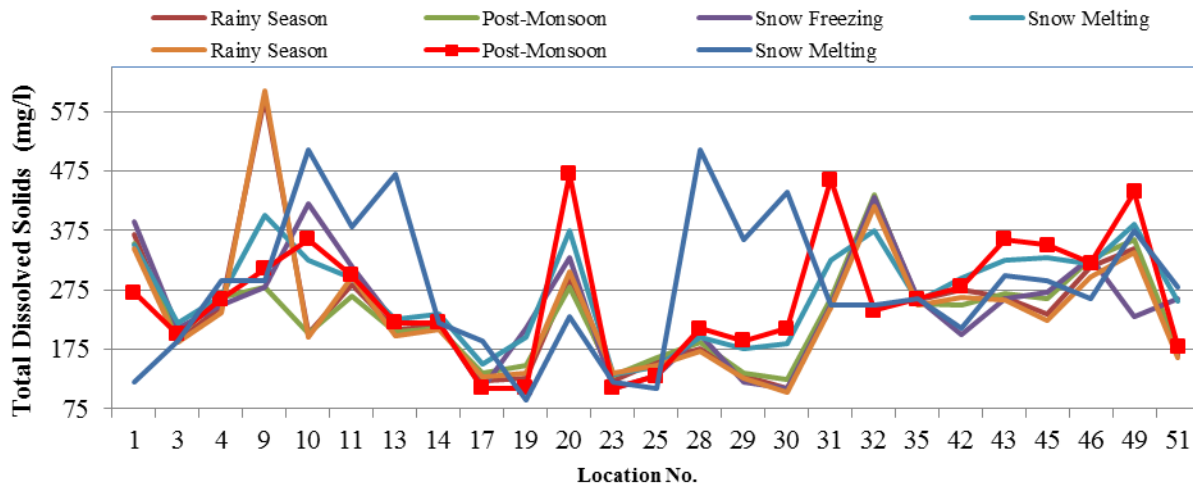
Fig. 11: TDS Variation in Deeper Aquifer

The study area comprises of upland hilly topography from Rishikesh to Dehradun, the geo-morphology indicates that the area has got unconfined shallow aquifers and confined deeper aquifers, and however at few locations in rocky areas perched aquifer system was also encountered. The groundwater in this zone is found to be alkaline, thus it is not found to be affected by glacial melt water.

This is followed by upland topography which starts from Haridwar extends 20 km from Dehradun to Saharanpur and runs parallel to uphill topography. The hydro-geomorphology indicates that the area has got perched aquifer system and the discharge and recharge capacity of this area is found to be very fluctuating in nature and it receives recharge from the hilly upland topography only, as surface and sub-surface runoff along with rainfall.

The plain land topography starts from Muzaffarnagar and extends upto Roorkee in the eastern direction and upto Saharanpur in the western direction. It is surrounded by the upland topographic units in the northern direction and low land topography in north-west and south-east direction. It comprises the largest area amongst various physiographic units of the study area. The hydro-geomorphology indicates that the area has got perched to unconfined aquifer system and the discharge and recharge capacity of this area is found to be unstable in nature and has got good response from the recharging parameters such as snowmelt water.

The low land was encountered at two places in between Roorkee and Haridwar at one end and from Shyamli to 32 kms towards Saharanpur. It is located in the north-western and south-western boundary of the study area. The typical feature of this area found as crescent shaped, being the low lying area it receives the surface and sub-surface run-off from the upper regimes and may be considered as typical recharge boundary for snowmelt water because of its groundwater quality.

The plain low land topography starts from Muzaffarnagar and extends upto Modinagar. This area is linear in character and was delineated for comparison of non-snowmelt recharge boundary to snowmelt recharge boundaries for the rest of the topographic units.

The direction of movement of groundwater is from hilly topography in Rishikesh, Haridwar and Dehradun towards plain areas of Saharanpur and Muzaffarnagar in general, however the groundwater movement is also affected by local topography at places. The flow of groundwater in an aquifer does not always mirror the flow of water on the surface. The groundwater flows from higher elevation to lower elevation in the direction of maximum change in elevation. Fractured rocks, weathered rocks and alluvial strata are the main water bearing formation in the study area from hilly region to plain topography. The aquifers are separated with thick clay with considerable thickness, which acts as confining layers in alluvial areas whereas the aquifers acting as perched and unconfined aquifer system in hilly formations. Water level data suggests presence of multi-layer aquifer system. The first one is unconfined and others are semi-confined to confined.

The data pertaining to pH, TDS, EC, groundwater temperature and atmospheric temperature collected from all the 51 locations is presented for shallow and deeper aquifer locations of study area from figure 2 to 11.

The geochemical analysis of the study area was done on the basis of physiography and lithological interpretation and their overall impact on the pH of the study area to determine the alkalinity vs acidic environment in shallow and deeper aquifers.

The pH in upland hilly topography varies from 7.5-9.0 which is a high alkaline zone owing to topography and lithology of the area. The pH range clearly indicates that this area is not affected by snowmelt water and contains natural groundwater in confined aquifers.

The pH in upland hilly topography varies from 6.0-6.5 which is medium alkalinity zone owing to topography and lithology of the area. The pH range clearly indicates that this area has been recharged by snowmelt water since the pH is reducing.

The pH in plain land topography area varies from 5.5-6.0 which is low alkalinity zone found to be reactive with snowmelt water and the snowmelt water has been absorbed by this area. Being the largest area within the study area which further dilutes the natural groundwater to acidic water and mostly occupied by shallow aquifers.

The pH in low land topography area varies from 4.0-5.5 which is very low alkalinity zone, this area represents the recharge boundary of the entire study area and receives maximum snowmelt water. Since the area is small therefore the snowmelt water reaction is very fast. Further the crescentric shape on both the sides clearly indicates the possibility of further zooming of the area in due course of time which may be monitored further to claim the Assessment of Impact of Global Warming on Groundwater Resources in Parts of Upper Ganga basin.

The pH in plain low land topography area varies from 6.5-7.5 which is alkaline zone owing to the topography and lithology of the area. The pH range indicates that this area is not affected by snow-melt water and primarily contains natural groundwater.

The variation of Electrical Conductivity in an area depends on the geology of the area, geo-chemistry of the area and hydro-geo-morphological conditions of the area. Likewise TDS, EC also represents the saline and fresh water conditions, lower the electrical conductivity, softer the groundwater and higher the electrical conductivity, higher the salinity. Through empirical relation the TDS is almost 60% of the electrical conductivity. The electrical conductivity reciprocates the electrical resistivity of the soil and water, and thus without any destructive tests like drilling etc EC becomes decisive factor indirectly to achieve the interphase between saline water and fresh water vertically as well as laterally.

VI.   CONCLUSION & RECOMMENDATIONS

The shallow aquifers are effected by recharging though snow-melt water in the upper region at present, however the deeper aquifers are found to be unaffected by the snow-melt water, in this way it maybe concluded that at present the change of pH towards acidity confined to shallow aquifers for a short period which does not have any direct or visible impact, however probably the deeper aquifers shall also be effected by snow-melt recharge factor and then the impact on the crops, human health and complete eco-system will be felt, if the rate of global warming goes at this pace, however there is no precise prediction of climate change, hence it is difficult to predict the bio-diversity factors for futuristic ecological systems.

It is therefore recommended that a continuous data monitoring system with installation of peizometric system with telemetric configuration maybe adopted in order to predict the impact of climate change on aquifer system.

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Ethiopian Banker's Perception of Electronic Banking in Ethiopia – A Case of Adama City

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Abstract- Traditionally banks are in the forefront in harnessing and using technology to improve their products and services. Over a period of time they have been using electronic and telecommunication networks extensively to provide products and services to the customers. This study attempts to understand and identify bankers perception of benefits and risks associated with electronic banking facilities in Ethiopia. Bank employees were the primary source of data and the data so collected was analyzed using mean score analysis. As per the findings of this study it is observed that bankers perceive ' a means to save time' and 'minimize inconveniences' as the most and the least advantage of electronic banking whereas   'Need for expertise and training' and ' charge a high cost for services' are considered as the most and the least risk associated with electronic banking
.

Index Terms- Electronic banking, Internet Banking, SMS Banking, Banker's perception.

I. INTRODUCTION

T Banks play a prominent role in improving economic efficiency by channelizing funds from resource surplus sectors to those sectors that are deficient, yet possessing better productive investment opportunities. Banks also play a vital role in trade and payment system by significantly reducing transaction costs and increasing convenience (NCA, 2006). Ethiopia is an emerging economy with a growing financial sector. With a double digit growth and internal stability unlike most economies in the African continent, Ethiopia is surging ahead to be a leader in the horn of Africa in the financial sector.

Electronic distribution channels provide alternatives for faster delivery of banking services to a wider range of customers (Kaleem and Ahmad, 2008), A very fast advancement in electronic distribution channels   has produced tremendous changes in the financial industry in the recent years with a increasing rate of change in technology and competition among participants (Huges, 2001). IT-based distribution channels also reduce personal contact between the service providers and the customers, which inevitably leads to a complete transformation of traditional bank-customers relationships (Barnes and Howlett, 1998).

According to Kaleem & Ahmad (2008), increasing competition among banks and from non-bank financial institutions also raises concerns as to why some people adopt one distributional channel and others do not, and that identifying the factors that may influence this decision is vital for service providers. Literature also supports that the level of user's acceptance of electronic

banking is to a large extend determined by their perceptions of its effectiveness in terms of costs and benefits (Gefen & Straud, 2004; Abu-Musa 2005; 2009;Olatokun & Igbinedion 2009).

How bankers perceive the benefits and threats that are associated with electronic banking system has a strong implication on the services provided by the bank to its customers in case of emerging economies such as the Ethiopian economy.

2. OBJECTIVES OF THE STUDY

This paper reviews the existing literature on electronic banking and attempts to address the following objectives:

1. To find the benefits that bankers expect their customers to receive when they use electronic banking.
2. To examine bankers' perceptions of the risk associated to electronic banking.
3. To review the existing literature and provide insights for researchers and bankers interested in provided electronic distribution channels.

Commercial Banking in Ethiopia:

The history of modern banking in Ethiopia goes back to 1900 when an agreement was reached in 1905 between Emperor Minilik II and Mr.Ma Gillivray, representative of the British owned National Bank of Egypt. Currently as per National Bank of Ethiopia estimates there are 18 private and 3 state owned banks. Out of these 19 banks, the state owned commercial Bank of Ethiopia(CBE) is the largest and leading bank in financial operations.

The financial sector in Ethiopia is composed of the banking industry, insurance companies, microfinance institutions, saving and credit cooperatives and the informal financial sector. The banking industry accounts for about 95% of the total financial sector assets, implying that the financial sector is undeveloped, and activities that banks could perform are legally limited, which in turn contribute to lesser contestability. (Zerayehu, Kagnew, & Teshome, 2013).

Commercial Banks as such provide all the banking services including ATM facility, Internet Banking, Telephone Banking, SMS banking and Mobile Banking beside the traditional banking activities.

Electronic Banking in Ethiopia:

The term electronic banking can be described in several ways. In very simple terms it means the provision of information or services by a bank to its customers, via a computer, television, telephone, or mobile phone. It as an electronic connection between bank and customer in order to prepare, manage and control financial transactions. (Daniel, 1999)

Furthermore, electronic banking is said to have three different means of delivery: telephone, PC, and the Internet. Daniel (1999), for example, introduces four different channels for electronic banking: PC banking, Internet banking, managed network, and TV-based banking.

Electronic banking is the newest delivery channel in many developed countries and there is a wide agreement that the new channel will have a significant impact on the bank market (Daniel, 1999.

According to Nehmzow (1997) Internet banking offers the traditional players in the financial services sector the opportunity to add a low cost distribution channel to their numerous different services.

Table No. 1
Delivery platform available for electronic banking

Types of service	Description
PC banking (private dial up)	Proprietary software, distributed by the bank, is installed by the customer on their PC. Access to bank via a modem linked directly to the bank
Internet banking	Access their bank via Internet
Managed network	The bank makes use of an online service provided by another party
TV based	The use of satellite or cable to deliver account information to the TV screens of customers (Also Internet based)
Telephone banking	Customers access their bank via telephone (Own personal ID and password required)
Mobile phone banking (SMS, WAP, 3rd generation)	Access with text message (SMS), Internet connection (WAP), or high speed 3rd generation mobile connection (also Internet based)

Source: Adapted from Daniel, 1999 and Karjaluoto, 2003

The appearance of E-banking in Ethiopia goes back to the late 2001, when the largest state owned, commercial bank of Ethiopia (CBE) introduced ATM to deliver service to the local users. Electronic banking facilities provided by most Ethiopian Banks are very basic. However e-banking facilities provided are at par with those in the region.

As per Zemen bank official web site(www.zemenbank.com) electronic banking facilities are multi channel based and include internet banking, ATM banking, Call centre banking and SMS banking.

Table No. 2
Features of Electronic banking services rendered by Ethiopian banks

Electronic Banking Service	Features of service rendered
Internet Banking	1. Personal Profile Administration 2. Balance enquiry 3. View daily transaction register, 4. Ability to link accounts together so that transfers can be completed from one account to another 5. Customer Service enquiry and resolution with in seconds 6. View check issuance status through the register 7. Password change and management features 8. Intrusion detection capability
ATM Banking	1. All customers will receive an ATM Card and Personal identification Number (PIN). **2.** The ATM allows you to receive cash at your convenience. It also allows you to check your balance, make transfers and deposit cash.

SMS Banking	1. Authentication and verification
	2. Check daily, weekly or monthly balance
	3. Interactively receive account balance
	4. Produce a mini statement on your mobile
	5. Receive alerts and notification on:
	  • Low balance
	  • Deposit and withdrawal
	  • Transfer of funds from your account or into your account

	1. Secure delegated 24 hour service

Call Center Banking	2. Authentication and verification
	3. Balance enquiry
	4. View daily transaction register
	5. Customer Service enquiry and resolution
	6. Request Online Statement

(Source : adapted from www.zemenbank.com)

3. LITERATURE REVIEW

The following section discusses some Literature relating to benefits and risks associated with electronic banking.

Benefits associated with electronic banking

Perception of various stakeholders, especially bankers has attracted the attention of researchers as per the available literature on electronic banking. According to Berry (1984), maintenance of high level of employee satisfaction and retention is essential if customer satisfaction has to be achieved and employees must be essentially viewed as internal customers by the management.

Banks normally assign their managers responsibility for the promotion of the use of electronic channels to customers (Lymperopoulos, and Chaniotakis, 2004). Their input as delivery staff is important. It is also the manager's responsibility to ensure that branch staff is professional, well-trained and knowledgeable about the range of services provided by the bank (Moutinho, 1997).

The perceived benefits associated with electronic banking have been extensively documented in several studies. As per Thornton and White (2001) several electronic distribution channels are available for banks in United States, further they concluded that customer orientations towards convenience, service, technology, change, knowledge about computing and the Internet affected the usage of different channels.

Similarly, Highlighting the impact of ICT in recent years, Rao, Metts and Mong (2003) observed that the 1990s witness the proliferation and hyper growth of internet and internet technologies, which together are creating a global and cost-effective platform for business to communicate and conduct commerce. Oladejo and Dada (2008) investigated the impact of IT on the performance of Insurance companies in Nigeria.

Jen and Michael (2006) indicate that E-banking has created unprecedented opportunities for banks and businesses globally, in the ways they organize financial product development, delivery, and marketing via the Internet. While it offers new opportunities to banks, it also poses many challenges such as the innovation of IT applications, the blurring of market boundaries, the breaching of industrial barriers, the entrance of new competitors, and the emergence of new business models (Liao and Cheung 2003).

Convenience of conducting banking outside the branch official opening hours has been found significant in cases of adoption. Banks provide customers convenient, inexpensive access to the bank 24 hours a day and seven days a week. Moutinho *et al.*, (1997) pointed out that each ATM could carry out the same, essentially routine, transactions as do human tellers in branch offices, but at half the cost and with a four-to-one advantage in productivity.

Robinson (2000) argued that the online banking extends the relationship with the customers through providing financial services right into the home or office of ustomers. The banks may also enjoy the benefits in terms of increased customers loyalty and satisfaction (Oumlil and Williams, 2000). However, Nancy, Lockett, Winklhofer, and Christine (2001), viewed the same situation differently and argued that customers like to interact with humans rather than machines.

Gerrard and Cunningham (2003) found a positive correlation between convenience and online banking and remarked that a primary benefit for the bank is cost saving and for the consumers a primary benefits is convenience. Multi-functionality of an IT based services may be another feature that satisfies customer needs (Gerson, 1998).

Howcroft *et al.,* (2002) found that the most important factors encouraging consumers to use online banking are lower fees followed by reducing paper work and human error, which subsequently minimize disputes (Kiang *et al.*, 2000).

Risks associated with electronic banking

As it is stated in different E-banking literature some of the problems related with adoption of E-banking are: Low level of internet penetration and poorly developed telecommunication infrastructure. According to Jensen (2003), most countries in Africa, except South Africa, have Internet infrastructure only in their major cities.

White and Nteli (2004) conducted a study that focused on why the increase in Internet users in the UK had not been paralleled by increases in Internet usage for banking purposes. Their results showed that customers still have concerns with the security and the safety aspects of the Internet.

Lack of specific laws to govern Internet banking is another important concern for both the bankers and the customers. This relates to issues such as unfair and deceptive trade practice by the supplier and unauthorized access by hackers. Larpsiri *et al.*, (2002) argued that it is not clear whether electronic documents and records are acceptable as sufficient evidence of transactions. They also pointed out that the jurisdiction of the courts and dispute resolution procedures in the case of using the Internet for commercial purposes are important concerns.

Disputes can arise from many sources. For instance, websites are not a branch of the bank. It is difficult for the court to define the

location of the branch and decide whether they have jurisdiction (Rotchanakitumnuai and Speece, 2003).

Other risks associated to electronic banking are job losses, lack of opportunities to socialize and the development of a lazy society (Black *at al.*, 2001).

Lack of suitable legal and regulatory framework for E-commerce and Electronic payment
is another impediment for the adoption of new technology in banking industry. There is no separate legislation that deals with electronic banking including enforceability of the validity of electronic contracts, digital signatures and intellectual copyright and restrict the use of encryption technologies and High rates of illiteracy. Low literacy rate is a serious impediment for the adoption of E-banking in Ethiopia as it hinders the accessibility of banking services. For citizens to fully enjoy the benefits of E-banking, they should not only know how to read and write but also possess basic ICT literacy (Gardachew 2010)

According to Ayana(2014) ,the major barriers Ethiopian banking industry faces in the adoption of Electronic banking are: security risk, lack of trust, lack of legal and regulatory frame work, Lack of ICT infrastructure and absence of competition between local and foreign banks.

Wondwossen & Tsegai (2005) observed the following reasons which may be considered as hindrance factors for the use of electronic payment system in Ethiopia. These hindrance factors include, lack of appropriate infrastructure for E-payment, lack of internet facilities with customer and learning how to interact with bank website. Moreover, factors that can affect adoption of E-banking in the country regarding the technological factor, organizational factor and Environmental factor.

Though problems aplenty a study conducted by Wondwossen and Tsegai (2005) revealed that an adequate legal structure and security framework could encourage the use of E-payments in Ethiopia. Therefore, a study of banker's perception of electronic banking becomes more relevant.

4. METHODOLOGY

The study used a questionnaire that was administered in Adama City where almost all banks(except Zemen Bank, which is a single branch bank) have their branch offices. A questionnaire adopted from literature study was used as a tool and bank employees were requested to complete the questionnaire.

All banks and branches located in Adama and providing or planning to provide electronic banking were included in the study. At least one employee at each levels of officer, manager and executive were included. Out of a total 78 questionnaires distributed, 74 were completed and received back . A five point Likert scale was used to measure all the statements (1 = strongly disagree to 5 = strongly agree). Before the field work, a pilot study was conducted in order to refine the questions. Finally,

data was analyzed via frequency analysis and mean score analysis.

5. RESULTS & DISCUSSIONS

Table no. 3
Profile of the Respondents

		N=74	%
Working Experience			
	1 to 5 Yrs	23	31.08
	6 to 10 Yrs	26	35.13
	More than 10 Yrs	25	33.78
Position	Executives	4	5.40
	Officers	50	67.56
	Managers	20	27.02
Qualification			
	Diploma	3	4.05
	Degree	66	89.19
	Master's and Above	5	6.75
	Professional Qualification	nil	Nil
Age			
	Upto 25 Yrs	5	6.75
	26 to 35 Yrs	49	66.21
	36 to 45 Yrs	4	5.40
	46 Yrs and above	2	2.70
Gender			
	Male	50	67.57
	Female	24	32.43

(Source: Primary Data)

The personal characteristics of banker's whose perception was sought is outlined in table 3. It is observed that 31.08 % of the respondents hold work experience between 1 to 5 years and 35.13 % between 6 to 10 yrs.

The position based classification of bankers includes Executive (5.4%), Officer (67.56%) and Manager(27.02%).
A look into the educational qualification reveals that 6.75 %held Master degrees; 89.19% held Bachelor degrees while another 4.05 % bankers held diplomas..A further insight reveals that 72.96% of the bankers are aged below 35yrs.

Table No. 4
Banker's Perception of benefits of electronic banking

Statements	Mean	Rank
1. Electronic banking minimizes the cost of transaction	4.5	3
2. Electronic banking saves time	4.73	1
3. Electronic banking minimizes inconveniences	4.22	9
4. Electronic banking provides upto date information	4.43	6
5. Electronic banking increases operational efficiency	4.42	7
6. Electronic banking reduces HR requirements	4.24	8
7. Electronic banking facilitates quick response	4.46	4
8. Electronic banking improves service quality	4.44	5
9. Electronic banking minimizes the risk of carrying cash	4.72	2

(Source: Primary Data)

Table 4 shows the mean scores of banker's perceptions of the benefits of electronic banking. It is observed that the statements, *"Electronic banking saves time", "Electronic banking minimizes the risk of carrying cash", and "Electronic banking minimizes the cost of transaction"* have the highest mean scores of 4.73 and 4.72 and 4.5.

The outcomes are not in line with those of earlier studies made by Moutinho et al., (1997), Thornton and White (2001), Howcroft et al., (2002) and Gerrard and Cunnigham (2003). In these studies mean scores were highest for statements "*Electronic banking minimizes the cost of transaction*" , "*Electronic banking minimizes inconveniences*" and "*Electronic banking saves time*"

The bankers give average importance to the statements, "*Electronic banking facilitates quick responses*" (4.46), "*Electronic banking improves service quality*" (4.44), "*Electronic banking provides up-to-date information*" (4.43), "*Electronic banking increases operational efficiency*" (4.42). These outcomes are contrary to the findings of Moutinho and Phillips (2002) in case of UK and Aladwani (2001) in case of Kuwait, where the managers gave the highest priority to faster, easier and reliable IT services for customers.

The statements *"Electronic banking reduces HR requirements"* (4.24) and "*Electronic banking minimizes inconveniences*" (4.22)

had the lowest mean scores. These findings are the opposite of those found by Birch and Young (1997) who found reductions in branches and associated staff with the introduction of Internet banking. The low mean score for a reduction in HR requirements was associated with the low level and recent penetration of electronic banking in the country, Boon and Ming (2003) suggested in case of Malaysia that the top management of the banks should enhance their operations through a mixture of branch banking and e-channels like ATMs, phone banking and PC banking.

Table No. 5
Banker's perception of risks associated with electronic banking

Statement	Mean	Rank
1. Electronic banking has the chance of data loss	3.10	4
2. Electronic banking has the chance of fraud	3.37	3
3. Electronic banking has the chance of government access	3.08	5
4. Electronic banking lacks information security	2.65	7
5. Electronic banking charge a high cost for services	2.14	9
6. Electronic banking has many legal and security issues	3.57	2
7. Electronic banking needs expertise and training	3.86	1
8. Electronic banking has inadequate information on the website	2.68	6
9. Electronic banking has less operational reliability	2.36	8

(Source: Primary Data)

Table 5 presents the bankers' perceptions of the risks associated with electronic banking. The results show some very interesting facts. Bankers of all categories consider" *Electronic banking needs expertise and training*"', "*Electronic banking has many legal and security issues*" and "*Electronic banking has the chance of fraud* "as very serious concerns where as "*Electronic banking has the chance of data loss* " and "*Electronic banking has the chance of government access*" are given just about average importance. "*Electronic banking has inadequate information on the website*", "*Electronic banking lacks information security*", "*Electronic banking has less operational*

reliability" "*Electronic banking charge a high cost for services*" are considered least important.

6. CONCLUSIONS

This study was conducted using attributes identified after a detailed literature review. It is aimed to cover the benefits and risks associated with electronic banking service in Ethiopia. This study investigated banks employees' perceptions of electronic banking using 18 attributes.

In one process of analysis, mean scores of benefits and risks associated with electronic banking were computed and ranked. Bankers consider *" Saves time"*, "M*inimizes the risk of carrying cash", and "Minimizes the cost of transactions"* to be important benefits and "N*eeds expertise and training'*", "M*any legal and security issues*" and "*Chance of fraud* " to be very serious concerns of electronic banking. The bankers do not consider *"Reduces HR requirements"* and "*Minimizes inconveniences* " to be important benefits and "L*ess operational reliability*" "H*igh cost for services* to be important risks associated with electronic banking.

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Analytic Hierarchy Process Model for Ranking the Disposal of Solid Wastes Based on Settlement Pattern

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Abstract- The research applied analytic hierarchy process (AHP) model to determine relative weights for ranking the disposal of solid wastes products in Abuja metropolitan. Three (3) settlement patterns, each having thirteen (13) wastes collection centres were identified. Presently, the disposal of solid wastes at these settlement patterns and their respective collection centres does not have proper schedules. It was found out that this lack of organised plan resulted in some centers, within a settlement pattern, having huge piles of solid wastes unattended to while others were disposed promptly. This unplanned schedule necessitated the application of AHP model to determine the relative weights that ranked the settlement patterns and the collection centres for proper schedule of disposal of the solid wastes. Nine point scales was used to quantify the verbal judgments obtained from the Officers of the Solid Waste Management Agency in respect of the preference of disposal of solid wastes at the centres given the three (3) settlement patterns. Pair-wise comparism matrices were developed and the judgments from the respondents used to develop matrices were determined to be consistent using consistency ratio.

The weights determined ranked the three settlement pattern as, population density first; very important person settlement pattern as second and road network/drainage channel as third. The results of the study also ranked the disposal at the collection centres within each of these all three (3) settlement patterns. These rankings will serve as input for developing planned schedule for the disposal of solid wastes at the collection centres.

Index Terms- Analytic Hierarchy Process, Disposal, Location, Priority, Settlement Pattern, Solid Waste.

I. INTRODUCTION

Solid wastes are wastes which are things that the owners no longer want at a given time and space and which have no current or perceived market value. They are not free flowing and thus have remained one of the man's most challenging environmental problems. Solid wastes are continuously generated and disposed and which have been observed to be a growing problem. The continous generation and disposal of solid wastes have been ascribed to industrial development and population growth. The disposal or disposal of solid wastes, which have been considered as the means of managing them, consumes huge amount of money and other resources such as time. Despite the huge investments government spends on them, their management have still remained one of the most problematic environmental sanitation challenges faced by

developing countries of the world (United States Environment Protection Agency, 2003; Martin, 2002; Huang *et al*, 2001).

The disposal or disposal of solid wastes has been an issue of concern for individuals and government officials especially in urban areas, since early modern times (Caruso, Colorni and Paruccini, 1993; Costi *et al*, 2003; Jadea *et al* , 2008) Solid wastes are generally an unavoidable by-product of economic activities. In Nigeria, due to industrialization and rapid population growth, wastes generally are generated faster than they are collected, transported and evacuated (United States Environmental Protection Agency, 20003; Ogwueleka, 2009; Onibokun and Kumuyi, 2003) . It has been observed that management (disposal) of solid wastes in Nigeria is far from being satisfactory. Many of Nigerian cities and towns do not benefit from any organized waste management services and for that reason, wastes are unattended to, buried, burnt or disposed haphazardly (Federal Ministry of Environment, 2005). The sources of solid wastes in Nigeria can be identified as market places, homesteads, factories, workshops, hospitals, seaports, primary, post primary and tertiary institutions (Akoni, 2007). It has been documented that the volume of waste does not actually constitute problem but the ability or inability of governments, individuals and waste disposal firms to keep up with the task of managing waste. Waste management involves collection, keeping, treatment and disposal of waste in such a way as to render them harmless to human and animal life, ecology and the environment generation. In this paper, disposal of wastes as one of the activities of wastes studied involves collection of wastes, transferring the collected wastes to disposal sites and disposal of same from their respective disposal sites. The wastes are usually collected at various collection centres which are located at different places within a given town or city. These locations may be characterized by population density (PD), very important persons'(VP) and Road Network/Drainage Channel (RNDC)settlement patterns. These collection centres are always associated with the volume of wastes growing faster than the volume transferred to disposal sites. This implies that the collection centres always have volumes of wastes accumulated and are rarely evacuated or disposed. The disposal at the collection centres do not seem to be treated equally because their relative locations are described by the population of individuals or firms, thereby giving rise to settlement patterns to be considered during disposal as PD , VP and RNDC. The unequal treatment, with respect to the disposal of these solid wastes, at the collection centres implies that disposal at some collection centres seem to be given more attention than others. In order to justify and measure this relative priority, a model needs to be developed and results derived from the model will provide

numerical measure that describes the preferential treatment of the solid waste disposal at the various collection centres.

AHP is a multi criteria decision making approach that has good mathematical properties appropriate for incorporating value judgments of decision makers in modeling for selection of best alternatives. It is equally appropriate for providing numerical measure of ranking of set decision making criteria. In addition to its usefulness for decision making, it is also a tool used for deriving information for planning. Thus, AHP is a decision support tool that can be used to solve complex decision problems. It is modeled in tree- like multi-level hierarchy structure of objective, criteria, sub-criteria and alternatives. Pair wise comparism of the criteria and or sub-criteria is established to model same as a pair wise matrix. The result of the evaluation of the matrix is weights of importance of the decision criteria and the relative performance measures of the alternatives in terms of each individual decision criteria (Alonso and Lamata, 2006; Winston, 1993; Zamali, Mohd and AbuOsman, 2010). In this paper, an Analytic Hierarchy Process (AHP) model is developed for determining ratings for solid waste disposal at collection centers in Abuja Metropolis. The model incorporates the value judgments of the stakeholders of solid wastes management. The choice of AHP for this problem situation is its suitability in determining accurate estimation pertinent to data through its pair wise comparison. Input to the pair wise comparison is the expression of decision maker's opinion about the value of one single pair wise comparison at a time. Doing this requires that a decision maker chooses his answers among 10-17 discrete choices- each choice is expressed as a linguistic phrase(Zamali, Mohd and Abu Osman, 2010; Saaty, 1980). The pair wise comparisons are quantified by using a scale which is one-to-one mapping between the sets discrete linguistic choices available to the decision maker and a discrete set of numbers, which represents the importance, or weights of the previous linguistic choices. Saaty (1980) proposed such scale quantification as contained in Table 1.

Table 1: Scale of Relative Importance.

Intensity of Importance	Definition	Explanation
1	Equal importance	Two activities contribute equally
3	Weak importance of one over another	Experience and slightly favour one activity over another
5	Essential or strong importance	Experience and judgment strongly favour one activity over another
7	Demonstrated importance	An activity is strongly favoured and its dominance demonstrated in practice
9	Absolute importance	The evidence favouring one activity over
		another is the highest possible of affirmation
2,4,6,8	Intermediate values between the two adjacent judgments	When compromise is needed
Reciprocals of above nonzero	If activity i has one of the non zero nos. assigned to it when compared to activity j, then j has the reciprocal value when compared to i.	

Triantaphyllou and Mann (1994) proposed an evaluation of seventy eight (78) different scales in which all alternative scales depart from some psychological theories and developed numbers which were used based on these psychological theories. According Triantaphyllou and Mann (1995) another attempt at providing scales was proposed by Weber in 1846 by stating a law regarding a stimulus of measurable magnitude. The law asserted that a change in sensation is noticed if the stimulus is increased by a constant percentage of the stimulus itself. This implies that people are unable to make choices from an infinite set. Psychological experiments have also shown that individuals cannot simultaneously compare more than seven objects (plus or minus two). This is the reason why Saaty established nine (9) as the upper limit and one (1) as the lower limit of his scales and a unit difference between successive scales.

The objective of this research is to provide numerical measures that rank the collection centres and settlement patterns relative to each other for preferential disposal of solid wastes at these centres and settlement patterns in Abuja Metropolitan Council. This is to serve as information for solid waste managers in planning for the disposal of solid wastes at these centres.

II. METHODOLOGY

Personal visitation to Abuja, the capital city of Nigeria was made in October, 2011. Face - to – face interview and questionnaire were used as instruments for eliciting responses from the Officers of Solid Waste Management Agency and Federal Ministry of Environment, Abuja. Documented materials on the operations of these organizations were also consulted for relevant data to the research. From the sources, the operations of the existing disposal functional element was identified and assessed. Parameters measured and assessed were:

(i)   Number and location of waste collection sites;
(ii)   The settlement patterns of the collection sites expressed as population density (PD), Very Important Population (VP) and Road Network/Drainage Channels (RNDC)
(iii)   Assessment, in terms of numerical ratings, of the priority of collection sites relative to each other and according to settlement patterns.

Based on the measurements and assessments of the parameters and the preferential scaling of verbal judgments of

the Staff of Solid Wastes Management Agency, Abuja, pair wise comparism matrices of the various collection sites, based on settlement patterns, were developed and from which their relative preferential ratings were determined. Numerical rating of the responses elicited from the respondents were established using nine point scale as contained in Table 2 below.

Table 2: Nine Point Scale for Assessment of Verbal Judgments of the Respondents

S. No.	Verbal judgments of preferences	Numerical Rating
1	Extremely preferred	9
2	Very strongly to extremely preferred	8
3	Very strongly preferred	7
4	Strongly to very strongly preferred	6
5	Strongly preferred	5
6	Moderately to strongly Preferred	4
7	Moderately preferred	3
8	Equally to moderately Preferred	2
9	Equally preferred	1

III.   RESULTS

Nine point (9) scales shown in Table 2 was used in rating the verbal judgments of the relative preferences of the collection sites and the settlement patterns. These assessments gave rise to the development of four pair wise comparism matrices (three of which are for the collection centres according to the three settlement patterns and one for the three settlement patterns). Pair wise comparison matrix showing preferences for the collection centers based on three settlement pattern are shown in Tables 3, 5 and 7 while the corresponding syntheses matrixes are shown in Tables 4, 6 and 8 respectively. Tables 9 shows the pair wise comparisons of the three settlement patterns, while Table 10 and 11 is corresponding the pair wise comparison matrix and synthases matrix.

Table3: The Pair wise Comparison Matrix Showing Preferences for the Collection centers based on PD Settlement Pattern

Location	Garki I	Garki II	Wuse I	Wuse II	Cent. A.	Gwarinpa	Maitama	Asokoro	Jabi	Durimi	Lugbe	Kado	Wuye
Garki I	1	2	½	½	4	3	4	4	2	3	3	2	3
Garki II	½	1	½	½	5	2	5	4	3	2	2	3	3
Wuse I	2	2	1	2	5	4	4	5	3	4	3	4	5
Wuse II	2	2	½	1	4	3	4	4	2	3	2	3	3
Cent. A.	¼	1/5	1/5	¼	1	½	6	3	½	½	⅓	½	½
Gwarinpa	⅓	½	¼	⅓	2	1	3	2	½	2	2	3	2
Maitama	¼	1/5	¼	¼	1/6	⅓	1	½	⅓	⅓	⅓	⅓	⅓
Asokoro	¼	¼	1/5	¼	⅓	½	2	1	1/2	⅓	⅓	½	¼
Jabi	½	⅓	⅓	½	2	2	3	2	1	2	½	2	3
Durimi	⅓	½	¼	⅓	2	½	3	3	½	1	2	3	2
Lugbe	⅓	½	⅓	½	3	1/2	3	3	2	½	1	2	2
Kado	½	⅓	¼	⅓	2	⅓	3	2	⅓	½	½	1	½
Wuye	⅓	⅓	1/5	⅓	2	½	3	2	⅓	½	½	2	1

Table 4: The Syntheses Matrix of the table 3.

Location	Garki I	Garki II	Wuse I	Wuse II	Cent. A.	Gwarinpa	Maitama	Asokoro	Jabi	Durimi	Lugbe	Kado	Wuye	**Priority**
Garki I	0.1165	0.1970	0.1049	0.0706	0.1231	0.1679	0.0909	0.1127	0.1274	0.1525	0.1744	0.0759	0.1161	**0.1254**
Garki II	0.0583	0.0985	0.1049	0.0706	0.1538	0.1119	0.1136	0.1127	0.1911	0.1017	0.1163	0.1139	0.1161	**0.1126**
Wuse I	0.2330	0.1970	0.2098	0.2824	0.1538	0.2239	0.0909	0.1408	0.1911	0.2034	0.1744	0.1519	0.1935	**0.1882**
Wuse II	0.2330	0.1970	0.1049	0.1412	0.1231	0.1679	0.0909	0.1127	0.1274	0.1525	0.1163	0.1139	0.1161	**0.1382**
Cent. A.	0.0291	0.0197	0.0420	0.0353	0.0308	0.0280	0.1364	0.0845	0.0318	0.0254	0.0194	0.0190	0.0194	**0.0401**
Gwarinpa	0.0388	0.0493	0.0524	0.0471	0.0615	0.0560	0.0682	0.0563	0.0318	0.1017	0.1163	0.1139	0.0774	**0.0670**
Maitama	0.0156	0.0125	0.0156	0.0156	0.0104	0.0208	0.0625	0.0313	0.0208	0.0208	0.0208	0.0208	0.0208	**0.0222**
Asokoro	0.0291	0.0246	0.0420	0.0353	0.0103	0.0280	0.0455	0.0282	0.0127	0.0169	0.0194	0.0190	0.0194	**0.0254**
Jabi	0.0583	0.0328	0.0699	0.0706	0.0615	0.1119	0.0682	0.0563	0.0637	0.1017	0.0291	0.0759	0.1161	**0.0705**
Durimi	0.0388	0.0493	0.0524	0.0471	0.0615	0.0280	0.0682	0.0845	0.0318	0.0508	0.1163	0.1139	0.0774	**0.0631**
Lugbe	0.0388	0.0493	0.0699	0.0706	0.0923	0.0112	0.0682	0.0845	0.1274	0.0254	0.0581	0.0759	0.0774	**0.0653**
Kado	0.0583	0.0328	0.0524	0.0471	0.0615	0.0187	0.0682	0.0563	0.0212	0.0254	0.0291	0.0380	0.0194	**0.0406**
Wuye	0.0388	0.0328	0.0420	0.0471	0.0615	0.0280	0.0682	0.0563	0.0212	0.0254	0.0116	0.0759	0.0387	**0.0421**

$$\lambda_{max} = 13.9500, \ CI = 0.0792, \ RI = 1.5551 \ and \ CR = \frac{CI}{RI} = 0.0509 \ < 0.1, \ is \ OK$$

From tables 3 and 4:

Table5: The Pair wise Comparison Matrix Showing Preferences for the Collection centers based on **VP** Settlement Pattern

Location	Garki I	Garki II	Wuse I	Wuse II	Cent. A.	Gwarinpa	Maitama	Asokoro	Jabi	Durimi	Lugbe	Kado	Wuye
Garki I	1	2	2	2	½	3	⅓	⅓	2	3	3	3	3
Garki II	½	1	½	½	⅓	2	⅓	¼	2	3	½	½	3
Wuse I	½	2	1	½	½	2	⅓	¼	½	2	½	2	3
Wuse II	½	2	2	1	½	2	¼	⅓	2	2	2	3	3
Cent. A.	2	3	2	2	1	3	⅓	½	3	3	3	3	4
Gwarinpa	⅓	½	½	½	⅓	1	½	¼	½	2	½	2	2
Maitama	3	3	3	4	3	2	1	4	3	3	4	4	4
Asokoro	3	4	4	3	2	4	¼	1	4	4	3	4	5
Jabi	½	½	2	½	⅓	2	⅓	¼	1	2	2	2	2
Durimi	⅓	⅓	½	½	⅓	½	⅓	¼	½	1	½	½	2
Lugbe	⅓	2	2	½	⅓	2	¼	⅓	½	2	1	2	2
Kado	⅓	2	½	⅓	⅓	½	¼	¼	½	2	½	1	2
Wuye	⅓	⅓	⅓	⅓	¼	½	¼	1/5	½	½	½	½	1

Table 6: The Syntheses Matrix of table 5

Location	Garki I	Garki II	Wuse I	Wuse II	Cent. A.	Gwarinpa	Maitama	Asokoro	Jabi	Durimi	Lugbe	Kado	Wuye	**Priority**
Garki I	0.0789	0.0882	0.0984	0.1277	0.0513	0.1224	0.0702	0.0406	0.1000	0.1017	0.1429	0.1091	0.0833	**0.0934**
Garki II	0.0395	0.0441	0.0246	0.0319	0.0342	0.0816	0.0702	0.0305	0.1000	0.1017	0.0238	0.0182	0.0833	**0.0526**
Wuse I	0.0395	0.0882	0.0492	0.0319	0.0513	0.0816	0.0702	0.0305	0.0250	0.0678	0.0238	0.0727	0.0833	**0.0550**
Wuse II	0.0395	0.0882	0.0984	0.0638	0.0513	0.0816	0.0526	0.0406	0.1000	0.0678	0.0952	0.1091	0.0833	**0.0747**
Cent. A.	0.1579	0.1324	0.0984	0.1277	0.1026	0.1224	0.0702	0.0610	0.1500	0.1017	0.1429	0.1091	0.1111	**0.1144**
Gwarinpa	0.0263	0.0221	0.0246	0.0319	0.0342	0.0408	0.1053	0.0305	0.0250	0.0678	0.0238	0.0727	0.0556	**0.0431**
Maitama	0.1875	0.1875	0.1875	0.2500	0.1875	0.1250	0.0625	0.2500	0.1875	0.1875	0.2500	0.2500	0.2500	**0.1971**
Asokoro	0.2368	0.1765	0.1967	0.1915	0.2051	0.1633	0.0526	0.1220	0.2000	0.1356	0.1429	0.1455	0.1389	**0.1621**
Jabi	0.0395	0.0221	0.0984	0.0319	0.0342	0.0816	0.0702	0.0305	0.0500	0.0678	0.0952	0.0727	0.0556	**0.0577**
Durimi	0.0263	0.0147	0.0246	0.0319	0.0342	0.0204	0.0702	0.0305	0.0250	0.0339	0.0238	0.0182	0.0556	**0.0315**
Lugbe	0.0263	0.0882	0.0984	0.0319	0.0342	0.0816	0.0526	0.0406	0.0250	0.0678	0.0476	0.0727	0.0556	**0.0556**
Kado	0.0263	0.0882	0.0246	0.0213	0.0342	0.0204	0.0526	0.0305	0.0250	0.0678	0.0238	0.0364	0.0556	**0.0390**
Wuye	0.0263	0.0147	0.0164	0.0213	0.0256	0.0204	0.0526	0.0244	0.0250	0.0169	0.0238	0.0182	0.0278	**0.0241**

From tables 5 and 6: $\lambda_{max} = 14.1111,$ $CI = 0.0926,$ $RI = 1.5551$ *and* $CR = \dfrac{CI}{RI} = 0.0595 < 0.1$ *is ok*

Table7: The Pair wise Comparison Matrix Showing Preferences for the Collection centers based on **RNDC** Settlement Pattern

Location	Garki I	Garki II	Wuse I	Wuse II	Cent. A.	Gwarinpa	Maitama	Asokoro	Jabi	Durimi	Lugbe	Kado	Wuye
Garki I	1	2	3	2	2	2	2	4	4	2	3	3	4
Garki II	½	1	½	½	¼	⅓	3	2	3	3	3	2	3
Wuse I	⅓	2	1	2	½	½	2	3	3	2	2	2	3
Wuse II	½	2	½	1	½	½	2	2	3	2	3	3	4
Cent. A.	½	4	2	2	1	2	2	3	3	3	2	4	3
Gwarinpa	½	3	2	2	½	1	2	2	2	3	2	2	4
Maitama	½	⅓	½	½	½	½	1	½	½	⅓	⅓	½	2
Asokoro	¼	⅓	⅓	½	⅓	½	2	1	½	⅓	½	3	4
Jabi	¼	⅓	⅓	⅓	⅓	½	2	2	1	½	½	½	2
Durimi	½	⅓	½	½	⅓	⅓	3	3	2	1	2	2	2
Lugbe	⅓	⅓	½	⅓	½	½	3	2	2	½	1	½	2
Kado	⅓	½	½	⅓	¼	½	2	⅓	2	½	2	1	2
Wuye	¼	⅓	⅓	¼	⅓	¼	½	¼	½	½	½	½	1

Table 8: The Syntheses Matrix of table 7

Location	Garki I	Garki II	Wuse I	Wuse II	Cent. A.	Gwarinpa	Maitama	Asokoro	Jabi	Durimi	Lugbe	Kado	Wuye	**Priority**
Garki I	0.1739	0.1200	0.2500	0.1633	0.2727	0.2124	0.0755	0.1595	0.1509	0.1071	0.1374	0.1250	0.1111	**0.1584**
Garki II	0.0870	0.0600	0.0417	0.0408	0.0341	0.0354	0.1132	0.0797	0.1132	0.1607	0.1374	0.0833	0.0833	**0.0823**
Wuse I	0.0580	0.1200	0.0833	0.1633	0.0682	0.0531	0.0755	0.1196	0.1132	0.1071	0.0916	0.0833	0.0833	**0.0938**
Wuse II	0.0870	0.1200	0.0417	0.0816	0.0682	0.0531	0.0755	0.0797	0.1132	0.1071	0.1374	0.1250	0.1111	**0.0924**
Cent. A.	0.0870	0.2400	0.1667	0.1633	0.1364	0.2124	0.0755	0.1196	0.1132	0.1607	0.0916	0.1667	0.0833	**0.1397**
Gwarinpa	0.0870	0.1800	0.1667	0.1633	0.0682	0.1062	0.0755	0.0797	0.0755	0.1607	0.0916	0.0833	0.1111	**0.1114**
Maitama	0.0313	0.0208	0.0313	0.0313	0.0313	0.0313	0.0625	0.0313	0.0313	0.0208	0.0208	0.0313	0.1250	**0.0385**
Asokoro	0.0435	0.0300	0.0278	0.0408	0.0455	0.0531	0.0755	0.0399	0.0189	0.0179	0.0229	0.1250	0.1111	**0.0501**
Jabi	0.0435	0.0200	0.0278	0.0272	0.0455	0.0531	0.0755	0.0797	0.0377	0.0268	0.0229	0.0208	0.0556	**0.0412**
Durimi	0.0870	0.0200	0.0417	0.0408	0.0455	0.0354	0.1132	0.1196	0.0755	0.0536	0.0916	0.0833	0.0556	**0.0664**
Lugbe	0.0580	0.0200	0.0417	0.0272	0.0682	0.0531	0.1132	0.0797	0.0755	0.0268	0.0458	0.0208	0.0556	**0.0527**
Kado	0.0580	0.0300	0.0417	0.0272	0.0341	0.0531	0.0755	0.0133	0.0755	0.0268	0.0916	0.0417	0.0556	**0.0480**
Wuye	0.0435	0.0200	0.0278	0.0204	0.0455	0.0265	0.0189	0.0100	0.0189	0.0268	0.0229	0.0208	0.0278	**0.0254**

From table 7 and 8: $\lambda_{\max} = 14.3104$, $CI = 0.1092$, $RI = 1.5551$ $\ and\ CR = \dfrac{CI}{RI} = 0.0702 < 0.1\ is\ ok$.

Table 9: The Pair wise Comparisons of the three Settlement Patterns

S/No.	Pair wise Comparison	More Important Criterion	How Much More Important	Numerical Rating
1	PD-VP	PD	Strongly to very strongly more important	6
2	PD-RNDC	PD	Moderately to strongly more important	4
3	VP-RNDC	VP	Moderately more important	3

Table 10: The Pair wise Comparison Matrix

Settlement Pattern	PD	VP	RNDC
PD	1	5	2
VP	1/5	1	3
RNDC	½	1/3	1

Table 11: The Syntheses Matrix of table 10

Settlement Pattern	PD	VP	RNDC	Priority
PD	0.5882	0.7895	0.3333	**0.5703**
VP	0.1176	0.1579	0.5000	**0.2585**
RNDC	0.2941	0.0526	0.1667	**0.1711**

$$\lambda_{max} = 3.0523, \quad CI = 0.0262, \quad RI = 0.5245, \quad CR = \frac{CI}{RI} = 0.0499 < 0.1$$

The judgment is consistent

Table 12: Summary of Relative Weights for each Collection Centres according to Settlement Pattern

Waste Collection Centers	Settlement Patterns		
	PD	VP	RNDC
Garki I	0.1254	0.0934	0.1584
Garki II	0.1126	0.0526	0.0823
Wuse I	0.1882	0.0550	0.0938
Wuse II	0.1382	0.0747	0.0924
Cent. A.	0.0401	0.1144	0.1397
Gwarinpa	0.0670	0.0431	0.1114
Maitama	0.0222	0.1971	0.0385
Asokoro	0.0254	0.1621	0.0501
Jabi	0.0705	0.0577	0.0412
Durimi	0.0631	0.0315	0.0664
Lugbe	0.0653	0.0556	0.0527
Kado	0.0406	0.0390	0.0480
Wuye	0.0421	0.0241	0.0254

Table 13: Rankings of the Collection Centres for Disposal of Population Density Settlement Pattern

Location/Collection Sites	Weight	Ranking
Wuse I	0.1882	1st
Wuse II	0.1382	2nd
Garki I	0.1254	3rd
Garki II	0.1126	4th
Jabi	0.0705	5th
Gwarinpa	0.0670	6th
Lugbe	0.0653	7th
Durimi	0.0631	8th
Wuye	0.0421	9th
Kado	0.0406	10th
Cent. A	0.0401	11th
Asokoro	0.0254	12th
Maitama	0.0222	13th

Table 14: Ranked Ratings of the Collection sites for Disposal at Very Important Persons Settlement Pattern

Location/Collection Sites	Weight	Ranking
Maitama	0.1971	1st
Asokoro	0.1621	2nd
Cent. A	0.1144	3rd
Garki I	0.0934	4th
Wuse II	0.0747	5th
Jabi	0.0577	6th
Lugbe	0.0556	7th
Wuse I	0.0550	8th
Garki II	0.0526	9th
Gwarinpa	0.0431	10th
Kado	0.0390	11th
Durimi	0.0315	12th
Wuye	0.0241	13th

Table 15: Ranked Ratings of the Collection sites for Disposal of Road Network /Drainage Channel Settlement Pattern

Location/Collection Sites	Weight	Ranking
Wuse I	0.1882	1st
Wuse II	0.1382	2nd
Garki I	0.1254	3rd
Garki II	0.1126	4th
Jabi	0.0705	5th
Gwarinpa	0.0670	6th
Lugbe	0.0653	7th
Durimi	0.0631	8th
Wuye	0.0421	9th
Kado	0.0406	10th
Cent. A	0.0401	11th
Asokoro	0.0254	12th
Maitama	0.0222	13th

IV. DISCUSSION OF RESULTS AND CONCLUSION

The computations and the results from Table 11 ranked the settlement patterns as follows: population density settlement should be given top most priority followed by Very Important Persons settlement and Road Network and Drainage Channel given least priority as indicated by their respect weights 0.5703, 0.2585 and 0.1711.

Table 12 contains the summary of the relative weights determined from the pair-wise comparism matrices for the thirteen collection centres within the respective settlement patterns. Based on the results of this table, the rankings of the collection centres within each settlement pattern were derived as contained on tables 13 to 14.

The results obtained in this study demonstrated that AHP can be applied to determine relative weights. In this study it has been applied to determine weights of the settlement patterns within respective collection centres, relative weights of the collection centres and the relative weights of the settlement patterns. These weights are the numerical measures that ranked the disposal of solid wastes at each settlement pattern within a collection area. This serves as information for proper planning towards solid waste disposal in Abuja Metropolitan Council and is therefore recommended for implementation by the Solid Waste Management Agency, Abuja.

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Generation of Optical Carrier Suppressed Signal for Radio-over-Fiber (RoF) System Using Dual-Drive Mach-Zehnder Modulator

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Abstract- This paper presents the generation of optical carrier suppressed signal for RoF system. RoF refers to an analog transmission over fiber technology where light is modulated by radio frequency (RF) signal and transmitted over an optical fiber link to wireless access. Both optical carrier suppression and signal modulation are made by using a Dual-Drive Mach-Zehnder modulator (DD-MZM). Suppressed carrier modulation is achieved by biasing at the null point of DD-MZM. Optical carrier suppression improves the performance of RoF system such as link gain and noise figure (NF). In this research, a single RF at 2100 MHz having data rate of a 1 Gbps modulates the 1550.12 nm optical carrier in the DD-MZM. In this paper, the carrier suppression and performances of RoF system are investigated by theory and simulation. The various values of optical carrier suppression ratio can be obtained by adjusting the extinction ratio of the DD-MZM. The transmission performance of the proposed system is verified by the simulation results.

Index Terms- Optical carrier suppression, Dual-Drive Mach-Zehnder modulator (DD-MZM), Single Mode Fiber (SMF), Radio-over-Fiber (RoF) system.

I. INTRODUCTION

The RoF is a technology used to distribute RF signals over analog optical links. In such RoF system, radio frequency (RF) signals are modulated onto an optical carrier at a central station (CO) and then transported to remote sites or base stations (BS) using optical fiber. The BS then transmits the RF signal over small signal areas using microwave antennas. Radio-over-Fiber (RoF) system are widely applied in applications because of lightweight, low loss, high capacity and high immunity to electromagnetic interferences [1-2]. In RoF system, although the optical carrier does not contain any information, it consumes most of the total optical power in quadrature-biased modulation link. Therefore, optical carrier power is essentially suppressed to improve performances of RoF link. The factors of performances of RoF link include link gain and noise figure (NF). Carrier suppression significantly reduces the noise contributions such as noise figure, thermal noise and shot noise [3]. Mach-Zehnder modulators are used to generate optical RF signal with double-sideband and carrier suppression [4]. Optical carrier suppression causes frequency doubling [5]. Many approaches are used to suppress undesired optical carrier such as low biasing Mach-Zehnder modulator [6], optical carrier filtering [7] and Stimulated Brillouin scattering [8].

Among them, low biasing Dual-Drive Mach-Zehnder modulator (DD-MZM) has been chosen in this research. Mach-Zehnder modulator has demonstrated to be a good carrier suppression but more input optical power is needed to keep the same modulation efficiency. The optical carrier suppression with DD-MZM has been used for both frequency up conversion and signal modulation. The important factor of carrier suppression ratio is the extinction ratio (ER) of DD-MZM. In this paper, optical carrier suppression, improvement of performances and generation of microwave baseband signal in RoF system are analyzed by the simulated signal waveforms, optical carrier-suppressed spectrum and bit-error-rate measurement. The simulation results are carried out by using Optisystem software.

II. THEORETICAL ANALYSIS OF MICROWAVE (MW) SIGNAL GENERATION BY OPTICAL CARRIER SUPPRESSION

A. Generation of MW Signal and Optical Carrier Suppression using DD-MZM Analysis
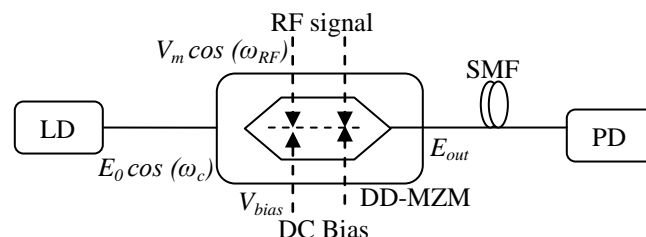
Fig. 1. The principle of optical carrier suppression and generation of MW signal.

Fig. 1 shows the principle of optical carrier suppression and generation of MW signal. Suppressed carrier modulation is achieved by biasing a DD-MZM such that the optical carrier components cancel at the output of the modulator. The power splitting ratio of both arms of DD-MZM is $r_1 = r_2 = 0.5$. An optical carrier out of one arm of the DD-MZM is expressed as

$$E_{out}(t) = E_0 \cos[\pi V(t)/2V_\pi]\cos(\omega_c t) \tag{1}$$

where E_0 and ω_c are the amplitude and angular frequency of the input optical carrier, respectively, V_π is the half-wave voltage of the DD-MZM and $V(t)$ is the applied driving voltage. The loss of DD-MZM is neglected. $V(t)$ consisting of an electrical sinusoidal signal and a dc biased voltage is given by

$$V(t) = V_{bias} + V_m \cos(\omega_{RF} t) \tag{2}$$

where V_{bias} is the dc biased voltage, V_m and ω_{RF} are the modulation voltage and the angular frequency of electrical driving signal, respectively. Therefore, the output of the DD-MZM converted from exponentials to sinusoidal results in

$$\begin{aligned} E_{out}(t) &= E_0 \cos(\pi/2[V_{bias}/V_\pi + V_m/V_\pi \cos(\omega_{RF} t)])\cos(\omega_c t) \\ &= E_0\{\cos x.\cos[m\cos(\omega_{RF} t)] - \sin x.\sin[m\cos(\omega_{RF} t)]\}\cos(\omega_c t) \end{aligned} \tag{3}$$

Where $x = (V_{bias}/2V_\pi)\pi$ is a constant phase shift that is induced by the dc biased voltage, and $m = (V_m/2V_\pi)\pi$ is the phase modulation index. Equation (3) is expanded by using Bessel functions as detailed in Appendix I.
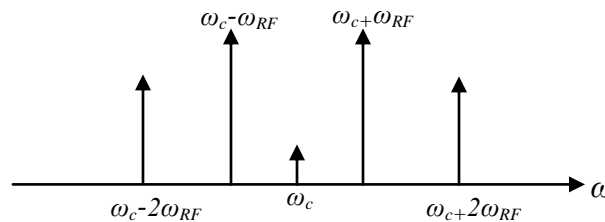
Fig. 2. The optical spectrum of the MW signals
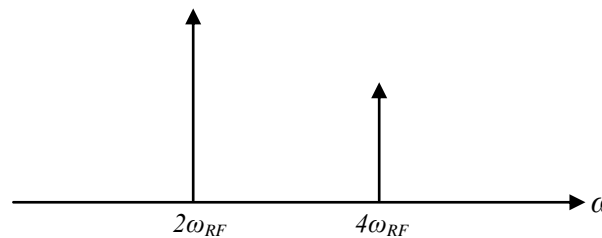
Fig. 3 Illustration of the electrical spectrum of generated MW signal using DD-MZM after PD detection.

Fig. 2 shows the optical spectrum of the MW signal obtained by optical carrier suppression modulation with the DD-MZM biased at the null point. After being detected by the photo-diode (PD), the electrical spectrum of the generated MW signal is achieved. Fig. 3 presents transmission electrical spectrum of the generated MW signal. The double-frequency signal ($2\omega_{RF}$) and the even terms of the harmonic distortions are observed.

B. Operation and Transfer Function of DD-MZM

The most popular modulator in optical communication systems is the Lithium Niobate (LiNbO$_3$) MZM. There are two types of MZM: single drive MZM and dual-drive MZM. The optical wave enters from the input side and then splits equally into two arms. The structure of the dual-drive MZM has two arms and electrodes. Data and inverted data are used by the DD-MZM to generate the intensity modulation. The modulation voltages are applied to both arms of the interferometer and phase changes of ± л/2 in the arms of the interferometer. When operating the DD-MZM at the appropriate bias null point or minimum point, optical carrier-suppressed

signal exits the output port. When the DD-MZM is biased at the quadrature point, the information carrying sidebands with optical carrier exit the output port. The RF-driven signals are applied to the two arms with different phase shifts and the two arms are biased by different DC voltages. The optical phase in each arm can be controlled by changing the voltage applied on the electrode. The transfer function of MZM is shown in Fig. 4 for optical carrier power suppression and double frequency generation.

The DD-MZM suppresses undesired optical carrier power. To suppress optical carrier power, the modulation is biased at the null point. These optical carrier power can degrade the performance of RoF system such as link gain and noise figure (NF). Thus, undesired optical carrier power needs to be suppressed. The bias voltage modulates at the null point to suppress undesired carrier power and then not only increased link gain but also reduced noise figure will be improved by the bias voltage. This performances relate to the bias voltage, as shown in Appendix I. Moreover, the more the value of ER, the more the power splitting ratio. The power splitting ratio of DD-MZM will be 0.5 when the ER is 30 dB. This is the best condition to suppress undesired carrier power. The MW signal is produced by optical carrier suppression modulation, the two first-order sidebands are the desired optical signals and the undesired optical carrier suppression are the key parameter in the RoF system. The Optisystem software is used to simulate the carrier suppression and generation of MW signal.
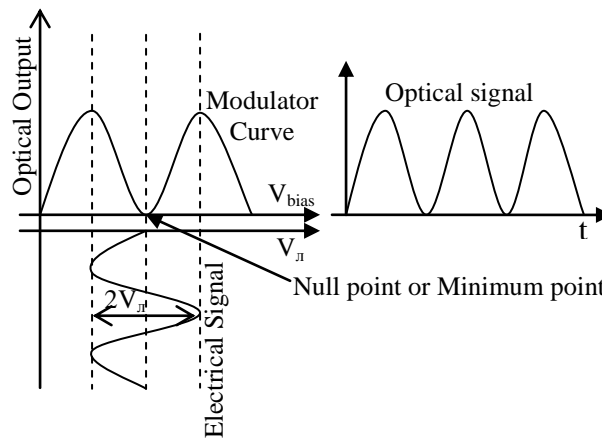
Fig. 4. The transfer function of Mach-Zehnder Modulator

III. SIMULATION OF CARRIER SUPPRESSION IN ROF SYSTEM

A. *Simulation Setup for the Proposed System*
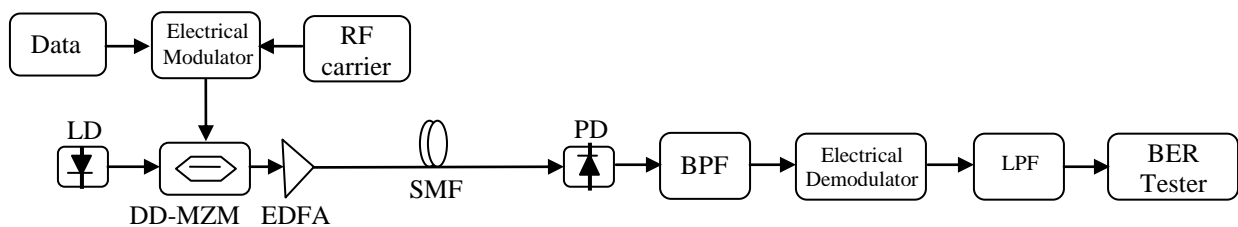
Fig. 6. The simulation setup of the RoF system for optical carrier suppression.

Fig. 6 illustrates the simulation setup of the RoF system with the carrier suppression using DD-MZM. The continuous wave is generated by a laser with a wavelength at 1550.12 nm. The radio frequency (RF) signal is generated by amplitude modulating 2100 MHz RF signal by 1 Gbps pseudorandom bit sequence data stream. The optical signal is modulated by the RF signal in the DD-MZM. The MZM is biased at the minimum transmission point and driven with 2100 MHz sine waves having a peak-to-peak amplitude of $2V_\pi$ (driving voltage). The V_π of the DD-MZM is 4 V at direct current (DC) frequency. The biased voltages are 0 V to 4 V ranges. The frequency difference of two optical sidebands is twice the frequency of the electrical driving signal after optical carrier power is suppressed at the DD-MZM. And then, the generated optical signal is amplified by using an erbium-doped fiber amplifier (EDFA) with 10 dB gain but the amplified spontaneous emission (ASE) noise was generated by EDFA. The optical signal is transmitted over 8-km SMF. After it is transmitted over 8-km SMF, the optical signal is converted to electrical signal by using PD at the BS and then the output is filtered by band-pass filter (BPF) with 4200 MHz. After filtering, the output is amplified by using an electrical amplifier. Finally the output electrical signal is demodulated by electrical demodulator and then a low-pass filter (LPF) is employed to reject the

undesired RF components and then the baseband signal is analyzed by a bit-error-rate (BER) tester.

B.   Simulation Results and Discussion

The RF wave will be at 2100 MHz at the transmitter. A CW lightwave was generated by a laser diode (LD) with a wavelength of 1550.12 nm and modulated with DD-MZM is driven by the RF signal. The DD-MZM is biased at the null or minimum transmission point to realize optical carrier suppression modulation. The optical waveforms and spectra after the DD-MZM are shown in Fig. 7. The optical carrier suppression ratio is around 5 dB and then the optical signal was transmitted over 8-km single mode fiber (SMF). At the BS, the output optical signal is detected by PD to convert into electrical signals, as shown in Fig. 8.

The optical MW signal is achieved by using DD-MZM that adjusts the bias voltage and the extinction ratio. When the DD-MZM ER is 30 dB, the carrier suppression ratio will be the best. More ER is needed to increase the carrier suppression ratio. As the ER falls from 30 to 15, optical carrier suppression ratio (OCSR) decreases from 5 to 1.3 dB, as shown in Fig. 10. Fig. 11 presents the extinction ratio (ER) versus the carrier suppression ratio following 8-km transmission of SMF. As the DD-MZM ER falls, the carrier suppression ratio decrease. When the DD-MZM ER is 30 dB, the carrier suppression ratio is 5 dB and the receiver sensitivity of the MW signal is acceptable.

The performance of RoF system is related to the optical carrier power which can be suppressed by using DD-MZM. The optical carrier suppression depends on the extinction ratio. If extinction ratio is increased, the optical carrier suppression ratio will be increased by using DD-MZM. The Q-factor initially can also increase and then decrease as ER falls from 30 to 10, as shown in Fig. 12, and the BER is the best at the optimal ER of 30. The bit-error-rate (BER) is measured for baseband signal, both back-to-back and over the fiber as shown in Fig. 13. After the optical RF signal is transmitted over 8-km SMF, the power penalty at BER of 10^{-9} is 4.356 dB and Q-factor value is 5.63564. The Q-factor value of Back-to-Back case at the output of transmitter is 5.69845.
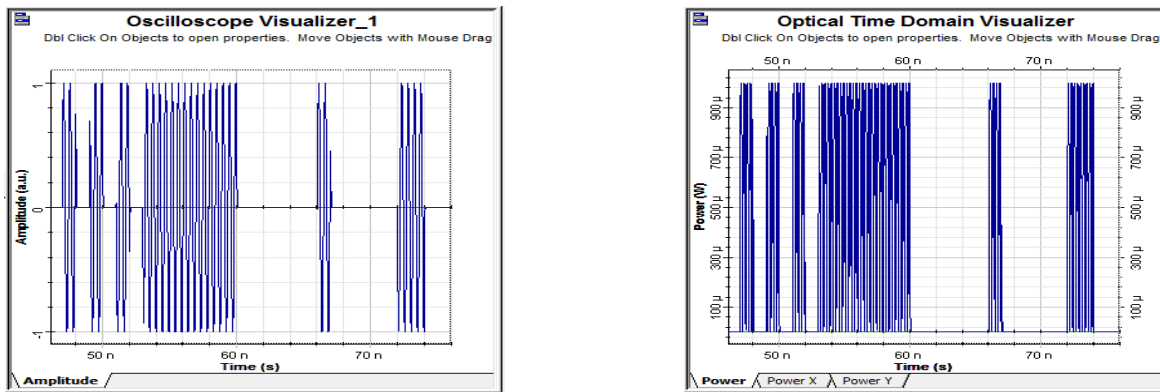
Fig. 7. The optical signal waveform and the carrier suppression spectrum at MZM output
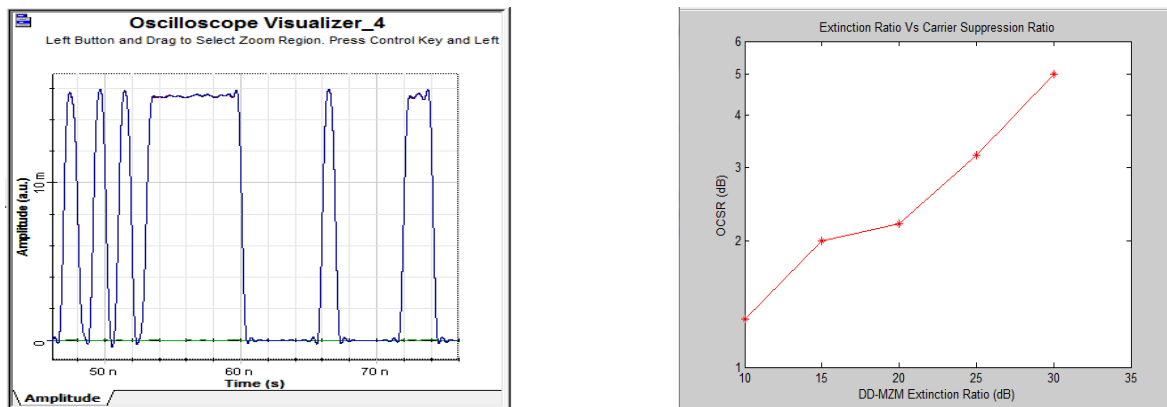
Fig. 8. The PD output RF signal   Fig. 9. The Extinction ratio and the optical carrier suppression ratio

(a)

(b)

(c)

(d)
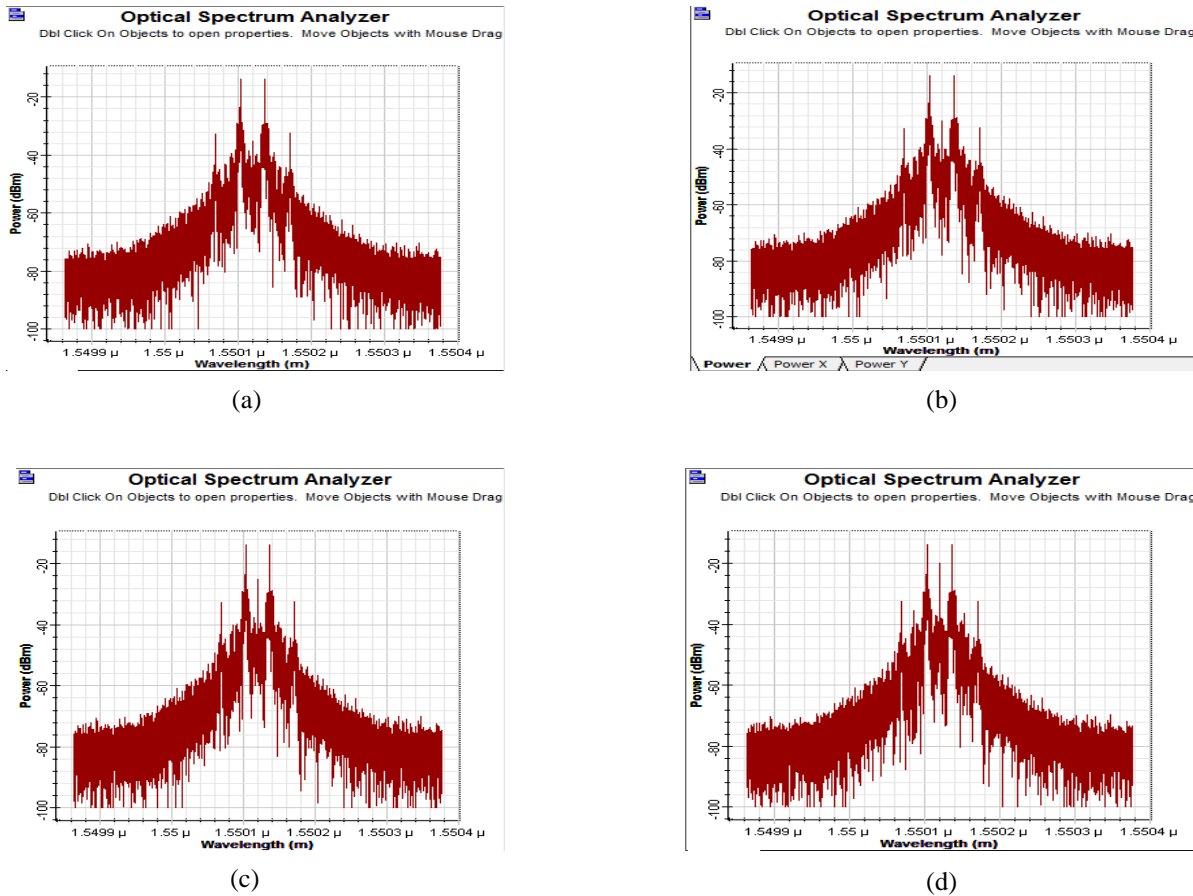
Fig. 10. The spectrum of optical carrier suppression with ER is set at (a) 30 dB, (b) 25 dB, (c) 20 dB, and (d)15 dB.
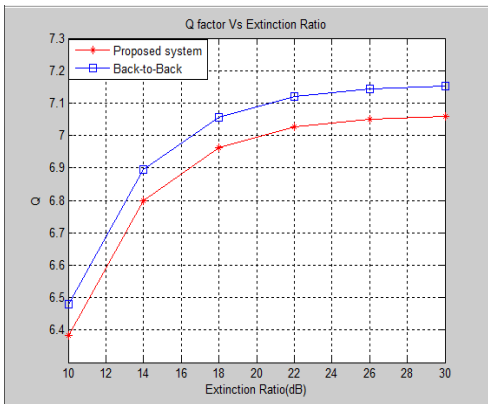
Fig. 11. Q-factor Vs Extinction Ratio
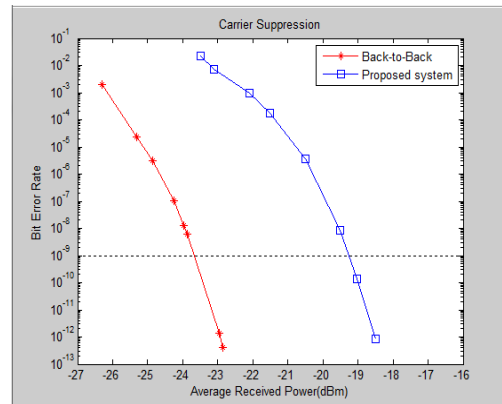
Fig. 12. BER curves of optical microwave signals after transmission over 8-km SMF and BTB.

IV. CONCLUSION

The generated electrical MW signal, performances of RoF system and optical carrier suppression was investigated with the simulation. The performance of RoF system and the optical carrier suppression using DD-MZM was theoretically studied. Moreover, the Q-factor, extinction ratio (ER) and power splitting ratio have been also discussed. According to the simulation results, more

extinction ratio of DD-MZM is required for better carrier suppression.

APPENDIX I

Equation (1) is expanded with Bessel function at the output of the DD-MZM as

$$E_{out}(t) = E_0 \cos x \left\{ \begin{array}{l} J_0(m)\cos(\omega_c t) \\ + \sum\limits_{n=1}^{\alpha} \left[\begin{array}{l} J_{2n}(m)\cos(\omega_c t + 2n\omega_{RF} t - n\pi) \\ + J_{2n}(m)\cos(\omega_c t - 2n\omega_{RF} t + n\pi) \end{array} \right] \right\}$$
$$+ E_0 \sin x \left\{ \sum\limits_{n=1}^{\alpha} \left[\begin{array}{l} J_{2n-1}(m)\cos(\omega_c t + (2n-1)\omega_{RF} t - n\pi) \\ + J_{2n-1}(m)\cos(\omega_c t - (2n-1)\omega_{RF} t + n\pi) \end{array} \right] \right\} \qquad \text{(A1)}$$

where J_n is the Bessel function of the first order n. The first term in this equation is the carrier component, and the second and third terms are the odd and even-order sidebands respectively. If the bias voltage is equal to the driving voltage, $V_{bias} = V_\pi$, cos x = 0 and sin x = 1 because of $x = (V_{bias}/2V_\pi)\pi$. So, the output of DD-MZM with the optical carrier suppression can be written as

$$E_{out}(t) = E_0 \left\{ \sum\limits_{n=1}^{\alpha} \left[J_{2n-1}(m)\cos(\omega_c t + 2n\omega_{RF} t - n\pi) + J_{2n-1}(m)\cos(\omega_c t - (2n-1)\omega_{RF} t + n\pi) \right] \right\} \qquad \text{(A2)}$$

After suppressing the carrier power, the performances of RoF system is improved. In external modulation , the link gain can be expressed as

$$G_{link} = 10\log\left\{ P_i \left[\sin\left(\frac{\pi V_{bias}}{2V_\pi}\right)\frac{\pi\Re}{2V_\pi} \right]^2 \times R_{mod} \times R_D \right\} \qquad \text{(A3)}$$

where G_{link} is link gain, P_i is the CW input optical power to the modulator, V_π is the modulator driving voltage, $\Re$ is photo-diode responsivity, R_{mod} is modulator load resistance and R_D is photo-diode resistance. After detection using PD, the photocurrent can be expressed as

$$I_D = T_{ff}T_{mod}\Re P_i \qquad \text{(A4)}$$

where T_{ff} is fiber loss and T_{mod} is modulator loss. Noise figure includes shot noise and relative intensity noise (RIN). RIN can neglected as the optical carrier power is suppressed. The relation of noise figure and shot noise can be written as

$$NF = 10\log\left(2 + \frac{2qI_D R_{mod}}{G_{link}\kappa T} \right) \qquad \text{(A5)}$$

where q is electric charge ($\pm 1.602*10^{-19}$), K is Boltzmann's constant ($1.38*10^{-23}$) and T = 290° K.

    The optical carrier suppression will improve the performance of RoF link. The improvement of link gain depends on the biased voltage. When the link gain is increased, the noise figure will decrease. When the biased voltage is 4 V at the null point modulation, the link gain is -36 dB with carrier suppression. When the biased voltage is 2 V at the quadrature point modulation, the link gain is -42 dB without carrier suppression. The values of noise figure are 31 dB with carrier suppression and 37 dB without carrier suppression. These performances are theoretically investigated. The link gain and noise figure depend on the bias voltage.

Myanmar who gave good suggestions for this research.

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Predictors of Organizational Commitment: A Causal Analysis

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Abstract- This study investigated the causal analysis relating the human resource management (HR) practices, perceived organizational politics (POP), and perceived satisfaction level (PSL) with the mediating role of organizational identification (OI) to organizational commitment (OC) among the employees of Adventist Medical Center and Adventist Medical Center College, Iligan City, Lanao del Norte. The study used a descriptive-correlation and causal non-experimental design and the selection of sample were done through simple random sampling. Results revealed that only HR practices has direct and indirect effects to OC. It is concluded that if HR practices within organization are more favorable to the employees, they will more likely possess higher satisfaction in their works. They also tend to have strong identification with the organization, which leads them to better commitment.

Index Terms- Organizational commitment, human resource practices, organizational identification

I. INTRODUCTION

Employees play a significant role in achieving organizational objectives and analysis of the different psychological characteristics and the impact of these on the organizational commitment are very essential. Organizational commitment, in particular, has been a major field of study in recent years.

Chan et al. (2008) showed on their study that perceived organizational politics is negatively associated to workers commitment in Singapore setting. In the same study, they also revealed that organizational identification was significantly related to workers (i.e. teachers) commitment. In addition, Guchait (2007) demonstrated that the human resource practices such as performance appraisal is positively associated to organizational commitment.

Based on the earlier literature, human resource practices have been measured as one of the important factors affecting organizational commitment (Guchait, 2007). The human resource programs affect employee's perceptions on the organizational commitment to human resource efforts, which in turn affect employees' work performance (Kinicki, et al. 1992). This study investigated further the causal relationship between human resource practices, perceived organizational politics, perceived satisfaction level and organizational commitment via the mediating role of organizational identification.

II. OBJECTIVES OF THE STUDY

There are two research objectives specifically use to guide in this study. First, to determine the (zero-order) correlation between HR, POP, PSL, OI and OC. Second, to examine the role of organizational identification in mediating the relationships of HR, POP, and PSL to OC.

III. METHODS

Design and Sample

This study utilized the descriptive-correlation and causal non-experimental design. The study describes and investigates the causal association between different predictor variables such as human resource practices (PM), perceived organizational politics (POP), and perceived satisfaction level (PSL) and the mediating role of organizational identification (OI) to organizational commitment (OC).

Sample respondents of the present study are randomly selected workers of the Adventist Medical Center and Adventist Medical Center College, Iligan City. It shows that 61% (n=91) of the total respondents are female and 39% (n=59) of them are male. Mostly of the respondents have age fluctuated within 38.23 years old (sd = 10.76) and with median value of 37.50 years, in which the minimum age is 22 years old and the maximum age among the respondents is 70 years old.

Research Instruments and Validity

The study utilized different existing survey questionnaires from the literature but some modifications of items were derived from other instruments. Factor analysis and Cronbach's alpha for reliability and psychometric properties were also tested. *Organizational Commitment (OC).* This is measured using a twelve (12) Likert-type items on a 5-point scale (1-strongly disagree to 5-strongly agree). The different indicators were adapted from OC questionnaire of Guchait (2007). Factor loading for the twelve items ranges from 0.45 to 0.74 and with Cronbach's alpha of 0.82. *Human Resource Practices (PM).* This is measured using a forty-two (42) Likert-type items on a 5-point scale (1-strongly disagree to 5-strongly agree). The PM Practices questionnaires with eight (8) different areas were adapted from the work of Guchait (2007). Factor loading for the forty-two items ranges from 0.51 to 0.93 and with and with overall Cronbach's alpha of 0.97. In this study the PM is measured as the composite sum of the eight different areas. *Perceived Organizational Politics (POP).* This is measured using a four Likert-type items on a 5-point scale (1 - strongly disagree to 5 -

strongly agree). The questionnaire was adapted from Chan et. al (2008). Factor loading for the four items ranges from 0.82 to .91 and with Cronbach's alpha of 0.89. *Perceived Satisfaction Level (PSL)*. This is measured using 26 Likert- type item with a 5-point scale (1-strongly disagree to 5-strongly agree). This is a self-constructed questionnaire survey used in the organization. Factor loading for the twenty-six (26) items ranges from 0.35 to 0.81 and with Cronbach's alpha of 0.93. *Organizational Identification (OI).* This is measured using four Likert-type item with a 5-point scale (1 - strongly disagree to 5 - strongly agree). The questionnaire was adapted from Voelkl (1997). Factor loading for the four items ranges from 0.85 to 0.93 and with Cronbach's alpha of 0.91

Analysis

The proposed structural model was analyzed and tested by path analysis of relating the relationship of HR, POP, PSL, via the mediating role of OI to OC. Pearson r Correlation was also used to assess the preliminary strength of relationship between the studied variables.

IV. RESULTS

Descriptive

The result of descriptive statistics is presented in Table 1. Skewness and Kurtosis are also presented to examine the normality assumption of the studied variables. As noted, the observed values of the skewness and kurtosis of the studied variables are within the normal range values of -1 to +1, which indicates less serious violation of normality assumption. Analysis showed that HR, PSL and OI are highly correlated to OC, but no evidence of significant correlation found between POP and OC. However, POP is negatively correlated to HR, PSL, and OI. Previous result showed that perceived organizational politics has negative association to organizational identification was replicated in the present study. Also, as supported by Chan, et al. (2008), organizational identification was found to be positively associated to organizational (i.e. teacher) commitment. In addition, Guchait (2007) stressed out that human resource management was also found to be positively related to organizational commitment.

Path Analysis

The different proposed and tentative causal model of organizational commitment regressed to human resource practices, perceived organizational politics, perceived satisfaction level and the mediating role of organizational identification were examined and tested.

Tentative Models

Proposed model 1 (see Figure 1) is a tentative model showing the relationship between the predictors such as human resource practices, perceived organizational politics and perceived satisfaction level to the mediating variable (organizational identification) and the organizational commitment (criterion variable) of the respondents. Result shows that the model 1 has a chi-square value of 13.244 (4df) with a p-value of 0.010, which rejects the hypothesis of goodness of fit. This further reveals that the model needs to improve even if all

the path coefficients (standardized regression weights) are significant, in which their corresponding critical ratio exceeded 2.0. In addition, the human resource practices, perceived organizational politics and perceived satisfaction level are highly correlated with each other and have significant direct effect to organizational identification. The organizational identification in turn has significant direct link to organizational commitment. The three predictors (HR, POP and PSL) explained 54% of the variation of OC, while OI explained 19% of the variation of OC.

The causal model shows a convincing and considerable findings but the lack of model fit has more concern in any model building and identification. The model fit indices are explained by normed fit index (NFI) with a cutoff value $\geq$ 0.95, comparative fit index (CFI) and Tucker-Lewis Index (TLI) have cutoff values of $\geq$ 0.95 and root mean squared error (RMSEA) has a cutoff value of $\leq$ 0.08. Result depicts that the model is a poor fit since the X^2 (df) = 13.244, p = 0.010 is significant, the TLI value was below 0.95 and the RMSEA extends beyond the value of 0.08 (Hooper, et al., 2008). Thus, the model needs to reexamine and try to modify possible path relationship among the given variables.

Proposed model 2 (see Figure 2) shows the causal relationship between the predictors (human resource practices, perceived organizational politics and perceived satisfaction level). Result reveals that the X^2 value of 10.208 (4df) with a p-value of 0.037 is significant, which indicates the rejection of good fit. The NFI and CFI have values beyond the cutoff value of 0.95, and somewhat has RMSEA above the cut-off values of 0.08, but a little lower as compared to path model 1. Furthermore, all the path coefficients in the model are significant (CR > 2.0), and with the restriction of not allowing the perceived organizational politics related to organizational identification. This further shows that human resource practices have direct and indirect effect to the organizational commitment of the respondents, while the satisfaction level of the respondents has indirect effect to the commitment of the respondents when organizational identification is used as the mediating variable. The two predictors (HR and PSL) accounted to 51% of the variation of OI, while the direct effect of HR and OI explained 24% of the total variation of OC. Thus, the proposed model 2 clearly dictates us that the model still needs to be improved and modified as what the different indices indicated.

Final Model

Proposed model 3 (see Figure 3) shows improvement of the two previous models presented where showing the direct and indirect relationship between human resource practices, perceived organizational politics, perceive satisfaction level, the mediating role of organizational identification and the organizational commitment of the respondents. The X^2-value of 6.361 (3df) with a p-value of 0.095, which implies the non-rejection of goodness of fit. The other model fit indices such as NFI, TLI, CFI and RMSEA showed goodness of fit of the model is not rejected. All the path coefficients in the model are significant (CR > 2.0). This further illustrates that the human resource practices has direct and indirect effect to organizational commitment, while the other predictors have indirect effect to organizational commitment via mediating role of organizational identification. Furthermore, the direct effect of HR, POP and

PSL explained 53% of the total variance of OI, while the direct effect of HR and OI accounted to 24% of the total variance of OC. The path model 3 is the final causal fit model that best describes the mediating role of organizational identification between the relationship of HR, POP and PSL on organizational commitment. Thus, OI completely mediated the effect of PSL on OC, and partially mediated the effect of HR on OC.

V. DISCUSSIONS

This study examined and investigated the path analysis of organizational commitment (OC) regressed to human resource practices (HR), perceived organizational politics (POP), perceived satisfaction level (PSL) and the mediating role of organizational identification (OI). These three antecedent (HR, POP, and PSL) variables have direct effect to OI, in which POP has negative direct effect to OI. Furthermore, these three antecedents have indirect effect to OC, in which the OI have positive effect to OC.

The largest effect in the causal model was that of PSL on OI ($b = 0.52$). This result indicates that there is a strong effect of perceived satisfaction level of teachers on their sense of identification in the organization. Employees' perceptions on their degree of identification were strongly affected by their own perceived satisfaction such as job, employment, fringe benefits and work environment. The negative effect of POP on OI ($b = -0.12$) is also significant, which suggests that employees who perceived more that politics are really working in the organization, they tend to lowered their perceived sense of belongingness in the organization.

In addition, HR reflected positive direct effect on OI ($b = 0.18$) and OC ($b = 0.24$) which indicates that good human resource management practices in the organization will likely to increase the employees sense of belongingness and commitment to the organization.

There is also a positive effect of OI on OC ($b = 0.30$) which shows that employees who perceive higher sense of identification in the organization are more likely to have higher organizational commitment.

The important contribution spelled out in the current study is if we want to really consider the OC of the employees, one should look into the HR practices, the organizational identification level, perceived satisfaction and the perceived organizational politics within the organization. Results revealed that an employee who is highly committed to his/her organization - he/she should somehow have higher sense of socialization and perceived satisfaction to the organization, in which the organization possessed good human resource practices. The study found out that no significant negative relation between POP and OC (as opposed to the findings of Chan, et al. 2008 and Cropanzano, et al. 1997)). This finding is also oppose to the result of Witt, et al. (2004) which perception of politics model argued that employees are unlikely to feel committed to organizations they perceived to be political. They further suggested that politics perceptions and organizational commitment are conversely related.

On the other hand, the hypothesized HR and PSL are positively related to OI. The study interestingly revealed that the parameter estimate (path coefficient) of the mediator is positive and strong. The causal model suggested that HR and PSL affect commitment via one process. A committed human resource management includes varied practices such as training, sharing information, employment security, performance based compensation, workers participation and ensuring employees' well-being (Chang, 2005; Gardner, et al., 2011).

It is concluded that if HR practices within organization are more beneficial to the employees and they perceived higher satisfaction in their works, they also tend to have strong identification with the organization and thus leads them to have greater commitment.

Finally, this study simply points out to the idea that there are practices of human resource that really enhance the organizational commitment of the employees. The study suggested that the human resource manager should have an updated evaluation of the different practices of personnel management in order to know which practices are working and not working in the organization.

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Table 1

Skewness, Kurtosis and Correlation among Study Variables

Variables	Skewness	Kurtosis	1	2	3	4	5
1. HR	-.201	.668	--				
2. POP	-.223	-.001	-.243**	--			
3. PSL	-.469	.732	.757***	-.398***	--		
4. OI	-.278	.314	.661**	-.370***	.700***	--	
5. OC	.499	.666	.447***	-.052	.344***	.412***	--

Note: *** - p < 0.01*   *** - p < 0.001*

X^2-value (df) = 13.244 (4), p = 0.010

NFI = 0.957, TLI = 0.923, CFI = 0.969, **RMSEA = 0.125**

*Note: All path coefficients in the figure are significant (**- p<.01, ***- p<.001)*
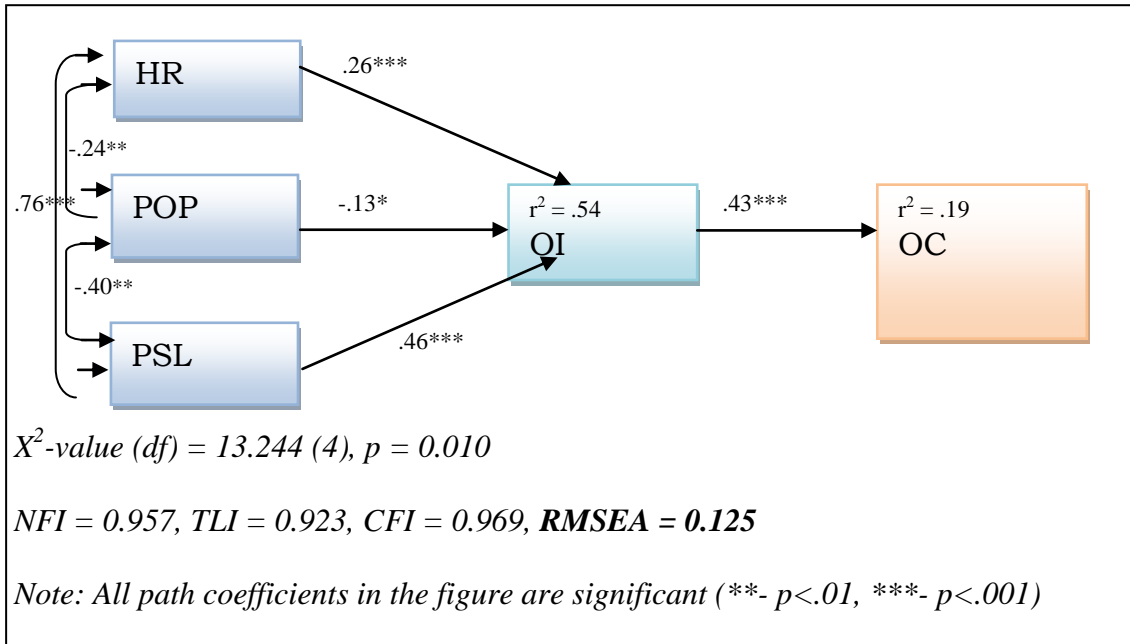
Figure 1 Proposed Model 1 of Organizational Commitment

X^2-value (df) = 10.208 (4), p = 0.037
NFI = 0.967, TLI = 0.948, CFI = 0.979, **RMSEA = 0.102**
*Note: All path coefficients in the figure are significant (**- p<.01 ***- p <.001)*
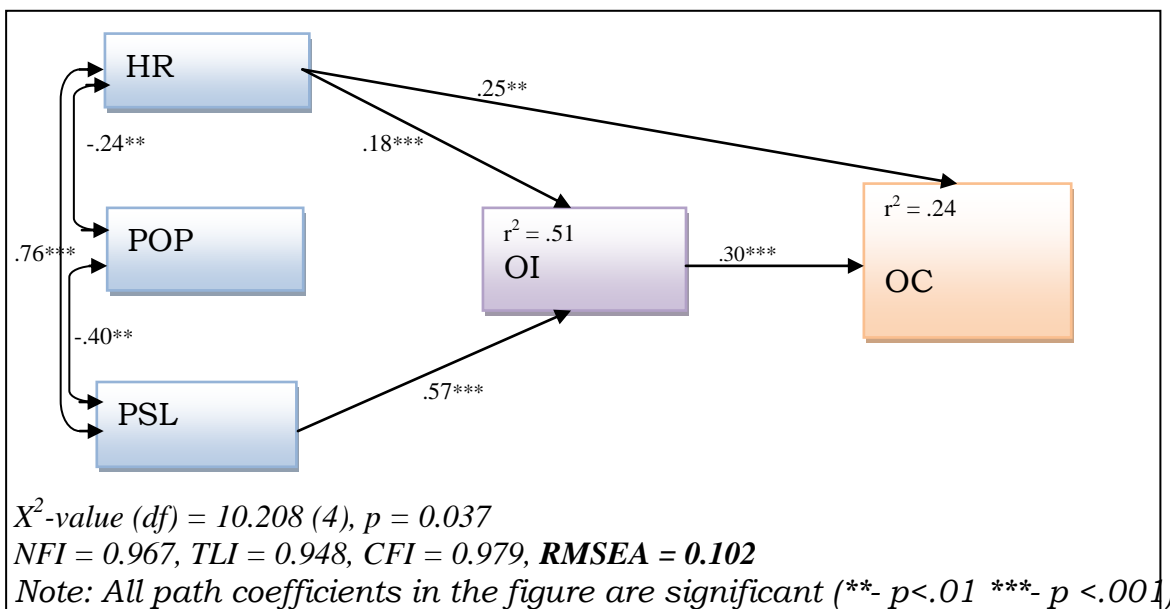
Figure 2 Proposed Model 2 of Organizational Commitment
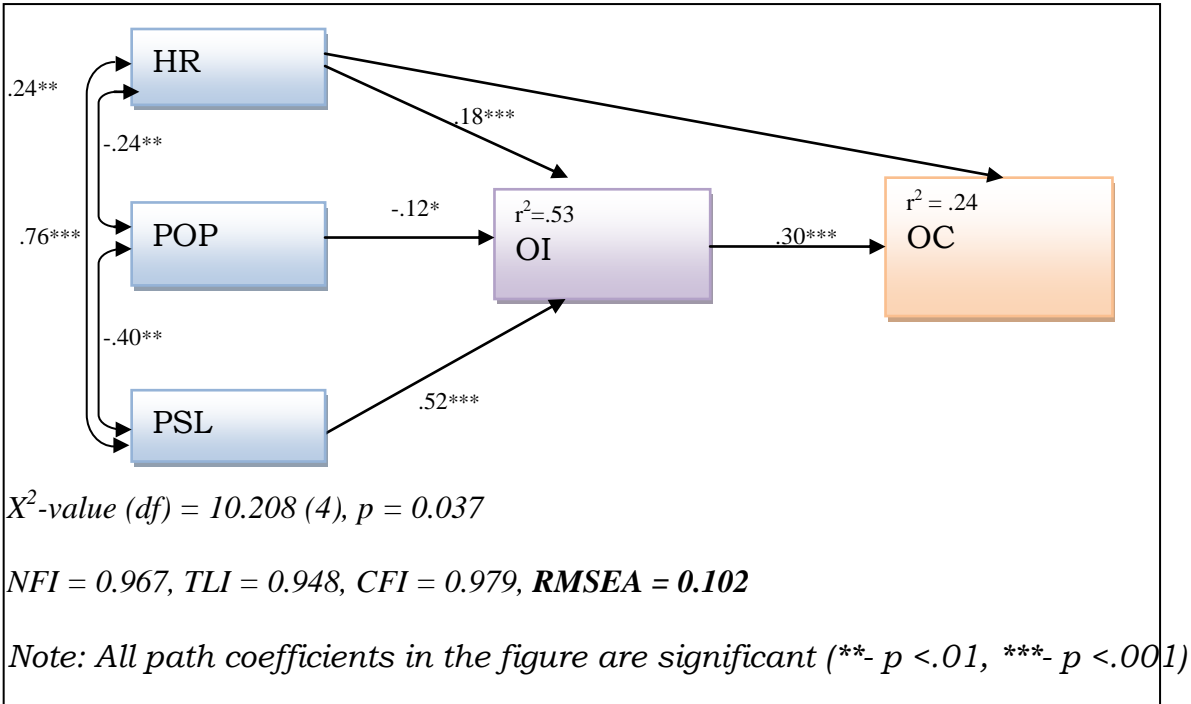
Figure 3 Final Causal Model of Organizational Commitment via the
Mediating Role of Organizational Identification

Computerized tomographic study of frontal sinus patterns in skulls of South Indian Population

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Abstract- The frontal sinuses are a part of paranasal sinuses and they are located in the frontal bone above each orbits. The structure of frontal sinus can be variable from person to person and its sizes might be different in different populations. 50 macerated skulls(Males=28, Females=22) of age group 40-60 yrs are cleaned and subjected to 3D axial multislider CT scan. Axial and coronal images of slice thickness of 4mm were obtained. Frontal sinus (symmetry and lobulations) were observed and classified. Frontal sinus symmetry was observed in 34 (68%) individuals, asymmetry in 15 (30%) individuals and frontal sinus was absent in 1(2%). The features of frontal sinus morphology make it most convenient part of the skeleton for forensic identification. Variations seen in the anatomy of frontal sinus will help otolaryngologists during surgical procedures involving frontal sinus and skull base.

Index Terms- Frontal sinus , CT scan , Skulls , Identification

I. INTRODUCTION

The frontal sinuses are two, situated in the posterior part of the superciliary arcs, between the external and internal faces of frontal bone , there is a septum between both, which usually deviates from the midline. Among the paranasal sinuses frontal sinus shows the maximum variations.[1] They are unique in every individual, even in monozygotic twins. They are not visible at birth, but begin to develop during the second year of life, become radiographically apparent at 5years of age[2]. The skull has been shown as a useful indicator of sex- the various parameters on a skull's surface, such as the supraorbital ridge, nasal aperture and mastoid process, assist in identifying the sex of skeletal remains to high levels of accuracy[3]. CT is a suitable imaging method in the identification of unknown human remains and presents a lot of advantages as compared with conventional radiographs.[4] CT scans of frontal sinus have conventionally performed with continuous 3 mm coronal and axial slices for imaging in three planes. The present study was undertaken to examine and classify variations of frontal sinus as observed in CT imaging which can be used for personal identification.

II. MATERIALS AND METHOD

Source of data: 50 skulls (Males=28, Females=22) of age group 50- 60 yrs were obtained from the recently buried bodies. JSS Medical College has got Institutional ethical committee and with its permission,   skulls were procured from the department of Anatomy.

Macerated skulls were taken, cleaned thoroughly and subjected for 3D axial multislider , Siemens sensation cardiac 16 slice CT scan at Vikram hospital Mysore. Images were obtained with slice collimation of 1mm thickness. Axial and coronal images with slice thickness of 4mm were obtained. Frontal sinus (symmetry and lobulations) were observed and classified according to symmetry , right or left dominant asymmetry and unilateral and bilateral aplasia.
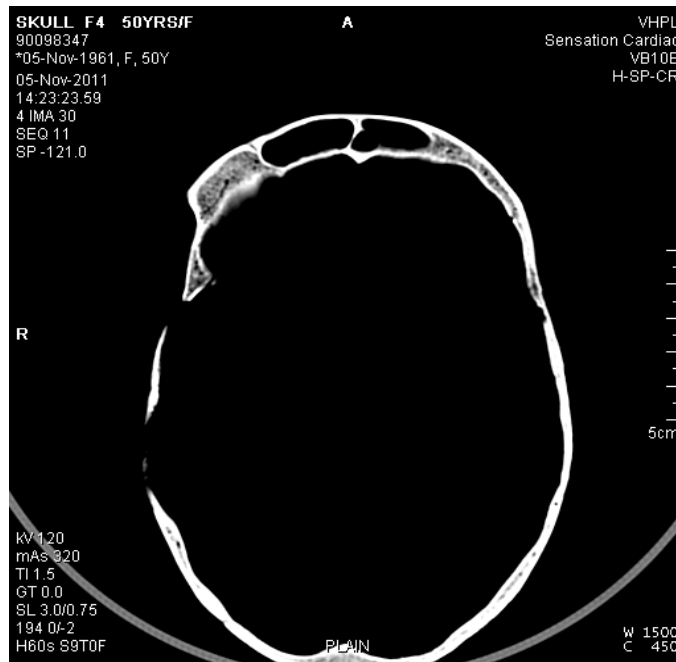
Image 1: Normal pattern of frontal sinus
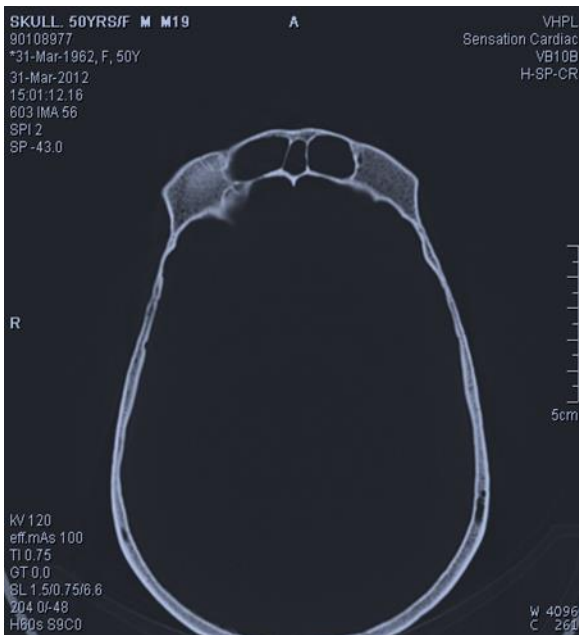
Image2 : presence of 2 septae and 3 lobulations
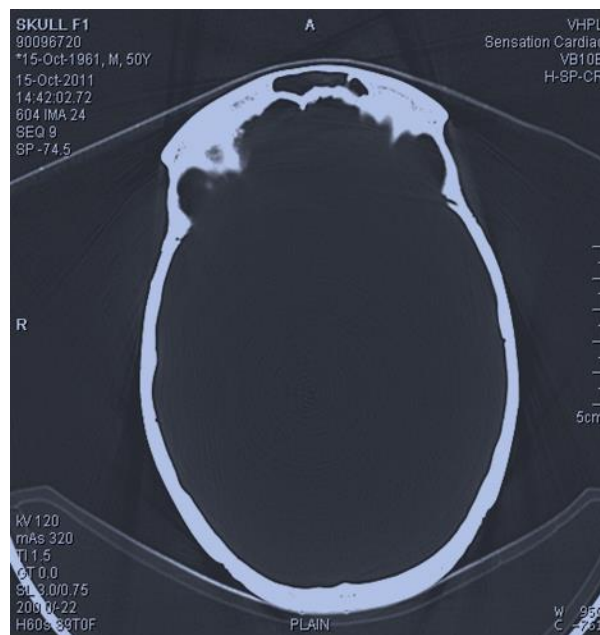
Image 3: absence of septa and one loculation

Image4:Single septum and unequal lobulations

Image5:Frontal sinus absent on both sides

III.   RESULTS

Table1: Frontal sinuses pattern in 50 dry skulls

Classification	No. of individuals		Percentage
	Males	**Females**	
Symmetry total	20 34	14	68%
Asymmetry Right Left Total	4 3 15	5 3	30%
Aplasia bilateral	1	0	2%

frontal sinus patterns

Legend: ■ Symmetry ■ asymmetry ■ aplasia
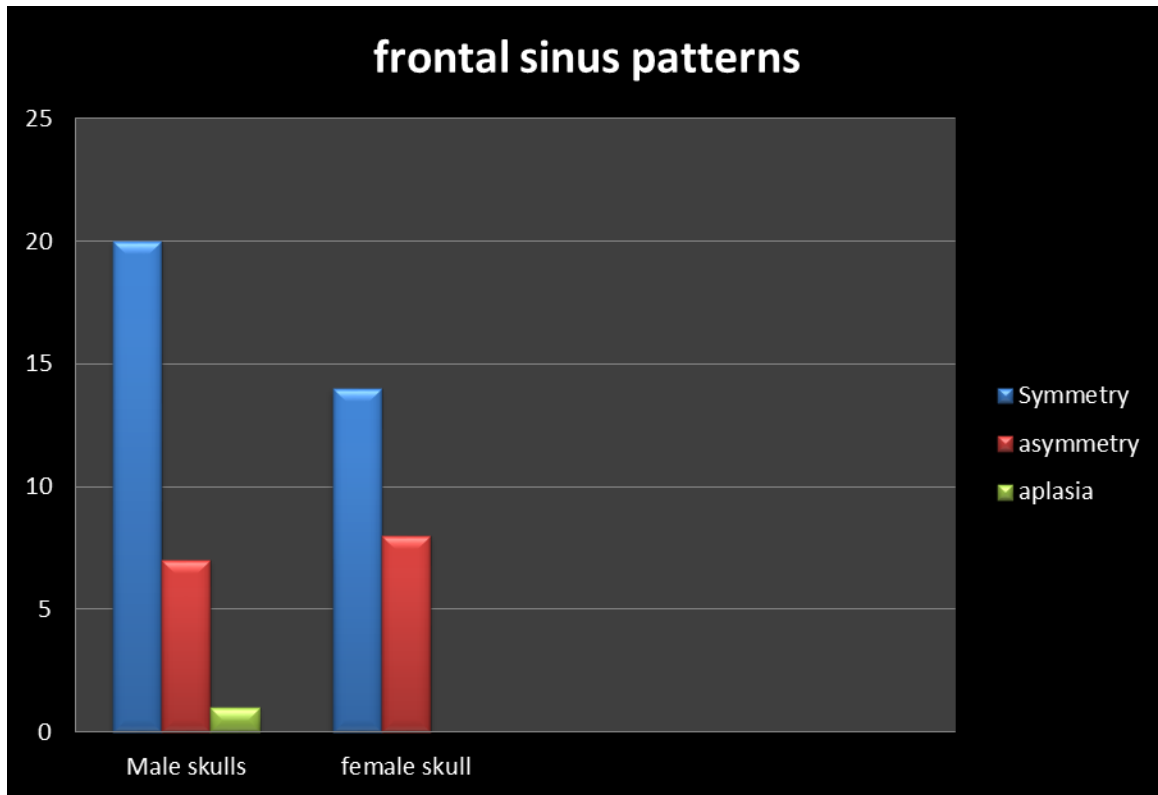
IV. DISCUSSION

In the present study frontal sinus symmetry was observed in 34 skulls (20 males and 14 females) (68%) , asymmetry in 15 skulls (7 males and 8 females) (30%) and frontal sinus was absent in 1(2%) in male skull.

David MP and othersconducted a study on 50 individuals whose age ranged from 25 to 50 years. The radiographs were recorded using a KODAK 8000 C machine and Dental Imaging Software 6.3.4. Frontal sinus and Nasal septum patterns were observed and classified. It made use of two patterns which could be covered in one radiograph. When combined usage of both frontal sinus and nasal septum patterns were assessed, they obtained 41 unique combinations, and nine individuals whose patterns matched one of the patterns of 41 individuals. Thus authors observed that frontal sinus and nasal septum patterns had considerable individual variations. They also observed frontal sinus symmetry in 29 individuals (58%) and asymmetry in 16(32%) , absent in 2 individuals (4%) and unilateral aplasia in 3 individuals (6%).[5]

Goyal M and others studied a total of 100 Paranasal sinus view radiographs of 50 males and 50 females each were evaluated for potential differences in frontal sinus configuration following the methods of Yoshino et al and Tang et al. The univariate Mann-Whitney U-test revealed statistically insignificant sexual dimorphism for Frontal Sinuses. Possible reasons for the low sexual dimorphism may be Frontal sinus' high inter-individual variability; also existing techniques that employ Frontal sinus classification systems may lead to a loss of information when features that require visual observation are grouped and assigned class numbers.[6]

Cameriere and others analysed radiographic images of the skulls of 98 Italians aged between 17-98yrs for frontal sinus patterns. The aim of this study was to improve the performance of Yoshino's method for identifying unknown skeletal remains by replacing the first two morphological items, frontal sinus size and bilateral asymmetry, by SOR1=left frontal sinus area/left orbit area and SOR2= right frontal sinus area/right orbit area.[7]

V. CONCLUSION

Detailed understanding of variations seen in the anatomy of frontal sinus will help the surgeon to avoid unnecessary complications during surgical procedures involving the frontal sinus and skull base. From our study we could conclude that use of frontal sinus patterns, as seen on ,CT Images could be used as one of the aids for personal identification. It could be adjunct to other methods of personal identification. With use of larger samples we suggest further studies, with implementation of newer parameters for the determination of gender, age, and ethnicity.

CONFLICTS OF INTEREST

No conflicts of interest for funding and from the staff members of the department for the present study.

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Histopathological and Cytogenetic analysis in oral potentially malignant disorders and oral squamous cell carcinoma : a hospital based study

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   Abstract- Tobacco related oral cancer occurs due to accumulation of genetic alterations induced by the genotoxins present in betel quid. The objective of the study was evaluate the cytogenetic damage in the peripheral blood of oral cancer patients and control subjects by anaysing the structural aberrations (STAs) .The frequency of STAs was analyzed in 60 histopathologically confirmed oral potentially malignant disorders (OPMDs) and oral squamous cell carcinoma (OSCC) patients. STAs showed a significant P value between the Controls, OPMDs & OSCC cases through ANOVA. Significant P value through t-test was also observed between the pairs of group namely Controls Vs OPMDs cases, Control Vs OSCC cases and OPMDs Vs OSCC cases. STAs showed a significant P value in the patients when compared with the controls and also showed an increased chromosomal alteration in OPMDs and further increased in OSCC thus correlating well with the clinical stages of the disease. CSAs were more than CTAs in the cases with dicentrics being more prevalent. The elevated STAs in the study group could be attributed to the fact they belong to high risk population for oral cancer. A predictor STAs identified in the present study may be used in future for early diagnosis and subsequent disease management of the tobacco related oral cancer patients.

   Index Terms- structural aberrations, oral potentially malignant disorders, oral squamous cell carcinoma, dicentrics

I. INTRODUCTION

Oral cancer is the third most common cancer in India. Nearly, 1,30,000 Indians die due to tobacco related oral cancer. Oral cancer is mainly attributed to the use of chewing betel quid and tobacco since, Indians chew tobacco than smoke it, due to which 75,000 to 80,000 new oral cancer cases have been identified in 2012 and these proportions will increase further by 2025.[1] Tobacco related oral potentially malignant disorders (OPMDs) and Oral Squamous Cell Carcinoma (OSCC) arises through an accumulation of genetic alterations, including chromosomal alterations, DNA changes and / or epigenetic alterations due to the toxins present in betel quid and tobacco. Detection, histopathological investigation, genetic tests, and treating tobacco related oral cancer patients especially in their premalignant state are the only hope in reducing the burden of this disease.
Even though the last four decades have witnessed the introduction of a number of relatively rapid genetic tests for detecting tobacco related oral cancer, a sensitive and specific test for early detection seem to be the need of the hour. The present hospital based study to assess the cytogenetic alterations in histopathologically confirmed cases of tobacco related OPMDs and OSCC employed chromosomal aberration test to identify the structural aberration known to initiate tumour progression. Although histopathological and cytogenetic study on OPMDs and OSCC patients has been extensively investigated, to the greatest of our knowledge, this work of combining histopathology and employing chromosomal structural aberration analysis is the first of its kind to be performed in Puducherry.

II. MATERIALS AND METHODS

   60 histopathologically confirmed patients referred from a tertiary care hospital, Mahatma Medical College and Research Institute (MGMCRI) in Pondicherry, with suspected OPMDs and OSCC during the years from September 2011 to May 2014 were included in the study. OPMDs and OSCC patients undergoing radiation treatment and with chromosomal anomalies like Klinefelters, Turners etc were excluded from the study. 2 ml of fresh heparinized venous blood was collected from the patients and equally matched control subjects for Leukocyte culture following standard Hungerford Method [2] to investigated structural chromosome aberrations (STAs) in OPMDs and OSCC cases. Cytogenetic damage was scored from 100 well spread Giemsa stained metaphases. Chromatid type aberration (CTA) and Chromosome type aberration (CSA) of structural aberrations were scored for the total STA. The metaphase cells were digitally imaged with Applied Spectral Imaging, Karyotyping software from ASI, Israel. Written informed consents fromthese patients and volunteering donors were taken. The study was designed in accordance with the Helsinki II declaration and approved by

the Institutional Human Ethical Committee. Statistical Analysis was done using SPSS 16 Version. The P value less then 0.05 is taken as significant.

III. RESULTS

60 histopathologically confirmed oral cancer cases consisted of 15 OPMDs and 45 OSCC at an incidence of 1OPMDs:2 OSCC ratio. OPMDs consisted of 8 patients with leukoplakia (3 mild dysplasia and 5 severe dysplasia) and 7 patients with sub mucosal fibrosis (2 early stage and 5 advanced stage). As per Broders' grading system, out of 45 OSCC cases, 12 belonged to well differentiated squamous cell carcinoma (WDSCC), 24 to moderately differentiated squamous cell carcinoma (MDSCC) and 9 to poorly differentiated squamous cell carcinoma (PDSCC). Prevalence of moderately differentiated OSCC was noted in the study population (53.33%).The study group comprised of 41 males and 19 females with a mean age 58.7 ± 12.7years. 41% belonged to ≥ 60 while 59% belonged <60 age group. The mean age of 13 males and 2 females of OPMDs was 50.5 ± 13.8 years with 10 patients <60 years and 5 patients ≥ 60 years of age. The mean age in 28 males and 17 females with OSCC was 61 ± 11 years with 21 patients <60 years and 24 patients ≥ 60 years of age. The patients were characterized into three groups based on their types of habits (risk factors). 40 patients chewed only betel quid(67%), 11 patients chewed betel quid and smoked (18%), while 9 patients smoked and consumed alcohol (15%).The 'betel quid' ingredients in the study group consisted of betel leaf, areca nut, slaked lime, and sun-dried tobacco. All cases in the study group belonged to tobacco related oral cancer. The duration of their habits was 30.2 ± 11.1 years (OPMDs - 22.33 ± 12.34 years and OSCC - 32.82 ± 9.4 years). The site of the oral cancer was also noted. 43 patients suffered oral cancer from buccal mucosa region, 13 from tongue, 2 from lip and 2 from palatal region.

Structural aberrations (STAs) showed a significant P value between the Controls, OPMDs & OSCC cases through ANOVA. Significant P value through t-test was also observed between the pairs of group namely Controls Vs OPMDs cases, Control Vs OSCC cases and OPMDs Vs OSCC cases. (Table 1) STAs showed a significant P value in the patients when compared with the controls and also showed an increased chromosomal alteration in OPMDs and further increased in OSCC thus correlating well with the clinical stages of the disease. CSAs (Table 2) were more than CTAs (Table 3) in the cases with dicentrics (Figure1) being more prevalent.

Table 1: Frequency of structural aberrations (STAs) in oral potentially malignant disorders (OPMDs) and oral squamous cell carcinoma (OSCC)

Group	N	CTAs*	CSAs*	STAs*
Control	60	0.12 ± 0.32	0.23 ± 0.56	0.35 ± 0.66
OPMDs	60	2.6 ± 5.42a	9.8 ± 7.11a	12.4 ± 7.36a
OSCC	60	1.27 ± 1.97b	19.93 ± 15.43bc	21.2 ± 15.42bc

'a' denotes Significant 'p' value between the Controls & OPMDs cases
'b' denotes Significant 'p' value between the Controls & OSCC cases
'c' denotes Significant 'p' value between the OPMDs & OSCC cases
In Chromatid type aberrations there is no significant 'p' value between the OPMDs & OSCC
* ANOVA shows significant 'p' value for all types of structural aberrations for 'a'. 'b' & 'c'.

Table 2: Chromosomal type aberration (CSAs) frequency in oral cancer cases and control subjects

Group	N	Breaks	Dicentrics	Rings	Fragments	Total CSAs%
Cases	60	1.9 ± 2.5	8.5 ± 6.6	2.82 ± 10.2	4.1 ± 6.1	**17.4 ± 14.5**
Control	60	0.08 ± 0.28	0.07 ± 0.25	0.02 ± 0.13	0.07 ± 0.3	**0.24 ± 0.56**

Table 3: Chromatid type aberration frequency in oral cancer cases & control

Group	N	Breaks	Interchanges	Total CTAs%
Cases	60	1.5 ± 0.3	0.12 ± 0.38	**1.6 ± 3.2**
Control	60	0.1 ± 0.3	0.02 ± 0.13	**0.12 ± 0.32**
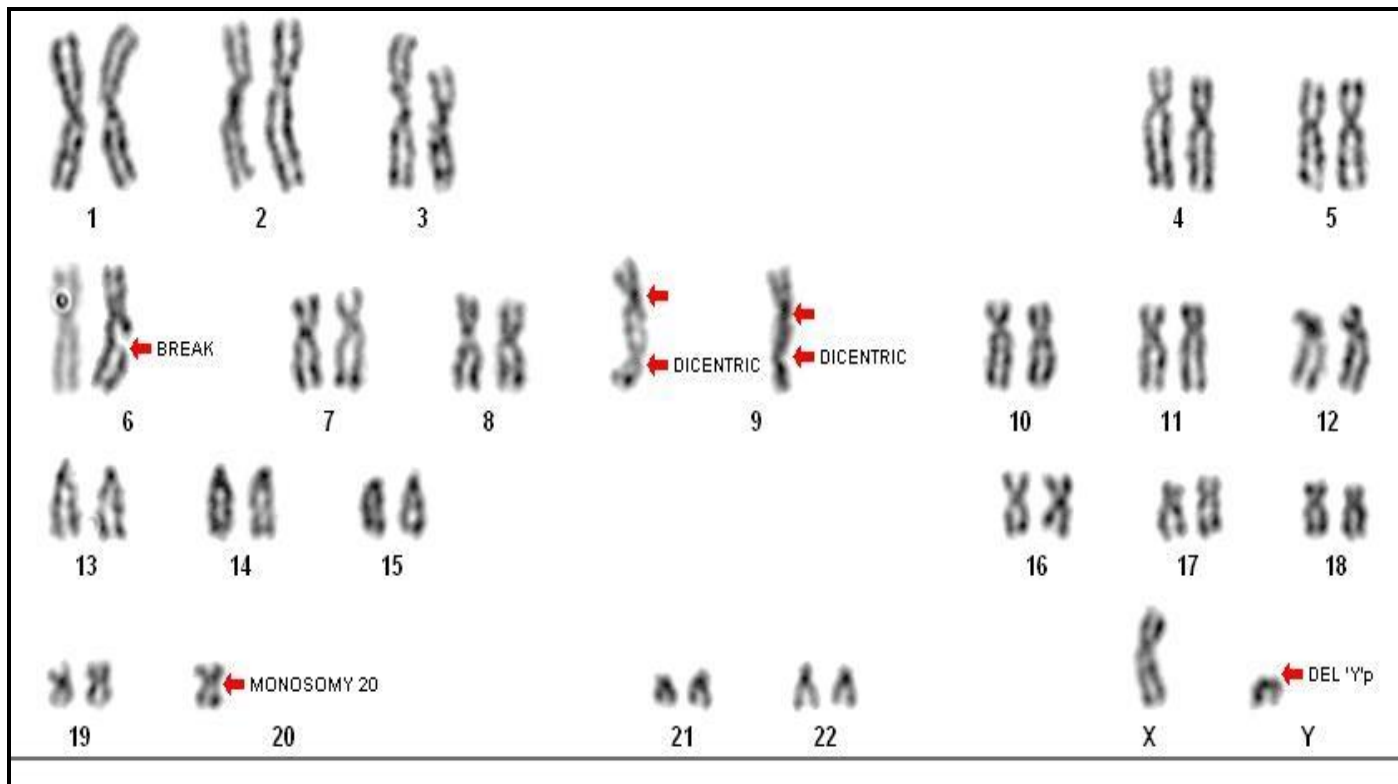
Figure 1: A composite karyotype showing various structural chromosomal aberrations

V DISCUSSION

Worldwide, one of the highest incidence rates of mouth cancer among men is found in Pondicherry (8.9 per 100,000)[3]. This hospital based study in tobacco related oral cancer was thus under taken at a MGMCRI in Pondicherry to identify a feasible method and to identify a cytogenetic predictor which could be used as a mass screening test in this high risk oral cancer population.

Cytogenetic study in the peripheral blood of oral cancer patients was employed not only for identifying the different genomics instabilities but to also introduce timely interventional strategies to combat and control the epidemic. Many cytogenetic studies have been carried out in oral cancers using tissue biopsy than leukocyte cultures. We used peripheral blood for our study which gave promising results. This was based on the proposition made by Johanson [4] et al., It states that "heritable acquired characteristics of neoplastic cells brought about by changes in the genetic material, does not imply that their neighboring non neoplastic cells are without importance. Tumour cells face not only each other but also surrounding stromal tissue and the systemic antitumor response including the 'immune surveillance' ". This proposition supports even peripheral blood which is a non-neoplastic tissue and was thus taken for the cytogenetic analysis.A conclusion section is not required. Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions. In the present study there is no association between the age & gender and the occurrence of chromosomal damage. In PMDs, leukoplakia showed an increased chromosomal damage than OSMF indicating a greater malignant transformation than OSMF. It is in concordance with several studies in India as the frequency of malignant alterations in oral leukoplakia has ranged from 0.13 to 2.2 % while in OSMF it ranged from 0.2 to 1.2%. Prevalence of moderately differentiated OSCC was noted in our study population (53.33%) while Agarwal and Rajderkar [5] and Ghoor et al[6] in their study group have noted a high incidence of well differentiated OSCC.

In this study we found that oral cancer in males was more common than females (2 fold) and this finding is comparable to others.[7,8]100% of the patients were of tobacco related oral cancer [8] but many studies have reported 25% to 80 % of cases belonging to tobacco related oral cancer [9,10,11] Since all the patients in the study group chewed and/or smoked tobacco high frequency of structural was seen which could be attributed to the synergism of the toxic effects present in betel quid taken with dried tobacco. In the present study 55 of the oral cancer patients (91.6 %) were over 40 years old, which is consistent with previous reports. [7,8] The consumption of tobacco and alcohol appear as the most important non-genetic risk factor associated with the development of head and neck squamous cell carcinomas (HNSCC).[12] Even though the present study showed that the site of the oral cancer showed no association with the chromosomal damage, we have observed 72 % of oral cancer cases having cancer in the buccal mucosa. This

could be attributed to the chronic use and the individual habit of the placement of betel quid in a particular site of buccal mucosa. Our study also showed the there is no correlation between the years of habits and their CA in regard to their different types of habits.

The frequency of STAs was not related to duration of the habits and is in agreement with Bhuvansesh et al.[13] who reported the accumulated chromosomal aberrations in head and neck squamous cell carcinoma are not significantly influenced by the severity of tobacco/alcohol exposure. The site of cancer had no influence in the frequency of STAs. We found 72% of the cases with buccal mucosa as site for oral cancer but Patrizio et al.[14] 2011 identified tongue to be more associated with chromosomal aberration in OPMDs than other sites. Van Dyke et al.[15] reported other cancer abnormalities appeared to be site specific but suggested a pattern of genetic evolution in squamous cell carcinoma that is independent of anatomic site.

Comparing the frequency of CA between the cases and the controls, it showed a significant higher p value in the patients than those of controls. Our findings were in accordance with several recent case-control studies; they revealed that spontaneous genetic damage in chromosomal aberrations of oral cancer patients was significantly higher than that of controls and thus genetic instability appeared to exist in oral cancer patients.[4-14] Sunil et al.[8] and Ravindaran et al.[16] reported 15-16% of CA in their OSCC case , almost consistent with our STAs at 14.32%.

The present study showed varied structural disorders (chromatid interchanges, breaks, dicentrics, rings and fragment) which initiate tumor progression leading to cancer. Not many studies have had reported structural aberrations in oral cancer in leukocyte cultures. Some authors have reported that no two karyotype were identical which vary in chromosome copy number and structure.[8,9] This was in concordance with our study where different structural chromosomal disorders were seen in all 60 cases. In the present study CSAs was more predominantly seen than CTAs and is similar to some studies[17] but others [18]have shown that there was no clear indication for cancer prediction between CSAs and CTAs suggesting that both DNA double-strand breaks and other initial DNA lesions responsible for CSAs and CTAs are associated with cancer risk. A high prevalence of dicentrics and ring chromosomes was noted. The cause and process of this phenomenon are unknown, but the malignant cell may contain an amplified area that has many transcriptions from proto-oncogenes. Indeed, in the carcinogenesis process, any cytogenetic disorders activate proto-oncogenes, or inactivate suppress tumor suppressor genes.

VI. CONCLUSION

Our study show that the STAs increases with the increase in its clinical manifestation ie from OPMDs to OSCC and between the grades of OSCC. High frequency of STA especially dicentrics present in the control population clearly indicates that the population belongs to a high risk for cancer. Structural aberrations in the chromosomes of an individual are thus clear predictors to screen any population at risk of cancer. Elevated STA levels in the oral cancer patients in the present study indicate that these structurally aberrant chromosomes may represent sites of putative tumor suppressor genes, a lesions or loss in them play a major a role in the pathogenesis of oral cancer, The findings identified in our study which may be used in future for early diagnosis and subsequent disease management of the tobacco related oral cancer patients, which is the only hope in lessening the mortality and morbidity associated with the disease and has thus paved way for such chromosomal studies in various others types of cancer too.

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Process Selection base on project scenario

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Abstract- With the emergence of the Internet, software development has become an integral part of almost every aspect of business today. Companies are going for the web based application as it can be accessed 24 hours from anywhere. Companies are preferred to go for the web based application for their convenience and real time information.

Therefore, an increasing number of resources are being allocated to the development of profitable software to meet customer needs/requirement. Because companies desire to maximize their profits, an efficient allocation of these resources is necessary to minimize costs. This can be achieved by implementing a process model that best converts their resources to quality products. Same times it is always be a question that we should go for which software methodology.

How agile could be better in today's changing market with other process. We will here try to compare the Agile and other software process /model and evaluate how its suffice the project requirement and suitable for which type of projects. Mainly software process selection is the key decision base on the type of projects (Fix price , Maintenance ,clear/not clear requirement).

Agile software development is a relatively new framework aimed at reducing risk and production costs and allow room to accept rapid changes. It is based on iterative development and continuous feedback from all stakeholders throughout the development cycle. The switch to an agile process model from a traditional waterfall process model can reduce the risk associated with producing a large-scale software application by decreasing lead times and increasing team morale and productivity.

There are the numbers of process work around where people are working and evaluating those processes, following best practices to make more profitable eventually.

How agile could be better in today's changing market with other process. We will here try to compare the Agile and other software process /model and evaluate how its suffice the project requirement and suitable for which type of projects

3 factors are important while selecting the process that how process could support the project execution in terms of the Quality, Cost and schedule, Of course other important factor is project requirement (Understanding of the functional and technical requirement) ..Mainly we will cover difference between the water fall and Agile (Not covered comparison with other module) and how its applicable to projects scenario.

In software development, waterfall and agile are both trade-offs between speed and risk

Where waterfall provides the more risk averse option at the cost of speed, agile is less disciplined and consequently a faster and more dynamic way to develop software.

Here we will try to conclude which of process is better or best for which type of project scenario.

I. INTRODUCTION

Agile methodology is the now key process implementation in the nowadays for software projects development. Today's business environment is getting changes rapidly where changes in software are obvious phenomena during the development part.

Agile methodology gives us the opportunity against the traditional model to accept changes where ever required .It has the feature to adapt client or end user requirement modification/changes in business process in today's competitive market where as the traditional methodology does not give much opportunity or not enough flexible to adapt changes or modification in terms of the process. Agile is nothing but the execution of projects milestone (SPRINT) under the waterfall model and exercise all its activities for that SPRINT only and it also cannot allow to move to next SPRINT until unless previous one is closed successfully. Agile we can say its combination of the waterfall and incremental and iterative model .Still how Agile is similar or different with the Waterfall and where it could be used.

II. MOTIVATION

I was always keen to research in process area. The research area which has been motivated to me to know about more on AGILE and same time I keen to know that how its different from other process. Although so many process/guideline are there like CMMi/ISO guideline, waterfall, Spiral but considering all process scenario curiosity is that how better AGILE perform in terms of project execution and .

Agile development is a general term covering number of different but somewhat similar method that have evolved within the software community as a response to years of market uncertainty increasing pace and competition. It is also an acknowledgement and a result of the high complexities.

In contrast the traditional waterfall methods which are being used for most of the software development projects agile method represent the integrated software development approach for software development activities.

Agile method emphasis on the flexibility and openness to changes in the project requirement specification when the surrounding market and potential user always demand to change as per their need . In traditional method often project success sticking on the predefined planned and requirement.

Base on the above criteria motivation was this to find out that how AGILE is better on project rather than other software process even assuming that it could take more time to develop the entire software in terms of schedule NOT in terms of the effort. This research project measures the data of the schedule cost and effort by using the EVM methodology to accomplish the above said assumption.

The challenges are following to do so
Adaptability of the AGILE.
Simultaneously running same project by different team
Implementation of EVM
Taking view of developer team on each stage of the projects

The AGILE is come up with the new integrated product development process which could be use in any industries weather its manufacturing or construction etc.

III. PROBLEM STATEMENT

It is always challenged that which process need to be applied on which kind of project and same time how it is going to be tracked and monitored with any technique like EVM (Earn Value Management). In organization some time you get development project some time you get maintenance, some time we work on product .

Similarly in front of the requirement some times its clear and sometimes very vague .it always confusion or dilemma for project sponsor or project manager that which process need to be selected. Here it need to be put some focus on the project type and suggestive process base on some parameter which would help to take decision or would work as guideline for selection of process. There are always be a factor on quality, schedule and cost end of the day before finalizing the any process . of course there are the other parameter like stake holder availability , location /cross location team etc.

IV. RELATED WORK

In today's business scenario agile implementation is the key factor to get the optimum output during the project development. Water fall is any way traditional approach of software development. In February 2001, 17 software developers met at the Snowbird, Utah resort, to discuss lightweight development methods. They published the Manifesto for Agile Software Development to define the approach now known as agile software development. Some of the manifesto's authors formed the Agile Alliance, a non-profit organization that promotes software development according to the manifesto's values and principles.

Lots of comparison has been done in between the Agile and waterfall process. AGILE SCRUM process has introduced base on AGILE principal. There are 3 key factors (quality, schedule, cost) to monitor the software projects. EMV is one of the methodologies to measure the schedule and cost for waterfall process on milestone basis. In same way cost and schedule index could be measured SPRINT basis on AGILE (SCRUM).

Now AGILE has been introduced so EMV need to be implemented on AGILE SCRUM

V. PROPOSED WORK

The proposed work will be finding out which process is suitable for which type of projects. We would start with following steps

1) Relationship: Find out where is Agile and waterfall process is related with each other. Study both process and work on their attributes/ feature and study the similarity and differences.
2) Implementation: Select project to Implement both processes in projects. Measure data time to time and study .
3) Check possibility of implementation of in AGILE and Waterfall for type of projects. Closely watch benefits and drawback during the project execution .
4) How nature of the project/product (under development or maintenance) make impact on process.
5) Study and understand EVM how its can be used for project management
6) Measure EMV (cost, schedule) base on milestone in Waterfall.
7) Measure EMV (cost, schedule) base on SPRINT in AGILE (SCRUM).

VI. CONCLUSIONS

In our study we recommend base on the execution of the projects with both process
1) If requirement is clear in this case better to approach waterfall and Agile can be used for the product.
2) The Agile process because of it would be easily adopted in the maintenance kind of projects or for product.
3) Agile could be give more client satisfaction as he is involved beginning of the project.
4) Maintaining CR is easy to manage.
5) Agile Methodology instills confidence early on (risk, operational effectiveness)
6) Agile embraces change – indeed, change is expected / encouraged
7) Traditional Methodology still best for Earned Value but EVM can be implemented in AGILE as well on SPRINT basis.
8) New methodologies necessitate new metrics.
9) Close interaction and observation with customer creates opportunity

10) Good relationship with customer promotes amiable environment
11) Proving added value to customer results in requests for additional work.
12) Customer involvement is the key aspect of a ideal Agile environment.
13) Agile environment creates useful products in short time
14) Successful products with close customer/developer relationship enhances confidence, builds trust, establishes reputation

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Heat Transfer in a channel bounded by a stretching sheet and Partially Filled with Porous Medium

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   Abstract- The study in this paper involves the steady two dimensional flows and heat transfer through a channel bounded by a stretching sheet and a highly porous layer with impermeable bottom. The expressions for the stream function, velocity, temperature distribution, coefficient of skin friction and the rates of heat transfer at the lower permeable surface and the upper sheet, have been obtained and discussed.
.

   Index Terms- Incompressible fluid, Impermeable, Porous, Stretching sheet

I. INTRODUCTION

The flow due to a stretching sheet has many scientific and engineering applications, and therefore, it was investigated by researchers. Flow in the boundary layer on a continuous solid surface with constant speed was studied by sakiadis (1961).McCormack and crane (1973), explained its importance in detail, in many situations arising in industries where it is essential to account the stretching of the sheet. Crane (1970), Wang (1984) studied flow past a stretching of Newtonian fluid, whereas Ali (1994,1996), Magyari and Keller (199b) studied the temperature distribution in boundary layer over a stretching sheet. Mc Leod and Rajgopal (1987) worked on the uniqueness of flow of a Navier Stokes fluid due to stretching boundary. Ariel (1995) gave a second solution of flow of viscoelastic fluid over a stretching sheet. Magyari and Kellar (2000) investigated the exact solution for the self -similar two dimensional steady boundary layer flows induced by permeable stretching walls. Many researchers such as Kumaran, Tiruchirappalli and Ramanaiah(1996), Raptics, C. Perdikis (2006) Ali and Al-Yousef (2002), Ishak, Amin and Pop(2004), Liu (2006), Ishak, Nazar and Pop (2008,2009), Makinde and Aziz(2011),etc. investigated flows in similar boundaries and matching conditions, whose one wall is a stretching sheet. In viscous flows through and across porous media ,the heat transfer was much investigated, however, in a stretching channel the literature is scanty when the one boundary wall is highly porous layer.
The study in this paper involves the steady two dimensional flows and heat transfer through a channel bounded by a stretching
 sheet and a highly porous layer with impermeable bottom. At the fluid porous interface a modified set of boundary conditions,
 is applied taking effective medium considerations in the permeable layer). The expressions for the velocity, temperature distribution, stream function, Pressure coefficient and the rates of heat transfer at the lower permeable surface and the upper sheet, have been obtained and discussed.

II. FORMULATION OF PROBLEM

   A viscous incompressible fluid is confined between a stretching sheet and a highly porous layer of thickness 'a', with impermeable bottom. A Cartesian coordinate system is used with origin at the lower porous interface and axis of y normal to it. The upper stretching sheet is at y = h, and it is stretched by introducing two equal and opposite forces so that the position of the point (0, h) on the sheet remains unchanged. The lower porous layer is saturated with fluid. It is impermeable bottom and the upper sheet, are maintained at constant temperatures, T_1 and T_2, respectively. All the variables are assumed to be independent of z.

The momentum and energy equations in free fluid region $\left(0 \le y \le h\right)$ are :

$$u\frac{\partial u}{\partial x}+v\frac{\partial u}{\partial y}=-\frac{1}{\rho}\frac{\partial p}{\partial y}+\upsilon\left(\frac{\partial^2 u}{\partial x^2}+\frac{\partial^2 u}{\partial y^2}\right) \qquad (1)$$

$$u\frac{\partial u}{\partial x}+v\frac{\partial v}{\partial y}=-\frac{1}{\rho}\frac{\partial p}{\partial y}+\upsilon\left(\frac{\partial^2 v}{\partial x^2}+\frac{\partial^2 v}{\partial y^2}\right) \qquad (2)$$

$$\rho Cp\left(u\frac{\partial t}{\partial x}+v\frac{\partial t}{\partial y}\right)u=\kappa\left(\frac{\partial^2 t}{\partial x^2}+\frac{\partial^2 t}{\partial y^2}\right)+\mu\left[2\left\{\left(\frac{\partial u}{\partial x}\right)^2+\left(\frac{\partial u}{\partial y}\right)^2\right\}+\left(\frac{\partial u}{\partial y}+\frac{\partial v}{\partial x}\right)^2\right] \qquad (3)$$

And the equation of continuity

$$\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}=0 \tag{4}$$

The momentum and energy equations in the porous region $\left(-a \leq y \leq 0\right)$ are :

$$\frac{1}{\rho}\frac{\partial P}{\partial x}-\frac{\upsilon U}{K_0}+\frac{\overline{\mu}}{\rho}\left(\frac{\partial^2 U}{\partial x^2}+\frac{\partial^2 U}{\partial y^2}\right)=0 \tag{5}$$

$$\frac{1}{\rho}\frac{\partial P}{\partial y}-\frac{\upsilon V}{K_0}+\frac{\overline{\mu}}{\rho}\left(\frac{\partial^2 V}{\partial x^2}+\frac{\partial^2 V}{\partial y^2}\right)=0 \tag{6}$$

$$\rho Cp\left(U\frac{\partial T}{\partial x}+v\frac{\partial T}{\partial y}\right)u=\overline{\kappa}\left(\frac{\partial^2 T}{\partial x^2}+\frac{\partial^2 T}{\partial y^2}\right)+$$

$$\overline{\mu}\left[2\left\{\left(\frac{\partial U}{\partial x}\right)^2+\left(\frac{\partial V}{\partial y}\right)^2\right\}+\left(\frac{\partial U}{\partial y}+\frac{\partial V}{\partial x}\right)^2\right]+\frac{\mu U^2}{K_0} \tag{7}$$

And the equation of continuity is

$$\frac{\partial U}{\partial x}+\frac{\partial V}{\partial y}=0 \tag{8}$$

Where, u, v and U ,V are the fluid velocity components along the x and y directions in the free fluid and porous regions respectively, p and P are the pressures in the free fluid and porous regions, respectively; t and T are the temperature in the free fluid and porous region respectively; ρ , is the density of the fluid; μ , the viscosity; υ , kinematic viscosity; $\overline{\mu}$, the effective viscosity in the porous medium; κ ,the thermal conductivity; $\overline{\kappa}$,the effective thermal conductivity; and Cp, is the specific heat on constant pressure.
The boundary conditions are:
At   y = h , u = cx,   v =0 , t = T_2

At   y = 0 , p = P, u =U, v = V, $\mu\dfrac{\partial u}{\partial x}=\overline{\mu}\dfrac{\partial U}{\partial y}$, t =T , $\kappa\dfrac{\partial t}{\partial y}=\overline{\kappa}\dfrac{\partial T}{\partial y}$,

At   y = -a , U = V=0, t = T_1 $\tag{9}$.

III.   SOLUTION OF PROBLEM

We Assume

$$u = Cxf'(\eta), \quad v = Chf(\eta), \quad \eta=\frac{y}{h}$$

$$U = CxF'(\eta), \quad V = -ChF(\eta),$$

$$t = T_1 + \frac{C^2 h^2}{RC_p}\left[s(\eta)+\frac{x^2 g(\eta)}{h^2}\right],$$

$$T = T_1 + \frac{C^2 h^2}{RC_p}\left[S(\eta)+\frac{x^2 G(\eta)}{h^2}\right], \quad R=\frac{Ch^2}{\upsilon} \tag{10}$$

Substituting (9) into (1) to (8) and solving, we get

$$f''' - R\left(f'^2 - ff''\right) = A(\text{Constant}), \tag{11}$$

$$\phi_1^{-1}F''' - \beta^{-1}F' = D(\text{Constant}), \tag{12}$$

And

$$s'' = -\left[2g + R\Pr\left(4f'^2 + fs'\right)\right], \tag{13}$$

$$g'' = R\Pr\left[\left(2f'g - fg'\right) - f''^2\right], \tag{14}$$

$$S'' = -\left[2G + R\Pr\phi_2\left(4\phi_1^{-1}F'^2 + FS'\right)\right], \tag{15}$$

$$G'' = R\Pr\phi_2\left[\left(2F'G - FG'\right) - \phi_1^{-1}F''^2 - \beta^{-1}F'^2\right],$$

(16)

Where, a prime denotes a differentiation with respect to η

$$\Pr = \frac{c_p\rho\upsilon}{k}, \quad \phi_1 = \frac{\mu}{\mu}, \quad \phi_2 = \frac{k}{k} \quad \text{and} \quad \beta = \frac{k_0}{h^2}$$

(17)

The corresponding boundary conditions are:

At $\eta = 1$, $f' = 1$, $f = 0$, $s = \phi$, $g = 0$,

At $\eta = 0$, $f' = F'$, $f = F$, $\phi_1 f'' = F''$, $s = S$, $g = G$, $\phi_2 s' = S'$, $\phi_2 g' = G'$,

At $\eta = -a^*$, $F' = 0$, $F = 0$, $s = 0$, $g = 0$,

(18)

Where $a^* = \dfrac{a}{h}$, and $\phi = \dfrac{1}{R\,Ec.}$

For small values of the stretching parameter R, a regular perturbation scheme can be developed by expanding of f, F, A, D, s, g, S, G in ascending power of R as.

$$f(\eta) = \sum_{n=0} R^n f_n(n), \qquad A = \sum_{n=0} R^n A_n,$$

$$F(\eta) = \sum_{n=0} R^n F_n(\eta), \qquad D = \sum_{n=0} R^n D_n,$$

$$s(\eta) = \sum_{n=0} R^n s_n(\eta), \qquad g(\eta) = \sum_{n=0} R^n g_n(\eta),$$

$$S(\eta) = \sum_{n=0} R^n S_n(\eta), \qquad G(\eta) = \sum_{n=0} R^n G_n(\eta),$$

(19)

Using (19) in equation (11) to (16), comparing coefficients of like powers of R, and on solving under the corresponding boundary conditions, We obtain

$$f(\eta) = f_0(\eta) + R f_1(\eta)$$

$$= \frac{A_0\eta^3}{6} + \frac{a_1\eta^2}{2} + a_2\eta + a_3 + R\left[\frac{A_0^2\eta^7}{2520} + \frac{A_0 a_1\eta^6}{360} + \frac{a_1^2\eta^5}{120} + \frac{(a_1 a_2 - a_3 A_0)\eta^4}{24} + \frac{\left(A_1 + a_2^2 - a_1 a_3\right)\eta^3}{6} + \frac{b_1\eta^2}{2} + b_2\eta + b_3\right]$$

$$F(\eta) = F_0(\eta) + R F_1(\eta)$$

$$= \frac{c_1 e^{\sigma\eta}}{\sigma} - \frac{c_1 e^{-\sigma\eta}}{\sigma} - D_0\beta\eta + c_3 + R\left[\frac{m_1 e^{\sigma\eta}}{\sigma} - \frac{m_2 e^{-\sigma\eta}}{\sigma} - D_1\beta\eta + m_3\right]$$

$$s(\eta) = s_0(\eta) + R s_1(\eta)$$

$$= \frac{\eta + \phi_2 a}{REc(\phi_2 a + 1)} + R\left[-\frac{A_0^2\eta^6}{36} - \frac{20(A_0 a_1 + h_1 A_0)\eta^5}{120} - \frac{\left(6a_1^2 + 8A_0 a_2 + h_1 a_1\right)\eta^4}{24} - \frac{(8a_1 a_2 - h_1 a_2)\eta^3}{6} + a_2^2\eta^2 - \frac{L_1\eta^3}{3} - L_2\eta^2 + M_1\eta + M_2\right]$$

$$S(\eta) = S_0(\eta) + R S_1(\eta)$$

$$S(\eta) = S_0(\eta) + RS_1(\eta)$$

$$= \frac{\phi_2(\eta + a)}{REc(\phi_2 a + 1)} + Rpr[\phi_2[(\frac{1}{\beta\sigma^2} - 7\phi_1^{-1})\frac{(c_1{}^2 e^{2\sigma\eta} + c_2{}^2 e^{-2\sigma\eta})}{8\sigma^2} - \{A_0\beta(\frac{4}{\beta\sigma^2} - 8\phi_1^{-1}) - \frac{\phi_2 h_1}{\sigma}\}\frac{c_2 e^{-\sigma\eta}}{\sigma^2}$$

$$-\{A_0\beta(\frac{4}{\beta\sigma^2} - 8\phi_1^{-1}) + \frac{\phi_2 h_1}{\sigma}\}\frac{c_1 e^{-\sigma\eta}}{\sigma^2} - 2c_1 c_2(\phi_1^{-1}\sigma^2 - \frac{1}{\beta})\frac{\eta^4}{12} + A_0{}^2\beta\frac{\eta^4}{12} + \phi_2 h_1 A_0\beta\frac{\eta^3}{6}$$

$$-4\phi_1^{-1}(A_0{}^2\beta^2 + 2c_1 c_2)\frac{\eta^2}{2} - \phi_2 h_1 c_3\frac{\eta^2}{2}] - \frac{L_3\eta^3}{3} - L_4\eta^2 + M_3\eta + M_4]$$

$$g(\eta) = g_0(\eta) + Rg_1(\eta)$$

$$= -R\,Pr\left[A_0{}^2\frac{\eta^4}{12} + A_0 a_1\frac{\eta^3}{3} + a_1{}^2\frac{\eta^2}{2} - L_1\eta - L_2\right]$$

$$G(\eta) = G_0(\eta) + RG_1(\eta) - R\,Pr[\phi_2\{\phi_1^{-1}\sigma^2(\frac{c_1{}^2 e^{2\sigma\eta} + c_2{}^2 e^{-2\sigma\eta}}{4\sigma^2} - c_1 c_2\eta^2 + \frac{1}{\beta}(\frac{c_1{}^2 e^{2\sigma\eta} + c_2{}^2 e^{-2\sigma\eta}}{4\sigma^2}$$

$$+ (A_0{}^2\beta + 2c_1 c_2)\frac{\eta^2}{2} - \frac{2A_0\beta}{\sigma^2}(c_2 e^{-\sigma\eta} + c_1 e^{\sigma\eta}))\} - L_3\eta - L_4]$$

The constant of integration $L_1, L_2, L_3, L_4, M_1, M_2, M_3, M_4, D_1, D_2, D_3, D_4, D_4, D_5, D_6, D_7, D_8, D_9$ and D_{10} are obtained by the corresponding boundary conditions and are not reported for the sake of brevity

IV. DISCUSSION

Figure 1. shows the streamline patterns for the flow due to a stretching sheet in the channel bounded by a highly porous layer. Due to the stretching of the upper deformable sheet of the channel, the fluid near it is thrown out axially, causing an adverse pressure gradient developed at a large distance and to keep continuity the fluid rushes from infinity towards the mouth of the channel through lower porous medium.
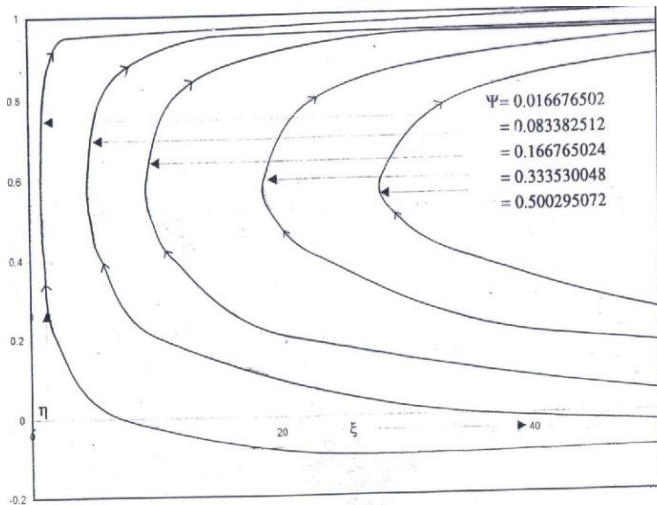
Fig. 1. Stream lines pattern for R=0.1, $\beta = 0.1, \phi_1 = 0.8$
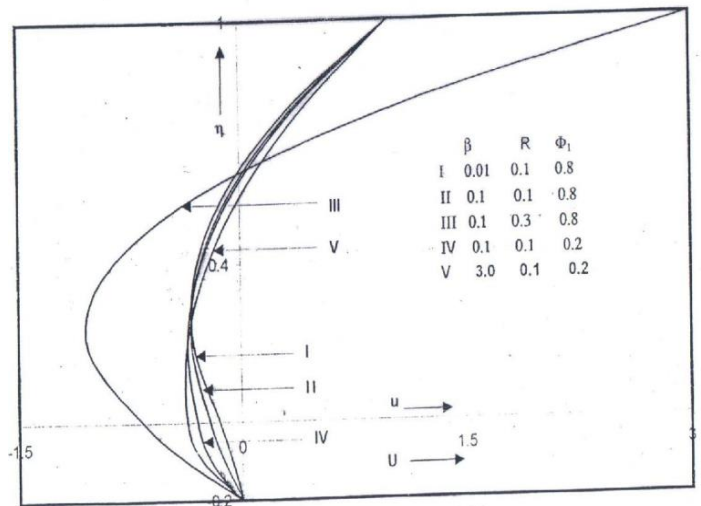
Fig. 2. u vs η for $\xi = 10$

Figure 2. shows the longitudinal velocity profiles, u, for various parameters. The stretching of the upper sheet induces a backward flow in the channel it is found that the stretching parameter are increases u near the upper plate, however, there is a back flow near the lower porous surface and also inside the porous medium which increases by increasing R.This

back flow in the channel also shift towards the upper plate by increasing R. The permeability parameter β also increases the flow near the upper plate and the back flow near the porous surface and inside porous medium, however, back flow decreases in the middle by increasing β by decreasing the viscosity ratio ϕ_1 ,back flow also increases.
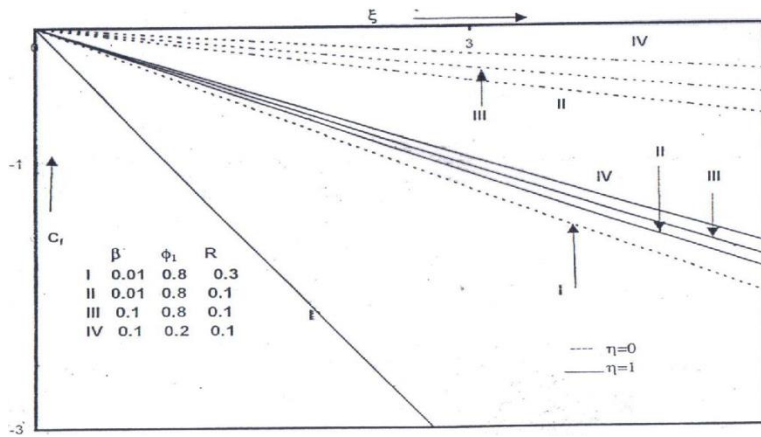
Fig.3 shows the variation of the coefficient of skin-friction C_{f0} and C_{f1}. It is observed that both C_{f0} and C_{f1} decrease numerically by increasing permeability of the porous medium, however, both increase substantially by increasing R. By increasing ϕ_1 both C_{f0} and C_{f1} also increase.

Fig. 3. C_f vs ξ

Fig.4 and Fig. 5 show the variation of temperature θ , and the rate of heat transfer at both walls of the channel for various parameters. It is found that the permeability of the porous matrix is to decrease the temperature in the channel, while temperature in the channel is increases by increasing the stretching parameter R or the prandtl number Pr.
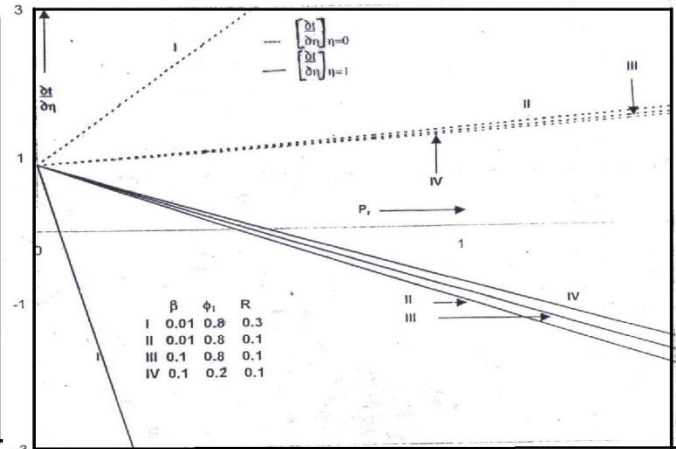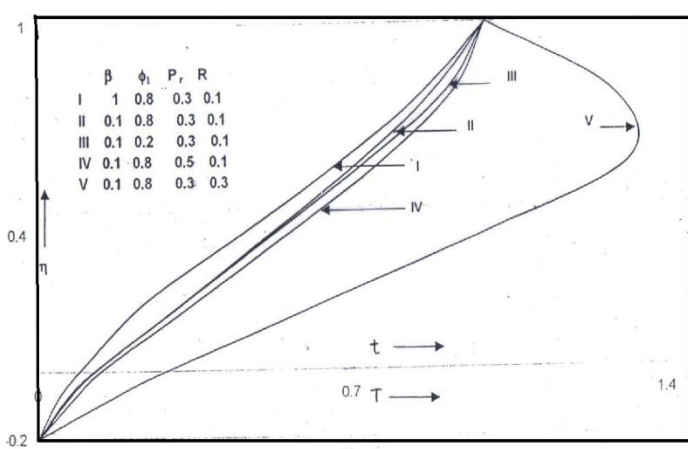
Fig.4. Temperature distribution for $\phi_2 = 0.6, E_c = 0.7 and \xi = 10$.   Fig.5.Rate of heat transfer for $\phi_2 = 0.6, E_c = 0.7 and \xi = 10$.

It decreases by increasing ϕ_1 . It is observed that the rate of heat transfer at the porous surface decreases by increasing β ,whereas it increases by increasing R and ϕ_1 . The rate of heat transfer at the upper wall increases by increasing β for small values of Pr, as Pr increases it changes sign at certain Pr and then decreases numerically by increasing β ,whereas at small Pr, it decreases by increasing R or ϕ_1 , then at certain Pr changes sign and increases numerically afterwards. The result may find applications in the polymer industry, bio-engineering, and many other industrial manufacturing processes, such as hot rolling, glass fiber and paper production and drawing the plastic films.

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Motivating senior high school accounting teachers to stay at post in Ghana: A tripartite elemental analysis

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Abstract- If productivity before motivation proves elusive, then it is wasteful to ensure consistent preaching of same. The best rather than discretionary approach is to apply the complete reversal of this working guideline. Efforts need to be channeled to motivating teachers to measure up to the required standard of performance. But it would be untenable if the teachers concerned did not require any more motivation. This necessitated the need to explore the level to which teachers, notably accounting teachers, were motivated to stay committed to duty. The motivational elements used in the study were salary, administrative practices, and the study leave policy. In all, 120 accounting teachers from senior high schools in the Central Region participated in the vignette administration. The study revealed that the senior high school accounting teachers were not motivated by their level of salary. They perceived apparent injustice and inequity in terms of qualification and workload in determining the salary. They believed that given the economic reality, the salary was not adequate. The administrative practices could neither motivate them. They blamed it on autocracy in decision making which was evidenced by poor communication and poor collegiality and coordination. The study leave policy had lost its real significance among the accounting teachers. It was indicative that the accounting teachers were searching for better avenues to quit the contract with Ghana Education Service for the fact that they were not motivated. Accordingly, it was recommended that Ghana Education Service remained proactive to address the problems in accounting teacher compensation packages to avoid accounting teacher attritions.

Index Terms- Ghana, school, accounting, teaching and learning resources, teachers, learners

I. INTRODUCTION

It is the pride of every student to have the privilege of a teacher in an organized environment for effective teaching and learning. Imagine how difficult the teaching and learning process will be without the teacher at the centre of affairs. Forojalla (1993) noted that capital and natural resources are passive factors of production; human beings are the active agents who accumulate capital, exploit natural resources, build social, economic and political organizations and carry forward national development agenda. There is always the need for someone with the requisite ability and qualification to be at the helm of affairs in whatever institution one finds oneself. Besides, come to think of what will happen in the absence of qualified personnel in the police service, hospitals, banks, churches, schools, among others. The end result will not fall short of being calamitous for such

organization. Therefore, the need to maintain staff with the requisite qualification and skill is paramount to every institution.

It is worthy to note, however, that many educational policies employed by various governments have sought to expand physical infrastructure and enrolment; but have failed to fully pay attention to the essential roles of teacher attraction and retention. Mention can be made of policies such as the Free Compulsory Universal Basic Education (FCUBE), the School Feeding Programme, and the Model Senior Secondary School Policy. The results of these measures are increased enrolments in schools, which have called for an adequate number of well-qualified, highly competent, stable and dedicated teacher workforces (Cobbold, 2007).

Human resource policies such as the study leave policy have enabled most teachers to upgrade their academic qualifications (Cobbold, 2007). However, a greater majority (about 70%) of such teachers do not return to the classroom after their studies (Quansah, 2003). It is widely recognized that teachers are central to students' success. To a larger extent, they play an important role in transmitting cultural and social values, such as tolerance, dialogue and gender equality, etc. (UNESCO, 2011). Due to these vital roles teachers play in the education of students, various governments continuously develop policies that will help attract and retain the best quality of teachers. Yet, many of the teachers are leaving the schools and the profession every year, particularly, in poorer, lower-performing schools (Issue Brief, 2008).

The concept of Teacher Attrition has been defined by many authors and schools of thought. Teacher attrition is not a myth and has been an ongoing global concern for years. Mark and Anderson (1978), Murnane (1981) Quartz et al., (2005) suggest that working conditions play a substantial role in decisions of teachers to leave teaching in a particular district, and they contribute to decisions to leave the profession altogether. It is interesting to note that teacher attrition in itself is not necessarily bad – it depends on the kind of teacher who leaves. If the teacher who leaves is not a trained or qualified teacher, then, it becomes good for the students, the school and the economy at large. However, if a trained or qualified teacher leaves, then, it becomes a great deal of a problem. This is because the future of the students as well as the educational sector will become gloomy. Indeed, the acute shortage of qualified teachers presents one of the biggest hurdles to a country to achieve global policy goals such as Universal Primary Education (UPE) and Millennium Development Goals (MDGs).

Recent Interventions of Teacher Attrition

It is the expectation of every profession and association that its competent members stay with them for a very long time,

possibly to eternity. As a matter of fact, organizations that do not put emphasis on retaining its human resource may find themselves in quagmire of despondency as their competitors may outwit them in the strategic employment of their human resources.

Samah and Aisha (2008) indicate that an enormous number of teachers are leaving their jobs and/or moving to other jobs. The challenge is even greater at senior high. It may even be on the back drop of these and other research works related to teacher attrition that led the Government of Ghana to introduce the Single Spine Pay Policy. This notwithstanding, the number of teachers leaving the profession is still on the ascendency. On 8th August, 2013 at the 4th Ashanti Regional Quadrennial Conference of GNAT in Kumasi, Mrs. Irene Duncan-Adanusa, the General Secretary of Ghana National Association of Teachers (GNAT), disclosed that an estimated 33,185 teachers had abandoned their post in recent years to seek greener pastures (graphic.com.gh, 15th August, 2013).

Previous studies investigating why Ghanaian teachers leave the profession cited inadequate salary, chronic prestige deprivation, and lack of opportunities for promotion as the major factors (Bame, 1991; Godwyll & Ablenyie, 1996; Cobbold, 2007). However, a common observation about these previous studies is that majority of them were undertaken before the introduction of certain government policies to retain teachers; notably, the Single Spine Pay Policy. As a result, there is the need to identify why teacher attrition is still high despite the numerous efforts by government to retain teachers. Accordingly, this study was designed to assess the influence of

1. current teacher salary levels on accounting teacher attrition in senior high schools;
2. school administrative practices on accounting teacher attrition in senior high schools; and
3. study leave policy on accounting teacher attrition in senior high schools.

II. METHODOLOGY

This study employed the descriptive research design to investigate how, if any, current monetary teacher motivational packages, administrative practices and study leave opportunities influenced senior high schools accounting teachers' attrition in in the Central Region. The object was to analyse these to generate some understanding of how these factors naturally influenced accounting teachers to quit their jobs.

The target population for the study comprised all senior high school accounting teachers in the Central Region. Senior high school accounting teachers were targeted because such teachers were graduates and had wider scope to switch to if their current occupation was not yielding the required satisfaction. Therefore, attrition was likely to be high among them unlike the teacher trainees with diploma in education who did not really have options. As well, for the fact that accounting related degrees were in high demand shifting patronage from the classroom to other sectors was highly anticipated.

Convenience sampling procedure was employed to recruit 120 accounting teachers to participate in the study. Vignettes were used in collecting the data for this research.

III. RESULTS AND DISCUSSION

Background Information

The respondents were asked to provide information regarding their gender, level of education, and years of teaching experience. This was not used in determining the factors that influenced teacher attrition. It was to give a better understanding of the results obtained.

Ninety-two of the teachers were males while the rest (28) were females. This indicates that the accounting teaching profession was mainly male-dominated. In traditional Africa and for that matter Ghana, males are the breadwinners of the home. Hence, they desire higher income in order to discharge this financial responsibility. So, with a greater number of the teachers being males, their quest for higher salary will always be intense. Per gender roles in Ghana, females, on the other hand, perform the supporting roles in the home and usually prefer spending quality time with their family to gaining higher income. So, female accounting teachers were likely to stay in the teaching profession without any desperate desire to change occupation even when salary level is not necessarily adequate. Therefore, due to the fact that the accounting teaching profession is male-dominated, attrition is likely to be on the rise since they (the male accounting teachers) desire to earn more to suit their role as breadwinners in the home.

Also, most (76) of the teachers were professionally trained and certificated bachelor's degree-holding teachers, while 28 of them were non-professional teachers. A small number of the teachers (16) had master's degree or equivalent. In effect, it could be concluded that most of the teachers in the profession were professionally trained to teach. This, therefore, suggests that quality teaching and learning in accounting were assured in most of the senior high schools. Also because the educational qualification of most of the senior high school accounting teachers surveyed gave them the opportunity to work in other fields apart from teaching, there was always a temptation to look out for other prospective avenues that would pay them more for their qualification; hence, increasing attrition.

Finally, some 52 accounting teachers had been teaching for not less than 5 years. This indicated that despite the inadequate levels of salary, most of the teachers were still staying at post for some other personal reasons. Due to this longevity of service, the quality of teaching was likely to be high because of the teaching experiences gained.

Influence of Motivation on Teacher Attrition

The subject of research purpose one was to find out how accounting teacher motivation influences their attrition. In accordance with this, Research Question One was formulated as, *What influence does the current teacher salary level have on accounting teachers' attrition in senior high schools?*

To address this research question, one regular motivational package was used as the test on attrition. This factor of motivation was salary. Therefore, some vignette was designed and administered to the participating teachers to find out how salary could, if possible, influence teacher attrition.

Detailed insightful qualitative thematic analysis was undertaken to thoroughly appreciate the phenomenon. Due the flexibility in qualitative studies some themes and sub-themes emerged. The main themes obtained from the results were

fairness and economic realities of the accounting teacher compensation packages as the key components based on which accounting teachers took decisions to quit.

Fairness

Pay equity is essential to ensuring that teachers as organisational members get committed to their profession and employers. There are several bases employees use as proxy for measuring fairness of treatment in compensation management and employment relationships. It was, however, found in the study that whilst some of the teachers were satisfied with the level of compensation awarded them, others were strenuously sentimental. Some of the teachers dexterously but honestly touted that their salary was

"... just a 'peanut' compared to other sectors like those in health, security services, etc. Now, the economy is in crisis where prices of goods and services are becoming very expensive day-in and day-out but salaries remain the same all because of this so called 'single spine'. I think the current pay policy should be called discrimination spine policy because it is favouring others whilst causing havoc to others. Teachers' financial position has not changed and under such circumstances it is absurd to reason that the current pay policy will achieve its objective of helping to attract and retain competent teachers."

This apparent lack of equity in teacher compensation wittingly described by the participant showed a clear case of reduced worker morale. As such, there is the propensity that this murky opinionated condition might turn out to be the factual circumstance covered by frivolous uneducated wishes that *all is well*. The fairness of the salary influencing the level of attrition was defined in terms of workload and qualification and accordingly ramified.

i.   Teachers' salary and workload

Some of the participating teachers actually found their salary to be adequate. Almost all of these teachers were willing to stay. Showing their apparent joy in embracing their salary teachers who were enthusiastic about their pay package described their salary as

... equitable to the workload and adequate if I compare it to the previous   years and for that matter I will not leave the profession to join another sector just based on salary. [The salary] is fair compared to people with similar qualification in other profession. I therefore have no intention of leaving to join any profession [on the basis of salary]. Besides, teaching provides me with enough time to attend to other personal and family obligations. [Emphasis added]

There were some benevolent teachers who in spite of the inequity were still ready to stay on. One of such teachers remarked the salary being

"... inadequate but the government has done well to have increased it to this current level. Comparatively, I don't see it to be fair in terms of qualifications in other professions. Also, I do not personally see it to be adequate when you compare it to other professions because other people are given various allowances in addition to the salary. This notwithstanding, I will not leave the teaching profession now because of the lack of job opportunities in the country."

However, this was one of the few teachers who were ready to be *cheated*. Indeed, this decision is reasonable. It is, in fact, the economic circumstance that compelled such teachers to remain committed and loyal to their profession and employer. This submission may serve as a basis to argue that some teachers were still willing to stay at post regardless of the inadequacy of the salary. However, one should not lose sight of the fact that it might be because of the lack of job opportunities in the country that is why these teachers had decided to remain at post.

Again, despite majority of the teachers admitting that their salaries were inadequate; there were a couple of them who had no intention to quit teaching in the short term. In relating the salary to the work output, one of the dissatisfied teachers described the salary to be

"...woefully inadequate. Colleagues in other institutions are earning much more than teachers. The work of the teacher is not only in the   classroom; it involves marking, guidance and counseling and a whole lot. So, I believe teachers are still not treated equitably. As a result, I would have left had it not been the lack of jobs in our country."

Accordingly, the teacher quantified the discrepancy between a teacher's salary and workload and summarized it as

"... The workload of the teacher is parallel to the salary being received. If the work output is being measured, it is expected for a teacher to "take home" not less than GHS 2,000 per month. So, if my colleagues in other sectors continue to receive higher salaries than teachers, I may join that profession for some time. However in the long run, I will upgrade myself so that I can teach at the tertiary level where the salary is better."

Taking teaching as an interim job makes the future of the profession bleak. Attrition with the attendant high rate of labour turnover means inexperience, slowing productivity, and escalating training and induction cost coupled with the opportunity cost of recruitment, induction, orientation and training. To salvage the situation it is prudent to pay heed to Feng's (2014) multinomial logit hazard analysis that higher salaries may help retain teachers in the field and improved working conditions may help reduce teacher mobility within the profession.

ii.   Teachers' salary and qualifications

The hue and cry about the inequity in teacher compensation is rooted in qualification as well. Teachers often use the securities personnel as proxy in determining the fairness of the compensation system. Teachers often compare the ratio of their input to outcome with those of others notably the police force (Kwarteng, 2012). In this comparison, one teacher decried the salary being

"... inadequate to cater for my family. If your child is in the second cycle   school or a private school, then, the payment of school fees becomes difficult looking at the economic situation now. Comparing to other professionals such as security services, especially, the police service, a constable who doesn't even have a degree takes more salary than me, a degree holder. Again, in the health sector, a nurse whose certificate is not even a diploma takes far more than a graduate teacher. I will therefore not think twice if any lucrative job opportunity presents itself. Besides, other people with my qualification (degree in Electrical Engineering) working in sectors like VRA, Guinness Ghana, etc.

take huge salaries. I admit that I enjoy holidays – an avenue that I can make extra money; but this cannot be a justification for me to receive a meagre salary. The teaching job, like that of doctors, relates to human life because whatever information I pass onto my students may not only affect them but may also affect generation yet unborn. There is therefore the need for teachers to be paid well. I will leave the profession if I get the opportunity to work in a lucrative industry."

Most of the teachers who found their salary to be highly inadequate had the intention to leave. Similar observation was made by Alugchaab (2011) when he concluded that more teachers were likely to leave if any better opportunity presented itself. The more the question is asked the more the more sentimental the teachers became. For instance, one teacher could not hide his frustration but lamented the salary being

"... inadequate looking at the pay policy in terms of "take you home". Comparing my pay and qualification with others working in the other field, it is a cheat. For instance, compare the pay of a professional degree holder teacher to a diploma holder nurse. The current pay policy has only encouraged me to look for a better job elsewhere."

Yet there were some teachers who were full to the brim with humour in sarcastically concluding

"... In the nutshell, my salary level is TWEAAA and never CO-EQUAL to [people with] similar qualification in other profession ..." [Emphasis added]

Indeed, some of the teachers described their level of salary as discriminatory. This can be likened to the research findings of Seniwoliba (2013) that there is a general perception of inequity among teachers whenever they compared themselves with others in non-teaching profession. The perception of inequity usually causes an unpleasant emotional state in employees compelling them to reduce effort or to leave the organization. Based on the above findings, it is clear that while better salary will influence a teacher's decision to stay; poor salary will equally influence a teacher's decision to leave. As Waititu (2013) concludes, teacher turnover is greatly affected by compensation or salary.

Economic Reality

In recent times, the economic downturn in the country has triggered hardship among the citizenry. Employers and employees are having their due share of the pinch the economic hardships are meting out. New public sector recruitments are halted and salary increments are frozen. It even took the Trades Union Congress's intervention for the government to provide the cost of living allowance to cushion public sector employees.

It is important to indicate that even though some of the teachers found their salary to be adequate, they assigned numerous reasons for their fear in managing the salary for their upkeep. The current economic situation was gradually dwindling the adequacy of the salary. It was therefore ordinary for the teachers to describe their salary as merely

"... adequate to take me home looking at the inroads the current pay policy has made when it was introduced; fairly comparable to people with similar qualifications in other professions. Indeed the new pay policy is intended to attract and maintain competent and qualified teachers. Notwithstanding that the current economic challenges in the country is making it

difficult to feel the real worth of the new pay policy. I am highly satisfied with my salary."

Buttressing this reality, another accounting teacher observed that:

".... Given the recent economic difficulties and high cost of living, the salary is becoming less and less adequate. In a situation where no extra income is earned and prices of goods increase with the depreciation of the Ghanaian cedis, a teacher's salary is nothing to write home about. Due to the lower level of my salary, I may join any sector that pays better."[Emphasis added]

Indeed, the acceptance of the salary component of the conditions of service of teachers just like any other workers is contingent on the general economic climate. Teachers measure the amount of salary they take vis-à-vis the basket of goods and services they could afford. Their definition of the adequacy of the salary is not independent of the state of the economy. Mihans (2008) believes that teachers' salaries must be competitive with other professions that require similar educational requirements.

Influence of School Administrative Practices on Teacher Attrition

The subject of research purpose two was to find out how school administrative practices influence teacher attrition. In accordance with this, research question two was formulated as, *What influence do school administrative practices have on accounting teacher attrition in senior high schools?*

To address this research question, the administrative practice of the school was used as the test on attrition. The factor under consideration was the conduciveness of the school climate with regard to the interaction between teachers and their colleagues, their head and the parents. Therefore, some vignette was designed and administered to the participating teachers to find out how the administrative practices in schools could, if possible, influence teacher attrition. It was noted that accounting teachers were likely to leave if the administrative practices are bad; or better still stay if the administrative practices were good.

They indicated that the administrative practices of their school could influence them to stay or leave. However, there was an accounting teacher who said regarding his school's administration that:

"... [The administrative practice of my school] is satisfactory. Even though the administrative practices in just one school can make a teacher quit the profession, I will not leave based on this [the administrative practices of a school] ..." [Emphasis added]

Finally, one teacher identified his school's administrative practice as that:

"... of good administrative work. Even though nothing is perfect, I think the administrative practices in my school are better than other schools. The machinery in place is perfect for hard, conscientious and honest working teachers. The administrative practice in my school challenges me to bring out the best in me. And it is one of the major reasons why I'm still in my school."

These findings are in line with Herzberg's Two-Factor Theory, specifically the hygiene factor. He explained that dissatisfaction (hygiene factors) leads to avoidance of work while

satisfaction (motivators) leads to attraction to work. As stated earlier, majority of the teachers considered their school's administrative practice (dissatisfier) a factor enough to compel them to leave. Accordingly, Tickle (2008) found that perceived administrative support is a significant predictor of teachers' job satisfaction and intent to stay in teaching.

Due the flexibility in qualitative studies some themes and sub-themes emerged. The main theme obtained from the results was autocracy in decisions which was further explained by poor communication and poor collegiality and coordination.

Autocracy in decisions

Leadership styles of school administrators have the potency of causing attrition or maintaining loyalty of teachers. Senior high schools heads who rise through the ranks to ascend the position need not create animosity by the leadership style they apply to manage their fellow teachers. It was however observed in the study that teachers harboured some hatred for their school heads leadership approaches.

The heads seemed to run the closed system of school administration where decisions were taken in secrecy. This was so glaring in one school to the extent that an accounting teacher who had taught for only a year observed that

"… teachers are made to teach under strict conditions. Decisions are taken by the authorities with no suggestions from the teachers. Teachers find it difficult to express their views on certain decision at the staff meetings. Even though I will not leave teaching because of this style of administration, I think it should be stopped so that teachers can deliver from their hearts. The head sees the administration as his bedroom where decisions taken are exclusive to his advantages. The administration has made teachers passive participants when issues are brought for discussion. The administrative practice of my school is making most teachers leave to other schools."

This apparent lack of openness in the administrative procedures of the schools might backfire. Taking teacher-proof decisions without due consultation of the teachers, especially if the decision concerns teachers might backfire. The school heads with all the power bestowed on them abused their offices to exploit the teachers. The heightened autocracy and power play were so evident that the teachers cried out that

"… There is so much autocracy and neglect in the school. This makes most teachers and other staff members not wanting to take up other responsibilities other than teaching. This is among the major reasons why I want to leave teaching and start my own business. Most decisions that affect teaching and learning are taken without the opinion of most senior members of staff. Accommodation for teachers is a major problem but management has not taken any noticeable steps about it. Honestly speaking, I have decided to leave this profession."

In fact these problems stemming from the centralization of decision making in the head of the school was articulated to be the function of poor human relations and poor communication between the office of the school head and the teachers involved.

i. Poor Communication

A leader acts beyond the activities required of a manager. Followers may quit when they perceive the leader to be egoistic. Yet because, reality defies perception, there is need for school heads to communicate effectively for the teachers to be informed and have full knowledge of the circumstances. The closed administrative system operated by the school heads ignited disdain among the accounting teachers for the latter to harbor the thoughts that

"… There is lack of interactions among the school administration and the teaching staff and the parents. Due to this, information is not shared fluidly among these stakeholders. I am not enthused to continue teaching here for long so I will seek transfer to somewhere that transparency and communication are upheld."

It was observed that the teachers perceived the administrative challenges to be context-bound rather than universal. The believed that seeking transfer from one school to the other might make things better.

ii. Poor collegiality and coordination

With time, arrogance, pomposity and a sudden feeling of superiority enslave some leaders. The fervent interest with which they are expected to serve gives way to boisterous recalcitrant attitude of self-worth at the expense of the followers. This level of autocracy in the senior high schools is jeopardizing the very existence of collegiality and reciprocity of respect. The friendliness in the school atmosphere had dissipated such that teacher were unimpressed with the school's administrative practices as they added that

"… the school climate is not teacher friendly. The headmaster doesn't relate well with the teaching staff."

However, prolonged attitude of this nature only breeds resentments and revolt among the followers. Unresolved human relations challenges impinge on teachers' quest to stay at post.

The coordination of strategic constituencies in managing problems in the school proved ineffectual. As the strategic and visionary leader the school head is expected to ensure that Parents Teacher Association (PTA) was working as desired. But evidence suggested that teachers lacked support from the PTA. This situation had denigrated some teachers' desire to continue serving their schools. This assessment follows a teacher's observation that the

"PTA is not supportive in solving challenges put forth by teachers. The existence of a good rapport and inter-personal relationship between teachers and parents provides a good working environment, but this does not have the power to make me leave the school."

Anyway, most of the teachers believed that problems with the PTA were not potent enough to get cause them to quit teaching. Curtis (2012) found a similar situation among mathematics teachers that, among other things, the mathematics teachers left teaching because of lack of administrative support.

Most teachers' quest to develop themselves is often curtailed by the prerogative of the school. Teachers need the permission and clearance from the school head to pursue academic or professional programmes for advancement. However, most teachers had their hopes dashed following the heads' decision to avoid giving such permits. Indeed, this state of affairs militates against any sound desire to stay on the job. The administrative practices of the school in this direction could negatively influence a teacher's decision to stay. It was apparent that the

teachers were not happy about the egoistic mentality the school heads had, following the contention that,

"... the management of the activities in my school is to maximize the wealth of administrators and parents but not teachers. Teachers are therefore exploited and suppressed against their personal development especially, the young teachers. Some colleague teachers also back-bite others for their personal selfish desires/favour and these do not motivate a teacher like me to stay."

Influence of Study Leave on Teacher Attrition

The subject of research purpose three was to find out how study leave influences teacher attrition. In accordance with this, research question three was formulated as,

What influence does the study leave policy have on accounting teacher attrition in senior high schools?

To address this research question, the field/area for further studies and the accessibility of study leave were used as the test on attrition. Therefore, some vignettes were designed and administered to the participating teachers to find out how they were making use of the avenues for further studies and the field of study that they desired to pursue. This was to help give a clue as to where teachers were likely to be after their further studies.

The results were presented thematically. These themes reflected how the study leave policy provided job security for some teachers and generated an avenue for escape form the GES for other teachers. Also, it detailed how the teachers perceived the study leave package as a means of teachers' professional development. .

Study Leave; Job security or an avenue for escape?

Majority of the teachers desired to undertake further studies in areas that related to education. Most of them preferred areas that would lead them to teach in higher institutions. It is relevant, however, to indicate that there were a handful of teachers, notably the non-professionals, who wanted to undertake courses that would help them teach effectively at the senior high level. However, they preferred to read it through the sandwich mode apparently because of the difficulty of obtaining clearance from the school heads. Some of the teachers embarked on the study because of job security. One of such non-professional teachers expressed her desire to undertake a

"... Post Graduate Diploma in Education (PGDE) because it will enhance my skills and improve the methodologies used in teaching. A Post Graduate Diploma in Education will also enhance my salary ... Sandwich Programmes in Education will help me the teacher to get the necessary knowledge and skills to teach the students very well since I am not a professional teacher at the moment. And move to other field when I meet the minimum requirement."

After all, according to Desimonte, Smith, and Phillips (2007), authority, not power is associated with teachers taking the kind of professional development that improves teaching and learning--activities focused on subject matter content and instructional strategies, as well as active interactions with other teachers around curriculum and instruction. Accordingly, these teachers willing to enhance their pedagogical content knowledge did so because it was required for job security.

They could not bear the indignation that stemmed from the study leave policy. Almost all the teachers desirous of teaching aimed at teaching at higher levels of education and wanted to read various Masters' degrees including

"... Teacher Education because it would equip [them] with the necessary pedagogical and methodology skills that would be needed to teach at the Colleges of Education across the country. Aside this, the minimum requirement to lecture at the College of Education is Masters' Degree so after obtaining the masters' degree I can then apply to be employed as a lecturer. Simply, I may enroll in M. Phil (African Studies) because that undertaking, I believe will prepare me adequately for a teaching career in a higher institution of learning."

There, however, was some sizeable number of the teachers who desired to undertake further studies in areas that would enable them end up in other areas other than teaching. They found the teaching profession unattractive. They were primarily looking for an avenue to escape the contract with GES without having to suffer economically. Two of such teachers expressed their desire to undertake further studies in

"... MBA (Finance) because it will afford me the opportunity to move to where I will get enough pay. The teaching field is not attractive at all and [I] have therefore decided to leave for [a field] where my services would be equally rewarded. Therefore, I have decided to read non-educational programmes because programmes related to education do not see any promotion in GES." [Emphasis added]

It therefore implies that, in the long run, most accounting teachers were likely to quit teaching at the senior high level. The accounting teachers were using teaching contract with the Ghana Education Service as the stepping stone to generate some means of living until they obtained their choicest jobs. After their further studies they would not get back to the classroom. Quansah (2003) noted this problem among those teachers who embarked on the study leave policy the GES has put in place. The majority of the teachers expressed their desire of leaving the senior high schools for the tertiary level after their further studies.

Study leave package: A cliché or reality

Notwithstanding the ever-increasing desire of the teachers to undertake further studies, almost all the teachers expressed dissatisfaction with the study leave policy of GES. They were therefore quick to add that their decision to pursue further studies was purely personal but not because of the "existence" of a study leave facility. One teacher commented that:

"... It is worthy to indicate that my decision to further my education does not stem from any study leave facility. The study leave facility is just a paper work; it is not readily accessible. The institution does not even place any value on it. Moreover, I wonder if the supposed government programmes such as study leave, are enough to prevent the high rate of teacher attrition. These programmes may be purposive, but to the extent that wages and salaries for teachers remain so low, the teaching profession will continue to be a "stepping stone" for more economically rewarding avenues."

The inaccessibility of the study leave facility has consequently left most of the teachers with no option than to further their education through the sandwich and distance

programmes. Yet Mihans (2008) suggested that mentoring programs should be available to teachers at all levels and that administrative support for teachers should be a priority in all schools.

These study leave policy had little, if any, influence on teachers' decision to further their education and subsequently deciding to leave or not – it is purely a personal reason. In short, accounting teachers' decision to leave had little to do with the inaccessibility of the study leave facility.

"... GES does not even recognize masters' degree let alone to pay for your study leave. No promotion after second degree. The Ministry of Education in general seems not to place any value on further studies, especially above 1st degree. I have decided to further my education based on personal reasons. I want to add that my decision to further my education is personal but not because of any GES study leave policy. The GES even has the notion that a teacher does not need any 2nd degree to be able to teach SHS students. In fact there have been instances whereby some teachers have been transferred to another district right after they attempted to further their education. These kinds of practices have the tendency to discourage teachers from staying in the profession. I would also prefer to leave had it not been my love for imparting knowledge."

This is in conformity with Herzberg's (1966) assertion that motivators such as opportunity for advancement (in this case, study leave facility) couldn't cause a person to avoid work – only hygiene factors could. Teachers' attribution of the blame to the doorstep of the Ministry of Education suggested a weak or rather ineffectual study leave policy guiding the teacher development. This situation may not be peculiar to Ghana as O'Brien (2011) noted a similar case in Scotland that the problematic issue of teacher professionalism is considered particularly in relation to the lack of a clearly articulated national strategy or statement of purpose.

IV. CONCLUSION

Should they decide to stay, the absence of adequate salary might make the accounting teachers use dubious means of getting money such as extortion of money from students. Others might engage in commercial activities to get extra money to support their low salaries. This, of course, might be done at the expense of going to the classroom to teach. This would in the long run lead to a fall in the academic performance of students since accounting teachers may not be dedicated and committed to their duties.

If teachers are not allowed to participate in decision making but rather made to accept decisions taken by heads it would make the former exhibit unwillingness and lackadaisical attitude towards those decision. This will in turn lead to job dissatisfaction. The dissatisfaction might make them ineffective in the classroom. There is the likelihood of teachers initiating action plans to work counter to the decisions they were not parties in their formulation.

Since the accounting teachers were willing to further their studies in education related courses with the aim of teaching at higher institutional level, in few years to come most them will be leaving the second cycle institutions. Because, the accounting teachers most often self-finance their further studies, they feel very reluctant and discouraged to return to the classroom. The logical conclusion is that, the fine experienced accounting teachers may quit for only new inexperienced ones to come around to begin the learning curve. This would affect the quality of instructional discourse. It is therefore prudent for the Ghana Education Service (GES) to be proactive and forward-looking to avert costly interruptions in the undesirable quality of accounting education in senior high schools.

The GES should champion the course of accounting teachers to demand better conditions of service. The Ghana Association of Business Education Teachers should strive for a bargaining certificate as an organized labour group to negotiate befitting compensation packages for the good of the membership.

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Impact of Telecommunication System in Ekiti State, Nigeria

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Abstract- This paper investigated the impact of Telecommunication System in Ekiti State, Nigeria. The study adopted descriptive research design of the survey type which was questionnaire based. The targeted population for the study was all the users of telecommunication systems in Ado Ekiti Local Government Area of Ekiti State, Nigeria. A simple random sampling technique was used to select one hundred (100) people (male and female) from Ado LGA of Ekiti State. A well structured questionnaire was used to elicit relevant information from the respondents to answer the five (5) generated research questions of the study. Data were analysed using frequency counts and Chie Square statistical analysis. The findings of this study showed that Telecommunication system play vital role in Ekiti State and Nigeria at large. The role played by Telecommunication cannot be substituted with any other facility. It was recommended among others that enabling environment should be provided for Telecommunication facilities in Ekiti State and Nigeria in general; Telecommunication facilities should be affordable by every citizen in Nigeria; Government should subsidize the cost of Telecommunication in the country because of its importance in the society; and every sector of Nigeria economy should adopt the use of Telecommunication system for their efficient performance.

Index Terms- Impact, Telecommunication, Communication system and Technology

I. INTRODUCTION

The world has become a global village with telecommunication being an indispensable tool in the entire process of globalization. However, it is not in dispute that Telecommunications and Information Technology (IT) play essential roles in this process. This is obviously why development in this vital sector over the years has been phenomenal all over the world. In fact, this is why emerging trends in socio - economic growth shows high premium being placed on Information and Communication Technology (ICT), by nations, organizations and homes. Nigeria, fortunately, has not been left out of this race for rapid development in the telecom industry. Unlike in the past, governments consider telecommunications service to be so vital to national interest and economic development that it was placed directly under their control in most countries until fairly recently, when deregulation and competition were introduced. These recent advances in telecommunications technology have been an important vehicle in permitting information exchange to develop as a valuable commodity for moving the country into post industrial and information based economic growth. In this present world, a modern telecommunication infrastructural development is not only essential for domestic economic growth, but is a prerequisite for participation in increasingly competitive world markets and for attracting new investments.

Telecommunication is the transmission of encoded sound, pictures, or data over significant distances, using radio signals or electrical or optical lines [9]. In earlier times, telecommunications involved the use of visual signals, such as beacons, smoke signals, semaphore telegraphs, signal flags, and optical heliographs, or audio messages via coded drumbeats, lung-blown horns, or sent by loud whistles. In the modern age of electricity and electronics, telecommunications now also includes the use of electrical devices such as the telegraph, telephone, and teleprinter, as well as the use of radio and microwave communications, as well as fiber optics and their associated electronics, plus the use of the orbiting satellites and the Internet. Telecommunications is an essential mode of communication. This technology allows us to speak to someone thousands of miles away instantly. Within seconds we can be connected with family and friends. Over the last 100 years telecommunications has expanded across the entire world. We also have the ability to communicate from just about anywhere with a cell phone. Using the telephone is a wonderful privilege that people can easily take for granted because it has become so easy to just pick up the phone and call.

Communication plays very important role in the human life. Since the moments of our existence we communicate our wants and needs. In the earlier days communication was very difficult due to the lack of proper means of communication. If anybody wanted to convey a message to a person who is living far away, that message used to be sent with the help of human being only. For a longer distance and more detailed message pigeons post was used. These all means were very costly, uncertain and time consuming also. Because of all these reasons there was a great need of efficient means of communication to save time and money and hard work.

Use of various means of telecommunication now becomes an integrated part of society. Information found to be one of the most important elements for the efficient growth of an economy. With efficient use of telecommunication one can remove various constraints of all the sectors in the economy resulting into increased productivity and better administration. Effective controlling mechanism can be possible only through better communication and with better use of telecommunication equipments. In the developing countries earlier telecommunication was a big problem because all the means of communications were confined to the rich people only. But with the revolution in this sector now all the means are also available

to middle and lower class people who play vital role in the growth of economy of any country.

In telecommunication, a communications system is a collection of individual communication networks, transmission systems, relay stations, tributary stations, and data terminal equipment (DTE) usually capable of interconnection and interoperation to form an integrated whole. The components of a communications system serve a common purpose, are technically compatible, use common procedures, respond to controls, and operate in unison. Telecommunications is a method of communication (e.g., for sports broadcasting, mass media, journalism, etc.). A communications subsystem is a functional unit or operational assembly that is smaller than the larger assembly under consideration.

An optical communication system is any form of telecommunication that uses light as the transmission medium. Equipment consists of a transmitter, which encodes a *message* into an optical signal, a channel, which carries the signal to its destination, and a receiver, which reproduces the message from the received optical signal. Fibre-optic communication systems transmit information from one place to another by sending light through an optical fibre. The light forms an electromagnetic carrier wave that is modulated to carry information.

A radio communication system is composed of several communications subsystems that give exterior communications capabilities. A radio communication system comprises a transmitting conductor in which electrical oscillations or currents are produced and which is arranged to cause such currents or oscillations to be propagated through the free space medium from one point to another remote there from and a receiving conductor at such distant point adapted to be excited by the oscillations or currents propagated from the transmitter.

Power line communication systems operate by impressing a modulated carrier signal on power wires. Different types of powerline communications use different frequency bands, depending on the signal transmission characteristics of the power wiring used. Since the power wiring system was originally intended for transmission of AC power, the power wire circuits have only a limited ability to carry higher frequencies. The propagation problem is a limiting factor for each type of power line communications.

A duplex communication system is a system composed of two connected parties or devices which can communicate with one another in both directions. The term *duplex* is used when describing communication between two parties or devices. Duplex systems are employed in nearly all communications networks, either to allow for a communication "two-way street" between two connected parties or to provide a "reverse path" for the monitoring and remote adjustment of equipment in the field.

A tactical communications system is a communications system that (a) is used within, or in direct support of, tactical forces, (b) is designed to meet the requirements of changing tactical situations and varying environmental conditions, (c) provides securable communications, such as voice, data, and video, among mobile users to facilitate command within, and in support of, tactical forces, and (d) usually requires extremely short installation times, usually on the order of hours, in order to meet the requirements of frequent relocation.

GSM mobile communication is one of the most explosive developments ever to have taken place in the telecommunications industry [8]. Combining the convenience of mobility with the rich multi-media content of the Internet and with the integration of the mobile telephone with palm-sized computers, cameras and content related information makes it almost inevitable that the ubiquitous access point to the electronic information is not the PC but rather some form of mobile appliance.

Impact of Telecommunication

According to [2], GSM facilitates economic development as it provides easy and effective communication needed to stimulate and promote trade between Nigeria and its foreign partners in the world. Even at home, it plays a significant role in communicating government programmes. Above all, it encourages investment which in the long run promotes employment opportunities.

According to a report in [11], government treasury has been boosted by payment of over 200 billion Naira in taxes and levies. National productivity has also been enhanced as travel times and associated risks have been reduced, business communications improve and the rural-urban divide narrowed. Social and family relationships and the security situation have also been significantly enhanced.

Adeyeye in [8] noted that telecommunication has discouraged rural-urban migration, now with GSM and Internet people travel to cities without boarding a vehicle. The introduction of GSM also has potential for reducing crime. Accessibility to phone services ensures quick calls to security operations when the need arises as well as informing fire stations during fire incidents to save live and properties. To [1], GSM is used by Nigerians mostly to communicate with another. He explained that students used it to communicate with their course mates, friends, lecturers and family relatives. Additionally, family matters, finance, and academic matters constitute the topics/ subject of mobile communication for a majority of students. Mobile phones limit the need for students to travel as well as facilitating the of exchange information as the need may arise.

GSM activities have increased and promote competition in the industry, resulting in an exponential growth in the number of telephone lines. It is instructive to note that while connected lines only grew at an average of 10,000 lines per annum in the four decades between independence in 1960 and end of 2000, in the last two years, an average growth rate of 1 million lines per annum was attained. As of September 2003, Nigeria had attained over 3 million lines, (2.3 million of which were digital mobile lines). Total tele-density, which had been just 0.4 lines per 100 inhabitants in 1999 stood at 2.6 per 100 inhabitants by September, 2003.

The emergence of Telecommunication has led to improvements in efficiency and productivity, reductions in transaction costs, increased service innovation and better quality of life for the rural dwellers. Close to 2,000 persons have been directly employed by the GSM operators and an estimated 400,000 Nigerians are benefiting from indirect employment generated by the GSM operators [5]. Indirect employment has also been created through contract awards to construction firms, research companies and media consultants. In the financial

sector, enterprising banks have designed innovative products that leverage the use of GSM.

The emergence of Telecommunication has also led to the return of significant numbers of Nigerians from abroad. These are telecom professionals who have come back to build the country's communications sector. Moreover, the GSM explosion has given birth to a new class of entrepreneurs who might otherwise have been unemployed. There is a nationwide network of dealers, vendors, GSM accessory sellers and the ubiquitous "umbrella-stand" operators, who interestingly received a special mention in a recent ITU publication for the service they are rendering to the Nigerian public.

Medical System: Healthcare telecommunications encompasses a vast range of equipment and services. Whereas previously the stalwart PBX was the primary healthcare telecom equipment, now routers, integration systems, ATM systems, videoconferencing systems, security systems, and call centers are joining the mix. Videoconferencing systems, integration systems, and Internet development systems are poised to represent significant aspect of healthcare telecommunications.

An integrated computerized patient record system means the time required to access radiology film has dropped from 24 hours to 3.5 seconds. Purchasing decisions are often shared by a coalition of surgeons, nursing staff, and hospital administrators, with purchasing decisions taking into account whether a product reduces the cost of treatment and/or attracts additional patients to a hospital. All of these factors, along with competition, have contributed to continuing reductions in prices for products.

Internet technology has enabled a new way to deliver healthcare solutions. Under the application services provider (ASP) model information solutions are delivered to hospitals from a remote location.

Business and Industries: Telecommunication has revolutionized the phase of business around the world. Local businesses have become international due to a simple website. I.T. has helped businesses in advertising. I.T. has helped in customer service, huge corporations like Microsoft attend to customer needs through email and chat services. Networking internal and external in organizations has improved the working of businesses. Staffs and clients likewise can get in touch with the managers for feedback, progress reports and extensions.

Communication has bloomed two business organizations if they need to work together can easily do so. Hotmail, when merged with MSN was easy since the service was online. Business these days require a lot of planning, due to high tech organization systems on computers, planning can be done on an organized pattern, with schedule formats, grant charts etc. Huge databases can now be controlled and stored on network and backup drives. Accessibility of files also has become an easy task with series of password keys and shared folders. Cash transactions are easily made, delay in reduced hence giving liquidity to business.

Education System: E-learning includes all forms of electronically supported learning and teaching, and more recently Edutech. The information and communication systems, whether networked learning or not, serve as specific media to implement the learning process. The term will still most likely be utilized to reference out-of-classroom and in-classroom educational

experiences via technology, even as advances continue in regard to devices and curriculum.

E-learning is the computer and network-enabled transfer of skills and knowledge. E-learning applications and processes include Web-based learning, computer-based learning, virtual education opportunities and digital collaboration. Content is delivered via the Internet, intranet/extranet, audio or video tape, satellite TV, and CD-ROM. It can be self-paced or instructor-led and includes media in the form of text, image, animation, streaming video and audio.

Social Impact: Telecommunication has played a significant role in social relationships. Nevertheless devices like the telephone system were originally advertised with an emphasis on the practical dimensions of the device (such as the ability to conduct business or order home services) as opposed to the social dimensions. It was not until the late 1920s and 1930s that the social dimensions of the device became a prominent theme in telephone advertisements. New promotions started appealing to consumers' emotions, stressing the importance of social conversations and staying connected to family and friends.

Since then the role that telecommunications has played in social relations has become increasingly important. In recent years, the popularity of social networking sites has increased dramatically. These sites allow users to communicate with each other as well as post photographs, events and profiles for others to see. The profiles can list a person's age, interests, sexual preference and relationship status. In this way, these sites can play important role in everything from organising social engagements to courtship. Prior to social networking sites, technologies like short message services (SMS) and the telephone also had a significant impact on social interactions

In cultural terms, telecommunication has increased the public's ability to access to music and film. With television, people can watch films they have not seen before in their own home without having to travel to the video store or cinema. With radio and the Internet, people can listen to music they have not heard before without having to travel to the music store. Telecommunication has also transformed the way people receive their news.

The objective of this paper is to examine the impact of telecommunication in different areas in Ado local government Area , Ekiti State, Nigeria. Areas like: Its impact on the Economy; Employment Opportunities; Time Management; and Crime Reduction in Ado local government area, Ekiti State.

II. RESEARCH QUESTIONS

The following research questions were generated and tested at $p < 0.05$:

1. Does the emergence of telecommunication have any relations with Nigeria economy?
2. Does the emergence of telecommunication provide job opportunities to dwellers in Nigeria?
3. Has the emergence of telecommunications reduce the rate of crime in Nigeria?
4. Of what relative impact is the emergence of telecommunication on time management?

5. Has the emergence of telecommunication improve the activities in education system, medical system, banking system and industries?

III. METHODOLOGY

The study adopted descriptive research design of the survey type which was questionnaire based. The population of the study was all the users of telecommunication systems in Ado Ekiti Local Government Area of Ekiti State, Nigeria. A simple random sampling technique was used to select the sample for this study. The sample was made up of one hundred (100) people (male and female) from Ado LGA of Ekiti State. A well structured questionnaire was used to elicit relevant information from the respondents to answer the five (5) generated research questions. The researchers administered the instrument on the respondents. The data collected were analyzed using Chi-square analysis.

IV. RESULTS AND DISCUSSION

Research Questions 1

Does the introduction of telecommunication have any relations with Nigeria economy?

Table 1:   Chi- Square Analysis of Data on Telecommunication and Nigeria   Economy

S/N	ITEMS	SA	A	D	SD	X^2-cal	x^2-tab	df
1.	Telecommunication has improved the standard of living in Nigeria?	74	21	3	2	137.20		
2.	Every sector of the economy in Nigeria has benefited from telecommunication	67	30	2	1	115.76	7.82	3
3.	Telecommunication is not relevant to all, because it is expensive to maintain	6	4	65	25	101.04		
4.	Telecommunication is of no impact on Nigeria rural economy	2	3	15	80	165.52		
5.	Telecommunication is meant for high income earners	28	12	40	20	47.52		

P < 0.05

The result in Table 1. reveals that x^2-cal = 137.20,115.76,101.04,165.52 and 47.52 for item No 1,2,3,4 and 5 respectively in research question one.   while x^2-tab = 7.82 showing that x^2-calculated is greater than x^2-table value at p <0.05 and df=3   (i.e. x^2-cal > x^2-tab) in all cases. Therefore, the result is significant, showing that Telecommunication has significant relationship with Nigeria economy.

Research Question 2

Does the introduction of telecommunication provide job opportunities to the dwellers in Nigeria?

Table 2:   Chi- Square Analysis of Data on Telecommunication and Job opportunities for the dwellers in Nigeria

S/N	ITEMS	SA	A	D	SD	X^2-cal	x^2-tab	df	Remark
1.	The emergence of telecommunication (e.g. GSM, Internet etc.) in Nigeria encourage small scale business thereby reducing employment.	43	54	2	1	90.80	7.82	3	*S
2.	Telecommunication has provided a source of income to many young school leavers.	65	25	4	6	96.08 5.04			
3.	Telecommunication had reduced poverty in Nigeria	34	26	21	19	125.20			
4.	Telecommunication provides employment opportunities for only a few influential Nigerians	71	24	3	0	89.18			

5.	Telecommunication provides holiday job for many students	76	23	1	0				

P < 0.05

The result in Table 2. reveals that x²-cal = 90.80, 96.08, 125.20, and 89.18 for item No 1,2,4 and 5 respectively in research question Two. While x²-tab = 7 .82 showing that x²-calculated is greater than x²-table value at p <0.05 and df=3 (i.e. x²-cal > x²-tab) in all cases. But item No 3 is not significant, because x²-cal =5.04 which is less than x²-tab = 7 .82 showing that Telecommunication has not reduce poverty in Nigeria. But on the average therefore, the result is significant, showing that Telecommunication provides job opportunity to the Nigeria dwellers.

Research Question 3

Of what relative impact is the introduction of telecommunication on time management?

Table 3: Chi- Square Analysis of Data on Telecommunication and Time Management

S/N	ITEMS	SA	A	D	SD	X²-cal	x²-tab	df	Remark
1.	Nigerians are now more time conscious with the advent of telecommunication	74	21	3	2	17.20	7.82	3	*S
2.	Telecommunication is time consuming (internet, GSM etc)	10	10	62	19	96.00 33.52 51.76			
3.	Telecommunication encourages time management	65	14	11	10				
4.	Telecommunication discourages time spent on unwarranted journey	84	3	10	3	44.96			
5.	Telecommunication enhances proper planning and	68	12	4	16				

	execution of private and public programmes.								

P < 0.05

The result in Table 3. reveals that x²-cal = 17.20,96.00, 33.52,51.76 and 44.96 for item No 1,2,3,4 and 5 respectively in research question Three. while x²-tab = 7 .82 showing that x²-calculated is greater than x²-table value at p <0.05 and df=3 (i.e. x²-cal > x²-tab) in all cases. Therefore, the result is significant, showing that Telecommunication encourages time management.

Research Question 4

Has the emergence of telecommunications reduce the rate of crime in Nigeria?

Table 4: Chi- Square Analysis of Data on Telecommunication and Crime rate in Nigeria

S/N	ITEMS	SA	A	D	SD	X²-cal	x²-tab	df
1.	Telecommunication has increased the rate of crime in Nigeria	23	14	42	21	23.04 71.28		
2.	Telecommunication encourages dishonesty among Nigerians	5	25	5	65	81.36	7.82	3
3.	The emergence of telecommunication assists in reporting and detecting criminal's activities in the society. (through the use of GSM, Biometrics).	35	28	20	17	186.96 89.84		
4.	Telecommunication has aided the activities of armed robbers	20	3	24	53			
5.	Emergence	6	23	1	5			

	of telecommunication had dramatically increased fraudulent activities in Nigeria			9	2				

P < 0.05

The result in Table 4. reveals that x^2-cal = 23.04, 71.28, 81.36,186.96 and 89.84 for item No 1,2,3,4 and 5 respectively in research question four. while x^2-tab = 7 .82 showing that x^2-calculated is greater than x^2-table value at $p <0.05$ and df=3 (i.e. x^2-cal > x^2-tab) in all cases. Therefore, the result is significant, showing that Telecommunication reduces crime rate in Nigeria.

Research Question 5

Has the emergence of telecommunication improve the activities in Education system, medical system, banking system and industries?

Table 5: Chi- Square Analysis of Data on Telecommunication and activities in Education system, medical system, banking system and industries.

S/N	ITEMS	SA	A	D	SD	X²-cal	x²-tab	df	Remark
1.	Telecommunication has increased the teaching and learning skills in educational system. (E-learning, internet facilities, computer etc)	28	42	12	18	20.64	7.82	3	*S
2.	Telecommunication helps to improve the medical system	55	25	5	15	56.00			
3.	Emergence of telecommunication helps to improve the activities in the banking sector. (E-banking system, internet facilities)	35	28	21	16	8.24			
4.	Telecommunication has help to improve the services rendered in industries. (GSM, Internet)	28	43	11	18	23.12			
5.	Emergence of telecommunication has facilitates the mode of business transaction. (E-business, internet services)	43	33	4	20	34.16			

P < 0.05

The result in Table 5. reveals that x^2-cal = 20.64,56.00,8.24,23.12 and 34.16 for item No 1,2,3,4 and 5 respectively in research question five. While x^2-tab = 7 .82 showing that x^2-calculated is greater than x^2-table value at $p <0.05$ and df=3 (i.e. x^2-cal > x^2-tab) in all cases. Therefore, the result is significant, showing that Telecommunication improves the activities in Education system, medical system, banking system and industries.

V. DISCUSSION

The results of the study were discussed based on the general questions:

The result in Table 1. reveals that x^2-cal = 137.20,115.76,101.04,165.52 and 47.52 for item No 1,2,3,4 and 5 respectively in research question one. while x^2-tab = 7 .82 showing that x^2-calculated is greater than x^2-table value at $p <0.05$ and df=3 (i.e. x^2-cal > x^2-tab) in all cases. Therefore, the result is significant, showing that Telecommunication has significant relationship with Nigeria economy.

Also, the result in Table 2. reveals that x^2-cal = 90.80, 96.08, 125.20, and 89.18 for item No 1,2,4 and 5 respectively in research question Two. While x^2-tab = 7 .82 showing that x^2-calculated is greater than x^2-table value at $p <0.05$ and df=3 (i.e. x^2-cal > x^2-tab) in all cases. But item No 3 is not significant, because x^2-cal =5.04 which is less than x^2-tab = 7 .82 showing that Telecommunication has not reduce poverty in Nigeria. But on the average therefore, the result is significant, showing that Telecommunication provides job opportunity to the Nigeria dwellers.

Furthermore, the result in Table 3. reveals that x^2-cal = 17.20,96.00, 33.52,51.76 and 44.96 for item No 1,2,3,4 and 5

respectively in research question Three. while x^2-tab = 7 .82 showing that x^2-calculated is greater than x^2-table value at p <0.05 and df=3 (i.e. x^2-cal > x^2-tab) in all cases. Therefore, the result is significant, showing that Telecommunication encourages time management.

Moreover, the result in Table 4. reveals that x^2-cal = 23.04, 71.28, 81.36,186.96 and 89.84 for item No 1,2,3,4 and 5 respectively in research question four. while x^2-tab = 7 .82 showing that x^2-calculated is greater than x^2-table value at p <0.05 and df=3 (i.e. x^2-cal > x^2-tab) in all cases. Therefore, the result is significant, showing that Telecommunication reduces crime rate in Nigeria.

Finally, the result in Table 5. reveals that x^2-cal = 20.64,56.00,8.24,23.12 and 34.16 for item No 1,2,3,4 and 5 respectively in research question five. While x^2-tab = 7 .82 showing that x^2-calculated is greater than x^2-table value at p <0.05 and df=3 (i.e. x^2-cal > x^2-tab) in all cases. Therefore, the result is significant, showing that Telecommunication improves the activities in Education system, medical system, banking system and industries.

VI.   CONCLUSION

As a result of the findings of this study, it is concluded that Telecommunication system play vital role in Ekiti State and Nigeria society. The role played by Telecommunication cannot be substituted with any other facility.

VII.   RECOMMENDATIONS

Based on the findings of this study, the following recommendations were made:

Enabling environment should be provided for telecommunication facilities in Ekiti State and Nigeria in general; Telecommunication facilities should be affordable by every citizen in Nigeria; Government should subsidize the cost of Telecommunication in the country because of its importance in the society; and every sector of Nigeria economy should adopt the use of Telecommunication system for their efficient performance.

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Students' Variables as Predictor of Secondary School Students' Academic Achievement in Science Subjects

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Abstract- The Students' Variables as Predictor of Secondary School Students' Performance in Science in Ikere Local Government Area of Ekiti State, Nigeria was investigated in this study. The study adopted a survey research design of the ex-post facto type. The sample comprised 125 senior secondary school II science students drawn from the five secondary schools in Ikere Local Government Area of Ekiti state. The instruments used for the study was questionnaire and past academic performance in three science subjects (Biology, Chemistry and Physics) of the students involved in the study. Two research hypotheses were generated and analysed in the study using Pearson's Moment Correlation and Multiple regression statistical analysis. Among others, the study revealed that: students' variables (study habit, attitude to and interest of students in Science subjects) are better predictors of students' performance in science subjects, while student gender has no influence on students academic performance . The results also revealed the individual contribution of students' variables to students performance in term of beta weight 0.231 (23.1%), 0.202 (20.26%), 0.181 (0.18.1%) and 0.101 10.1%) for students attitude to Science, study habit, students interest and gender of the students respectively. Conclusion and recommendations were also made in this paper.

Index Terms- Science, students, variables and academic performance

I. INTRODUCTION

Development of any nation is a measure of her development in the area of Science and Technology. Technological growth of a nation leads to its social and economic development. In the world today, science and technology has become a dominant power development indicator. America, Russia, Japan and China are typical examples of nations which are now referred to as developed, as a result of their development in the area of Science and Technology.

Science has become such an indispensable tool that no nation, developed or developing, wishing to progress in the socio-economic sphere will afford to relegate its learning in schools. The role of science in this modern era of technology is wide and profound. In line with this reasoning, [24] emphasized the importance of scientific knowledge in boosting national prestige, military might, national income and international rating of the country.

The role of science in this modern era of technology is wide and profound. In line with this reasoning, [6] emphasized the importance of scientific knowledge in boosting national prestige, military might, national income and international rating of the

country. According to them, science gives birth to the production of micro computers and their innovative applications which earned the developed countries such as the United States of America and Japan unparalleled national wealth, military potential and enviable national prestige.

In Nigeria, in spite of the enormous role that science plays in national development and the efforts of government and other stakeholders in improving science education, science (Biology, Chemistry and Physics) results in most certified examination bodies like the West African Examinations Council (WAEC) and National Examinations Council (NECO) have not been satisfactory especially in Ekiti state, Nigeria [10]. Many factors have been attributed to this ugly and unwholesome situation. These factors, include: students' negative attitude towards Science subjects, students' lack of interest in science subject, gender inequality and student study habits according to [2]; [7]; [3] and [22].

Attitude is an opinion or general feeling about something [12]. In the studies of Wilson and [13], students' positive attitudes to science correlate highly with their science achievement. Similar reports were recorded by [31] and [29], that students show more positive attitudes after been exposed to self-learning strategy such as computer and text-assisted programmed instruction, self-learning device, self- instructed and problem-based instruction. Moreover, several studies, such as [5]; [23]; [32]; [1]; [32]; [14] have variously reported that students' positive attitudes towards science highly correlate with their achievement in science and students' attitude towards Chemistry have significant direct effect on students' achievement. [4] in his study affirms that improved students' attitude in science will enhance students' performance in the subject.

Interest is a feeling of curiosity or concern about something that makes attention turn towards it [12]. Research has shown that students will study and learn science subjects better and, moreover, choose sciences as courses in upper secondary school if they are interested in it [17].

In the same way, modern research on interest [15] has also shown that interest-based motivation to learn has positive effects both on studying processes and on the quality and quantity of learning outcomes.

[26] in their study on science and technology education in democratic government for sustainable national development, assert that unimpressive response to science and technical education is particularly evident in students' poor performance in science subjects at secondary school level. Similarly, [8] observed lack of interest in science subjects by students due to preconceived idea that sciences are difficult subjects, and this has affected the enrolment and performance of students in sciences.

Researchers have identified a number of factors that may have impact on students' interest in specific subjects. For example, in a study on structural and dynamic aspects of interest development, [18] identified a significant decline in interest in Physics, Chemistry and Mathematics as students' progress through secondary school. He also noted that this decline is especially pronounced for girls. Similarly, according to [34], research into students' attitude and interest in Physics originates from the 1960s and 1970s, basic questions are still open: how to make students' attitude towards science more favourable and how to increase their interest in the subject. Interest has many implications for studying and learning.

It is particularly noteworthy that a variety of research also found significant gender differences in attitude towards, and interest in science, with girls losing interest faster than boys in secondary school ([14]; [30]; and [11]). Also, [20] indicate that these gender differences were most likely to be connected with a number of variables related to classroom experiences, including pedagogical variables. [28] in their study to determine the factors which predict performance in secondary school science subjects asserts that sex is a very good predictor of performance in science subjects at secondary school level. Similarly, the findings of [6] reveals significant in the aspect of gender difference in favour of boys in Physics achievement. Also, [25] observed that there is gender inequality in science, technology and mathematics.

Conversely, [16], [21] and [9] in their separate studies on comparative analysis of SSCE and NECO results in Ohaukwu local government area of Ebonyin State, gender differences in learning outcomes background and differences in gender gap comparisons across racial/ethnic groups in education and work respectively reported that there is no significant effect of gender on achievement of Physics.

II. RESEARCH HYPOTHESES

The following research hypotheses were formulated and tested at $p < 0.05$:

HO_1. There is no significant relationship between student variables and student academic performance in science subjects.

HO_2 : There is no significant relationship between the contributions of student variables to the academic performance of secondary school student in science subjects.

III. METHODOLOGY

The study was a descriptive survey of *ex-post facto* research design which was questionnaire based. The target population for this study comprised of all senior secondary class II (SS 2) science students in all the public secondary schools in Ikere Local Government Area of Ekiti State, Nigeria. Stratified random sampling technique was used to select twenty (25) students each from each of the five (5) selected secondary schools from Ikere Local Government Area of Ekiti State. A total of one hundred and twenty five (125) students were used as samples for the study, these comprise of seventy two (72) male and fifty three (53) female. The instruments used for this study was questionnaire and past records of academic performance of

students in Biology, Chemistry and Physics obtained from the schools involved in the study. The questionnaire is designed to elicit information about students' attitude towards Biology, Chemistry and Physics; Interest in Biology, Chemistry and Physics; Students' study habits; and Students' gender. With the permission of the authorities of the schools used for the study, the questionnaires were administered on the affected senior secondary class 2 Science students. The questionnaire copies were then collected and each of them was scored accordingly and the data collected were later analysed using Pearson's Product Moment Correlation and Multiple regression statistical analysis at 0.05 level of significance.

IV. RESULT AND DISCUSSION

Hypothesis 1

There is no significant relationship between student variables and student academic performance in Science.

Table 2: Correlation matrix of student variables and student academic performance in Science

	Gender	Physics Attitudinal Scale	Physics Interest Scale	Study Habit	Student Academic Performance
Gender	1.000				
Physics Attitudinal Scale	.031	1.000			
Physics Interest Scale	-.042	.209*	1.000		
Study Habit	.014	.055	.410*	1.000	
Student Academic Performance	.057	.371*	.300*	.512*	1.000

* correlation is significant at the 0.05 level (2 – tailed)

The result from table 2 shows that r-cal between the students study habit and their academic performance in science is significant (i.e. r-cal = .512 > r-table =0.195). Also, student attitude towards science and their academic performance in science is also significant (i.e. r-cal = .371 > r-table = 0.193). Similarly, It also shows that r-cal between student interest in science and Students performance in science subjects is significant (i.e. r-cal = .300 > r-table = 0.193). Moreover, student study habit and their interest in science subjects are significant (i.e. r-cal = .410 > r-table = 0.193). It also shows that r-cal between student interest in Science and Students attitude towards science subjects is significant (i.e. r-cal = .209 > r-table = 0.193). The result further revealed that r-cal between student gender and Students performance in science is not significant (i.e. r-cal = .057 < r-table = 0.193).

In summary, student study habit shows the highest relationship with student academic performance in science with r-cal = 0.512, followed and interest in science with r-cal = .410, followed by students' attitude and their academic performance in science with r-cal = .371, followed by student interest and their

performance in science subjects with r-cal = .300 while the correlation between students' interest in science and attitude towards science subjects has the least value of r-cal = .209. The result shows no correlation between students' gender and Students performance in science subjects.

Hypothesis 2

There is no significant relationship between the contributions of student variables to the academic performance of secondary school student in science subjects.

In order to test the hypothesis, scores on all the identified predictors (students' variables) of academic performance constitute the independent variables while students' academic performance represents the dependent variable. These set of scores were subjected to statistical analysis using multiple regression analysis at 0.05 level of significance.

The regression model is specified as follows:

$Y = f(x)$

$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + U_i$

Where X_1 = student study habit

X_2 = science interest Scale

X_3 = science Attitude Scale

X_4 = gender

b_i = slope

U_i = stochastic error term.

Regression result is presented in table 3 below

Table 3: Multiple regressions of the student variables and academic performance of secondary school students' in science subjects.

Model	B	Std Error	Beta	T	Sig T	Remark
Constant	198.846	22.322	-	8.746	.000	Sig
Gender	7.113	2.047	.101	.314	.442	Not Sig
Student Attitude Scale	.120	.174	.231	.690	.490	Sig
Science Interest Scale	.041	.058	.181	.459	.076	Sig
Study Habit	.101	.054	.202	1.918	.056	Sig

Dependent Variable: student academic performance.

Multiple R = 0.871

Multiple R^2 = .759

Adjusted R^2 = .759

F = 86.647

Sig. F = .000

The result from table 3 shows that the students' attitude is the single best predictor of student academic performance in science subjects with beta weight 0.231 (23.1%). Student study habit is the second best predictor of student academic performance in science subjects with beta weight 0.202 (20.2%). This is followed by students' interest in science subjects and students'

gender with beta weight 0.181 (18.1%) and 0.101 (10.1%) respectively.

The composite relationship between predictors (students' variables) and academic performance is very high, positive and statistically significant at 0.05 level (R=0.871, P<0.05). The coefficient of determinant (R^2) is 0.759. This implies that about 75.9% variation in the students' academic performance is jointly explained by variation in the predictor variables. The remaining 24.1% unexplained variation is largely due to variation in other variable which are not in line with the regression model but otherwise constitute the stochastic error term.

Testing the effect of individual predictor variable on students' academic performance, the result shows that students' study habit (t=1.918, P<0.05), students' attitude (t=0.690, P<0.05) and students' interest in Science (t= .459) were statistically significant at 95% confidence level in each case. However, the impact of Student gender (t= .314, P>0.05) are not statistically significant at 0.05 level.

The regression model is statistically significant in terms of overall goodness of fit (F = 86.647, P < 0.05).

V. DISCUSSION

The results of the study were discussed based on the two research questions:

The result from table 2 shows significant difference in the student attitude towards science subjects and their academic performance in science subjects significant (i.e. r-cal = .371 > r-table = 0.193). This shows that positive attitude towards science subjects is a good predictor academic performance in science subjects. This results agrees with the findings of [13] and [4] that students' positive attitudes to science subjects correlate highly with their science achievement and that improved students' attitude to science subjects enhance students' performance in the subject.

Similarly, It also shows that r-cal between student interest in Science subjects and Students performance in science subjects is significant (i.e. r-cal = .300 > r-table = 0.193).That is , the result is significant. This results agrees with the findings of [15] that interest-based motivation to learn has positive effects both on studying processes and on the quality and quantity of learning outcomes. Moreover, the result that r-cal between student gender and Students performance in science subjects is not significant (i.e. r-cal = .057 < r-table = 0.193) agrees with the findings of [16], [21] and [9] in their separate studies reported that there is no significant effect of gender on achievement of science subjects.

The result from table 3 shows that the students' attitude is the single best predictor of student academic performance in science subjects with beta weight 0.231 (23.1%). This results agrees with the findings of [13] and [4] that students' positive attitudes to science subjects correlate highly with their science achievement and that improved students' attitude to science subjects will enhance students' performance in the subject. This is followed by students' interest in science subjects and students' gender with beta weight 0.181(18.1%) and 0.101 (10.1%) respectively.

The composite relationship between predictors (students' variables) and academic performance is very high, positive and statistically significant at 0.05 level (R=0.871, P<0.05). The

coefficient of determinant (R^2) is 0.759. This implies that about 75.9% variation in the students' academic performance is jointly explained by variation in the predictor variables. The remaining 24.1% unexplained variation is largely due to variation in other variable which are not in line with the regression model but otherwise constitute the stochastic error term.

VI. CONCLUSION

As a result of the findings of this study, it is concluded that students' variables (students' attitude towards science subjects, Students' interest in science subjects and study habit) were significantly important to students' academic performance in science subjects. This simply implies that performance of student in science subjects strongly depend on students' attitude towards science subjects, Students' interest in science subjects and study habit of the students.

VII. RECOMMENDATIONS

Based on the findings of this study, it was recommended that:

Students of Biology, Chemistry and Physics must cultivate right attitude towards the learning of the subjects. They should have the mind that science subjects are fascinating; view it as something around them every day and not as an abstract subject.

It is also recommended that science students must cultivate good study habit and good interest in the subject. They should learn how to go over what they were being taught for that day in science subjects at night and make consultation to other text to widen their knowledge on the topic.

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Impact of School Location on Academic Achievement of Science Students in Senior Secondary School Certificate Examination

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Abstract- The study examined the impact of school location `on academic achievement of Science Students in Senior Secondary School Certificate Examination. The purpose was to determine whether the geographical location has any impact on the achievement of the students in Biology, Chemistry and Physics. The design adopted for the study was an ex-post facto of survey type. The targeted population for the study was Senior Secondary III (SS III) Physics students of public secondary schools in Ekiti West Local Government Area of Ekiti State, Nigeria. A total of one hundred and twenty (120) science students were used as samples for the study. The sample consisted of twenty (20) science students that were randomly selected from six (6) public secondary schools selected for the study. Computerized result sheets sent to each school by WAEC were collected on the 2010-2013 May/June West African Senior Secondary School Certificate Examination (WASSSCE) from all the selected schools for the study. The average of the scores of each candidates selected that formed the population of this study were computed in Biology Chemistry and Physics, these serves as the achievements in science. Three research hypotheses were formulated and analysed using t-Test statistical analysis at $P< 0.05$ level of significant. The findings showed that there was no statistical significant difference in the achievement mean scores of male and female students in the rural school areas and also there was no statistical significant difference in the achievement mean scores of male and female students in the rural school areas. The findings further revealed that there was statistical significant difference in the achievement mean scores of students in rural and urban school located areas. Conclusion and recommendations were also made in this paper.

Index Terms- school location, achievement, science subjects and students.

I. INTRODUCTION

Science has become such an indispensable tool that no nation, developed or developing, wishing to progress in the socio-economic sphere will afford to relegate its learning in schools. The development of any nation, which depends on science and technology, hinges on the nation's science education. Science education is a distinct form of creative human activity which involves distinct ways of seeing, exploring and understanding reality. Science, being a fundamental part of everyday life and essential to our understanding of the world, teaches us a way of finding out about the world (by becoming curious and seek explanations) and this helps us to develop a growing body of ideas and information about the ways things work. Science and technology play an important role in nation building and development [1]. The reason is that science can exert a dominant, if not decisive influence on the life of individual as well as on the developmental effort of a nation [2].

Despite the importance of science (Biology, Chemistry and Physics) and its education value which is relevant to the need of individual learner, economics and technological breakthrough of a nation and the effort of researchers to improve on its teaching and learning, the performance of students in the subjects is not still encouraging. This is manifested in the poor performance of students in science subjects in the West African senior school certificate examination results. Some inhibiting factors affecting science subjects learning and hence students' poor academic in science have been identified. Among these factors, according to [24] include: school location, gender inequality and others.

Location of schools could also be a factor that affects the performance of students in science subjects. [21] in his study on: "classroom environment as correlate of students' cognitive achievement in senior secondary school geography" stated that schools' location means urban and rural schools. Similarly, [19] asserts that location is a particular place in relation to other areas. [22] stated that urban areas are those with high population density, high variety and beauty while rural areas are those with low population, subsistence mode of life, monotonous and burden. Similarly, [18] indicated that schools in urban areas have electricity, water supply, more teachers, more learning facilities and infrastructure. In the same way, [17] in their studies on the influence of study interest and school location on the attitude of secondary school students towards Mathematics in Ekiti State, Nigeria that students that resided in urban centres especially where there are higher institutions like polytechnics or universities are likely to have inclination for higher education than those in the rural setting. [17] further asserts that students in urban setting could have more access to libraries, laboratories, etc. than those in rural setting.

[12] in their studies on school location and academic achievement of secondary school in Ekiti state, Nigeria asserts that the various review of literature on school location influence on academic performance is not the same. While some maintain that urban students perform better in examinations than their rural counterparts, other found that rural students (in spite of all odds) perform better. Some have submitted in their findings and concluded that no particular set up (urban or rural) can claim

superiority over the other because their performances are the same. [15] in his studies on the influence of sex and location on relationship between student problem and academic performance affirms that sex and location do not affect the negative relationship between student problems and academic performance. In another development, [14] studied students' in Australia and found out that geographical location do not significantly predict outcomes in school performance. Conversely, [3] asserts that school location has been viewed as one of the factors that affect students' academic achievement. Similarly, [20] stated that sex and location of school influences students' academic achievement in some areas.

[6] contends that school location and school size influences students' performance in sciences (Physics in particular). [4] that the entire unattractive physical structure of the school building could de-motivate learners to achieve academically. This is referring to learner's environment mismatch. In the same way, [10] also found statistically significant differences in students' science achievement in favour of urban schools as compared to rural schools. The reasons for this may be varied and complex but is probably related to differential access to resources required for quality teaching and learning [5].

Moreover, [13] while looking at the effects of classroom and environmental noise on children's academic performance found out that both chronic and acute exposure to environmental and classroom noise have a detrimental effect upon children's learning and performance. Rural schools are disproportionately likely to have an inadequate pool of teachers qualified in Physics and insufficient funds to maintain up-to-date computers, instructional software, and laboratory facilities [11] and [23]. In addition, [9] and [8] in their separate studies indicated that schools in urban areas achieved more than schools in the rural areas in science subjects. Specifically, [9] observed in his study that schools in urban locations had better academic achievement than their rural counterpart in Chemistry.

Conversely, [7] in their study to determine the factors which predict performance in secondary school Physics in Ebonyi North educational Zone of Ebonyi State, asserted that the effect of school location on the performance in secondary school Physics was not significant, hence, they concluded that school location does not influence Physics achievement of students in secondary school.

Similarly, in a study of school location versus academic achievement in Physics, [24] observed that there was no significant difference in the mean achievement score of students in urban schools that were exposed to learning Physics through Computer-Assisted Instruction (CAI) and students in rural schools that were also exposed to the same treatment. In addition, [16] in their study on four Ability Process Dimension (4APD) as a function of improving teaching and learning as basic Mathematics in Ekiti State secondary schools revealed that the mean performances of students from urban and rural locations in Mathematics are not statistically different.

II. RESEARCH HYPOTHESES

The following research Hypotheses were formulated and tested at $p < 0.05$:

Ho_1: There is no significant difference in the achievement mean scores of male and female students in the rural school located areas.

Ho_2: There is no significant difference in the achievement mean scores of male and female students in the urban school located areas.

Ho_3: There is no significant difference in the achievement mean scores of students in rural and urban school located areas.

III. METHODOLOGY

The design of this study was an ex-post facto of survey type. The targeted population for the study was Senior Secondary III (SS III) Physics students of public secondary schools in Ekiti West Local Government Area of Ekiti State, Nigeria.

The sample of the study consists of twenty (20) science students (i.e. students that registered and wrote WAEC examinations on Biology, Chemistry and Physics) were randomly selected from six (6) public secondary schools selected for the study. A total of one hundred and twenty (120) science students were used as samples for the study. The sample is made up of sixty (60) science students randomly selected from rural schools and sixty (60) science students that were randomly selected from urban schools. This sample comprises of sixty eight (68) male and fifty two (52) female.

The researchers made personal contact with all the selected schools for this study and collected the 2010-2013 May/June West African Senior Secondary School Certificate Examination (WASSSCE) computerized result sheets sent to each school by WAEC. The average of the scores of each candidates selected that formed the population of this study were computed in Biology Chemistry and Physics, these serves as the achevements in science.

IV. RESULTS

Research Hypothesis 1

There is no significant difference in the achievement mean scores of male and female students in the rural areas.

Table 1 : t-Test Analysis of academic performance of students in schools located in rural areas.

GROUP	N	$\overline{X}$	SD	df	t-value t-cal.	Test t-tab	Remarks
Male	34	63.87	4.54	58	1.54	1.96	* *
Female	26	62.94	3.86				

* * = Not Significant at P > 0.05

The table 1 above revealed that the calculated t–value (t-cal) is less than the tabulated t-value (t-table) at 0.05 level of significant (i.e. t-cal = 1.54 < t-table =1.96, df = 58; P > 0.05). Hence, the null hypothesis is hereby accepted. That is, there is no significant difference in the achievement mean scores

(WASSSCE results) of male and female students in the rural areas.

Research Hypothesis 2

There is no significant difference in the achievement mean scores of male and female students in the urban school located areas.

Table 2 : t-Test Analysis of academic performance of students in schools located in urban areas.

GROUP	N	$\overline{X}$	SD	df	t-value		Test	Remarks
					t-cal.	t- tab		
Male	32	46.65	6.54					
				58	1.54	1.96		* *
Female	28	45.94	5.86					

* *   =   Not Significant at P>0.05

The table 2 above revealed that the calculated t–value (t-cal) is less than the tabulated t-value (t-table) at 0.05 level of significant (i.e. t-cal = 1.54 < t-table =1.96, df = 58; P > 0.05). Hence, the null hypothesis is hereby accepted. That is, there is no significant difference in the achievement mean scores (WASSSCE results) of male and female students in the school located in the rural areas.

Research Hypothesis 3

There is no significant difference in the achievement mean scores of students in rural and urban school located areas.

Table 3 : t-Test Analysis of academic performance of students in schools located in rural and urban areas.

GROUP	N	$\overline{X}$	SD	df	t-value		Test	Remarks
					t-cal.	t- tab		
Rural	60	76.15	7.46					
				118	6.74	1.96		*
Urban	60	68.62	8.34					

*   = Significant at P < 0.05

The table 3 above revealed that the calculated t–value (t-cal) is greater than the tabulated t-value (t-table) at 0.05 level of significant (i.e. t-cal = 6.74 > t-table =1.96, df = 118; P < 0.05). Hence, the null hypothesis is hereby rejected. That is, there is significant difference in the achievement mean scores (WASSSCE results) of   students in rural and urban school located areas.

V. DISCUSSION

As shown in table 1, there is no significant difference in the achievement mean scores (WASSSCE results) of male and female students in the rural areas. The findings established the homogeneity of male and female students in terms of academic achievement irrespective of school location. In order words, it could be said that the knowledge baseline for the two groups (male and female) are equal. This finding agreed with that of [15] that sex and location do not affect the negative relationship between student problems and academic performance.

Furthermore, As also shown table 2, there is no significant difference in the achievement mean scores (WASSSCE results) of male and female students in the urban areas. The findings further established the homogeneity of male and female students in terms of academic achievement irrespective of school location. In order words, it could be said that the knowledge baseline for the two groups (male and female) are equal. Similarly, the finding also still in line with that of [15] that sex and location do not affect the negative relationship between student problems and academic performance.

Moreover, table 3 showed that there is significant difference in the achievement mean scores (WASSSCE results) of students in rural and urban school located areas. This means that geographical location of schools has influence on the academic achievement of students. This finding agreed with that of [9] and [8] in their separate studies indicated that schools in urban areas achieved more than schools in the rural areas in science subjects.

VI. CONCLUSION

The findings revealed that there was no statistical significant difference in the achievement mean scores (WASSSCE results) of male and female students in the rural school areas and also there was no statistical significant difference in the achievement mean scores (WASSSCE results) of male and female students in the rural school areas. The findings also revealed that there was statistical significant difference in the achievement mean scores (WASSSCE results) of students in rural and urban school located areas.

VII. RECOMMENDATIONS

The following recommendations based on the findings of this study were made:

That government and science educators should focus more attention in terms of necessary facilities and pedagogy on the schools located in rural areas for them to have the same opportunity like their counterpart in the urban school location areas, and to enhance student's achievement in science subjects irrespective of the geographical school location.

Science educator and other stake holders should discourage gender stereotype in teaching and learning of science subjects irrespective of the geographical school location

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Regression Based Forecast of Electricity Demand of New Delhi

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Abstract- The forecast of electricity demand in India is of considerable interest since the electricity sector has been the prime focus of past as well as present Governments. This study presents three models of prediction of electricity demand of New Delhi, namely Multiple Regression, Trend Seasonality Model and ARIMA modelling. The significance of climatic and seasonal factors on electricity demand as well as comparison of the relative accuracy of the models have also been discussed

Index Terms- ARIMA, Electricity Forecast, Multiple Regression, Trend Seasonality

I. INTRODUCTION

Forecasting of electricity demand has an important function in short term load allocation and distribution as well as long term planning for future electricity generation facilities. Governments worldwide use energy demand forecasting as one of the most important policy tools. Accurate load forecasting can lead to better budget planning, overall reduction in cost and maintenance scheduling and fuel management. Without energy forecast, shortage in power or overcapacity may lead to large losses.

Demand of electricity is subject to a range of uncertainties such as weather conditions (temperature, humidity, precipitation etc.), population growth, technology, economy and irregularity in individual usage. It is also affected by some known calendar effects such as the time, day, year and holidays.

Load forecasting has been a subject of considerable research in the past. Ching-Lai Hor et al. [1] have used multiple regression as a means of investigating the effect of climatic factors on the electricity demand of England and Wales. Exponential smoothing has been investigated by Barakat et al. [2] and Infield and Hill [3] to forecast demand based on past trend in Saudi Arabia and Shetland, Scotland respectively. Adaptive load forecasting algorithms such as the Kalman Filter based regression used by Ojeda et al. [4] have also garnered interest in the past.

Apart from these, stochastic time series such as Autoregressive Integrated Moving Average Models (ARIMA) have also been efficient in predicting dependent variable, particularly when the independent variable data is missing or erroneous. Li Wei and Zhang zhen-gang [5] have successfully demonstrated this.

An accurate and robust demand forecast requires accurate and adequate data without which the results of the forecast are a bit unreliable. However, India does not have a robust system of collecting, maintaining and reporting data related to electricity usage in the public domain. It is hoped that with increasing stress on accurate electricity forecast, efficient data management systems will be devised to aid better quality forecasts.

The main contribution of this study is the development of robust statistical models to forecast electricity demand incorporating meteorological factors to improve the accuracy and bring out the relative contribution of the influence of these meteorological factors. Multiple regression, the Trend-Seasonality model and ARIMA models have been used to predict the electricity demand of New Delhi, India. In each case, the root mean square error has been used as a measure of the accuracy of the prediction.

The structure of this paper is as follows: Section II describes the data sources from which data for demand as well as the independent variables have been collected. Section III analyses the nature of electricity demand data of New Delhi. In section IV, we develop the statistical model to forecast electricity demand in New Delhi and relate electricity demand to climatic factors using multiple regressions. Section V gives a basic overview of the application of the Trend-Seasonality model on electricity demand. ARIMA modelling of the data and least error ARIMA formula are presented in Section VI. Finally, in Section VII, the main findings of the study are summarized and conclusions are drawn.

II. DATA SOURCES

To achieve an accurate electricity demand forecast, accurate data was required on electricity demand, climate and demography of Delhi and India. The required data was collected from the following sources.

1) Load generation balance report 2005-2013 by Central Electricity Authority, India for electricity demand data [6]
2) Tutiempo for Climate Data [7]
3) World Bank, India Data, 1961-2012 [8]

III. ANALYSIS OF ELECTRICITY DEMAND DATA

In this section the main characteristics of electricity demand data have been analyzed using standard electricity demand-time plots.

The time frame can be a day, month or years depending upon the characteristic to be analyzed. Electricity demand data can be considered to be a time-series data and all the mathematics for time-series data is applicable to electricity demand data.

A. Non-Stationary

Electricity demand data cannot be considered to be stationary because the mean of electricity demand data doesn't remain constant throughout the year.

B. Seasonality

There is seasonality in electricity demand data. Intuitively, the time-series has been divided into four seasons in the literature which are Winter, Summer, Pre-Monsoon and Post-Monsoon.

Table 1: Average monthly electricity demand data of Delhi from 2005-2012

Month	Jan	Feb	Mar	Apr	May	Jun
Average	1764	1484	1620	1945	2351	2443

Table 2: Average monthly electricity demand data of Delhi from 2005-2012

Month	Jul	Aug	Sep	Oct	Nov	Dec
Average	2536	2418	2231	1909	1552	1634
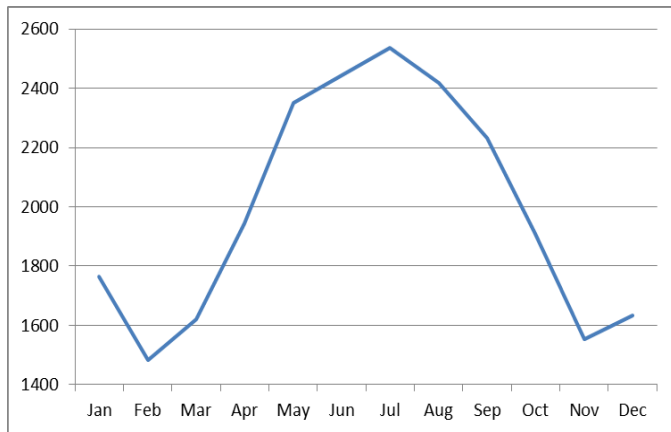
Figure 1: Plot of Average monthly electricity demand data of Delhi from 2005-2012

C. Trend

If the mean electricity demand data each year is analyzed over a period of many years, a tendency of the demand to increase is observed. Thus it can be said that there is a long-term trend in electricity demand data.

Year	2005	2006	2007	2008
Mean	1800.6	1860.8	1859.7	1896.6

Table 3: Average yearly electricity demand data of Delhi

Year	2009	2010	2011	2012
Mean	1983.4	2120.5	2218.7	2189.8

Table 4: Average yearly electricity demand data of Delhi
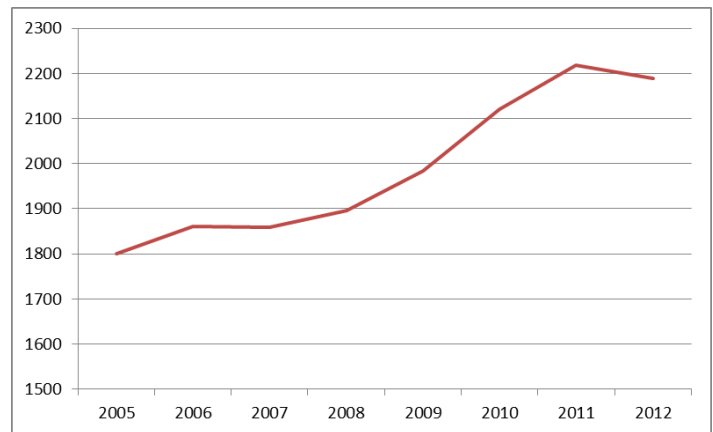
Figure 2: Plot of average yearly electricity demand data of Delhi

IV. MULTIPLE REGRESSION

In this section, we will forecast the electricity demand of New Delhi on a monthly basis through multiple regression. In multiple regressions, a dependent variable is predicted by two or more independent variables. Literature in the area indicates that temperature, humidity and precipitation are the major meteorological factors which tend to influence the electricity demand in a region. We will use past electricity demand and these factors to forecast electricity demand. The data was collected from January 2005 to March 2013.
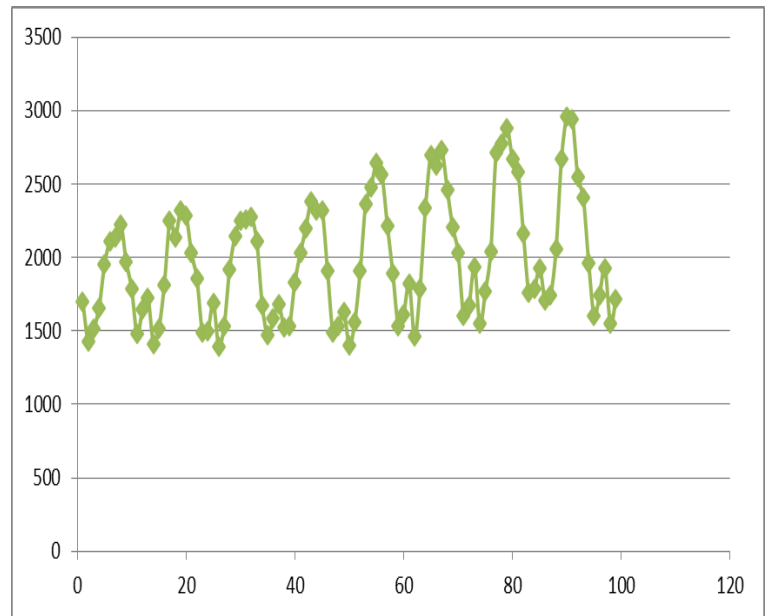
Figure 3: Electricity Demand in Delhi

Clearly, as we can see from Figure 1,2 and 3, the data has a time trend, seasonality and irregularity.

Temperature, humidity and precipitation are taken as independent variables and electricity demand is the dependent variable. Since, the data has a time trend; time will also be taken as a dependent variable. Also, the data collected is monthly data and hence 11 dummy variables will be taken to account for monthly variation in electricity demand. The final model is

$$Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 \ldots\ldots + B_{14}X_{14} + B_{15}X_{15}$$

Where

Y = Monthly electricity demand in Delhi (MU)
X_1 = Temperature (ºC)
X_2 = Mean humidity percentage
X_3 = Precipitation (mm)
X_4 = Time trend
X_5 to X_{15} = Dummy variables for January to November

The B's are regression coefficients. A regression coefficient in multiple regressions is the slope of the linear relationship between the dependent variable and the part of a dependent variable that is independent of all other independent variables

Regression performed in Microsoft Excel gives the coefficients in as specified in Table 5.

	Coefficients	T Statistics
B_0	1016.70	3.39
B_1	37.66	2.93
B_2	-3.13	-1.24
B_3	-0.27	-1.01
B_4	5.22	12.60
B_5	233.48	4.10
B_6	-232.30	-3.50
B_7	-364.37	-3.03
B_8	-305.18	-1.65
B_9	0.31	0.00
B_{10}	101.22	0.42
B_{11}	368.94	1.57
B_{12}	303.31	1.30
B_{13}	143.70	0.69
B_{14}	-147.10	-1.02
B_{15}	-281.15	-3.23

Table 5: Regression coefficients – Multiple regression model

We need to analyze the goodness of fit of the model. The goodness of fit of a statistical model describes how well it fits a set of observations. Measures of goodness of fit typically summarize the discrepancy between observed values and the values expected under the model in question. The regression has an adjusted goodness of fit of 0.926 indicating an extremely good fit model.

The T Statistics indicates the confidence level with which we can say that a particular dependent variable indeed predicts the independent variable and that the corresponding regression

coefficient is non zero. We can say that temperature regression coefficient is non zero with confidence level 99.5%, mean humidity percentage and precipitation regression coefficients are non-zero with confidence level 70%. This indicates strong correlation between electricity demand and climatic variables such as temperature, mean humidity percentage and precipitation. However we can neglect mean humidity and precipitation if their data is not available to us as 70% is not deemed to be a very good confidence interval.

We plot the error term i.e. the difference between Actual electricity demand and electricity demand predicted according to the model. The Root Mean Square Error obtained is 102.54. The plot of the error terms is shown in Figure 4
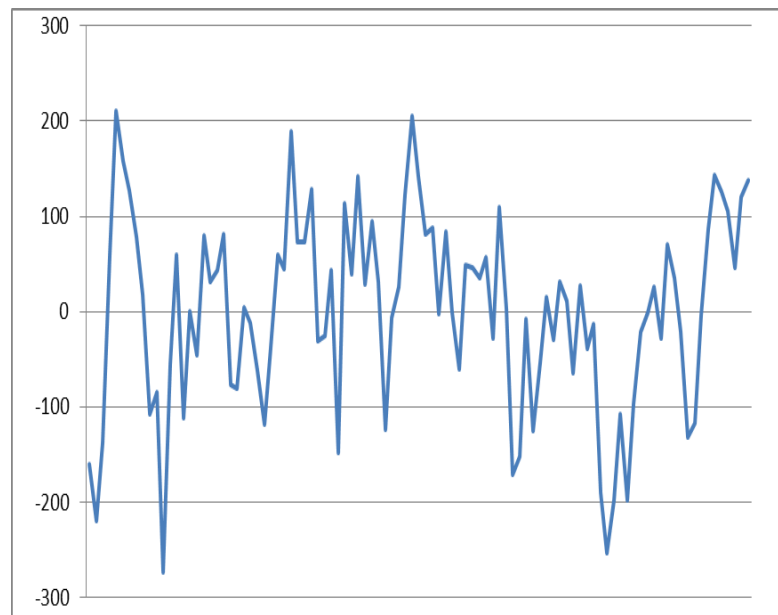
Figure 4: Errors – Multiple regression model

In order to improve the fit of the model and reduce error, we use another model where the dependent variable is logarithm of electricity demand. Literature suggests that due to the nature of electricity demand data, taking logarithm of electricity demand will lead to a better statistical result.

The coefficients from the multiple regressions for the logarithmic model are specified in Table 6.

	Coefficients	T Statistics
B_0	7.12	54.90
B_1	0.01	2.64
B_2	0.00	-0.96
B_3	0.00	-1.18
B_4	0.00	13.78
B_5	0.12	4.94
B_6	-0.12	-4.30
B_7	-0.14	-2.68
B_8	-0.06	-0.75
B_9	0.09	0.90

B_{10}	0.13	1.24
B_{11}	0.23	2.30
B_{12}	0.21	2.11
B_{13}	0.14	1.54
B_{14}	-0.01	-0.12
B_{15}	-0.13	-3.41

Table 6: Regression coefficients – Multiple regression logarithmic model

The regression has an adjusted goodness of fit of 0.943 indicating an improved model as compared to the previous case. We can say that temperature regression coefficient is non zero with confidence level 99%, mean humidity percentage regression coefficient is non zero with 65% confidence level and precipitation regression coefficients is non-zero with confidence level 70%. This indicates strong correlation between electricity demand and climatic variables such as temperature, mean humidity percentage and precipitation.

We plot the error term i.e. the difference between Actual electricity demand and electricity demand predicted according to the model. The plot of the error terms from the new model is shown in Figure 5. The errors have clearly reduced as compared to the previous case. The new Root Mean Square Error is 87.36.
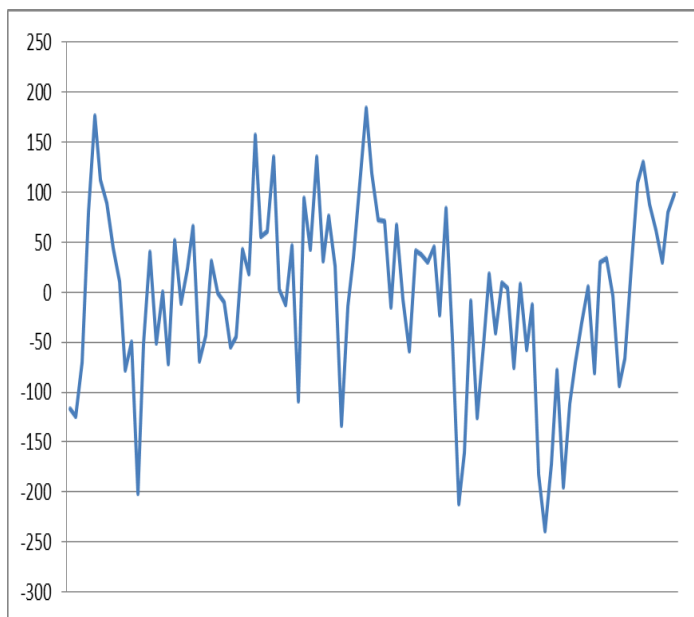

Figure 5: Errors – Multiple regression logarithmic model

V. TREND-SEASONALITY MODEL

The advantages of predicting a dependent variable on regression of itself has distinct advantages as compared to regressing on multiple independent variables.

Regressing on auto regressions implies that all of the factors that affect the dependent variable y_t are included in auto regressions of y_t i.e. y_{t-1}, y_{t-2} etc. according to Wooldridge. Therefore, one doesn't have need of all the independent factors, and this has a

lot of advantages on the data side, particularly with respect to its collection and storage, as we only need to collect and store the dependent variable and we can lag it according to our need. This is particularly apt for India, as here data for independent variables is either unavailable for public or extremely costly.

The trend seasonality model assumes that the dependent variable can be modeled as the product of a Trend T (which varies linearly with time), Cyclicity C (which is periodic on a short duration), Seasonality S (which is periodic on a long duration) and an Irregular component I (error). Electricity is a variable which does not vary on a short duration; therefore we can generally remove C without affecting the model to a great extent.

The methodology adopted for this method is as follows -

1) Assume trend to be constant for the period of the seasonality. In our case, the period of seasonality is 12. Calculate a moving average over y_t to y_{t-12}. This is the fixed trend component for that value.

$$MA(12) = \frac{\sum_{i=1}^{12} y_{t-i}}{12}$$

2) Divide the values by the Moving Average for that value. This means that we are left with the seasonal and the irregular component.
3) To get seasonal component, consider each month separately. Find all seasonal values for that particular month and average to remove irregular component. We get a fixed seasonal component S1 for a month. Repeat for every month.
4) Divide each value by its seasonal component to get the trend component.
5) Since trend is linear, hence we can easily regress this on time to get a linear relation w.r.t. time.
6) Forecast the trend from the linear relationship and multiply by the average seasonal value for the particular month to get prediction for the particular time.

Employing the method for New Delhi electricity demand, a plot showing the seasonal and trend components of the New Delhi and solely the linear trend component after deseasonalizing can be obtained as seen in Fig 6.
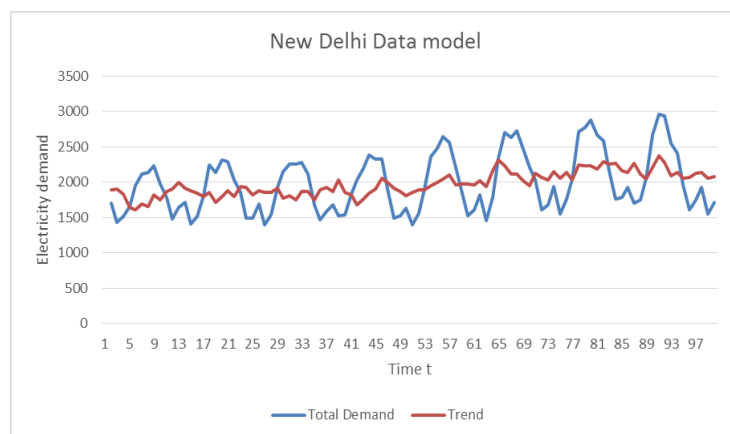

Figure 6: Seasonal and trend components of Demand

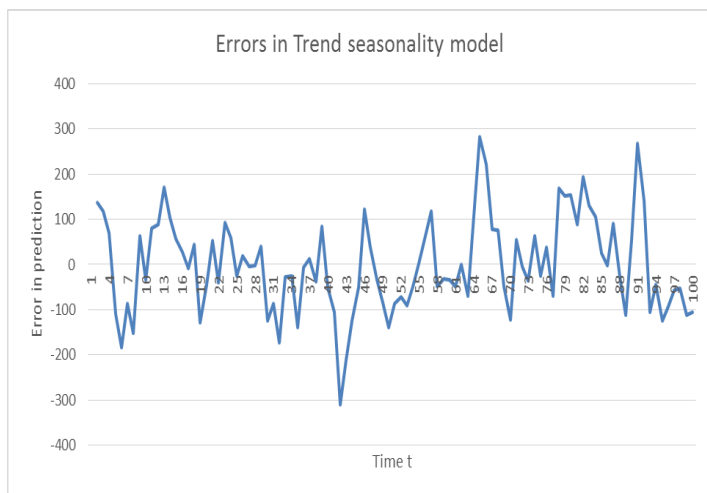A plot of the error terms for this model is shown in Fig 7. The Root Mean Square Error obtained is 104.

Figure 7: Errors – Trend Seasonality Model

Finally, a, plot of the actual and forecasted load demand is shown in Fig 8
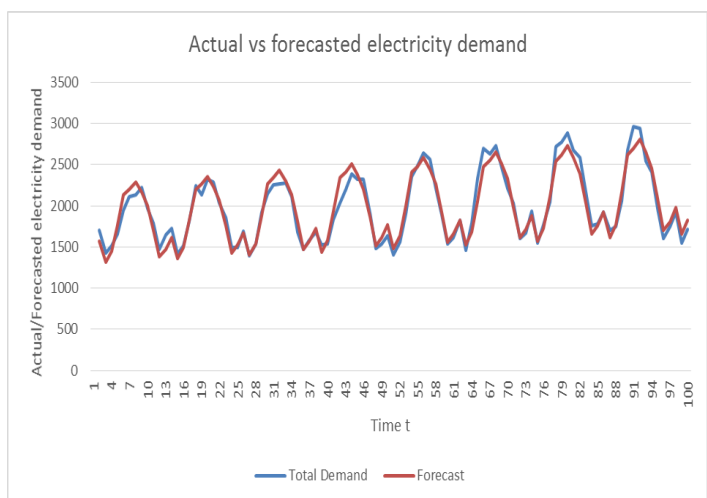

Figure 8: Actual vs Forecasted Demand – Trend Seasonality Model

VI. ARIMA MODELLING

The ARIMA model uses the fact that electricity demand is a stochastic time series.

This modelling regresses the dependent variable y_t on – p lags of the dependent variable (Autoregressive) and q lags of the error term (Moving Average).Sometimes instead of dependent variable y_t, $L^d y_t$ can be used as the dependent variable. Here L is the one step lag operator i.e.

$$Ly_t = y_{t-1}$$

The general equation of ARIMA model is as follows -

$$\left(1 - \sum_{k=1}^{p} \alpha_k L^k\right)(1 - L)^d X_t = \left(1 + \sum_{k=1}^{q} \beta_k L^k\right)\varepsilon_t.$$

Where ε_t is white noise error.

A. Dickey-Fuller Test

The ARMA model (AR and MA) can only be applied is the dependent variable has no trend i.e. it is stationary w.r.t. time. Since our data has a trend variable it has to be differenced to remove the trend. This is the differencing which appears in the ARIMA model I and the order of differencing is decided by the Dickey-Fuller tests. Dickey-Fuller test identifies the unit root in the equation. If the equation has a unit root, the variable is non-stationary. [9]

The significance results when regression of lagged values of y_t are performed to determine the presence of a unit root are tabulated in Table 7.

Dependent variable	Coefficient of Var_{t-1}	t-stat for Var_{t-1}	P-Value for Var_{t-1}
Ly_t (Simple)	-0.008	-0.6364	0.526
Ly_t (With drift)	-0.203	-3.2954	0.0013
Ly_t (With time trend)	-0.218	-3.3459	0.0011
$L^2 y_t$	0.663	6.8410	7.61E-10

Table 7: Dickey-Fuller Test Significance Results

As can be seen the t-statistic for the simple case is very low and therefore in this case the null hypothesis is rejected. Hence the simple variable cannot be used in the ARIMA model.

We can use the 'With drift' and 'With time trend' variable, however their t-stats are just on the verge of the 95% confidence interval level. Hence it would be better to take Ly_t as the dependent variable as its t-stat has the largest possible value amongst all.

Hence the order of differencing d = 1 for the ARIMA model as specified by the Dickey-Fuller tests.

A. Box-Jenkins Method

The Box Jenkins method is a tool that can be used to predict the degree of p and q for an ARIMA model by comparing the Autocorrelation function (ACF) and the Partial Autocorrelation function (PACF) of the data. [10]

The autocorrelation function at lag k is the correlation of the data with k lags of itself. In our case since the data is essentially Ly_t, hence the ACF(k) for our model is –

$$ACF(k) = \frac{Cov(Ly_t, Ly_{t-k})}{\sqrt{Var(Ly_t)}\sqrt{Var(Ly_{t-k})}}$$

The Partial Autocorrelation function at lag k is the correlation of data with k lags of itself discounting for all effects of the k-1 lags. For Ly_t, the PACF(k) can be found out be regressing Ly_t on k lags of itself, and finding the coefficient of Ly_{t-k}.

Box and Jenkins have specified a wide variety of the characteristic ACF and PACF should obey in order to be an AR(p), MA(q), ARMA(p,q) or even a seasonal ARIMA model.

Therefore, the ACF and PACF of the data should be analyzed first which are shown in Fig 9 and 10 respectively. All of the plots have been conceived using Microsoft Excel.

Figure 11: ACF of Ly_t differenced by 12
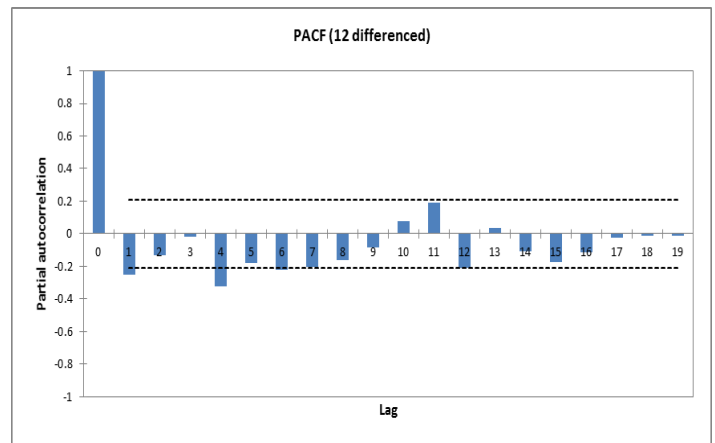
Figure 9: ACF of Ly_t

Figure 12: PACF of Ly_t differenced by 12

We observe that from the ACF, significant spikes are located at lag 1, 4 and 12 indicating MA(1), MA(4) and MA(12) terms and there are significant spikes at lag 1, 4 and 12 in the PACF indicating AR(1), AR(4) and AR(12) terms. We will not consider > AR(4) spikes in this as the spikes start to die out after lag 4, indicating that they are not to be considered.

Hence our final ARIMA model becomes –

$$\textbf{ARIMA}(0,1,0)(1,0,1)^{12}(4,0,4)^{12}(12,0,12)^{12}$$

(The formula has been written in typical seasonal ARIMA representation.)

The Root Mean Square Error from this model is 99.61 which is less than the RMSE calculated from the Trend Seasonality Model.

Figure 10: PACF of Ly_t

There is a certain periodicity with period 12 in the ACF plot and spikes are significant at 0 and 12, therefore according to Box Jenkins a seasonal ARIMA plot with period 12 must be considered.

Hence Ly_t is differenced by 12, i.e. we consider $Ly_t - Ly_{t-12}$ as the new variable to which ACF and PACF are applied. The plots for the new ACF and PACF are shown in Fig 11 and Fig 12 respectively.

VII. CONCLUSION

The Root Mean Square Error, used as a measure of accuracy, is tabulated for all the models presented.

Method	RMSE
Multiple Regression	102.54

Logarithmic Multiple Regression	87.36
Trend-Seasonality Model	104
ARIMA model	99.61

Table 7: Root Mean Square Error for various models

It is evident that Logarithmic Multiple Regression would be the best model to apply in the particular case of predicting Electricity Demand for New Delhi as it gives the lease RMSE as well as provides the significance of climatic factors on Electricity demand.

However, if data for independent variables is absent, the ARIMA models should be used as it gives a lesser RMSE than the Trend-Seasonality Model and also provides a definite formula which can be put into statistical software or Microsoft Excel which has been used to demonstrate all the methods presented here.

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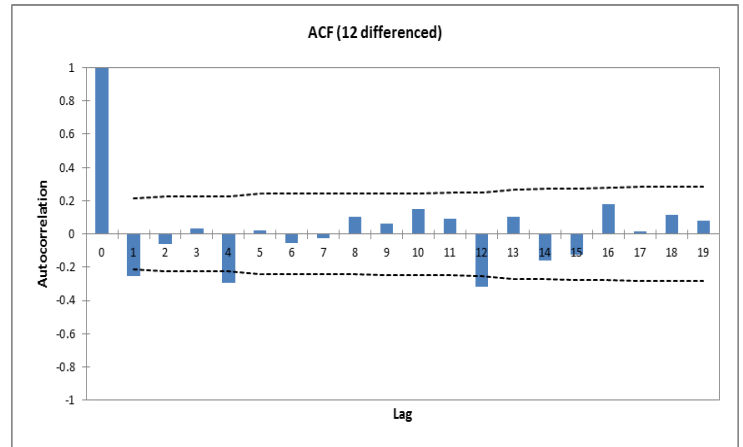
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Optimization of the Process Parameters in Micro-Electric Discharge Machining Using Response Surface Methodology and Genetic Algorithm

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Abstract- Micro Electric Discharge Machining is a non-traditional machining process which can be used for drilling micro holes in high strength to weight ratio materials. This present research study deals with the single optimization of micro EDM process using Genetic Algorithm. Mathematical models using Response Surface Methodology (RSM) is used to correlate the response and the parameters. The desired responses are minimum tool wear rate. The control parameters considered are pulse on time, peak current and flushing pressure on micro EDM of AISI stainless steel 304. The process control parameters of the machine have to be set at an optimal setting in order to achieve the desired responses.

Index Terms- Micro electric discharge machining (micro EDM), Response surface methodology (RSM), Genetic Algorithm (GA), TWR.

I. INTRODUCTION

Micro-EDM is a recently developed process which is used to produce micro-parts in the range of 50μm -100μm. In this process, metal is removed from the work piece by melting and vaporization due to pulse discharges that occur in a small gap between the work piece and the electrode. It is a novel machining process used for fabrication of a micro-metal hole and can be used to machine hard electrically conductive materials. The characteristic of non-contact between the tool and the work piece in this process eliminates the chance of stress being developed on the work piece by the cutting tool force.

However, to achieve the desired responses, the independent control parameters which affect the responses are to be set at an optimal value. Such problems can be solved by first developing mathematical models correlating the responses and the parameters. The second step is to choose a suitable optimization technique to search for correct parameter values for the desired responses.

Mukherjee and Ray [1] presented a generic framework for parameter optimization in metal cutting processes for selection of an appropriate approach. In practice, a robust optimization technique which is immune with respect to production tolerances is desirable [2]. Hung et al. [3] while using a helical micro-tool electrode with Micro-EDM combined with ultrasonic vibration found that it can substantially reduce the EDM gap, variation between entrance and exit and machining time, especially during deep micro-hole drilling. Jeong et al. [4] proposed a geometric simulation model of EDM drilling process with cylindrical tool to predict the geometries of tool and drilled hole matrix. The developed model can be used in offline compensation of tool wear in the fabrication of a blind hole.. Karthikeyan et al. [5] conducted general factorial experiments to provide an exhaustive study of parameters on material removal rate (MRR) and tool wear rate (TWR) while investigating performance of micro electric discharge milling process. Taguchi method is used for experiment design to optimize the cutting parameters [6]. Experimental methods increase the cost of investigation and at times are not feasible to perform all the experiments specially when the number of parameters and their levels are more. RSM is employed to design the experiments with a reduced number of experimental runs to achieve optimum responses [7]. Lalwani et al. [8] applied RSM to investigate the effect of cutting parameters on surface roughness in finish hard turning of MDN250 steel using coated ceramic tool. Yildiz [9] compared state-of-the-art optimization techniques to solve multi-pass turning optimization problems. The results show the superiority of the hybrid approach over the other techniques in terms of convergence speed and efficiency. Yusup et al. [10] discussed evolutionary techniques and basic methodology of each technique in optimizing machining process parameters for both traditional and modern machining. Application of evolutionary techniques in optimizing machining process parameters positively gives good results as observed in the literature. Samanta and Chakraborty [11] proved the applicability and suitability of evolutionary algorithm in enhancing the performance measures of non-traditional machining processes. Jain et al. [12] used GA for optimization of process parameters of mechanical type advanced machining processes. Traditional optimization methods are not suitable to solve problems where the formulated objective functions and constraints are very complicated and implicit functions of the decision variables.

II. RSM MODELING

Table 1 lists the values for process control parameters of pulse on time, peak current and flushing pressures with five levels for each parameter. A sum of twenty experimental runs is designed using Centre composite design. The combinatorial effects of process control parameter at different levels on the measured response are listed in Table 2.

Table 1 Coded and actual control parameter values at different levels

Machining parameters	Symbol	Units	Levels				
			1	2	3	4	5
Coded Value			-1.682	-1	0	1	1.682
Pulse-on-time	(Ton)	µs	1	5	12	18	22
Current	(Ip)	A	0.4	0.7	1.2	1.7	2.0
Flushing Pressure	(P)	Kg/cm^2	0.1	0.2	0.3	0.4	0.5

Table 2 Design of experiments matrix showing coded values and observed response

Sl. No.	Coded values of parameters			Actual values of response
	Pulse-on-time (µs)	Current (A)	Flushing Pressure (Kg/cm^2)	Tool Wear Rate (mg/min)
1	-1	-1	-1	0.00033
2	1	-1	-1	0.00040
3	-1	1	-1	0.00047
4	1	1	-1	0.00136
5	-1	-1	1	0.00149
6	1	-1	1	0.00127
7	-1	1	1	0.00062
8	1	1	1	0.00123
9	-1.682	0	0	0.00062
10	1.682	0	0	0.00112
11	0	-1.682	0	0.00066
12	0	1.682	0	0.00089
13	0	0	-1.682	0.00060
14	0	0	1.682	0.00150
15	0	0	0	0.00081
16	0	0	0	0.00074
17	0	0	0	0.00077
18	0	0	0	0.00078
19	0	0	0	0.00082
20	0	0	0	0.00078

The mathematical model correlating the tool wear rate with the process control parameters is developed as:

Y(TWR)= $(0.000708)+((0.000070*x(1))-((0.000058)*x(2))+((0.000296)*x(3))+((0.000011)*x(1)*x(1))-((0.000004)*x(2)*x(2))+((0.000095)*x(3)*x(3))+((0.000112)*x(1)*x(2))-((0.000038)*x(1)*x(3))-((0.000252)*x(2)*x(3));$

....(1)

Where,
X_1= pulse on time
X_2= current
X_3= Flushing pressure

III.   OPTIMIZATION USING GA

Genetic algorithm is an evolutionary algorithm which applies the idea of survival of the fittest amongst an interbreeding population to create a robust search strategy. Initially a finite population of solutions to a specified problem is maintained. It then iteratively creates new populations from the old by ranking the solutions according to their fitness values and interbreeding the fittest to create new off-springs which are optimistically closer to the optimum solution to the problem at hand. It uses only the fitness value and no other knowledge is required for its

operation. It is a robust search technique different to the problem solving methods used by more traditional algorithms which tend to be more deterministic in nature and get stuck up at local optima. As each generation of solutions is produced, the weaker ones fade away without producing offspring's, while the stronger mate, combining the attributes of both parents, to produce new and perhaps unique offspring's to continue the cycle. Occasionally, mutation is introduced into one of the solution strings to further diversify the population in search for a better solution.

The present research work optimizes the desired response and control parameters by writing the mathematical models as developed in equations 1 as .M-files and then solved by GA using the MATLAB software. The initial population size considered while running the GA is 20. A test of 10 runs has been conducted and the results are listed in Tables 3 for minimum tool wear rate.

The GA predicted value of minimum tool wear rate and the corresponding control parameter values are shown in Figure 1. It is observed from the figure that the best minimum tool wear rate predicted using GA is 0.00082664 mg/min with the corresponding control parameter values of 1µs for pulse on time, 0.4 A for peak current and 0.1 kg/cm2.

The results predicted using GA for minimum tool wear rate is listed in Table 3. Trial and error method for the selection of initial population size found the best result when the initial population size of 20 was chosen.
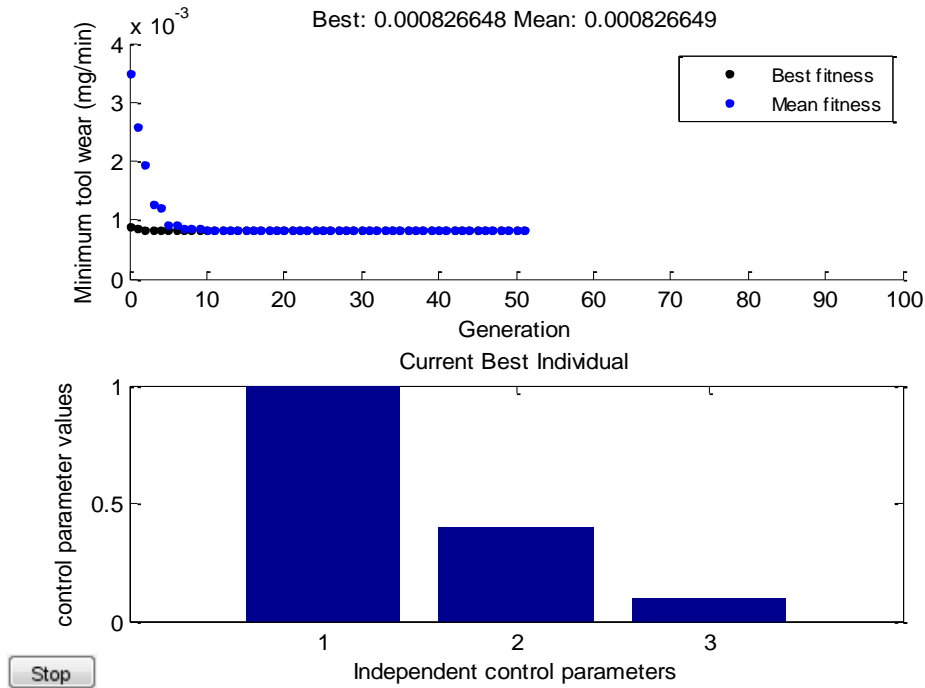
Fig. 1 GA predicted plot for minimum tool wear rate and the control parameter values

Table 3 GA predicted results for minimum tool wear rate

Trial number	Control parameters			TWR (mg/min)
	Pulse on time	current	Flushing pressure	
1	18	1.7	0.4	0.00195386
2	18	1.7	0.4	0.00199364
3	18	1.7	0.4	0.00225604
4	12	1.2	0.3	0.00285234
5	12	1.2	0.3	0.00452525
6	12	1.2	0.3	0.00625264
7	5	0.7	0.2	0.00975433
8	5	0.7	0.2	0.00094524
9	1	0.4	0.1	0.00089732
10	1	0.4	0.1	0.00082663

IV.   VALIDITY OF GA PREDICTED RESULT

Validation of the simulation results with the experimental results is done in order to conform the simulation results to the actual working conditions and to know how much is it varying with the actual experimental results which is measured by the percentage of prediction error.

The percentage of prediction error is calculated as:

$$\text{Prediction error \%} = \frac{(\text{Experimental result} - \text{GA predicted result})}{(\text{Experimental result})} \times 100$$

In order to validate the test results predicted by GA, five random experimental results are compared with the GA predicted results as shown in Table 4.

Table 4 Comparison of Experimental and GA predicted results

S. No.	Experimental result	GA Predicted result	Prediction error %
1	0.00112	0.00109	2.678
2	0.00136	0.00128	5.882
3	0.00089	0.00083	6.741
4	0.00152	0.00148	2.631
5	0.00082	0.0008264	0.762
Average % of error			3.737

It is observed from the table that average prediction percentage error is well within acceptable limits thus establishing the results predicted using GA to be valid.

V.   RESULT AND ANALYSIS

While drilling micro holes by micro EDM in AISI SS 304, the objective, tool wear rate is considered to be important as they affect the machining efficiency and the quality of the product. While optimizing the responses individually, the GA predicted value of minimum tool wear rate is 0.00082664 mg/min with the corresponding control parameter values of 1μs for pulse on time, 0.4 A for peak current and 0.1 kg/cm2. It is observed that the all three of the control parameters are to be set at low values in order to obtain minimum tool wear rate.

Also, the average percentage prediction error of GA when compared with the experimental results as shown in Table 4 is 3.737. Thus, the GA predicted results are within acceptable limits establishing the validity of the GA as an appropriate optimization technique for the micro EDM process.

VI.   CONCLUSION

AISI SS 304 has a wide range of applications in engineering due to its characteristic of high strength to weight ratio. Micro EDM offers a suitable process for drilling micro-holes in SS 304 mainly due to its characteristic of non contact between the tool and the work piece. The qualities required during micro hole drilling in SS 304 is to decrease the tool wear rate while drilling a micro-hole. The tool wear rate can be considered as a measure of machining efficiency.

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QoS Matrix evaluation by varying route maintenance parameters of AODV for moving Source-Destination pair using opnet 14.5

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Abstract- The mobile nodes in a network which can communicate with each other through a radio wave without any specific infrastructure is widely known as Mobile Ad-hoc Network(MANET). MANET has a number of routing protocols. The popular routing protocols so far are Dynamic Source Routing (DSR), Destination Sequenced Distance Vector (DSDV), Ad-hoc On-demand Distance Vector (AODV) and Temporally-ordered Routing Algorithm (TORA) routing protocol. Among them the AODV routing protocol meets efficiently with the ad-hoc network specification. For last few years routing protocols of mobile ad-hoc networks (MANETs) were simulated as a function of mobility, number of nodes, and size of the network but not as a function of route maintenance parameters such as Active Route Timeout (ART) and Delete Period Constant (DPC=n) with moving source-destination (node) pairs in network as well. The simulation study of proposed routing protocol is carried out using opnet 14.5 simulation tool. The simulation results of different 'ART' and 'n' for the performance metrics net throughput, avg. delay and avg. jitter are analyzed graphically for proposed routing protocol. The default values for AODV are ART =3 and n = 5. Finally this paper presents the Performance matrices evaluation and comparison of AODV routing protocol by varying Active Rote Timeout (ART) and Delete Period Constant (n) at different Source – Destination (node) pair using opnet 14.5.

Index Terms- MANETs, AODV, ART, DPC, Random Way Point, Route Maintenance, Opnet 14.5.

I. INTRODUCTION

Mobile ad-hoc network (MANET) is a collection of independent mobile nodes that can communicate to each other via radio waves [11]. The mobile nodes that are in radio range of each other can directly communicate, whereas others need the aid of intermediate nodes to route their packets. These networks are fully distributed, and can work at any place without the help of any infrastructure. This property makes these networks highly flexible. Owing to the limited transmission range of wireless network interfaces, multiple hops are needed to exchange data between nodes in the network. There are various routing protocols such as DSDV, AODV, OLSR, TORA, DSR, etc., which can be categorized as table driven (proactive), on-demand driven (reactive) and hybrid protocols. AODV stands for ad-hoc on-demand distance vector and is, as the name already says, a reactive protocol, even though it still uses characteristics of a proactive protocol. Performance evaluation of different routing protocols is carried out for quality of service (QoS)

metrics, such as throughput, drop, delay, jitter, packet delivery ratio etc and route maintenance parameters, such as ART, delete period constant, etc., in constant scenario (network load, network size and mobility).

Route maintenance is the mechanism used by a source node to detect a link breakage along its source route to a destination node. Using this mechanism the source node can know it can still use the route or not. When the source node indicates the existence of a broken link in the source route, it can use another route or trigger a new route discovery process [10] [5].

ART is the time at which route is consider as a valid route. When a route is not used for some time, the nodes will remove the route state from the routing table. The time until the node removes the route states is called ART [1]. Delete period constant specifies the time after which an expired route is deleted. An expired route is deleted after delete period multiplied by the greater of Active Route Timeout (ART) or hello interval.

Delete period = Delete period constant (n) × max (active route timeout or hello interval), where delete period constant is having default value of n = 5 s. Delete period is intended to provide an upper bound on the time for which an upstream node. The figure illustrates this concept which described just below. A can have a neighbour B as an active next hop for destination D, while B has invalidated the route to D as shown in Figure 1, where C is source node and D is destination node. As delete period is route maintenance parameter, it is clear that if the path between node C to node D has been setup via node A and node B as intermediate node, and node B has invalidated the route to node D due to the random topology of ad hoc network then up to delete period, node B can setup the route. After the delete period default value if node C still wants to communicate with node D it has to create new setup.

Figure 1 Concept of delete period

Figure 1
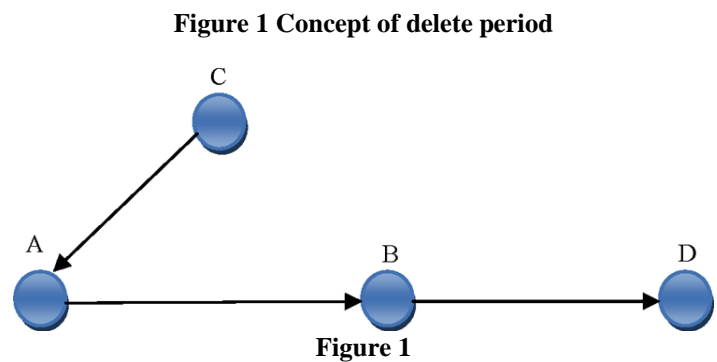
II. BRIEF SUMMARY ON AD-HOC ON DEMAND DISTANCE VECTOR ROUTING

AODV can be called as a pure on-demand route acquisition system [8]. Here, nodes do not lie on active paths neither maintain any routing information nor participate in any periodic routing table exchanges. Further, a node does not have to discover and maintain a route to another node until it needs to communicate.

To maintain the most recent routing information between nodes the concept of destination sequence numbering will be used [4] [5]. Each ad hoc node maintains a monotonically increasing sequence number counter, which is used to supersede stale cached routes. WLAN (IEEE 802.11b), which is mostly used in ad hoc networks to make the physical connection directly between two nodes, is used in this simulation environment [2].

This section explains each process that is required in an AODV network to create, delete and maintain routes [8].

PATH DISCOVERY

The path discovery process is initiated whenever a source node needs to communicate with another node for which it has no routing information in its table. Every node maintains two separate counters; a node sequence number and a broadcast id. The source Effect of variation in active route timeout and delete period constant 181 node initiates path discovery by broadcasting a Route Request (RREQ) packet to its neighbors [4] [5].

REVERSE PATH SETUP

There are two sequence numbers included in a RREQ; the source sequence number and the last destination sequence number known to the source. The source sequence number is used to maintain fresh information about the reverse route to the Source and the destination sequence number specifies how fresh a route to the destination must be before it can be accepted by the source. As shown in the Figure 2 when the source node S determines that it needs a route to the destination node D and does not have the root available. Immediately node S starts broadcasting RREQ message to its neighbouring nodes in quest of route to the destination. The nodes 1 and 4 being as neighbours to the node S receive the RREQ message. So, nodes 1 and 4 create a reverse link to the source from which they received RREQ. Since the nodes 1 and 4 are not aware of the link to the node D, they simply rebroadcast this RREQ to their neighbouring nodes 2 and 5. As the RREQ travels from a source to various destinations, it automatically sets up the reverse path from all nodes back to the source as shown in Figure 2. This reverse route will be needed if the node receives a RREP back to the node that originated the RREQ. Before broadcasting the RREQ, the originating node buffers the RREQ ID and the originator IP address. In this way, when the node receives the packet again from its neighbours, it will not reprocess and re-forward the packet.

Eventually, a RREQ will arrive at a node that possesses a current route to the destination or the destination itself.
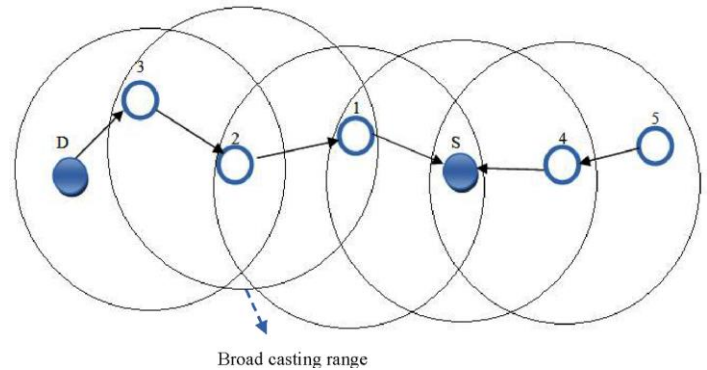
Figure 2 Reverse path setting

Broad casting range

Figure 2

FORWARD PATH SETUP

The receiving node first checks that the RREQ was received over a bi-directional link. If an intermediate node has a route entry for the desired destination, it determines whether the route is current by comparing the destination sequence number in its own route entry to the destination sequence number in the RREQ. If the RREQ's sequence number for the destination is greater than that recorded by the intermediate node, the intermediate node must not use its recorded route to respond to the RREQ. Instead the intermediate node rebroadcasts the RREQ. The intermediate node can reply only when it has a route with a sequence number that is greater than or equal to that contained in the RREQ. If it does have a current route to the destination and if the

RREQ has not been processed previously, the node then unicast a route reply packet (RREP) back to its neighbour from which it received the RREQ. By the time a broadcast packet arrives at a node that can supply a route to the destination, a reverse path has been established to the source of the RREQ. As the RREP travels back to the source each node along the path sets up a forward pointer to the node from which the RREP came, updates its timeout information for route entries to the source and destination, and records the latest destination sequence number for the requested destination. Figure 3 represents the forward path setup as the RREP travels through the nodes 3, 2, 1 from the destination D to the source node S. Nodes 4 and 5 are not along the path determined by the RREP, and will timeout after ART and will delete the reverse pointers from these nodes.
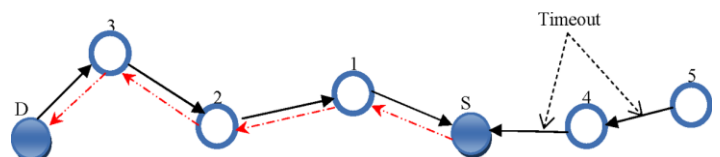
Figure 3 Forward path setting

Timeout

Figure 3

A node receiving a RREP propagates the first RREP for a given source node towards that source. If it receives further RREPs, it updates its routing information and propagates the RREP only if the RREP contains either a greater destination

sequence number than the previous RREP, or the same destination sequence number with a smaller hop count. Now the source node S can begin data transmission as soon as the first RREP is received, and can later update its routing information if it learns of a better route.

ROUTE TABLE MANAGEMENT

A timer associated with reverse path routing entries is called the route request expiration timer. The purpose of this timer is to erase reverse path routing entries from those nodes that do not lie on the path from the source to the destination .The expiration time depends upon the size of the ad-hoc network. Another important parameter associated with routing entries is the route caching timeout or the time after which the route is considered to be invalid. In each routing table entry, the address of active neighbours through that packets for the given destination are received is also maintained. A neighbour is considered active for that destination, if it originates or relays at least one packet for that destination within the most recent active timeout period [8]. This information is maintained so that all active source nodes can be notified when a link along a path to the destination breaks. A route entry is considered active, if it is in use by any active neighbours. A mobile node maintains a route table entry for each destination of interest.

III. OPNET 14.5

Opnet 14.5 modeler and simulation software provide solution for application and network management issues. This software is widely used for research and development of emerging networking technologies; for performance evaluation, testing, and debugging of communication networks, protocols, and applications; and for teaching and research. OPNET software has an easy-to-use graphical user interface, which can be used to build various network configurations and test their performance with simple drag-and-drop actions and a few clicks of a mouse. OPNET software contains a huge library of models that simulate most of the existing hardware devices and cutting-edge communication protocols. Opnet is a discrete event simulator which provides a good balance between ease of use and extensibility and power in terms of what scenarios can be simulated. Also, it does not have as much complexity as some tools, which results in a shorter learning curve. Finally, it has quite advanced wireless modules with new technologies being incorporated into the tool relatively quickly.

IV. SIMULATION ENVIRONMENT

Different parameters for simulation environment have been considered as per Table 1 Here, the ART is taken as the values of [0.5, 2.0, 3.0, 3.5, and 5.0] (in sec) and for each value of ART, the value of delete period constant (n) is taken as [2, 3, 4, 5, 6, 7, and 8]. Default value of route maintenance parameters of AODV routing protocol are given in Table 2.

TABLE 1
SIMULATION PARAMETERS

Parameters at Physical Layer	
Radio type	802.11b
Antenna height	1.5m
Antenna Efficiency	0.8
Antenna model	Omni-Directional
Path loss model	Two ray
No. of channels	1(2.4GHz) Ad-hoc mode
Parameters at MAC Layer	
Mac protocol	802.11
Parameters at Network Layer	
Subnet channel	Wireless
Network protocol	IPv4
Routing Protocol	AODV
Parameters at Application Layer	
Applications	CBR
Packet size	512 Byte
Data Rate	10 kbps
Number of send packet	3600
General parameters	
Network Simulator	QualNet 7.1
Total simulation time	180 seconds
Terrain size	1KM x 1 KM
Number of node	20
Number of SD pair	5, 7
Maximum propagation distance	200 meter
Transmission power	15dbm
Node placement	Randomly
Device type	Human
Mobility model	Random waypoint
Pause time	30 second
Minimum speed	0 m/s
Maximum speed	10 m/s
Routing protocol	AODV
Consider Active Route Timeout (ART)	0.5, 2, 3, 3.5, 5 (second)
Consider Delete Period Constant (DPS)	2, 3, 4, 5, 6, 7, 8 (second)

TABLE 2
DEFAULT VALUE OF ROUTE MAINTENANCE PARAMETERS OF AODV ROUTING PROTOCOL

Active Route Timeout (ART)	3 s
Delete Period Constant (DPS)	5 s
My Route Timeout	2x Active Route Timeout

interval	(ART)
Node Traversal Time	40 s
Maximum Route Request Retries	2
Maximum Number of Buffer Packets	100
Net_Traversal_Time	2*Node_Traversal_Time*Net Diameter
Path_Discovery_Time	2 * Net_Traversal_Time
Allowed_Hello_Loss	2

Graphs have been analyzed using D for each value of ART with different values of delete period constant on X-axis and of Received Throughput/Average End to End Delay/Average Jitter and Loss Packet on Y-axis.

1. RECEIVED THROUGHPUT (BITS/SECOND)

Throughput is the number of packets that is passing through the channel in a particular unit of time.

Performance metrics show the total number of packets that have been successfully delivered from source node to destination node. With ACKs and retransmission, this would not necessarily lead to lost packet, but will add to the network's load as well as the mean delay. Over all received throughput is higher for 7 SD pair because in this number of passing signal is high. And almost it is constant throughout distributed DPC.

Figure 4 Throughput at ART= 2 Sec

Figure 5 Throughput at ART= 3 Sec

2. AVERAGE END-TO-END DELAY (SECONDS)

Network delay is defined as the average delay experienced by all connection throughputs the simulation experiment. Each data transmission between a source and a destination will experience a network delay in the network.

The delay is defined as the difference in time the moment all transmission of packets is delivered and the time these all packets are actually received or a specific packet is transmitting from source to destination and calculates the difference between send times and received times. Delays due to route discovery, queuing, propagation and transfer time are included in the delay metric. From figure clear that delays totally uncertain.

Figure 6 End to end Delay at ART= 2 Sec
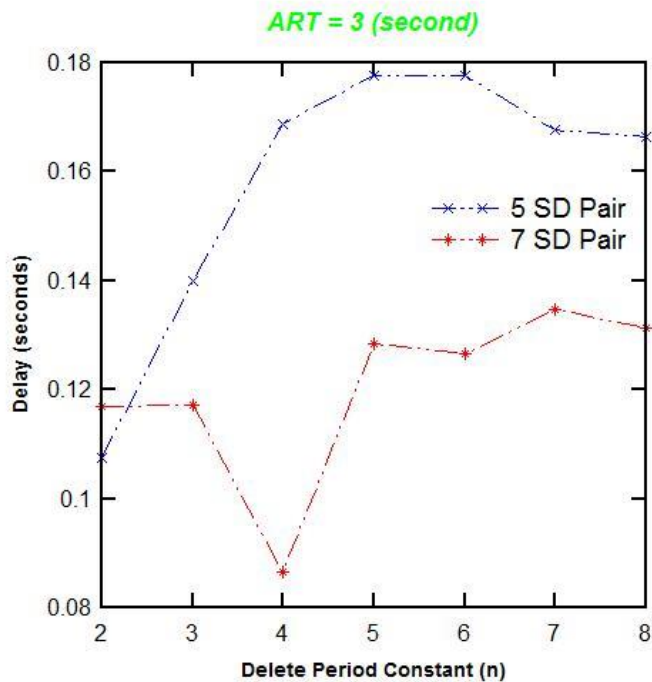
Figure 7 End to end Delay at ART= 3 Sec
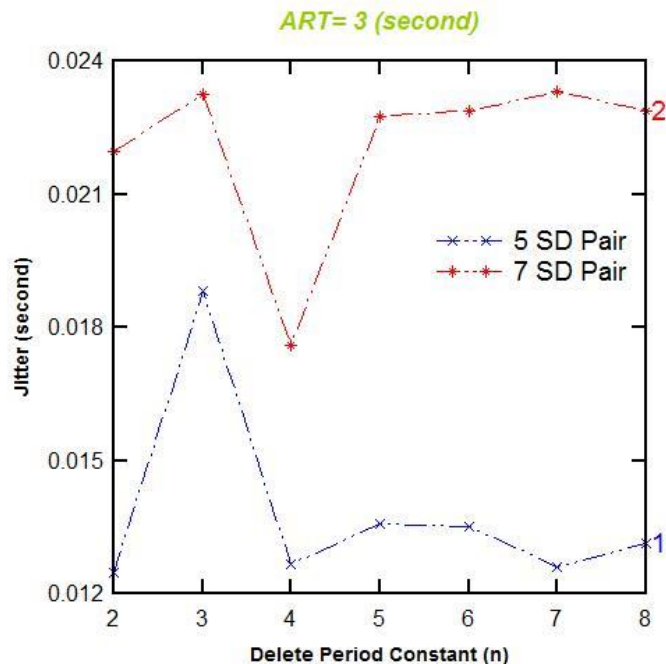
Figure 9 Average Jitter at ART= 3 Sec

3. AVERAGE JITTER (SECONDS)

The term jitter is often used as a measure of the variability over time of the packet latency across a network. A network with constant latency has no variation (or jitter).Packet jitter is expressed as an average of the deviation from the network mean latency. From figure 8 and 9 it is clear that average jitter is greater in case of 7 SD pair than 5 SD pair because in case of 7 SD pair active node is more so that's why network traffic is high than 5 SD pair at given node density in our case it has been taken 20 node.

Figure 8 Average Jitter at ART= 2 Sec

V. CONCLUSION

The prime objective of this paper is to analyze the performance of AODV routing protocol, if it's default value of route maintenance parameters are varied in mobile ad hoc networks (MANETs) environment. There is various route maintenance parameter 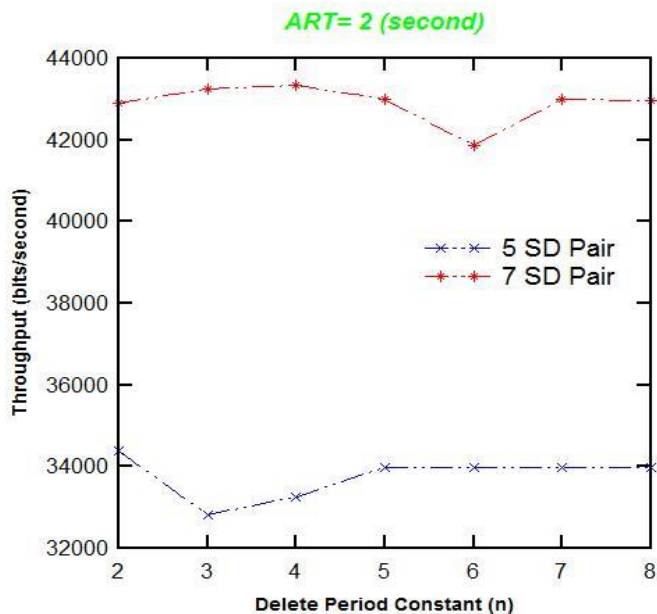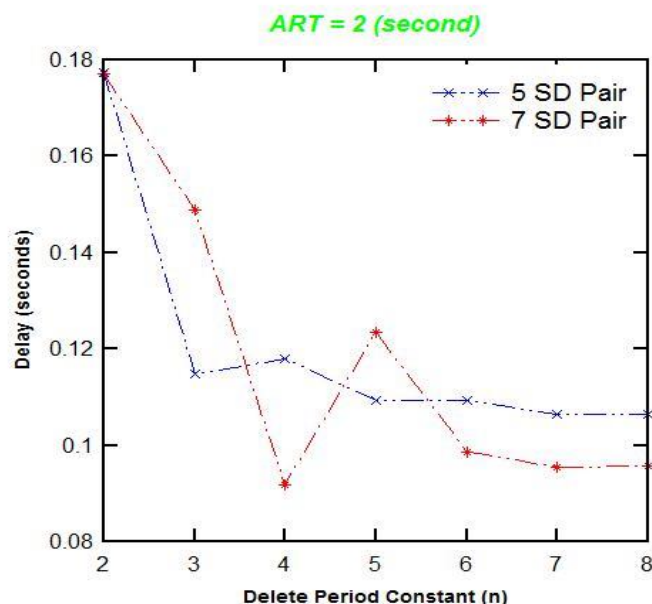of AODV routing protocol, which are listed in Table 2. Among them only two route maintenance parameters have been considered, to analyze the performance of AODV routing protocol for this dissertation that are Active Route Timeout (ART) and Delete Period Constant (DPC=n), the default value of these route maintenance parameters are 3 second and 5 second respectively.

According to taken scenario, AODV delivered maximum net throughput at *"ART=3.0 & DPC=4.0 sec."* for both SD pair. Delivered throughput by 7 SD pair is always greater than the 5 SD pair because number of generated packets from all clients is higher so number of passing packets from channel at particular unit of time is high in case of 7 SD pair, this can be seen on figure (4, and 5). Increasing of number of SD pair in constant network density doesn't mean that always performance will increase. It may increase till wireless channels are easily available for data transmission after that it may degrade when channel becomes highly congested or transmitted data is highly more than the numbers of free available channels in the network. In case of average end to end delay, AODV gives best performance at *"ART=3.5 & DPC=2 sec."* and at *"ART=3.0 & DPC=4 sec."* for 5 and 7 SD pair respectively. 7 SD pair gives minimum delay for almost all value of ART but analytical values are uncertain in both cases; it can be cleared from figure (6 and 7). Minimum delay is possible in case of 7 SD pair because number of active node is more, so there are a no difficulties in route discovery process. In this presented scenario, network gives
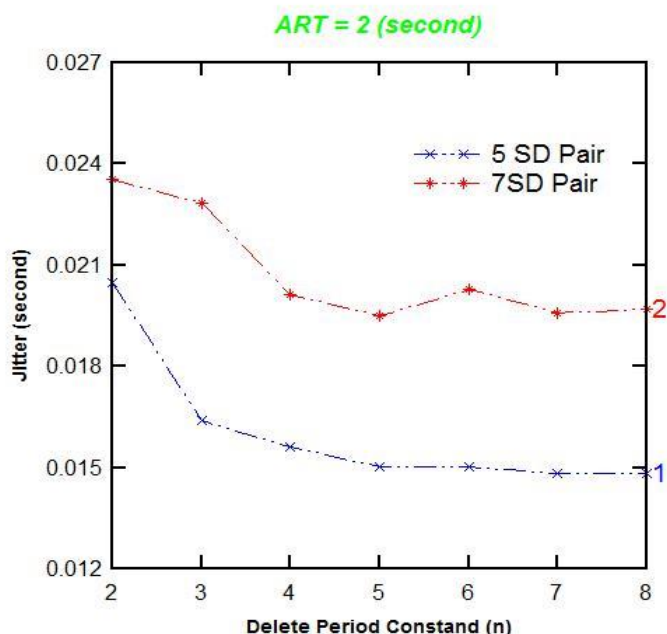
minimum jitter at *"ART=3.0 & DPC=6, 7 sec."* for 5 SD pair and at *"ART=3.0 & DPC=4sec."* for 7 SD pair. Here best performance is observed for 5 SD pair, which is shown on figure (8 and 9) but analytical values are again uncertain like as delay for both cases. Average jitter is minimum for 5 SD pair this might be feasible because in case of 5 SD pair network load is less than 7 SD pair, so packets not need to change route frequently in the network for successful transmission of data along the destination.

The original default value of ART and DPC have been considered as 3 sec & 5 sec respectively in AODV algorithm developed by C. Perkins, here in this scenario we got best performance of AODV at ART as 3 sec for all performance matrices except average end to end delay in case of 5 SD pair, here it is 3.5 second. Best performance given by AODV for net throughput at DPC = 4 second, for average end to end delay at DPC= 2 & 4 for 5 & 7 SD pair respectively, for average jitter at DPC=6 & 7 for 5SD pair and at DPC=4 for 7 SD pair respectively. So it is clear that as per our analysis in case of throughput DPC value is 1 sec less, for delay average DPC value is 2 sec less, for jitter average DPC value is 0.667 sec greater than the original default value, which results in less memory overheads except in case of jitter. Generally performance matrices are constraint of each other so it is depends on the user choice.

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Genetic variation for seed yield and Yellow Mosaic Virus Resistance in Soybean [*Glycine max* (L.) Merrill]

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Abstract- Forty four genotypes of soybean (*Glycine max* (L.) Merrill] including indigenous germplasm of North East India were studied to evaluate genetic variation for seed yield and Yellow Mosaic Virus (YMV) resistance. All traits under study viz, Plant height (PH), Internodal length(IL), No. of trifoliate leaves plant^{-1} (TL), Pods plant^{-1} (PP), Seeds plant^{-1} (SP), 100-seed weight (SW), Pod weight (PW), Seed yield plant^{-1} (SY), Days to 50% flowering (DF) and Days to maturity (DM) exhibited wide variation among the genotypes. 100-seed weight exhibited highest coefficient of variance at both genotypic (GCV) and phenotypic level (PCV) followed by seed yield plant^{-1} and seeds plant^{-1} indicating wide variation among the genotypes under study. High heritability coupled with high genetic advance was observed in 100-seed weight, seeds plant^{-1}, seed yield plant^{-1}, plant height and pod weight plant^{-1} indicating their potential to be selected for the effectiveness of further improvement. Character association studies revealed significant and positive genetic correlation of seed yield plant^{-1} with pod weight plant^{-1} and 100-Seed weight. Screening for Yellow Mosaic Virus resistance revealed one highly susceptible variety viz. JS 335 and two highly resistant varieties viz.DS 9712 and DS9814.

Index Terms- Genetic variation, seed yield, Yellow mosaic virus resistance, soybean.

I. INTRODUCTION

Soybean [*Glycine max*] is the unique grain legume globally known for its dual purpose use as pulse and oilseed containing 38-44% protein and 18-22% oil. Soybean also finds place as the key component in a diverse range of industrial products like solvents, adhesives, inks, lubricants and insulating foams are. In a large section of vegetarian people in country like India, soybean plays an important role as a rich source of protein. Occupying an area of 12.03 mha with total production of 12.98 mt and productivity 1079 kg /ha soybean finds an important place in the Indian agriculture (Anonymous 2013). India is the third largest importer of soya oil in the world and is one of the major exporters of soya meal to the other Asian countries (Anonymous, 2013). The south and central India particularly the state of Madhya Pradesh and Maharashtra are the hubs of soybean production in India, where soybean has already been established as an important industrial crop.

Although Soybean is not a major crop for north- east India, the crop is traditionally grown by Tribal communities of the entire region, where soybean pods and seeds are consumed as either raw or cooked vegetables. However, due to non availability of improved varieties and industrial support in the region it has not yet gained the status of a well established crop with desired degree of farmer's acceptance (Bhuyan and Sarma, 2007). Soybean was *already* demonstrated as a successful crop in north eastern region of India (Tiwari *et al*., 2001). In spite of the feasibility of growing commercial soybean in the region and availability of indigenous cultivars, very less scientific efforts have been made so far for the genetic studies and development of improved varieties except the attempts for identification of few soybean varieties (Singh and Singh, 2002) for the region. It is in this context important to study the magnitude of genetic variability of the native soybean germplasm with respect to seed yield and other adaptive traits in the region for breeding improved soybean varieties. An attempt, therefore, was made to study the extent of genetic variation for quantitative traits associated with seed yield and resistance to yellow mosaic virus disease which appears to be the very serious disease of soybean in the entire country. Character association both at genotypic as well as phenotypic level was also studies so as to provide a basis for formulating selection criteria in breeding improved soybean genotypes for the region.

Knowledge of correlation between grain yield and other characters is helpful in selection of suitable plant type. (Aditya *et al*. 2011). The present investigation was aimed in deciding desirable traits for development of high yielding variety. We studied the genetic parameters of variation viz, Range, Mean, Standard error of Mean, CD%, Genotypic and phenotypic variance as well as coefficient of variance, Heritability and Genetic Advance of44 Soybean germplasm comprising native genotypes of North East India along with varieties from all over India.

Soybean production has been challenged by a number of biotic and abiotic stresses. Among the different biotic stresses, Yellow Mosaic Virus (YMV) disease is one of the predominant viral diseases, especially in North, North east and Central India. This YMV disease is transmitted by white fly *Bassimia tabacci*. The All India Coordinated Research Project on Soybean has identified YMV disease as one of the most biotic threats to soybean. Yield losses due to this disease are as high as 80% (Nene, 1972). In severe cases, the growing tip stops growing and becomes a clump of un-opened leaves. Pod setting gets drastically reduced with eventual loss of yield. The incidence of YMV disease in soybean is most pronounced in North Eastern India as well as Northern India(Annual Report, AICRP-Soybean ,2000-2002, 2004-05 and 2005-06,2008-09,2009-10). Yield losses due to its attack are as high as 80%. So, further spread of this disease may bring disaster towards soybean industry in our country. Therefore, resistance to YMV must be improved and

incorporated into selected germplasm to minimize yield loss. We tried to screen the germplasm resistance towards the infectivity of Yellow Mosaic Virus and hence can be considered for selection and breeding programme to design variety with YMV resistance.

II. MATERIALS AND METHOD

The materials for the present investigation comprised of a set of 44 soybean genotypes representing native soybean germplasm of North East India and some improved varieties and breeding lines procured from various organizations, viz., All India Coordinated Research Project on Soybean, ICAR Research Complex for North Eastern Hill Region, Borapani, Meghalaya and by personal collection from farmers' field of various parts of the region. The set of genotypes were grown in the experimental field of BN College of Agriculture, Biswanath Chariali during Kharif 2012 and 2013 as per Randomized Block design in three replications (Each variety in 3 rows with spacing of 30 cm between rows and 10 cm between plants). Observations were made on the eight quantitative traits viz., Plant height (PH), Internodal length (IL), Number of trifoliate leaves plant^{-1} (TL), Pods plant^{-1} (PP), Seeds plant^{-1} (SP), 100-seed weight (SW), Pod weight (PW), and Seed yield plant^{-1} (SY) based on five randomly selected plants per plot. Days to 50% flowering (DF) and Days to maturity (DM) were recorded on whole plot basis. Data on the above traits were recorded based on the standard criteria.

Frequency distributions for all the traits were computed. Number of intervals was considered 10 as per convenience using the software STIATISTICA. Observed data of 10 quantitative traits were subjected to Analysis of Variance (ANOVA) of Randomised Complete Block Design with three replications following Panse and Sukhatme (1967). The mean sum of squares obtained from ANOVA was subjected to estimation of genetic parameters of variation as per Singh & Choudhury (1985). Estimates of variability parameters, heritability and genetic advance were calculated using standard methods of Burton and Devane (1953) and Johnson *et al.* (1955). Phenotypic and genotypic correlation coefficients were calculated using the method adopted by Johnson *et al.* (1955). For identification of stable source of resistance for YMV disease in soybean, 44genotypes comprising the germplasm accessions as well as varieties were used and scoring was done using 0-9 scale (Table 1). Based on the disease symptom, score were assigned and the genotypes were grouped accordingly.

Table 1: Scoring criteria for YMV incidence

Score	Symptom
0	No symptoms on any plant
3	Yellow mottle on 10% or fewer plant
5	Necrotic mottle on most plants, no reduction in plant growth, no yield loss.
7	Yellow mottle not covering whole leaf on most plants, reduction in leaf and plant growth
9	Yellow mottle on most plant, severe reduction in leaf and plant growth as well as yield.

III. RESULT & DISCUSSION

The Soybean genotypes under observation exhibited significant variability among the traits (Table 2). The variability among all the quantitative traits under study was clearly demonstrated in the form of histograms of the frequency distributions (Fig 1-10) .Observation on days to 50% flowering revealed that most of the genotypes showed flowering at 26-28 days. When we talk about days to maturity, it was observed that maximum number of genotype was matured during the period of 90-92 days. For plant height, maximum number of genotypes (17) was observed between 40 to 60 cm. Very few genotypes occupied extreme phenotypic classes. Likewise only four genotypes were of less than 40 cm height. Observation on intermodal length indicated that the varieties were widely diverse. It was observed that 47.7% of total genotypes showed internodal length of 4-6 cm while only one variety exhibited intermodal length of more than 12 cm. In case of number of trifoliate leaves, maximum frequency was found in intermediate classes and 13 genotypes showed 25-30 numbers of trifoliate leaves. Only three genotypes were found having trifoliate leaves more than 35 while only one variety occupied extreme phenotypic class. The genotypes showed remarkable difference with respect to the trait Pods plant$^{-1.}$ Only three genotypes occupied extreme high phenotypic class. While seven genotypes occupied extreme less frequency. Maximum number of genotypes exhibited 30-40 Pods plant$^{-1.}$ Eight genotypes were found to fall in the class, 40-50 Pods plant^{-1} while three, four, two and one genotypes occupied the classes 50-60, 60-70, 70-80, 80-90, respectively. Similar observation was recorded in case of the trait seeds plant$^{-1.}$ Only three genotypes belonged to extreme less and two genotypes belonged to extreme high phenotypic class. Nineteen numbers of genotypes occupied the class 50-100 followed by 13 genotypes occupying the class 100-150. In case of the trait Pod weight, intermediate classes were observed to show high frequencies. Only one variety exhibited lowest pod weight class (less than 10 g) as well as highest pod weight class (more than 80 g). Observation on seed weight revealed that the varieties widely differed in their seed weight. About 25% of the total genotypes showed less than 10 g of seed weight while about 45.4% exhibited seed weight in the class 10-20 having the highest frequency. Five genotypes were found to exhibit seed weight n the range of 20-30 g while four and three varieties belong to the class 30-40 and 40-50, respectively. Only one genotype was observed to occupy the highest phenotypic class. The trait seed yield also exhibited diverse variation. The intermediate classes exhibited highest seed yield. Twenty seven *per cent* of total genotypes exhibited seed yield of more than 10 g and less than 20 g. Only three genotypes occupied the highest phenotypic class and nine genotypes belong to the lowest phenotypic class.

The significant mean sum of squares indicated the high degree of variability among the genotypes for the traits under study. The considerable range of variation expressed for the traits indicated good scope for genetic improvement which is clearly revealed in Table 3. Good agreement was observed between the magnitudes of phenotypic as well as genotypic variance. Highest genotypic variance was observed for the attribute number of seeds plant^{-1} followed by plant height and pods plant^{-1}. Mere study of the magnitude of variance does not justify the

comparison of variability exhibited by different traits. Estimation of Coefficient of variation which takes into account the mean of each characters, gives the real basis for comparison. In the present study, 100-seed weight exhibited highest coefficient of variance both genotypic (GCV) and phenotypic level (PCV) followed by seed yield plant[-1] and seeds plant[-1]. Malik *et al.* 2011 reported high variability for pods plant[-1], 100-seed weight and seed yield plant[-1] in a set of germplasm of Japan, Pakistan, USA, North Korea and other Asian countries. Wide genetic diversity among soybean genotypes with respect to Leaf area (cm), Days to flowering initiation, Days to flowering, Days to maturity, Plant height (cm) Pods plant[-1,] Branches plant[-1] 100-seed weight (g) Seed yield plant-1(g) Oil content (%) were observed by various workers in different countries (Sihag *et al.* 2004, Chettri *et al.* 2005, Muhammad *et al.*2003, Malik *et al.* 2006, etc.). High GCV did not provide a clear picture of genetic gain to be achieved from selection of phenotypic trait unless the heritable fraction of variation was known (Burton 1952). Here lies the essence of estimation of heritability and genetic advance (Sarma and Richharia 1995). Johnson *et al.* 1955 and Gandhi *et al.* 1964 suggested that high heritability should be accompanied with high genetic advance for effectiveness of selection. In the present investigation 100-seed weight, seeds plant[-1], seed yield plant[-1,] plant height and pod weight plant[-1] exhibited high heritability coupled with high genetic advance. Considering the magnitude of genetic variability, the traits 100-seed weight, seeds plant[-1], and seed yield plant[-1,] were observed to be the most potential for further improvement.

Estimation of correlation coefficients among the traits under study at both genotypic and phenotypic level is presented in table 4. Knowledge of correlation between grain yield and other characters is helpful in selection of suitable plant type. (Aditya *et al.* 2011). Correlation studies at both phenotypic and genotypic level revealed that the magnitude of genotypic and phenotypic coefficient was found to be almost collinear indicating less environmental influence on the traits under study. It was observed that seed yield plant[-1] exhibited varied degree of association with other traits among different sets of genotypes studied. Seed yield plant[-1] exhibited significant and positive correlation coefficient at both genotypic and phenotypic level with pod weight plant[-1,] and 100-Seed weight. Selection for these traits would be effective for improving seed yield plant[-1.] Mukhekar *et al.* 2004, Chandel *et al.* 2005 & Turkec 2005 also reported similar pattern of correlation between seed yield plant[-1] and 100-seed weight. Significant and negative correlation was observed among 100-Seed weight, pods plant[-1,] and seeds plant[-1]. This undesirable negative association must be broken in order to improve seed yield in the present set of Germplasm under study. There is a possibility of getting soybean variety with early maturing and high seed yield plant[-1] as seed yield plant [-1] is negatively correlated with days to maturity and days to 50% flowering. Pod weight was significantly and positively correlated with seeds plant[-1] and pods plant[-1]. It was observed that a significant and positive correlation is present between days to flowering and days to maturity .Similar result regarding days to maturity and days to flowering were recorded by Malik *et al,* 2011. A trend was observed that seeds plant[-1] increased with increase in plant height, days to maturity and days to flowering. Number of pods and number of trifoliate leaves showed

significant correlation with plant height and days to maturity. The present investigation indicated that intermodal length is of no significance as a yield attribute.

It was revealed that increased seed yield plant[-1] was associated with increase in 100-seed weight which in turn showed negative correlation with number of pods plant[-1] and seeds plant[-1.] From this observation, it was indicated that higher seed weight is related with less number of seeds which was not desirable. Hence breaking off this negative correlation is required which can be achieved by recombination breeding between genotypes with contrasting values for these traits. The positive significant association of pods plant with plant height indicated that pods plant[-1] could be increased by selecting tall plants. Similar pattern was also observed by Malik *et al.* 2006.

The set of 44 genotypes were screened for incidence of yellow mosaic virus (YMV) resistance (Table 5). A moderate to severe incidence of the disease was observed only in a limited number of entries (Nine moderate and one highly susceptible). It was observe that all the native genotypes of North East India showed moderate susceptibility where infection is present but no yield loss due to infection was recorded. The frequency distribution of YMV resistance (Fig 11) showed that 31 genotypes exhibited moderate susceptibility without any yield loss followed by nine genotypes scoring 7. The genotype JS335 has been identified as the highly susceptible having the highest degree of disease incidence. Rest of the genotypes exhibited either zero or very low incidence of YMV. The genotypes DS 9712 and DS 9814 were found to be highly resistant to YMV infection.

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Table 2 : Frequency distribution of different morphological and agronomic traits in Soybean Germplasm under study

Traits	Phenotypic classes	Number of genotypes	Percent of genotypes
Days to 50%flowering (DF)	22-24	4	9.0
	24-26	10	22.7
	26-28	15	34.0
	28-30	12	27.2
	30-32	2	4.5
	32-34	1	2.2
Days to Maturity	Less than 84		
	84-86	4	9.0
	86-88	10	22.7
	88-90	12	27.2
	90-92	13	29.5
	92-94	2	4.5
	94-96	2	4.5
	96-98	1	2.2
Plant Height	20-40	4	9.0
	40-60	17	38.6
	60-80	9	20.4
	80-100	7	15.9
	100-120	5	11.3
	120-140	2	4.5
Internodal length	2-4	9	20.4
	4-6	21	47.7
	6-8	7	15.9
	8-10	4	9.0
	10-12	3	6.8
	12-14	1	2.2
Trifoliate leaves	5-10	1	2.2
	10-15	7	15.9
	15-20	6	13.6
	20-25	8	18.1
	25-30	13	29.5
	30-35	6	13.6
	35-40	3	6.8
Pods plant[-1]	20-30	7	15.9
	30-40	16	36.3

	40-50	8	18.1
	50-60	3	6.8
	60-70	4	9.0
	70-80	2	4.5
	80-90	1	2.2
	90-100	3	6.8
Seeds plant^{-1}	Less than 50	3	6.8
	50-100	19	43.1
	100-150	13	29.5
	150-200	6	13.6
	200-250	1	2.2
	250-300	2	4.5
Pod Weight	Less than 10	1	2.2
	10-20	7	25.9
	20-30	9	20.4
	30-40	13	29.5
	40-50	7	15.9
	50-60	4	9.0
	60-70	2	4.5
	70-80	1	2.2
Seed Weight	Less than 10	11	25.0
	10-20	20	45.4
	20-30	5	11.3
	30-40	4	9.0
	40-50	3	6.8
	50-60	1	2.2
Seed yield plant^{-1}	5-10	9	20.4
	10-15	10	22.7
	15-20	10	22.7
	20-25	5	11.3
	25-30	5	11.3
	30-35	2	4.5
	35-40	3	6.8

Table 3: Genetic parameters of variation in Soybean germplasm under study for 10 quantitative traits.

Parameters	Days to 50 %flowering	Days to Maturity	Plant height	Internodal length	No. of Trifoliate leaves	Pod No plant[-1]	Seed No plant[-1]	Pod weight plant[-1]	100-Seed Weight plant[-1]	Seed Yield plant[-1]
Range (Minimum)	23.50	85.50	32.10	3.00	9.10	22.50	46.00	9.13	3.95	6.24
Range(Maximum)	32.50	94.50	124.00	12.02	40.00	97.50	285.00	74.84	57.48	37.23
Mean	27.31	89.60	68.56	5.78	23.78	46.45	115.23	34.56	18.69	17.88
SEm ($\pm$)	1.39	2.26	2.75	0.63	0.99	2.02	5.00	3.84	1.92	1.00
CD 5%	2.34	3.80	4.62	1.05	1.65	3.40	8.40	6.45	3.22	1.68
Genotypic Variance	4.036	4.04	637.14	4.50	69.18	391.90	3098.43	219.42	163.31	74.98
Phenotypic Variance	5.99	5.99	644.71	4.90	70.16	396.00	3123.46	234.20	166.99	75.99
Genotypic Coefficient of Variance	7.35	2.25	36.82	36.67	34.97	42.61	48.30	42.85	68.35	48.42
Phenotypic Coefficient of Variance	8.96	2.74	37.03	38.24	35.22	42.836	48.49	44.27	69.12	48.74
Environmental Coefficient of variation (CV)	5.11	1.56	4.01	10.85	4.15	4.36	4.34	11.12	10.26	5.61
Heritability (Hb%)	67.39	44.67	98.82	91.98	98.61	98.96	99.19	93.69	97.79	98.67
Genetic Advance (GM PS)	12.44	3.80	75.39	72.43	71.54	87.33	99.10	85.45	139.24	99.08

Table 4: Genotypic, phenotypic and environmental correlation coefficient among the 10 quantitative traits of soybean under study.

Parameters	Correlation coefficient	DF	DM	PH	IL	TL	PP	SP	PW	SW	SY
Days to 50 %flowering (DF)	r_g	1.00	1.03**	0.34*	-0.18	0.39**	0.38*	0.38*	-0.16	-0.40*	-0.29
	r_p	1.00	0.77**	0.27	-0.17	0.31*	0.32*	0.32*	-0.13	-0.33*	-0.24
	r_e	1.00	0.49**	0.01	-0.18	-0.15	0.13	0.15	-0.01	-0.12	-0.06
Days to Maturity	r_g		1.00	0.54**	-0.20	0.47**	0.63**	0.58**	0.01	-0.40**	-0.28
	r_p		1.00	0.35*	-0.12	0.33*	0.43**	0.40**	-0.02	-0.33	-0.19
	r_e		1.00	-0.12	0.02	0.26	0.19	0.23	-0.15	-0.12	-0.03
Plant height	r_g			1.00	0.04	0.41**	0.40**	0.33	0.08	-0.19	-0.12
	r_p			1.00	0.04	0.40**	0.40**	0.33	0.08	-0.19	-0.12
	r_e			1.00	0.05	-0.07	0.06	0.03	0.09	-0.19	0.12
Internodal length	r_g				1.00	0.25	-0.07	-0.11	-0.10	0.04	-0.06
	r_p				1.00	0.25	-0.07	-0.10	-0.09	0.06	-0.05
	r_e				1.00	0.15	0.05	0.04	0.13	0.36*	0.10
No.of Trifoliate leaves	r_g					1.00	0.30*	0.25	0.25	0.11	0.31*
	r_p					1.00	0.30*	0.25	0.25	0.11	0.30*
	r_e					1.00	0.06	0.08	0.08	0.04	0.10
Pod No plant⁻¹	r_g						1.00	0.89**	0.34*	-0.55**	-0.04
	r_p						1.00	0.89**	0.33*	-0.54**	-0.04
	r_e						1.00	0.98**	0.38*	0.08	0.31
Seed No plant⁻¹	r_g							1.00	0.36*	-0.53**	0.11
	r_p							1.00	0.36*	-0.52**	0.11
	r_e							1.00	0.31*	0.15	0.33
Pod weight plant⁻¹	r_g								1.00	0.13	0.48**
	r_p								1.00	0.12	0.47**
	r_e								1.00	-0.18	0.27
100-Seed Weight plant⁻¹	r_g									1.00	0.67**
	r_p									1.00	0.66**
	r_e									1.00	0.06
Seed Yield plant⁻	r_g										1.00
	r_p										1.00
	r_e										1.00

r=0.304 at 5% level of significance, r= 0.393 at 1% level of significance, *= Significant at P=0.05, **= Significance at P=0.0

Table 6: Screening of genotypes for YMV resistance

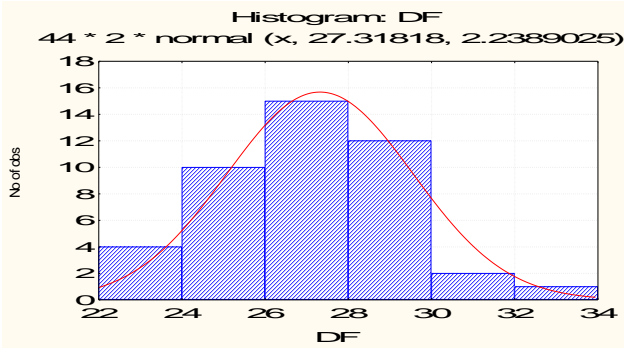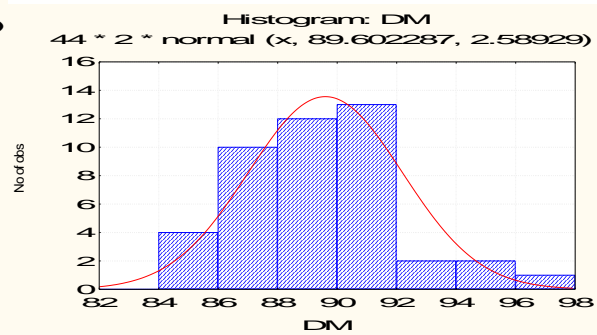| Score	No.of genotypes	Percent of genotypes	Percent of yield loss
0	2	4.5	NIL
3	31	70.4	NIL
5	1	2.2	20%
7	9	20.4	65%
9	1	2.2	85%

Figure 1: Histogram of Days to 50%floweing
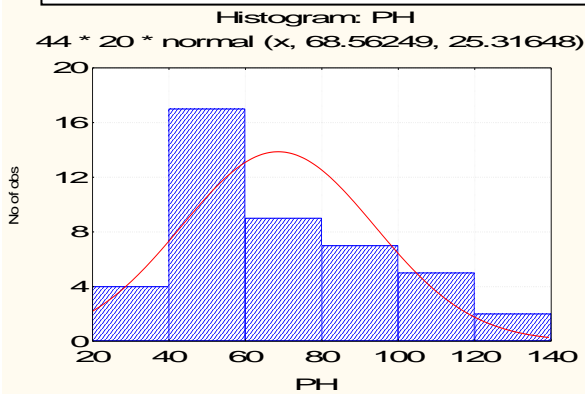

Figure 2: Histogram of Days to Days to maturity

Figure 3: Histogram of Plant height (PH)

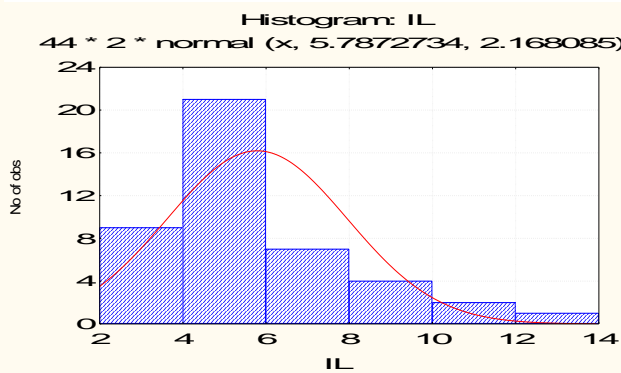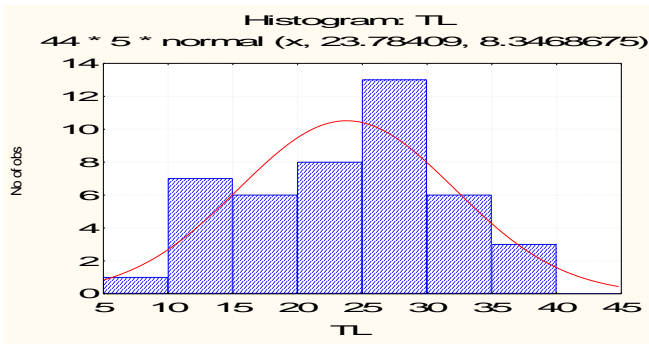
Figure 4: Histogram of Internodal

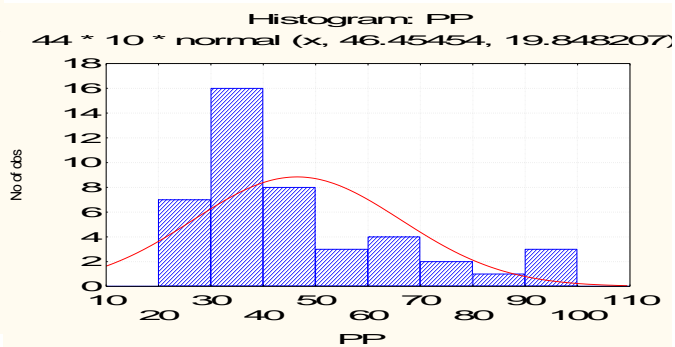Figure 5: Histogram of Number of Trifoliate leaves(TL)
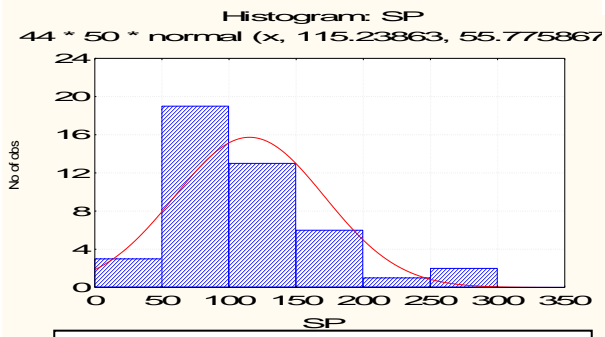

Figure 6: Histogram of Pods plant[-1.] (PP)
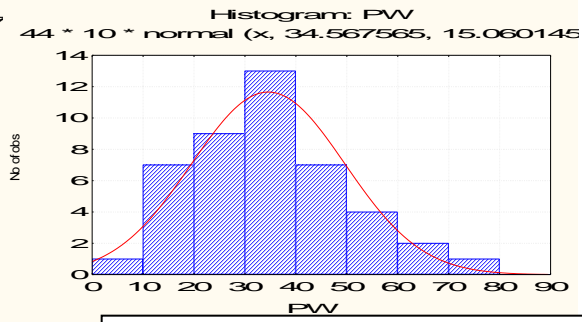
Figure 7: Histogram of Seeds plant[-1.] (SP)
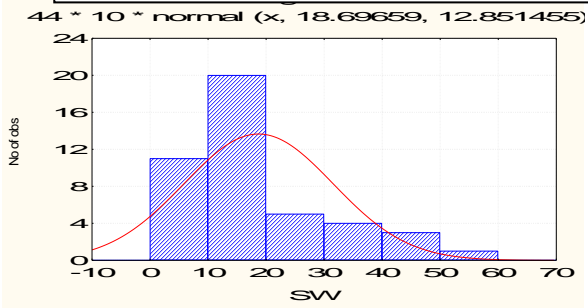

Figure 8: Histogram of Pod weight (PW)

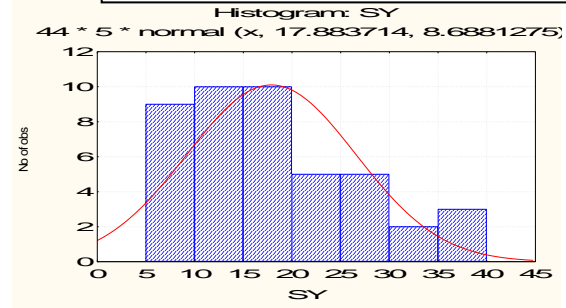Figure 9: Histogram of Seeds weight. (SW)

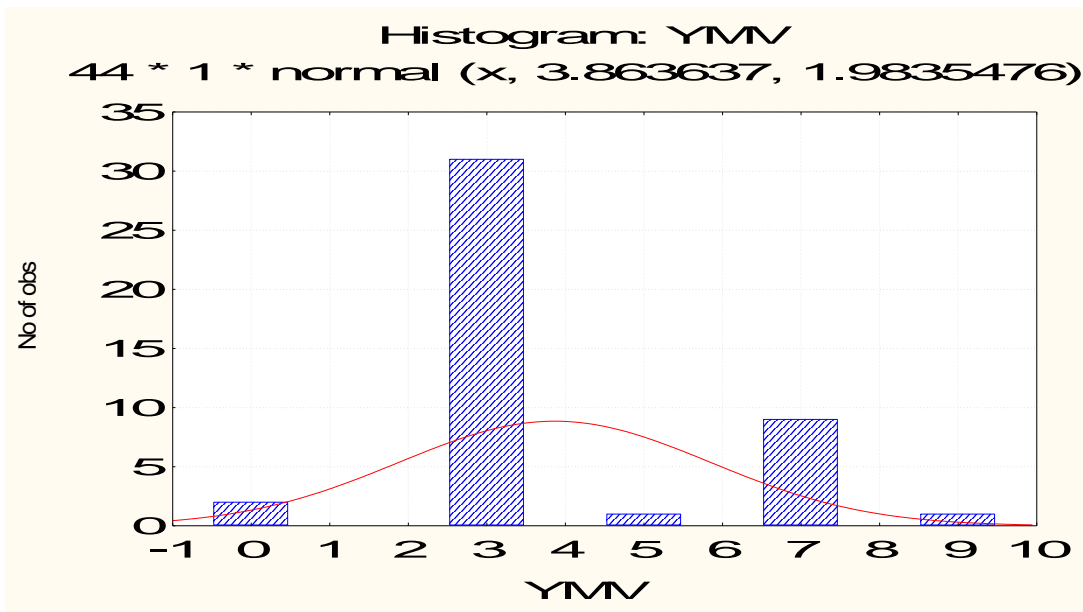Figure 10: Histogram of Seed Yield plant[-1.] (SY)

Figure 11: Histogram of YMV infection

Genetic Variability and Diversity Studies in Soybean [Glycine max (L.) Merrill] using RAPD Marker

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Abstract- Soybean (Glycine max) is an important vegetable oilseed crop. It is considered to be a cash crop. It is a major source of edible vegetable oils and proteins which contains about 40% protein and 20% oil. The genetic diversity was estimated among 7 varieties of Soybean using 22 RAPD primers. The RAPD marker is useful tool for assessing genetic variation and resolving cultivars identities. Among the 22 primers, 11 primers showed polymorphism.

Index Terms- Soybean, RAPD, Polymorphism, Genetic diversity.

I. INTRODUCTION

Soybean (*Glycine max* (L.) Merr.)is a principle grain legume in developing countries where it meets the expanding needs for protein, edible oil and calories. It is a good source of cheap dietary protein in Africa. Soybean (*Glycine max* (L.) Merril) is a member of Papilionaceae family and believed to have originated in Northeastern China and distributed in Asia, USA, Brazil, Argentina etc. This crop is aptly called as "Golden Bean" or "Miracle crop" of the 20th century, because of its multiple uses. It is rich in lycine and vitamins A, B and D.

Soybean occupies 912.99 lakh ha of area with 2099 million tonnes of annual production and 22.99 q per ha productivity in the world. In India, it occupies 69 lakh ha of area with 66 million tonnes of production and 9.56 q per ha productivity.

Assessment of genetic diversity in available cultivars has important implications in understanding the progress made in any breeding programme (Chen L. F. O, Yun W. C, Kou H. Y And Chen M. H,1994). Morphological markers are routinely used for estimating the genetic diversity, but recently many molecular marker techniques have developed into powerful tools to analyze genetic relationships (Bhandarkar S. 1999). Molecular markers employed for the analysis of genetic diversity in soybean viz. random amplified polymorphic DNA (Das P. N, 2000).The objective of the present study was to investigate and compare genetic diversity using random amplified polymorphic DNA (RAPD) markers, for assessing the genetic base of released cultivars of Soybean (Bains K. S. and Sood K. C, (1984). The study also aims to generate molecular fingerprints for varietal identification.

II. MATERIALS AND METHODS

Plant Materials and DNA isolation

The plant materials used for this study included seven genotype of Soybean popularly grown in different regions of Maharashtra. Seeds of these varieties were collected from Oil seed research centre , Latur (M.S.) India. Seeds of seven Soybean genotypes were germinated under field conditions. The DNA isolation was done as per CTAB method described by (Doyle and Doyle. 1990). One-week-old seedlings were ground in preheated CTAB buffer and incubated at 60°C for 1 h. The aqueous phase containing DNA was separated using chloroform : isoamyl alcohol (24:1). The DNA was precipitated with chilled isopropanol and the pellet was dissolved in 100 μl of T.E.buffer. The RNA was eliminated by adding 0.5 μl of RNase. The pellet was dissolved in appropriate amount ofT.E. (Tris10mM, EDTA 1mM) buffer. DNA samples wasquantified by UV spectrophotometry and finally diluted to a concentration of 25 ng/μl.

III. PCR AMPLIFICATIONS

RAPD markers were tested for their ability to detect polymorphisms using template DNA and 20 arbitrary 10 bp long oligonucleotides, as primers belonging to RPI series (GeNei, Banglore). PCR conditions were standardized using varying concentrations of primers and template DNA. After standardization, the reaction were carried out in 25 μl volume and contained 6.5 μl of 10× Taq buffer, 4μl of 2mM dNTP mix, 1μl primer,1μl of Taqpolymerase and 1μl MgCl2, 10.5μl Nuclease free water and 1μl template DNA. The thermal cycling program was carried out in a Thermal cycler. The PCR program had an initial denaturation step at 94°C for 5 min, followed by 44 cycles of 94°C for 1 min, 35°C for 1 min, and 72°C for 2 min. A final extension step given at 72°C for 7 min. The amplified products were resolved by electrophoresis at 50V for 3 hours in 1.2% agarose gel in 1× TAE buffer. The DNA bands were visualized by staining gel in 1% ethidium bromide solution and photo- graphed under UV light using a Digidoc gel documentation system. A 100 bp DNA ladder was used as a molecular weight marker for determining the molecular weight of the amplified products.

IV. SCORING AND DATA ANALYSIS

Digitized gel photograph of RAPD results were analyzed using NTSYS PC Ver.2.0 numerical software package. Data was recorded as 1 (presence) or 0 (absence), each of which were treated as an independent character. The bands which were very faint were not considered for scoring. For each primer, PCR reactions were repeated two times and only reproducible

bands were considered for analysis. The primers which did not produce amplification were repeated thrice before discarding them.The pair wise similarity between isolates and polymorphic bands were calculated using Jaccard's coefficient, a common estimator of genetic identity, or estimates interspecific relationships. The similarity co-efficients were used to construct a dendrogram for determining relationship using unweighted pair group method with arithmetic average (UPGMA). Robustness of clusters was evaluated by bootstrap analysis using NTSYS-pc version 2.0, Exeter software, New York.

V. RAPD ANALYSIS

Universal Primers of RPI series were used to evaluate seven soybean genotypes. The PCR amplified products of each Primer were resolved on 2% agarose gel electrophoresis and the size of the amplified products was compared with DNA molecular weight marker. Random amplified polymorphic DNA (RAPD) markers have more polymorphism information content (PIC) value. These computations were performed using NTSYS-PC (ver. 2.02j; Exeter Software (N.Y., Rohlf, 1993).

Similarity matrix based on RAPD Profile

The RAPD patterns obtained from seven soybean accessions of *Glycine max*using primer RPI. The Jaccard estimate of simulator was used to construct a similarity matrix.

Cluster Analysis

Similarity coefficient matrices were used to generate a dendrogram of Soybean genotypes based on UPGMA analysis.

VI. RESULT AND DISCUSSION

In the present investigation Random Amplified Polymorphic DNA (RAPD) markers were used to study the genetic diversity of seven soybean genotypes. DNA isolation was done successfully by the CTAB isolation method and it was also standardized for PCR amplification of DNA. In this study, 22 primers of RPI series were used. Among the 22 Primers,11Primers produced total 118 amplified bands. The typical banding patterns produced viz. shown in plate 1, in which 111 bands (94.06%) were polymorphic and 7 bands (5.94%) were found monomorphic viz. showed in table 1. Among 11 Primers used in this study, the percentage of polymorphic products ranged from 50% to 94.06%. In this RPI-4,RPI-5,RPI-6,RPI-8, RPI-9,RPI-10,RPI-11,RPI-12,RPI-15,RPI-19, and RPI-20 showed 100% of polymorphism and RPI-18 showed 50% of polymorphism. The similarity value viz. shown in table 2 ranged from 0.130 to 1.309 indicated substantial diversity present in the germplasm. Highest degree of similarity at 1.309 was observed between MAUS 71 and MAUS 32 and lowest similarity value at 0.130 was observed between MAUS 32 and MAUS 2. The cluster A is divided into two sub cluster i.e. A1, A2. The cluster A1 consist of two genotypes in which MAUS 61 and MAUS 1 were found closely related. The cluster A2 consist of three genotype in which MAUS 32 and MAUS 71 are closely related and genotype MAUS 158 is a solitary cluster. The cluster B also consist of two genotypes in which MAUS 81 AND MAUS 2 are closely related

Sr.No.	RAPD primers	Accession No.	Total no.of bands	Monomorphic bands	Polymorphic bands	Percentage of polymorphism	PIC value
1	RPI-4	AM773770	4	0	4	100%	-
2	RPI-5	AM773771	19	0	19	100%	0.79
3	RPI-6	AM773773	3	0	3	100%	-
4	RPI-8	AM773315	3	0	3	100%	-
5	RPI-9	AM750045	17	0	17	100%	0.76
6	RPI-10	AM773316	3	0	3	100%	0.67
7	RPI-12	AM773775	17	0	17	100%	0.72
8	RPI-15	AM765830	7	0	7	100%	0.77
9	RPI-18	AM773777	14	7	7	50%	0.42
10	RPI-19	AM773317	19	0	19	100%	0.37

| 11 | RPI-20 | AM765820 | 12 | 0 | 12 | 100% | 0.75 |
| 12 | Total | | 118 | 7(Avg-5.94) | 111 | 94.06% | 3.67 |

Table 1 :Details of RAPD band produced by 11 primers and polymorphism percentage

RAPD method was displayed appreciable inter population variation or molecular polymorphism between seven *Glycine max*varieties and phylogenetic tree was showing a relationship between seven, soybean varieties. This study has also confirmed, RAPD marker is potentially simple,rapid, reliable and effective method of detecting polymorphism for assessing genetic diversitybetween genotype and these help in the selection of parent for hybridization.RAPD technique is useful in areas of genetic diversity and DNA fingerprinting analysis. As the need to protect proprietary germplasm as it is likely to increase in the future, RAPD will have animportant role in securing a plant variety right by virtue of its unique efficiency in distinguishingclosely related germplasm. Future thrust will be directed towards the holistic use of RAPD primes for DNA fingerprinting, genetic analysis and linkage mapping in soybean.
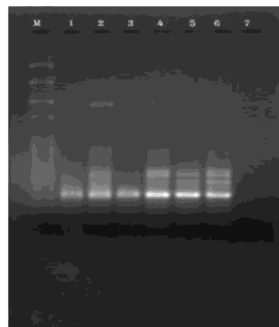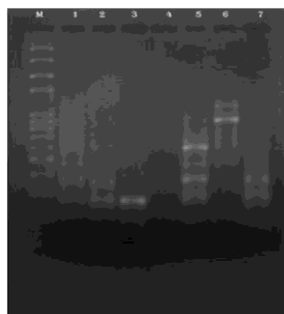
Plate 1&2. RAPD profiles for 7 Soybean cultivars produced using primer RPI-12&RPI-5.

Varieties-1)MAUS-81, 2)MAUS-6102, 3)MAUS-1, 4)MAUS-2, 5)MAUS-158, 6)MAUS-32, 7) MAUS-71.

Rows\Cols	MAUS81	MAUS6102	MAUS1	MAUS2	MAUS158	MAUS32	MAUS71
MAUS81	0.000						
MAUS6102	0.756	0.000					
MAUS1	0.399	0.824	0.000				
MAUS2	0.635	0.635	0.399	0.000			
MAUS158	0.441	0.532	0.693	0.360	0.000		
MAUS32	0.693	0.693	0.635	0.130	0.485	0.000	
MAUS71	0.693	0.824	0.532	0.824	0.982	1.309	0.000

Table 2. Similarity matrix for Jaccard's coefficient of seven Soybean genotypes obtained from RAPD Marker analysis.
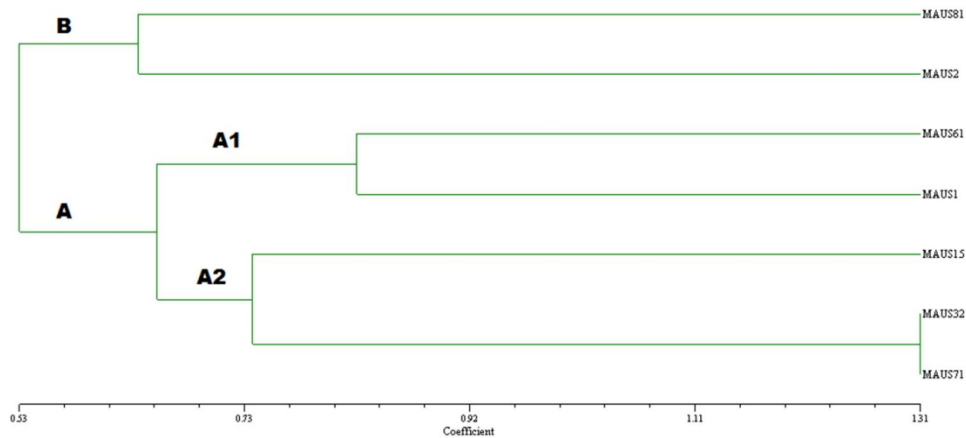
Fig.1 Dendrogram showing genetic diversity for RAPD markers in *Glycine max*.

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Reduce cost and efficient access for cloud storage Using Intermediate Cloud Datasets

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Abstract- Cloud computing provides massive computation power and storage capacity which enable users to deploy computation and data-intensive applications without infrastructure investment. Along the processing of such applications, a large volume of intermediate data sets will be generated, and often stored to save the cost of re computing them. However, preserving the privacy of intermediate data sets becomes a challenging problem because adversaries may recover privacy-sensitive information by analyzing multiple intermediate data sets. Encrypting ALL data sets in cloud is widely adopted in existing approaches to address this challenge. But we argue that encrypting all intermediate data sets are neither efficient nor cost-effective because it is very time consuming and costly for data-intensive applications to en/decrypt data sets frequently while performing any operation on them. In this paper, we propose a novel upper bound privacy leakage constraint-based approach to identify which intermediate data sets need to be encrypted and which do not, so that privacy-preserving cost can be saved while the privacy requirements of data holders can still be satisfied. Evaluation results demonstrate that the privacy-preserving cost of intermediate data sets can be significantly reduced with our approach over existing ones where all data sets are encrypted.

Index Terms- Cloud computing, data storage privacy, privacy preserving, intermediate data set, privacy upper bound

I. INTRODUCTION

Technically, cloud computing is regarded as an inge-nious combination of a series of technologies, establish-ing a novel business model by offering IT services and using economies of scale [1], [2]. Participants in the business chain of cloud computing can benefit from this novel model. Cloud customers can save huge capital investment of IT infrastructure, and concentrate on their own core business [3]. Therefore, many companies or organizations have been migrating or building their business into cloud. However, numerous potential custo-mers are still hesitant to take advantage of cloud due to security and privacy concerns [4], [5]. The privacy concerns caused by retaining intermediate data sets in cloud are important but they are paid little attention. Storage and computation services in cloud are equivalent from an economical perspective because they are charged in proportion to their usage [1].

Thus, cloud users can store valuable intermediate data sets selectively when processing original data sets in data-intensive applications like medical diagnosis, in order to curtail the overall expenses by avoiding frequent re-computation to obtain these data sets [6], [7]. Such scenarios are quite common because data users often reanalyze results, conduct new analysis on intermediate data sets, or share some intermediate results with others for collabora-tion. Without loss of generality, the notion of intermediate data set herein refers to intermediate and resultant data sets [6]. However, the storage of intermediate data enlarges attack surfaces so that privacy requirements of data holders are at risk of being violated. Usually, intermediate data sets in cloud are accessed and processed by multiple parties, but rarely controlled by original data set holders. This enables an adversary to collect intermediate data sets together and menace privacy-sensitive information from them, bringing considerable economic loss or severe social reputation impairment to data owners. But, little attention has been paid to such a cloud-specific privacy issue.

Existing technical approaches for preserving the privacy of data sets stored in cloud mainly include encryption and anonymization. On one hand, encrypting all data sets, a straightforward and effective approach, is widely adopted in current research [8], [9], [10]. However, processing on encrypted data sets efficiently is quite a challenging task, because most existing applications only run on unencrypted data sets. Although recent progress has been made in homomorphic encryption which theoretically allows per-forming computation on encrypted data sets, applying current algorithms are rather expensive due to their inefficiency [11]. On the other hand, partial information of data sets, e.g., aggregate information, is required to expose to data users in most cloud applications like data mining and analytics. In such cases, data sets are anonymized rather than encrypted to ensure both data utility and privacy preserving. Current privacy-preserving techniques like generalization [12] can withstand most privacy attacks on one single data set, while preserving privacy for multiple data sets is still a challenging problem [13]. Thus, for preserving privacy of multiple data sets, it is promising to anonymize all data sets first and then encrypt them before storing or sharing them in cloud. Usually, the volume of intermediate data sets is huge [6]. Hence, we argue that encrypting all intermediate data sets will lead to high overhead and low efficiency when they are frequently accessed or processed. As such, we propose to encrypt part of intermediate data sets rather than all for reducing privacy-preserving cost.

In this paper, we propose a novel approach to identify which intermediate data sets need to be encrypted while others do not, in order to satisfy privacy requirements given by data holders. A tree structure is modeled from generation relationships of intermediate data sets to analyze privacy propagation of data sets.

As quantifying joint privacy leakage of multiple data sets efficiently is challen-ging, we exploit an upper bound constraint to confine privacy disclosure. Based on such a constraint, we model the problem of saving privacy-preserving cost as a constrained optimization problem. This problem is then divided into a series of subproblems by decomposing privacy leakage constraints. Finally, we design a practical heuristic algorithm accordingly to identify the data sets that need to be encrypted. Experimental results on real-world and extensive data sets demonstrate that privacy-preser-ving cost of intermediate data sets can be significantly reduced with our approach over existing ones where all data sets are encrypted.

The major contributions of our research are threefold. First, we formally demonstrate the possibility of ensuring privacy leakage requirements without encrypting all intermediate data sets when encryption is incorporated with anonymization to preserve privacy. Second, we design a practical heuristic algorithm to identify which data sets need to be encrypted for preserving privacy while the rest of them do not. Third, experiment results demonstrate that our approach can significantly reduce privacy-preserving cost over existing approaches, which is quite beneficial for the cloud users who utilize cloud services in a pay-as-you-go fashion.

This paper is a significantly improved version of [14]. Based on [14], we mathematically prove that our approach can ensure privacy-preserving requirements. Further, the heuristic algorithm is redesigned by considering more factors. We extend experiments over real data sets. Our approach is also extended to a graph structure.

The remainder of this paper is organized as follows: The related work is reviewed in the next section. A motivating example and problem analysis are given in Section 3. In Section 4, we present the fundamental privacy representa-tion of data sets and derive privacy leakage upper bound constraints. Section 5 formulates our approach. In Section 6, we evaluate the proposed approach by conducting experi-ments on both real-world data sets and extensive data sets. Finally, we conclude this paper and discuss our future work in Section 7.

II. RELATED WORKS

We briefly review the research on privacy protection in cloud, intermediate data set privacy preserving and Privacy-Preserving Data Publishing (PPDP).

Currently, encryption is exploited by most existing research to ensure the data privacy in cloud [8], [9], [10]. Although encryption works well for data privacy in these approaches, it is necessary to encrypt and decrypt data sets frequently in many applications. Encryption is usually integrated with other methods to achieve cost reduction, high data usability and privacy protection. Roy et al. [15] investigated the data privacy problem caused by MapRe-duce and presented a system named Airavat which incorporates mandatory access control with differential privacy. Puttaswamy et al. [16] described a set of tools called Silverline that identifies all functionally encryptable data and then encrypts them to protect privacy. Zhang et al. [17] proposed a system named Sedic which partitions MapReduce computing jobs in terms of the security labels of data they work on and then assigns the computation without sensitive data to a public cloud.

The sensitivity of data is required to be labeled in advance to make the above approaches available. Ciriani et al. [18] proposed an approach that combines encryption and data fragmentation to achieve privacy protection for distributed data storage with encrypting only part of data sets. We follow this line, but integrate data anonymization and encryption together to fulfill cost-effective privacy preserving.
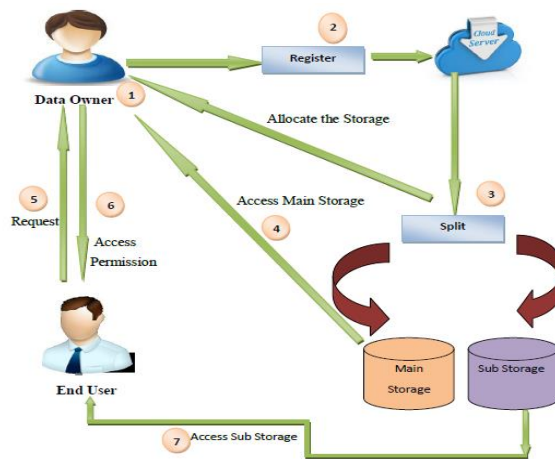
The importance of retaining intermediate data sets in cloud has been widely recognized [6], [7], but the research on privacy issues incurred by such data sets just com-mences. Davidson et al. [19], [20], [21] studied the privacy issues in workflow provenance, and proposed to achieve module privacy preserving and high utility of provenance information via carefully hiding a subset of intermediate data. This general idea is similar to ours, yet our research mainly focuses on data privacy preserving from an economical cost perspective while theirs concentrates majorly on functionality privacy of workflow modules rather than data privacy. Our research also differs from theirs in several aspects such as data hiding techniques, privacy quantification and cost models. But, our approach can be complementarily used for selection of hidden data items in their research if economical cost is considered.

The PPDP research community has investigated exten-sively on privacy-preserving issues and made fruitful progress with a variety of privacy models and preserving methods [13]. Privacy principles such as k-anonymity [22] and l-diversity [23] are put forth to model and quantify privacy, yet most of them are only applied to one single data set. Privacy principles for multiple data sets are also proposed, but they aim at specific scenarios such as continuous data publishing or sequential data releasing [13]. The research in [22], [21] exploits information theory to quantify the privacy via utilizing the maximum entropy principle [22]. The privacy quantification herein is based on the work in [22], [21]. Many anonymization techniques like generalization [12] have been proposed to preserve privacy, but these methods alone fail to solve th Problem of preserving privacy for multiple data .Our
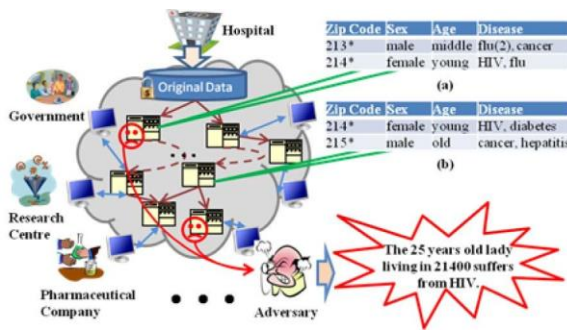
Fig. 1. A scenario showing privacy threats due to intermediate data sets.consider the economical aspect of privacy preserving, adhering to the pay-as-you-go feature of cloud computing.

III.   MOTIVATING EXAMPLE AND PROBLEM ANALYSIS

Section 3.1 shows a motivating example to drive our research. The problem of reducing the privacy-preserving cost incurred by the storage of intermediate data sets is analyzed in Section 3.2.

4.1 Motivating Example

A motivating scenario is illustrated in Fig. 1 where an online health service provider, e.g., Microsoft HealthVault [27], has moved data storage into cloud for economical benefits. Original data sets are encrypted for confidentiality. Data users like governments or research centres access or process part of original data sets after anonymization. Intermediate data sets generated during data access or process are retained for data reuse and cost saving. Two independently generated intermediate data sets (Fig. 1a) and (Fig. 1b) in Fig. 1 are anonymized to satisfy 2-diversity, i.e., at least two individuals own the same quasi-identifier and each quasi-identifier corresponds to at least two sensitive values [20]. Knowing that a lady aged 25 living in 21,400 (corresponding quasi-identifier is h214_; female; youngi) is in both data sets, an adversary can infer that this individual suffers from HIV with high confidence if Fig. 1a and Fig. 1b are collected together. Hiding Fig. 1a or Fig. 1b by encryption is a promising way to prevent such a privacy breach. Assume Fig. 1a and Fig. 1b are of the same size, the frequency of accessing Fig. 1a is 10 and that of Fig. 1b is 100. We hide Fig. 1a to preserve privacy because this can incur less expense than hiding Fig. 1b.

3.2 Problem Analysis

3.2.1 Sensitive Intermediate Data Set Management

Similar to [6], data provenance is employed to manage intermediate data sets in our research. Provenance is commonly defined as the origin, source or history of derivation of some objects and data, which can be reckoned as the information upon how data were generated [28]. Reproducibility of data provenance can help to regenerate a data set from its nearest existing predecessor data sets rather than from scratch [6], [20]. We assume herein that the information recorded in data provenance is leveraged to build up the generation relationships of data sets [6].

We define several basic notations below. Let d_o be a privacy-sensitive original data set. We use $D \frac{1}{4} fd_1; d_2; \ldots ; d_ng$ to denote a group of intermediate data sets generated from d_o where n is the number of intermediate data sets. Note that the notion of intermediate data herein refers to both intermediate and resultant data [6]. Directed Acyclic Graph (DAG) is exploited to capture the topological structure of generation relationships among these data sets.

Definition 1 (Sensitive intermediate data set graph). A DAG representing the generation relationships of intermediate data sets D from d_o is defined as a Sensitive Intermediate data set Graph, denoted as SIG. Formally, SIG $\frac{1}{4} hV ; Ei$, where $V \frac{1}{4} fd_og [D$, E is a set of directed edges. A directed edge $hd_p; d_ci$ in E means that part or all of d_c is generated from d_p, where $d_p; d_c 2 fd_og [D$.

In particular, an SIG becomes a tree structure if each data set in D is generated from only one parent data set. Then, we have the following definition for this situation.

Definition 2 (Sensitive intermediate data set tree (SIT)).
An SIG is defined as a Sensitive Intermediate data set Tree if it is a tree structure. The root of the tree is d_o.

An SIG or SIT not only represents the generation relationships of an original data set and its intermediate data sets, but also captures the propagation of privacy-sensitive information among such data sets. Generally, the privacy-sensitive information in d_o is scattered into its offspring data sets. Hence, an SIG or SIT can be employed to analyze privacy disclosure of multiple data sets. In this paper, we first present our approach on an SIT, and then extend it to an SIG with minor modifications in Section 5.

3.2.2 Privacy-Preserving Cost Problem

Privacy-preserving cost of intermediate data sets stems from frequent en/decryption with charged cloud services. Cloud service venders have set up various pricing models to support the pay-as-you-go model, e.g., Amazon Web Services pricing model [21]. Practically, en/decryption needs computation power, data storage, and other cloud services. To avoid pricing details and focus on the discussion of our core ideas, we combine the prices of various services required by en/decryption into one. This combined price is denoted as PR. PR indicates the overhead of en/decryption on per GB data per execution.

Algorithm 1. Privacy-Preserving Cost Reducing Heuristic

Description	Iteratively identifies the intermediate datasets that need to be encrypted, achieving a low level privacy-preserving cost under the constraint PLC_1.
Input	A SIT with root d_o; all attribute values of each intermediate dataset are given, i.e., size, frequency, privacy leakage; privacy requirement threshold ε.
Output	A vector of local solutions $\langle \pi_1, \ldots, \pi_H \rangle$ that comprise a near-optimal global privacy-preserving solution; and the global privacy-preserving cost: C_{global}.
Step 1	Initialize the following variables.
1.1	*Define a priority queue: $PQueue$.*
1.2	*Construct the initial search node with the root of the SIT: SN_0 $= \langle\langle \pi_0 \rangle \leftarrow \langle\{d_o\}, \emptyset\rangle, f(SN_0) \leftarrow 0, ED_0 \leftarrow \{d_o\}, C_{cur} \leftarrow 0, \varepsilon_1 \leftarrow \varepsilon\rangle$, i.e., the five parameters are the current solution, the current heuristic value, the current ED, the current cost and the privacy leakage requirement for the sequent layers.*
1.3	*Add the node into $PQueue$: $PQueue \leftarrow SN_0$.*
Step 2	Iteratively retrieve the search nodes from $PQueue$, and in turn add their child search nodes to $PQueue$.
2.1	*Retrieve the search node with the highest heuristics from $PQueue$: $SN_i \leftarrow PQueue$.*
2.2	*Check whether $ED_i = \emptyset$. If yes, a solution is found and the algorithm will go to Step 3.*
2.3	*Label the datasets in CDE_i as encrypted if their privacy leakage is larger than ε_i. Sort the unlabeled datasets in CDE_i ascendingly according to $C_k/PL_s(d_k)$, $d_k \in CDE_i$: $SORT(CDE_i)$. If the number of unlabeled datasets are larger than M, only the first M datasets are considered to generate candidate nodes.*
2.4	*Generate all the possible local solutions in Λ_i.*
2.5	*Select a solution from Λ_i: $\pi \leftarrow SELECT(\Lambda_i).$:* 1) Calculate the privacy leakage upper bound of this solution and the encryption cost: $PL_{local} \leftarrow \sum_{d \in UD_\pi} PL_s(d)$, $C_{local} \leftarrow \sum_{d_k \in ED_\pi}(S_k \cdot CR \cdot f_k)$, where $\pi = \langle ED_\pi, UD_\pi \rangle$. 2) Calculate the remaining privacy leakage $\varepsilon_{i+1} \leftarrow \varepsilon_i - PL_{local}$.
2.6	*Compute the heuristic value according to (12);*
2.7	*Construct new search node from the obtained values, add it to $PQueue$. Then go to Step 2.1.*
Step 3	Obtain the global encryption cost C_{global}: $C_{global} \leftarrow C_{cur}$, and the corresponding solution $\langle \pi_1, \ldots, \pi_H \rangle$.

IV. CONCLUSIONS AND FUTURE WORK

In this paper, we have proposed an approach that identifies which part of intermediate data sets needs to be encrypted while the rest does not, in order to save the privacy-preserving cost. A tree structure has been modeled from the generation relationships of intermediate data sets to analyze privacy propagation among data sets. We have modeled the problem of saving privacy-preserving cost as a constrained optimization problem which is addressed by decomposing the privacy leakage constraints. A practical heuristic algorithm has been designed accordingly. Evaluation results on real-world data sets and larger extensive data sets have demonstrated the cost of preserving privacy in cloud can be reduced significantly with our approach over existing ones where all data sets are encrypted.

In accordance with various data and computation intensive applications on cloud, intermediate data set management is becoming an important research area. Privacy preserving for intermediate data sets is one of important yet challenging research issues, and needs intensive investigation. With the contributions of this paper, we are planning to further investigate privacy-aware efficient scheduling of intermediate data sets in cloud by taking privacy preserving as a metric together with other metrics such as storage and computation. Optimized balanced scheduling strategies are expected to be developed toward overall highly efficient privacy aware data set scheduling.

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Inhibitive Action of Calcium Lignosulfonate on the Corrosion of Mild Steel in Sulfuric Acid Medium

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Abstract- The functioning of calcium lignosulfonate (CLS) as the potential inhibitor in the corrosion of mild steel in 0.5 M H_2SO_4 medium has been studied. The various parameters in connection with the corrosion behaviour of the metal and the inhibitive action of CLS were obtained by weight loss, potentiodynamic polarisation, electrochemical impedance spectroscopy (EIS) and scanning electron microscopy(SEM) methods. The effect of temperature on the mild steel surface has been reported. The results of the present investigation show that CLS acts as a good inhibitor and it is of mixed type. The mode of action is by the process of adsorption at anodic and cathodic sites. The scanning electron microscopic studies gives the picture of surface morphology of mild steel in the presence and absence of inhibitor.

Index Terms- Calcium Lignosulfonate, Corrosion inhibitor, Mild steel, Sulfuric acid, Langmuir adsorption isotherm.

I. INTRODUCTION

Materials of iron especially mild steel, are largely used in acidic media in most industries including oil/gas exploration and ancillary activities. During such activities, hydrochloric acid is widely used in pickling, descaling and stimulation of oil wells in order to increase oil and gas flow. Normally inhibitors are used to control corrosion in such a corrosion conditions the protection of metal from corrosion phenomenais of paramount importance and some have been found to be hazardous to health and the environment at large [1]. The unique advantage of the possibility of adding inhibitors is that this can be done without distruption of the industrial process. Specific chemical compounds are often used as inhibitors in these processes mainly to control the metal dissolution reaction and thereby increasing the service life of steel materials. The inhibition efficiency has been described as primarily due to their adsorption at corroding metal surfaces . A protective film formed due to adsorption of these inhibitor molecules restricts either the movement of ions away from the corroding surface or the consumption of electrons .

Organic corrosion inhibitors are useful when their addition in small amounts prevents corrosion. When higher concentrations of organic compounds are added additional testing for environmental impact is required. Compounds containing nitrogen, sulphur and oxygen are being used as inhibitors [2]. The most efficient inhibitors are organic compounds having pi bonds in their structures. However polymeric compounds owing to their multiple active sites adsorb more strongly on the metal surface compared with their monomer analogues. Therefore, it is expected that the polymers will be the better corrosion inhibitors [3-13]. In the case of polymers by increasing the hydrocarbon chain length, solubility decreases. Thus, the presence of hydrophilic functional groups which increase the solubility are required. Thus efforts are now directed towards the formulation of modern, environmentally safe inhibitors. These inhibitors are chosen because they are eco-friendly, economical, readily available and obtained from renewable sources. The green inhibitors are more significant in the sense that they do not contain any heavy metal in their composition [14-17]. Several authors also reported the use of natural products as the potential corrosion inhibitors for various metals and alloys under different environments [18-31]. In the present investigation we used calcium lignosulfonate as the inhibitor which is a green inhibitor with potential inhibitive property and eco friendly.

II. EXPERIMENTAL

The aggressive solution (0.5M H_2SO_4) was prepared by dilution of analytical Grade 98% H_2SO_4 with double-distilled water. Prior to all measurements, the mild steel samples (0.09% P; 0.38% Si; 0.01% Al; 0.05% Mn; 0.21% C; 0.05% S and the remainder iron) were polished with different emery paper up to 1200 grade, washed thoroughly with double-distilled water, degreased with AR grade ethanol, acetone and drying at room temperature. The solution volume was 100 mL with and without the addition of different concentrations of CLS . The mild steel specimens used had a rectangular form (1 cm x 1 cm). The immersion time for the weight loss was 1 h at 30 $^{\circ}$ C.

After the corrosion experiments, the specimens of steel were carefully washed in double-distilled water, dried and then weighed. The rinse removed the loose segments of the film of the corroded samples. Duplicate experiments were performed in each case and the mean value of the weight loss is reported. Weight loss allowed us to calculate the mean corrosion rate as expressed in mpy.

2.1 Weight loss Studies

The corrosion rate and inhibition efficiency IE(%) were calculated according to the Eqs. (1) and (2) respectively.

Corrosion rate (mpy) = 534 W/ ρA t   (1)

Where W is the weight loss (mg), ρ is the density of the specimen (cm^3), A is the area of the specimen (cm^2), and t is the exposure time (h).

IE% = $\dfrac{CR^o\text{-}CR}{CR^o}$ × 100 (2)

CR^o- Average weight loss without inhibitor, CR- Average weight loss with inhibitor

2.2 Preparation of the CLS

Calcium lignosulfonate is an amorphous material obtained from the sulfite pulping of softwood. The lignin framework is a sulfonated random polymer of three aromatic alcohols: coniferylalcohol, *p*-coumaryl alcohol, and sinapyl alcohol, of which coniferylalcohol is the principal unit. After completion of the pulping, the water-soluble calcium lignosulfonate is separated from the cellulose, purified (ultrafiltration), and acidified. The recovered material is evaporated and spray dried. The commercial product has a weight average molecular weight range of 40,000 to 65,000. It is purchased from Lanxess india private limited. It is obtained as a powder form and it is soluble in water.

Figure 1 Molecular structure of Calcium Lignosulfonate

Figure 2 IR Spectrum of Calcium Lignosulfonate

Infrared spectrum of SLS was taken in KBr pellet form in the region 400- 4000 cm^{-1}. The characteristic IR absorption bands of SLS are as follows: a broad band at 3423 cm^{-1} is attributed to stretching vibrations of O-H groups, the band at 1043 cm^{-1} is due to ether linkage group, the band at 1385 cm^{-1} is due to (- CH_3) linkage group, the band at 1214 cm^{-1} corresponds to plane bending vibrations of O-H groups.

III. WEIGHT LOSS METHOD

Table 1 Variation of inhibition efficiency and surface coverage (θ) with different concentration of the inhibitor and at various temperatures

InhibitorConcentration (V/V)	Inhibition efficiency (%)				Surface coverage (θ)				C/θ			
	303K	313K	323K	333K	303K	313K	323K	333K	303K	313K	323K	333K
2	52.3	48.2	47.0	46.0	0.52	0.48	0.47	0.46	3.80	4.20	4.30	4.34
6	58	49.8	47.1	41.7	0.58	0.49	0.47	0.41	10.34	12.24	12.76	14.63
10	61.6	49.1	46.1	45.0	0.61	0.49	0.46	0.45	16.4	20.50	21.7	22.2
14	73.8	48.3	45.2	44.0	0.72	0.48	0.45	0.44	18.97	29.20	31.1	31.8
18	88.4	42	40.9	36	0.88	0.42	0.40	0.36	20.3	42.85	45	50.00

The data obtained from the conventional weight loss method is given in **Table 1.** It is inferred from the data that with the increasing concentration of the inhibitor the inhibition efficiency increases regularly at 303K. However at higher temperatures (313, 323, 333K) inhibition efficiency increases initially with increasing concentration of inhibitor and at later stage there is a decreasing trend (**Table 1, Figure 3**). This result shows that at higher temperatures the phenomenon of desorption predominates rather than adsorption and so there is decreasing inhibition efficiency.

Figure 3   Variation of Inhibition efficiency (%) with various concentrations of inhibitor at different temperatures 303K, 313K, 323K and 333K

IV.   ADSORPTION ISOTHERM

In the present investigation the values of **θ,** the degree of surface coverage is calculated at different concentrations by using the equation (3).

$$\theta = (CR^{o} - CR) / CR^{o} \qquad (3)$$

θ – degree of surface coverage, CR^{o}-average weight loss without inhibitor, CR- average weight loss with inhibitor.

At lower temperature the surface coverage increases with rise in concentration of the inhibitor due to adsorption of the inhibitor on the metal surface. Nevertheless, at higher temperature the surface coverage decreases with reference to a particular concentration. To understand the nature of adsorption of the inhibitor on the metal   surface, several adsorption isotherms are in handy to fit the experimental data.

Here the plot of C/θ vs. C (Langmuir adsorption isotherm) at different temperatures (303, 313, 323, 333K) is given in **Figure 4** . The linear relationship indicates the present system obeys Langmuir adsorption isotherm which implies that the adsorption of the inhibitor results monolayer adsorption on the surface of the mild steel.

Figure 4   Variation of   C/θ vs. C at different temperatures

V.   ELECTROCHEMICAL STUDIES

Table 2   Potentiodynamic parameters in different concentrations of CLS at 303 K

C	E_{corr}	I_{corr}	β_c	β_a	IE
% (v/v)	(mv/SCE)	(10^{-3} mA/cm^2)	(mv/dec)	(mv/dec)	%
0	-740	7.78	5.73	6.54	
2	-734	3.87	5.93	7.77	50.25
6	-723	3.04	6.43	7.48	60.92
10	-740	1.36	6.91	8.08	82.51
14	-756	1.10	7.23	8.59	85.86
18	-763	0.89	7.28	8.81	88.56

Electrochemical measurements are performed in a conventional three electrode cell consisting of a mild steel working electrode (WE), platinum counter electrode (CE) and silver as the reference electrode. By using emery paper, these electrodes are degreased and dried at room temperature before used. The area of the working electrode is 1 cm^2. The current density (Icorr) curves obtained by extrapolation of the Tafel lines.

Potentiodynamic polarization measurements were carried out for this system and the details are given **Table 2**. The kinetic parameters obtained by this method **Figure** 5 such as E_{corr}, I_{corr}, anodic and cathodic tafel slopes (β_a & β_c) are given in **Table 2**. It is observed that with addition of increasing concentration of inhibitor the corrosion potential (E_{corr}) shifts slightly towards the cathodic direction. For the blank, E_{corr} is -740mV and at higher concentration of inhibitor 18 %(v/v) its value is -763 mV. These values indicate that there is a dismal effect on corrosion potential with increase in the concentration of the inhibitor. However there

is a progressive change in the values of anodic and cathodic Tafel slopes. This clearly shows that the mechanism of anodic dissolution of metal and cathodic hydrogen evolution steps are affected by the inhibitor. This shows that the inhibition is due to the adsorption of the inhibitor on the mild steel surface. The values of β_c and β_a show increasing trend indicating the inhibitive action is of mixed type**.** From the Potentiodynamic polarization measurements the inhibition efficiency is attained using the equation.

$$IE\% = \frac{I_{corr} - I_{corr}(inhibitor)}{I_{corr}} \times 100$$

(4)

Where I_{corr} and $I_{corr\ (inhibitor)}$ are the values of corrosion current densities of mild steel without and with the inhibitor respectively. The inhibition efficiency increases with the increase in concentration of the inhibitor.

Figure 5   Polarization curves of mild steel in 0.5 M H$_2$SO$_4$ with and without CLS at various concentration.

Table 3   Electrochemical impedance parameters at different concentrations of inhibitor

conc. % (v/v)	R_{ct} Ω cm^2	C_{dl} μF cm^{-2} 10^{-7}	IE %
0	2.92	5.45	
2	4.77	3.33	38.87
6	5.32	2.98	45.16
10	5.52	2.88	47.09
14	10.31	1.54	71.66
18	24.90	0.53	88.27

Electrochemical impedance spectroscopy (EIS) studies were carried out in a frequency range of 100KHz to 10 MHz with amplitude of 10 mV using AC signals at open circuit potential (OCP). The charge transfer resistance (R_{ct}) values have been obtained from the diameter of semicircles of Nyquist plots.

Figure 6   Nyquist plots for mild steel immersed in 0.5 M H2SO4 solution without and with inhibitor at various concentrations

The effect of the inhibitor concentration on the impedance behaviour of mild steel in 0.5 M H_2SO_4 has been determined and the Nyquist plots are given in **Figure 6.** The impedance spectra show a single semicircle and as the concentration of inhibitor increases diameter of the semicircle increases. The results indicate that the R_{ct} significantly increases with increase in concentration of inhibitor and C_{dl} tends to decrease. This decrease in C_{dl} may be due to decrease in local dielectric constant and/or an increase in the thickness of protective layer at electrode surface which enhances the corrosion resistanc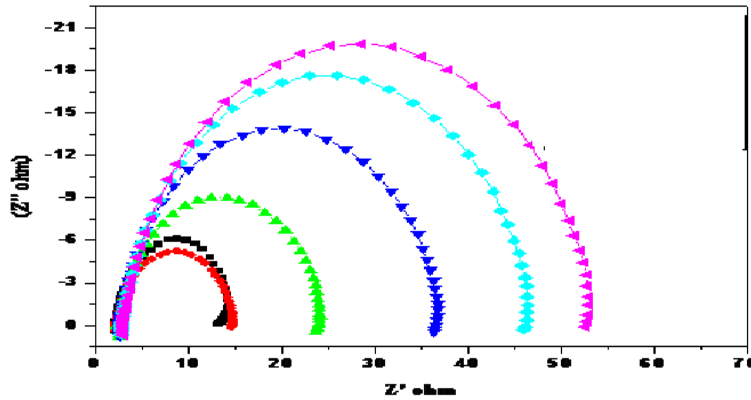e of the mild steel. The increase in R_{ct} values is attributed to the formation of protective film at the metal-solution interface.

The double layer capacitance (C_{dl}) and the inhibition efficiency has been calculated by using the equations (5) and (6).

$$C_{dl} = \frac{1}{2 \times 3.14 \times f_{max} \times R_{ct}}$$

(5)

C_{dl} – double layer capacitance, f_{max}- frequency maximum, R_{ct}- charge transfer resistance

$$IE \% = \frac{R_{ct} - R^0_{ct}}{R_{ct}} \times 100$$

(6)

R_{ct} - charge transfer resistance with inhibitor, R^o_{ct} - charge transfer resistance without inhibitor

VI.   SCANNING ELECTRON MICROSCOPY (SEM)

The mild steel specimen immersed in 0.5M H_2SO_4 for 3 hrs was taken out and washed with distilled water, dried and taken SEM micrograph. Similarly the mild steel specimen immersed in resin solution containing acid for 3 hrs was taken out, rinsed with double distilled water, dried and subjected to surface examination by scanning electron microscopy (SEM) using HITACHI S-3000H instrument.
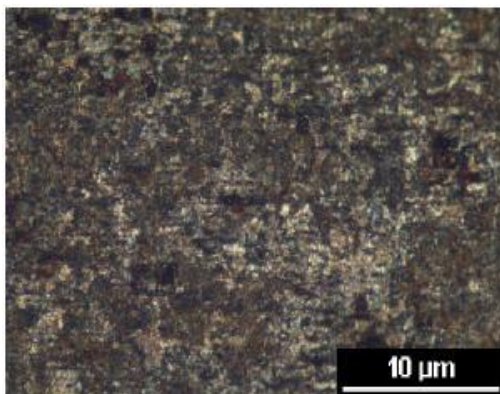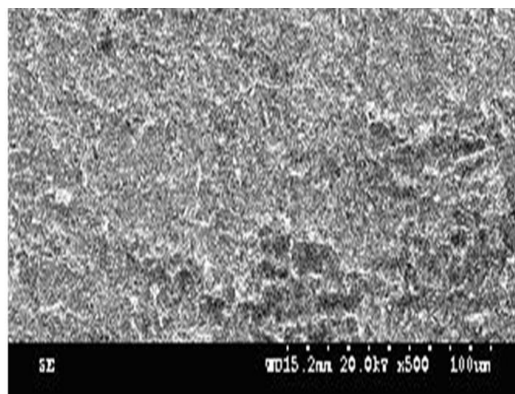
Figure 7 SEM micrograph without inhibitor

Figure 8   SEM micrograph with inhibitor

Scanning Electron Microscopy (**SEM**) is a wonderful technique to examine the surface features with better understanding. In the present work the SEM micrograph of mild steel in 0.5 M H_2SO_4 solution in the absence and presence of inhibitor after 3hours exposure is given in **Figure 7 and Figure 8**.

The SEM image shows that the mild steel was affected by uninhibited solution of sulfuric acid and holes are formed due to pitting corrosion, however in the presence of inhibitor no holes are found in the SEM image **Figure 8**. This is due to the adsorption of inhibitor and shielding the mild steel surface from corrosion.

VII.   CONCLUSIONS

1. CLS has been found to be a good corrosion inhibitor for mild steel in 0.5M H_2SO_4 medium.
2. The Inhibition efficiency (%) and corrosion resistance of the mild steel increased with increase in inhibitor concentrations.
3. The Tafel polarization curves indicate that it is a mixed type inhibitor.
4. The present system obeys Langmuir Adsorption Isotherm.

SEM images show that the corrosion of the mild steel is due to pitting and the addition of inhibitor protects the mild steel surface from the corrosion.

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Index Terms- Calcium Lignosulfonate, Corrosion inhibitor, Mild steel, Sulfuric acid, Langmuir adsorption isotherm.

I. INTRODUCTION

Materials of iron especially mild steel, are largely used in acidic media in most industries including oil/gas exploration and ancillary activities. During such activities, hydrochloric acid is widely used in pickling, descaling and stimulation of oil wells in order to increase oil and gas flow. Normally inhibitors are used to control corrosion in such a corrosion conditions the protection of metal from corrosion phenomenais of paramount importance and some have been found to be hazardous to health and the environment at large [1]. The unique advantage of the possibility of adding inhibitors is that this can be done without distruption of the industrial process. Specific chemical compounds are often used as inhibitors in these processes mainly to control the metal dissolution reaction and thereby increasing the service life of steel materials. The inhibition efficiency has been described as primarily due to their adsorption at corroding metal surfaces . A protective film formed due to adsorption of these inhibitor molecules restricts either the movement of ions away from the corroding surface or the consumption of electrons .

Organic corrosion inhibitors are useful when their addition in small amounts prevents corrosion. When higher concentrations of organic compounds are added additional testing for environmental impact is required. Compounds containing nitrogen, sulphur and oxygen are being used as inhibitors [2]. The most efficient inhibitors are organic compounds having pi bonds in their structures. However polymeric compounds owing to their multiple active sites adsorb more strongly on the metal surface compared with their monomer analogues. Therefore, it is expected that the polymers will be the better corrosion inhibitors [3-13]. In the case of polymers by increasing the hydrocarbon chain length, solubility decreases. Thus, the presence of hydrophilic functional groups which increase the solubility are required. Thus efforts are now directed towards the formulation of modern, environmentally safe inhibitors. These inhibitors are chosen because they are eco-friendly, economical, readily available and obtained from renewable sources. The green inhibitors are more significant in the sense that they do not contain any heavy metal in their composition [14-17]. Several authors also reported the use of natural products as the potential corrosion inhibitors for various metals and alloys under different environments [18-31]. In the present investigation we used calcium lignosulfonate as the inhibitor which is a green inhibitor with potential inhibitive property and eco friendly.

II. EXPERIMENTAL

The aggressive solution (0.5M H_2SO_4) was prepared by dilution of analytical Grade 98% H_2SO_4 with double-distilled water. Prior to all measurements, the mild steel samples (0.09% P; 0.38% Si; 0.01% Al; 0.05% Mn; 0.21% C; 0.05% S and the remainder iron) were polished with different emery paper up to 1200 grade, washed thoroughly with double-distilled water, degreased with AR grade ethanol, acetone and drying at room temperature. The solution volume was 100 mL with and without the addition of different concentrations of CLS . The mild steel specimens used had a rectangular form (1 cm x 1 cm). The immersion time for the weight loss was 1 h at 30 ^{o} C.

After the corrosion experiments, the specimens of steel were carefully washed in double-distilled water, dried and then weighed. The rinse removed the loose segments of the film of the corroded samples. Duplicate experiments were performed in each case and the mean value of the weight loss is reported. Weight loss allowed us to calculate the mean corrosion rate as expressed in mpy.

2.1 Weight loss Studies

The corrosion rate and inhibition efficiency IE(%) were calculated according to the Eqs. (1) and (2) respectively.

Corrosion rate (mpy) = 534 W/ ρA t   (1)

Where W is the weight loss (mg), ρ is the density of the specimen (cm^3), A is the area of the specimen (cm^2), and t is the exposure time (h).

$$IE\% = \frac{CR^o - CR}{CR^o} \times 100 \quad (2)$$

CR^o- Average weight loss without inhibitor, CR- Average weight loss with inhibitor

2.2 Preparation of the CLS

Calcium lignosulfonate is an amorphous material obtained from the sulfite pulping of softwood. The lignin framework is a sulfonated random polymer of three aromatic alcohols: coniferylalcohol, *p*-coumaryl alcohol, and sinapyl alcohol, of which coniferylalcohol is the principal unit. After completion of the pulping, the water-soluble calcium lignosulfonate is separated from the cellulose, purified (ultrafiltration), and acidified. The recovered material is evaporated and spray dried. The commercial product has a weight average molecular weight range of 40,000 to 65,000. It is purchased from Lanxess india private limited. It is obtained as a powder form and it is soluble in water.

Figure 1 Molecular structure of Calcium Lignosulfonate

Figure 2 IR Spectrum of Calcium Lignosulfonate

Infrared spectrum of SLS was taken in KBr pellet form in the region 400- 4000 cm^{-1}. The characteristic IR absorption bands of SLS are as follows: a broad band at 3423 cm^{-1} is attributed to stretching vibrations of O-H groups, the band at 1043 cm^{-1} is due to ether linkage group, the band at 1385 cm^{-1} is due to (- CH$_3$) linkage group, the band at 1214 cm^{-1} corresponds to plane bending vibrations of O-H groups.

III.   WEIGHT LOSS METHOD

Table 1 Variation of inhibition efficiency and surface coverage (θ) with different concentration   of the inhibitor and at various temperatures

InhibitorConcentration (V/V)	Inhibition efficiency (%)				Surface coverage (θ)				C/θ			
	303K	313K	323K	333K	303K	313K	323K	333K	303K	313K	323K	333K
2	52.3	48.2	47.0	46.0	0.52	0.48	0.47	0.46	3.80	4.20	4.30	4.34
6	58	49.8	47.1	41.7	0.58	0.49	0.47	0.41	10.34	12.24	12.76	14.63
10	61.6	49.1	46.1	45.0	0.61	0.49	0.46	0.45	16.4	20.50	21.7	22.2
14	73.8	48.3	45.2	44.0	0.72	0.48	0.45	0.44	18.97	29.20	31.1	31.8
18	88.4	42	40.9	36	0.88	0.42	0.40	0.36	20.3	42.85	45	50.00

The data obtained from the conventional weight loss method is given in **Table 1.** It is inferred from the data that with the increasing concentration of the inhibitor the inhibition efficiency increases regularly at 303K. However at higher temperatures (313, 323, 333K) inhibition efficiency increases initially with increasing concentration of inhibitor and at later stage there is a decreasing trend (**Table 1, Figure 3**). This result shows that at higher temperatures the phenomenon of desorption predominates rather than adsorption and so there is decreasing inhibition efficiency.

Figure 3   Variation of Inhibition efficiency (%) with various concentrations of inhibitor at different temperatures 303K, 313K, 323K and 333K

IV.   ADSORPTION ISOTHERM

In the present investigation the values of $θ$, the degree of surface coverage is calculated at different concentrations by using the equation (3).

$$θ = (CR^o - CR) / CR^o \qquad (3)$$

$θ$ – degree of surface coverage, CR^o-average weight loss without inhibitor, CR- average weight loss with inhibitor.

At lower temperature the surface coverage increases with rise in concentration of the inhibitor due to adsorption of the inhibitor on the metal surface. Nevertheless, at higher temperature the surface coverage decreases with reference to a particular concentration. To understand the nature of adsorption of the inhibitor on the metal   surface, several adsorption isotherms are in handy to fit the experimental data.

Here the plot of C/θ vs. C (Langmuir adsorption isotherm) at different temperatures (303, 313, 323, 333K) is given in **Figure 4** . The linear relationship indicates the present system obeys Langmuir adsorption isotherm which implies that the adsorption of the inhibitor results monolayer adsorption on the surface of the mild steel.

Figure 4   Variation of   C/θ vs. C at different temperatures

V.   ELECTROCHEMICAL STUDIES

Table 2   Potentiodynamic parameters in different concentrations of CLS at 303 K

C	E_{corr}	I_{corr}	β_c	β_a	IE
% (v/v)	(mv/SCE)	(10^{-3} mA/cm^2)	(mv/dec)	(mv/dec)	%
0	-740	7.78	5.73	6.54	
2	-734	3.87	5.93	7.77	50.25
6	-723	3.04	6.43	7.48	60.92
10	-740	1.36	6.91	8.08	82.51
14	-756	1.10	7.23	8.59	85.86
18	-763	0.89	7.28	8.81	88.56

Electrochemical measurements are performed in a conventional three electrode cell consisting of a mild steel working electrode (WE), platinum counter electrode (CE) and silver as the reference electrode. By using emery paper, these electrodes are degreased and dried at room temperature before used. The area of the working electrode is 1 cm^2. The current density (Icorr) curves obtained by extrapolation of the Tafel lines.

Potentiodynamic polarization measurements were carried out for this system and the details are given **Table 2**. The kinetic parameters obtained by this method **Figure** 5 such as E_{corr}, I_{corr}, anodic and cathodic tafel slopes (β_a & β_c) are given in **Table 2**. It is observed that with addition of increasing concentration of inhibitor the corrosion potential (E_{corr}) shifts slightly towards the cathodic direction. For the blank, E_{corr} is -740mV and at higher concentration of inhibitor 18 %(v/v) its value is -763 mV. These values indicate that there is a dismal effect on corrosion potential with increase in the concentration of the inhibitor. However there

is a progressive change in the values of anodic and cathodic Tafel slopes. This clearly shows that the mechanism of anodic dissolution of metal and cathodic hydrogen evolution steps are affected by the inhibitor. This shows that the inhibition is due to the adsorption of the inhibitor on the mild steel surface. The values of β_c and β_a show increasing trend indicating the inhibitive action is of mixed type**.** From the Potentiodynamic polarization measurements the inhibition efficiency is attained using the equation.

$$IE\% = \frac{I_{corr} - I_{corr}(inhibitor)}{I_{corr}} \times 100$$

(4)

Where I_{corr} and $I_{corr\ (inhibitor)}$ are the values of corrosion current densities of mild steel without and with the inhibitor respectively. The inhibition efficiency increases with the increase in concentration of the inhibitor.

Figure 5   Polarization curves of mild steel in 0.5 M H$_2$SO$_4$ with and without CLS at various concentration.

Table 3   Electrochemical impedance parameters at different concentrations of inhibitor

conc. % (v/v)	R$_{ct}$ Ω cm^2	C$_{dl}$ μF cm^{-2} 10^{-7}	IE %
0	2.92	5.45	
2	4.77	3.33	38.87
6	5.32	2.98	45.16
10	5.52	2.88	47.09
14	10.31	1.54	71.66
18	24.90	0.53	88.27

Electrochemical impedance spectroscopy (EIS) studies were carried out in a frequency range of 100KHz to 10 MHz with amplitude of 10 mV using AC signals at open circuit potential (OCP). The charge transfer resistance (R_{ct}) values have been obtained from the diameter of semicircles of Nyquist plots.

Figure 6   Nyquist plots for mild steel immersed in 0.5 M H2SO4 solution without and with inhibitor at various concentrations

The effect of the inhibitor concentration on the impedance behaviour of mild steel in 0.5 M H_2SO_4 has been determined and the Nyquist plots are given in **Figure 6.** The impedance spectra show a single semicircle and as the concentration of inhibitor increases diameter of the semicircle increases. The results indicate that the R_{ct} significantly increases with increase in concentration of inhibitor and C_{dl} tends to decrease. This decrease in C_{dl} may be due to decrease in local dielectric constant and/or an increase in the thickness of protective layer at electrode surface which enhances the corrosion resistance of the mild steel. The increase in R_{ct} values is attributed to the formation of protective film at the metal-solution interface.

The double layer capacitance (C_{dl}) and the inhibition efficiency has been calculated by using the equations (5) and (6).

$$C_{dl} = \frac{1}{2 \times 3.14 \times f_{max} \times R_{ct}}$$
(5)

C_{dl} – double layer capacitance, f_{max}- frequency maximum, R_{ct}-charge transfer resistance

$$IE\% = \frac{R_{ct} - R^0_{ct}}{R_{ct}} \times 100$$
(6)

R_{ct} - charge transfer resistance with inhibitor, R^o_{ct} - charge transfer resistance without inhibitor

VI. SCANNING ELECTRON MICROSCOPY (SEM)

The mild steel specimen immersed in 0.5M H_2SO_4 for 3 hrs was taken out and washed with distilled water, dried and taken SEM micrograph. Similarly the mild steel specimen immersed in resin solution containing acid for 3 hrs was taken out, rinsed with double distilled water, dried and subjected to surface examination by scanning electron microscopy (SEM) using HITACHI S-3000H instrument.

Figure 7 SEM micrograph without inhibitor

Figure 8   SEM micrograph with inhibitor
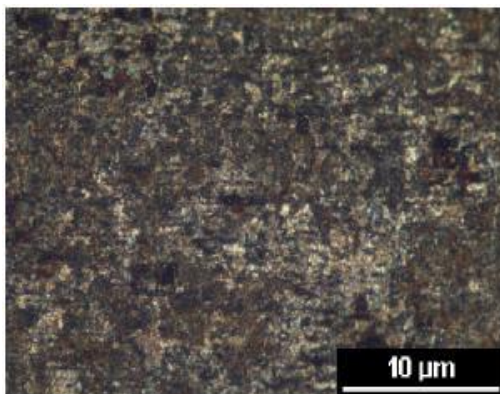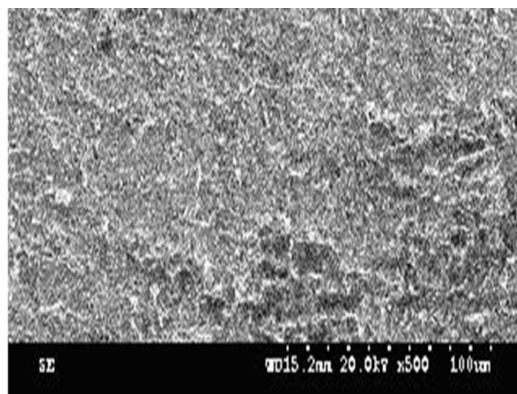
Scanning Electron Microscopy (**SEM**) is a wonderful technique to examine the surface features with better understanding. In the present work the SEM micrograph of mild steel in 0.5 M H_2SO_4 solution in the absence and presence of inhibitor after 3hours exposure is given in **Figure 7 and Figure 8**.

The SEM image shows that the mild steel was affected by uninhibited solution of sulfuric acid and holes are formed due to pitting corrosion, however in the presence of inhibitor no holes are found in the SEM image **Figure 8**. This is due to the adsorption of inhibitor and shielding the mild steel surface from corrosion.

VII.   CONCLUSIONS

5. CLS has been found to be a good corrosion inhibitor for mild steel in 0.5M H_2SO_4 medium.
6. The Inhibition efficiency (%) and corrosion resistance of the mild steel increased with increase in inhibitor concentrations.
7. The Tafel polarization curves indicate that it is a mixed type inhibitor.
8. The present system obeys Langmuir Adsorption Isotherm.

SEM images show that the corrosion of the mild steel is due to pitting and the addition of inhibitor protects the mild steel surface from the corrosion.

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Optical Method for the Detection of Dental Caries in Oral Cavity

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Abstract- Optical imaging in medical field is crucial for early detection of oral diseases, to carry out more effective minimally-invasive targeted-therapies and to restore diseased tissues functionally and aesthetically. Optical methods can be based on the properties of light scattering, absorption and fluorescence. In doing so, LEDs and classical light sources can be used. All of these methods have one basic principle in common; the optical spectrum of a tissue contains information about the biochemical composition and/or the structure of the tissue, which provide diagnostic information for tissue characterization. Among them, the most promising techniques to detect and classify different stages of caries are those based on the quantitative measurements of tooth auto fluorescence and diffuse reflectance. These techniques are non-destructive and allow detection of structural and elemental changes on the surface and inside of tissue. When tooth is irradiated with UV or blue light, several fluorophores in tissue produce a broad fluorescence distribution in the visible wavelength region. This fluorescence is referred to as the auto fluorescence, or endogenous fluorescence. Optical proprieties of caries affected tooth are different from sound tissue. Spectral imaging based on this concept may be advancement for the diagnosis of diseases.

Index Terms- LIF, NADH, DR, Dental caries, MATLAB

I. INTRODUCTION

Dental caries is an important Dental-Public-Health dilemma and it is the most widespread oral disease in the world. The prevalence of dental caries has been of great concern for long and is a principal subject of many epidemiological researches carried out in India and abroad. This disease not only causes damage to the tooth, but is also responsible for several morbid conditions of the oral cavity and other systems of the body (WHO 1981). The prevalence pattern of dental caries not varies with age, sex, socio economic status, race, geographical location, food habits and oral hygiene practices. All the teeth and all the surfaces are not equally susceptible to caries.

Factors contributing to the progression of the disease include diet (mainly fermentable carbohydrates), microbes, and the host (amount and constituents of the saliva, habits). The progression of dental caries lesions needs time.

Detection of dental caries using optical techniques is receiving a lot of attention these days. Several, published data demonstrate the potential of optical spectroscopy to characterize caries lesions. By keeping this idea in mind diagnostic techniques based on optical imaging allow non-invasive and real-time characterization of tissue. In particular, these techniques are fast, quantitative and can be easily automated. As well as, they also elucidate the chemical composition and morphology of the tissue which in turn help in monitoring metabolic parameters of the tissue and also distinguish sound from carious tooth. Among them, the potential of light-induced fluorescence (LIF) and diffuse reflectance (DR) is enormous and yet, is not fully explored for early detection of dental caries in vivo. The hypothesis of present work is that these optical techniques will help to discriminate different stages of caries with good

sensitivity and specificity. This work mainly aims at testing the applicability of LIF and DR imaging techniques for detecting caries in its early stage.

II. FLUORESCENCE IMAGING

A. Concepts

Fluorescence imaging is a type of electromagnetic imaging which analyzes fluorescence from a sample. It involves using a beam of light, usually ultraviolet light, that excites the electrons in molecules of certain compounds and causes them to emit light; typically, but not necessarily, visible light. Tissue autofluorescence [2] originates from native tissues. Under UV and blue light irradiation, all biological tissues emit fluorescence from various endogenous fluorophores in tissue with a broad distribution in the visible wavelength region [5]. Diagnostic techniques based on fluorescence imaging have the potential to link the biochemical and morphologic properties of tissues to individual patient care. In particular, these techniques are fast, non-invasive and quantitative.

. Fluorophores that are speculated to play a major role of fluorescence in dental caries are the structural proteins like collagen, NADH and porphyrin[4] (bacteria content). Collagen forms the organic part of the dentin and any structural or pathologic association with caries processes, could be reflected in lower autofluorescence intensity. Porphyrin derivates i.e., porphyrins and metalloporphrins, are responsible for fluorescence emission from carious tooth in the red wavelength region. They typically have absorption maxima between 398 and 421nm and emission maxima between 530 and 633 nm. When excited with 407 nm[1] UV light, bacterial species such as Actinomycets odontolytics, Bacteroides intermedius, Prevotella intermedia, Corynebacterium species and Candida albicans emit fluorescence in between 620-635 nm.

B. Experiment Details

The major components used in the setup are power supply, LED driver circuit, LED module, lens, filter, USB Camera module and the display device.

LED module means the arrangement of four 405 nm LEDs (**HPLighting Corp.,** part# HPL-H44LU1C0, 120^0, 700mA) about 90° to each other around the camera. By arranging the LEDs in the same plane of detector it is easier to get uniform illumination at the tooth surface with the help of an LED driver circuit.

Long-pass filter (Passband = 490-850nm, 10mm in diameter) is fixed on the USB camera (5 MP USB2.0, FOV= 67°) provides necessary filtering to acquire fluorescence signals. The fluorescing images of the tooth are highly resolved and can cover an area of 12X12 mm with a field of view of 23.07°. The image acquisition interface and the pseudo coloring of the image have performed by using IMAQ & image processing tool boxes of MATLAB. Figure 1 explains the basic setup used for the fluorescence imaging of tooth caries.
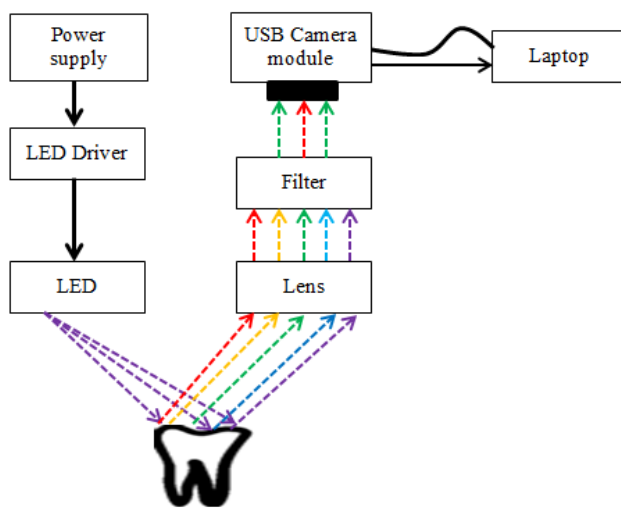
Figure 1.   Setup for fluorescence imaging of tooth caries

C. Results and Discussion

The fluorescence images of tooth obtained in vivo are shown in the fig 2. The important section in this analysis is pseudo coloring or false coloring. False color refers to a group of color rendering methods used to display images in color which were recorded in the visual or non-visual parts of the electromagnetic spectrum. A false-color image is an image that depicts an object in colors that differ from those a photograph (a true-color image) would show. This colored image, when displayed, can make the identification of certain features easier for the observer.

Depending on the table or function used and the choice of data sources, pseudo coloring may increase the information contents of the original image. Here it is done by assigning pseudo color to the intensity of red channel and reallocating the pixel value in the image. The color coded image is shown in fig 2.
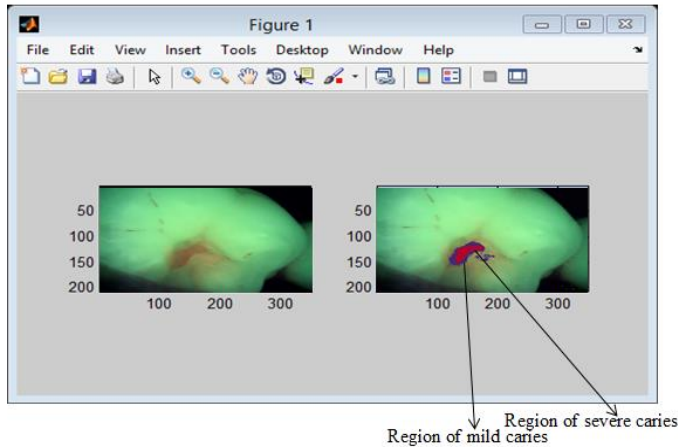
Figure 2.   Fluorescence imaging of tooth with caries

Magenta: Region of severe caries
Blue: Region of mild caries
GREEN: Normal region of tooth.
Black: Noisy surrounding region

III.   SPECTRAL IMAGING

A.   Concepts

Spectral imaging which utilizing the use of diffuse reflectance extends the capabilities of biological and clinical studies to simultaneously study multiple features such as organelles and proteins qualitatively and quantitatively. Spectral imaging combines two well-known scientific methodologies, namely spectroscopy and imaging [1], to provide a new advantageous tool. The combination of these two is, however, not trivial, mainly because it requires creating a three-dimensional (3D) data set that contains many images of the same object, where each one of them is measured at a different wavelength. Here in this spectral imaging, it has been decided to use two different wavelengths and thereby two different images. The need to measure the spectrum at each point of the image requires combining dispersive optics with the more common imaging equipment, and introduces constrains as well.

The DR intensity of caries tooth is markedly lower than that of sound tooth. The DR spectrum shows a broad reflectance dip between 520, 540 and 580 nm, which might be due to hemoglobin absorption. The normalized spectrum shows a reduction in relative intensity with caries formation in the spectral window below 600 nm [6] whereas the trend reverses beyond 625 nm.

So that for DR imaging, we can consider any two regions of interest such as one relating to absorption and the other to point of maximum intensity i e, no absorption. Here the two LEDs that can use as the wavelength of interest are 520 nm and 625 nm. Under normal conditions, it may provide the image of usual teeth. But under caries affected situations, an additional reduction of intensity can be seen on the tooth surface.

B.   Experiment Details

The major parts that have remarkable identities in spectral imaging section are oral camera (Hand piece) with its unique structure, LEDs with its switching section and processing software (MATLAB).

The hand piece resembles an oversized pen is mainly designed to work as an oral camera. The main advantage of using oral camera is that it is a small camera that takes an X-ray of the outside of gum or tooth. Figure 3 represent the basic setup has been used for spectral imaging of tooth caries.
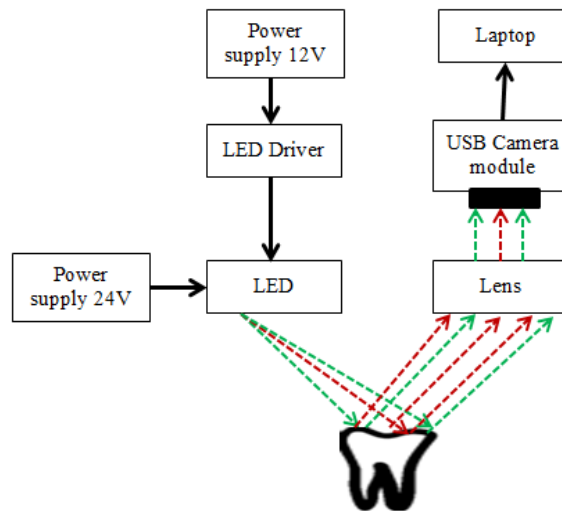
Figure 3.   The basic setup for spectral imaging of tooth

The two LEDs arranged alternatively in the same plane for the illumination purposes are of 520nm (VLMTG1300−GS08, Viewing angle: 130°) and 625 nm (SML‑D12U8W, Viewing angle: 160°). Both of them have very ultra-small foot print of 1.6 mm x 0.8 mm x 0.8 mm (L x W x H).

This can be accomplished by the spectral imaging process. Driving section and a switching section in the LED switching setup illuminates the two different sets of LEDs sequentially with fixed delay duration in between them. So that it can provide two different images within this particular fixed delay. Dividing the two images of different wavelengths (520 nm & 625 nm), one ratio image (625/520) can be obtained. It may carry the information about any abnormality in the tooth structure.

C. Results and Discussion

Image acquisition and processing of the image is done by using MATLAB. Figure 4 represents the images obtained by illuminating the tooth surface with red (625nm) and green (520 nm) visible light.
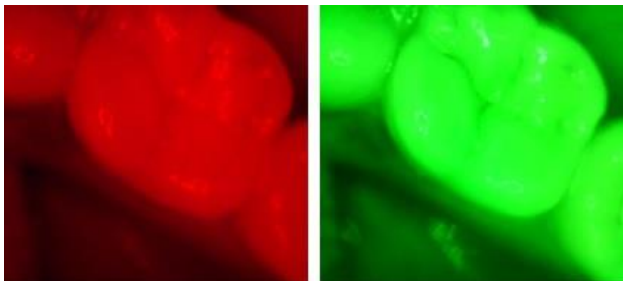
Figure 4.   Images obtained by illuminating the teeth with red and green LEDs

Color mapping has done to make the acquired image more interactive and informative and it is done by converting the ratio image into gray scale and then assigns the pseudocolours by analyzing the intensity levels of entire pixels sequentially. So that it is easier to understand the image ie, the pixels with red color is the indication of high ratio intensity (Development of caries) and the pale blue colored pixels is the indication of low ratio intensity (Normal region).
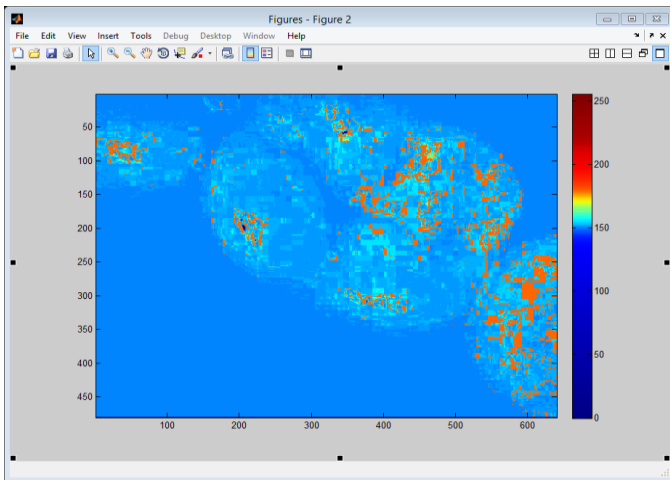
Figure 5.   Pseudo colored image of the teeth

The pseudo color images has shown in the figure 5 is obtained must be standardized by performing sufficient number of patient trials and the results must be correlated with X-ray diagnostic procedures. With valid data, pseudo color map can be performed to distinguish the depth of demineralization. It means the depth of disease could be mapped with different color ranges.

IV.   CONCLUSION

Many products are found to be safe and effective in bench testing, *in vitro* testing or animal studies, but fail to demonstrate the same effect in humans. These investigational products must be proven safe and effective in a clinical study in humans before use in the general population. So that Clinical trials are fundamental to the development of innovative, investigational products. The applicability of these two methods can be proven only after detailed patient trials.

This setup can be developed as a compact system by combining both fluorescence and Spectral imaging (diffused reflectance imaging) modalities. For this we can align the illumination sources of each modality in interchangeable heads. Hence the multimodal diagnostic approach can effectively monitor the caries lesions noninvasively. New designs can be launched include options of wired and wireless connectivity for convenience of the medical practitioners. This will be ushering for more dental practitioners to use this technology.

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Block-Based Neural Network for Automatic Number Plate Recognition

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Abstract- Automatic Number Plate Recognition (ANPR) system is highly accuracy-demanded application for car identification. This paper presents a new method of block-based ANPR system for recognition of Indian car license number plates. Since number plate guidelines are not strictly practiced in India and wide variations found on these plates in terms of font type, character size, screws/dots etc., it often becomes difficult to correctly identify the non-standard number plate characters. This proposed method works well with both standard and non-standard Indian number plate images taken under various illumination conditions. By using the block-based feature extraction process this method of recognition provides a high recognition rate of 98.2% and speed up the processing time of each character to 3.3ms when using a database of 3399 character images.

Index Terms: Block-Based Character Recognition, Image acquisition, Image enhancement, Neural Networks, Segmentation.

I.   INTRODUCTION

Automatic Number Plate Recognition (ANPR) system is an image processing system, which lies under the computer vision field. It has been a special area of interest due to its many applications such as for traffic law enforcement; find stolen cars, parking lots and surveillances [4]. ANPR is used to identify vehicles by capturing license plates and recognize the characters. The software of recognition process generally composed of four main stages: 1) Image enhancement, 2) Segmentation, 3) Feature extraction and 4) Character recognition. This paper will discuss these stages in detail. A wide variety of techniques have been developed in the past, but most of them worked under restricted conditions and causes challenges in recognition task such as, projections and pixel connectivity are the most common methods for segmentation [1], [6], [7], [8]. There are also some paper proposed segmentation methods are using prior knowledge of characters [4], [12], character contour [14], combined features [11]. For the recognition of the characters, many classifiers can be used such as the most common used Artificial Neural Networks (ANN) is feed-forward ANN which has a simple architecture as compared to the other common pattern matching techniques like Self-Organizing neural network having problem with joined and missed characters, template matching which can recognize only single font, fixed size characters [1], [4], [9], [11]. Other methods like Normalized
Cross-Correlation (NCC) and Support Vector Machine (SVM) having high computational cost, HNN requires too much memory and fuzzy logic does not work well with bad quality images [13], [3], [2], [4]. The current methods of ANPR system worked accordingly to the guiding parameters of specific country traffic norms and standards [5]. Although, in India, number plate standards exists, but they are rarely practiced. As a result, wide variations are found in the number plates, in terms of font type, character size, screws/dots and location of the number plate, also many unnecessary characters are present on the number plate. Various other issues involved in the number plate recognition in terms of plate and environmental variations. The aim of this study is to develop a Block-Based ANPR system for recognition of Indian car license number plates by resolving these issues with non-standard number plates, to provide high recognition rate and to speed up the processing time as compared to the other ANPR system based on neural network in [13]. The proposed algorithm has been implemented and tested with a database of 3399 Indian binary character images using MATLAB.

The rest of this paper is organized as follows: Section II describes the proposed methodology used to develop an ANPR system. The MATLAB implementation and analysis of the results are presented in Section III. Section IV concludes the paper.

II.   METHODOLOGY

The proposed Block-Based recognition system using neural network introduce a new method for segmentation and feature extraction process to extract the character features, which have a great effect on recognition process. By optimizing these two steps before recognition, the proposed system gives good results of recognition using feed-forward Artificial Neural Network. The proposed approach, use these basic concepts for each module as shown in the Figure 1: image pre-processing system and projection profiles for segmentation, block-based feature extraction using edge density calculations and neural network for recognition.
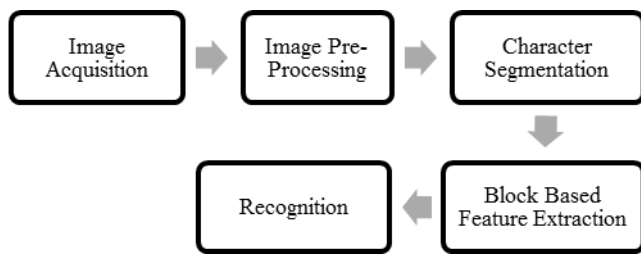
Figure 1: Modules of the Proposed System

Each module of the proposed ANPR system contains several processing steps and detailed description of each module is given based on its importance given in the proposed methodology of the proposed ANPR system.

A. Image Acquisition

The input to the proposed ANPR system is the original images of car number plates captured by average resolution camera of 14 Mega pixels which are cropped manually. The captured images are taken from 5-12 feet away from the vehicle mounted with standard high security Indian number plates and normal number plates. The two separate sets of 1000-cropped license plate images are then acquired in MATLAB for further processing of training and testing of ANN.

B. License Plate Image Pre-Processing

Figure 2 shows the basic block diagram of the pre-processing steps. The block shows different techniques that are performed for improving the image quality.
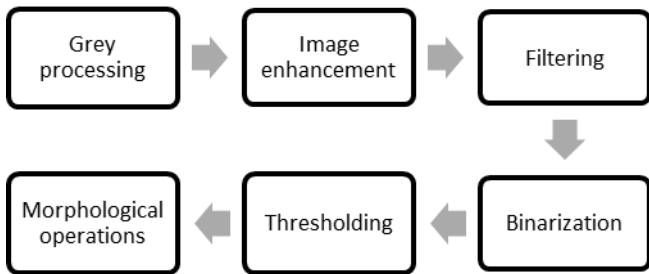
Figure 2: Steps for Image Pre-Processing

a. Converting RGB to Gray-Scale Images

Gray scale processing is a very important step in an image pre-processing; its results are the foundation of later steps. The true-color to gray-scale conversion is performed by [11]:

Gray = (0.299 x R) + (0.587 x G) + (0.114 x B) ----- (1)

Where Gray is the new pixel value and RGB are the red, green, and blue values of the original pixel.

b. Image Enhancement

The principle objective of the image enhancement is to process an image for a specific task so that the processed image is better viewed than the original image [1]. The technique of image pre-processing falls into image enhancement. Due to various limitations of the image extraction devices, images acquired by them are prone to errors like spatial and temporal limitations. The effect of all these limitations includes noise, bad illumination and blur in the acquired images. Image analysis required often pre-processing in which different filters are applied for removing the noise by preserving clinically important structures. This may help to improve the performance of subsequent tasks [6]. It typically consists of two tasks, noise removal and binarization. Simple spatial linear filter like mean filter that is easy to implement and used to remove impulsive noise is used for smoothing purposes in the proposed ANPR system.
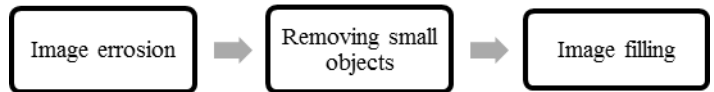
a. Algorithm of Mean Filter

The algorithm of the mean filter is as follows:

Step 1: Select a 2D image $I_{(i,j)}$ select two-dimensional window W of size 3*3. Assume that the pixel being processed is C (x,y).

Step 2: Compute W$_{mean}$ the mean of the pixel values in window W using following equation:

$$I_{(i,j)} = \frac{\sum_{i=1}^{i=3} \sum_{j=1}^{j=3} I_{(i,j)}}{9} ----------- (2)$$

Where, $i \neq 2$ and $j \neq 2$

Step 3: Replace the C (x,y) by W_{mean}.

Step 4: Repeat Steps 1 to 3 until all the pixels in the entire image are processed.

c. Binarization

The image of various grey level intensities are converted, into binary image with one representing white and zero represents black [11]. This is used for two purposes: highlighting characters and suppressing the background [1]. Binarization greatly affects the character segmentation and accuracy of character recognition [5]. The proposed method uses Otsu's method of binarization. This method is globally adopted which would increase processing speed as compare to the Niblack's Method. The size of the grayscale license plate image has M rows and N lines that define f(x,y) (0 ≤ x< M, 0 ≤ y <N) as a grey pixel, so binarization can be expressed at any pixel if the value of the pixel f(x,y) > Th. It is converted into white (1) pixel else black (0), expressed by the following formula [8]:

$$f(x,y) = \begin{cases} 1, & if\ f(x,y) > Th \\ 0, & if\ f(x,y) \leq Th \end{cases} \text{------- (3)}$$

Th is the threshold and is computed as:

$$Th = A \times \sum_{i=0}^{m} \sum_{j=0}^{n} \frac{Gray(i,j)}{M \times N} \text{------- (4)}$$

Where, $Gray(i,j)$ is the gray value of pixel, M is the Height of the image and N is the width of image. The background of the license plate image determines the coefficient of A. If the background has little noise this coefficient A is large and vice-versa [8].

d. Morphological Operations

Some morphological operations are performed on the binary image consists of three steps as shown in the Figure 3.

Figure 3: Steps for Morphological Operations

i. Image Erosion

Binary erosion is performed in which the binary objects i.e. characters and numbers in the candidate image that are combined with the unwanted small objects are eroded or shrinked slightly by the small amount using structuring element (SE) of disk shape having diameter 2 for the proposed system. This step refines the binary image, which are further processed for other morphological operations to remove small objects and image filling on the image.

ii. Removing Small Objects and Image Filling

Along with the numbers and characters on the number plate, it also contains small lines and dots/screws in middle and upper part of the number plate region. These objects are considered as small regions in the candidate region, which creates problem for segmentation and recognition process. In this step, all those regions, which have pixels less than P-pixels are removed from the plate region. In this way, there will be only characters, numbers exist on the number plate, and all other small and unwanted objects are removed from the plate image.

Centre-Line of license plate

C. Character Segmentation

To ease the process of identifying the characters, it is preferable to divide the extracted plate into different images, each containing one isolated character [10]. Segmentation is a step where plates elements i.e. characters and numbers are being extracted from the plate's background [11]. Segmentation of the characters of the number plate is done by extracting each connected components from the binary plate region, which are either 4-connected or 8-connected, and by default, it is 8-connected [11].The proposed segmentation process as shown in the Figure 4 is able to deal with the problem of characters like joined or broken characters, different character font types etc. as well as gives good results for bad quality images (blurred images), some degree of inclination, and dirty plates images to segment the characters from the number plate.

Figure 4: Segmentation Process

a. Connected-Component Analysis

Connected-Components are the individual components or objects in an image that are formed by pixel connectivity. After morphological operations, label the each 8-connected-component in the binary license plate image with a unique number to make an indexed image. The components in the indexed image consists the large size components of blobs of characters and numbers with small line and rectangular components. This image is further analysed to find components of blobs from an indexed image.

b. Centre-Line Rule

This is an important step of segmentation process where main task is to extract only the characters and numbers of the number plate from the plate region and eliminate all other unwanted connected-components like unnecessary textual details mostly found at the bottom of the Indian number plates. This centre-line rule works on the principal that, for each connected component in the binary plate image this rule check, if the surface of character or number touch with the centre-line of the binary image where this centre-line is calculated by taking half the image of the row dimension as shown in Figure 5. Thus, the resulting indexed image contains only the required blobs from the number plate image.

Figure 5 : Centre Line Method

c. Blob Extraction

In order to extract each blob from the plate image, the image is processed vertically and horizontally to find the starting and ending positions of each blob using maximum and minimum parameters.

In this height and width of each blob is calculated by taking its minimum and maximum row and column dimensions. In this, the horizontal segmentation is first executed, in which top and bottom edges of the characters and numbers are found by examining the minimum and maximum value of row dimension of the characters, by adding and subtracting 10 pixels from both values (min and max) and using the left most boundaries of the binary plate image. Similarly, the vertical segmentation of the characters is based on finding the left and right boundaries of the characters by examining the minimum and maximum value of column dimension of the characters, as shown in Figure 6.
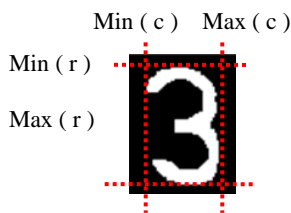
Figure 6: Starting and Ending Positions of Character

Finally, after analysing the height to width ratio of each blob only useful blobs of characters and numbers are extracted. After extracting each blob of the plate images from the database these extracted blobs are further processed for recognition process as shown in Figure 7 and these are re-sized to the universal font size 70 mm x 50 mm.

Figure 7: Blob Extraction

D. Block-Based Character Recognition
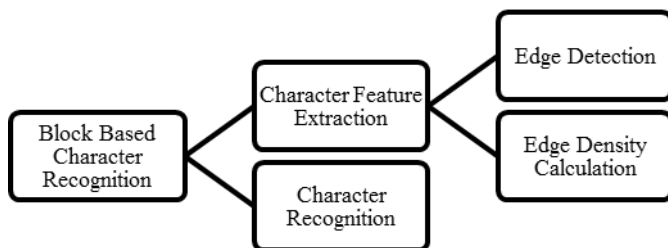
Figure 8: Block Based Character Recognition

It is a critical stage of ANPR system. After each character is segmented from the plate image, the final operation is the character recognition process. The block-based character recognition process consists of two parts: character feature extraction and character recognition as shown in Figure 8.

a. Character Feature Extraction.

The block-based feature extraction process is used in the proposed system to extract the specific features of each single segmented blob of the number plate rather than all the character pixels. It consists of two steps: edge detection and edge density calculation.

i. Edge Detection

Find edges of each blob for calculating edge density of each blob in the next step. The edge is composed by a set of joined pixels, which lies on the region of the blobs images. In this method, scan every horizontal line of the image, then get the value of zeroes and ones between white and black pixel for every line. In the up and down scanning of lines the change value of pixel at character region is more than other lines. The up and down horizontal scanning of lines will produce the up and down border of the character image. The boundary object image for each extracted blob can be created as shown in Figure 9 and is further used for edge density calculation.
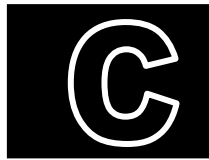
Figure 9: Boundary Object Image

ii. Edge density calculation

In this method, initially the character is divided into four equal blocks and four features are extracted from every block [15]. These features are formed by calculating edge density in each block. Then these features are used to obtained feature vector of each character, which is compared with feature vectors of all the stored templates. For each block k=1 to 4, the features vector of four features are { f1, f2, f3, f4 } where, f1 is the first feature which is formed by edge density calculation in first block using the following equation:

$$F(k) = \frac{\sum_{i=1}^{m} \sum_{j=1}^{n} B_k(i,j)}{m*n} \quad \text{--------- (5)}$$

Where, $B_k(i,j)$ is the edge magnitude of each block, m and n are the dimensions of boundary object image.
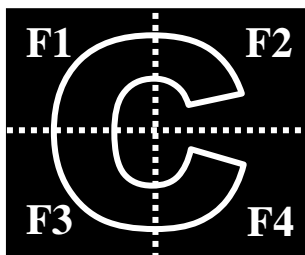
Feature Vector of ('C')

= [0.2974, 0.2544, 0.3772, 0.3447]

Figure 10: Edge Density Calculation

Similarly, f2 is formed by edge density calculation in second block and so on as shown in the Figure 10. The value of the four window blocks represents the feature vector of that character as feature vector of 'C' character.

After calculating the edge density in each block the 2-D binary image is converted into 1-D feature vector for each character. The feature vector table of these values are used as inputs to the neural network for training purpose of the proposed system. Separate FVT of outputs is maintained for setting the target categories of zeroes and ones of the neural networks to classify the inputs patterns. For example, FVT of inputs for the given number plate as shown in the Figure 11 which is used for training of ANN are shown in Table 1.

Char → / Featu re (F) ↓	H	R	0	3	Q	2	0	0	0
F1	0.25	0.20	0.22	0.16	0.21	0.17	0.23	0.23	0.23
F2	0.24	0.18	0.25	0.30	0.24	0.30	0.24	0.24	0.24
F3	0.22	0.26	0.25	0.19	0.24	0.24	0.24	0.25	0.24

Figure 11: License Plate Image

F4	0.26	0.31	0.24	0.30	0.27	0.22	0.24	0.24	0.24

Table 1: Feature Vector Table of Figure 11

b. *Character Recognition*

After feature extraction, feed-forward Artificial Neural Network is employed for character recognition at the second level. The proposed system gives more recognition accuracy; reduce the complexity of the network and increase the processing speed of recognition of characters.

i. *Learning Mechanism*

The two-layer feed-forward neural network used in the proposed system has simple architecture, which classifies the inputs to the set of target categories. In this mechanism, characters are taught to the neural network in a supervised manner. A character is presented to the system and is assigned a particular label. Several variant patterns of same character are taught to the neural network under the same label. During the training process, the input to the neural network is the 1-D input matrix of the character after feature extraction process. This set of input vectors are used to make feature vector tables of inputs, which are used for training purpose of the neural network. The neural network will get these inputs and outputs in a matrix form and understand to which set of target categories that input character belongs. The set of target categories or outputs of the neural network are developed based on; in Indian number plate system, there are 26 letters and 9 numbers out of which the number plate contains the two letters, two numbers, a space followed by one or two letters and four further numbers. For each 36 characters and numbers, a unique code is provided that are used to make FVT of outputs. Simple two-layer feed-forward neural network architecture for the proposed system network has 4 inputs for each character and 36 outputs using 10 neurons in the hidden layer are shown in the Figure 12.
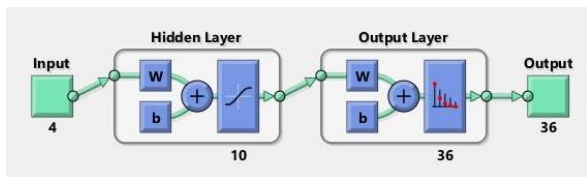
Figure 12: Two-Layered Feed Forward Network

When each candidate character taught to the neural network, it possesses a corresponding weight matrix. As the learning of the network progresses, this weight matrix is updated which is initialized to zero because of supervised training. The Scaled Conjugate Gradient (SCG) algorithm is used in this as a training method of the neural network, due to its advantages that it is a faster method and give better results than the traditional back propagation algorithm [13]. The network uses the following activation function for both hidden and output layers:

$$\tanh(x) = \frac{e^x - e^{-x}}{e^x + x^{-x}} \quad \text{------} \quad (6)$$

For the neural network, using more neurons in the hidden layer will give the more character recognition rate but this will results in higher number of multiplications, which significantly increase the scale of the neural network. Therefore, the developed system optimizes the numbers of neurons give a very large advantage of decreasing complexity. This network is trained using a separate set of 1000 license plate image samples.

III   IMPLEMENTATION AND RESULTS

The presented work is to recognize the Indian vehicle number plates, over a two separate datasets of 1000 license plate images, used for training and testing the performance of the proposed system. Simulation in MATLAB environment-using PC equipped Intel® Core i3-3227U CPU and 2.00 GB of RAM running on Microsoft Windows 8, 64-bit Operating System, and x64-based processor.

Figure 13 shows an example of the output result of the testing images for testing this proposed method which can correctly predict the Indian number plate.
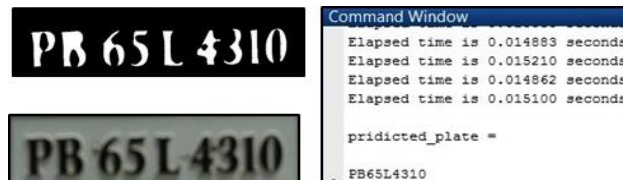
Figure 13: Predicted output result of testing image

The output results of some more sample images having shadow affects, ambiguous characters like 'B' & '8', '0' & 'O', 'V' & 'Y' etc, blurred images and broken character images is shown in the Figure 14.

Figure 14: Output results of testing images having ambiguities

Dataset of 1000 License Plate Images are divided into 3 sets. 1st set contains dataset of 3450 character images recognition rate of which is shown in Figure 15. 2nd set contains 6071 character images recognition rate of which is shown in Figure 16 & 3rd set contains 8699 character images recognition rate of which is shown in Figure 17.

S. No	Character Images	Match Cases	Unmatch Cases	Recog. Rate	Process Time
1	3450 Characters	3399 Characters	51 Characters	98.521%	115.006 s
2	6071 Characters	5955 Characters	116 Characters	98.089%	256.451 s
3	8699 Characters	8532 Characters	167 Characters	98.080%	379.374 s
		Average Recognition Rate		**98.2%**	

Figure 15: Character recognition rate of each character for 3450 character images
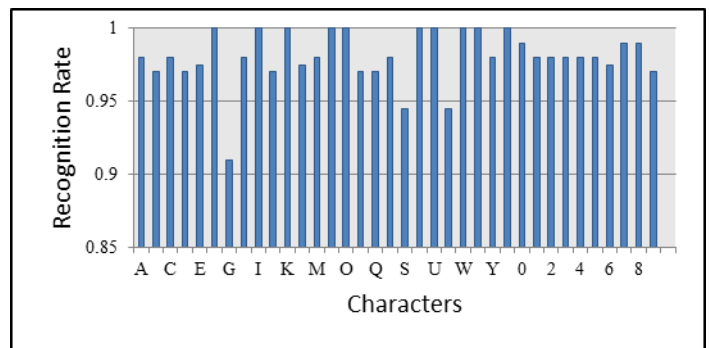
Figure 16: Character recognition rate of each character for 6071 character images

Figure 17: Character recognition rate of each character for 8699 character images

The proposed ANPR system achieved its promising results of giving high character recognition rate and high processing speed. Results of three datasets having different character images are given in Table 2.

Table 2: Table of results showing Recognition Rates of Proposed System

The proposed system have higher character recognition rate of 98.2% as shown in the Table 4.2 as compared to the other neural network based systems in [13] which was 97.3% for 3700 character images. Total processing time of the proposed system is 115.006 s for 3399 characters, which comes out to be only 3.39 ms for each character, as compared to 8.4 ms of the existing system in [13].

IV   CONCLUSION

In this paper, the ANPR system for Indian number plates is presented, as the proposed system consist of five main modules, in which by using morphological operations, the problems with the bad quality images are resolved and by optimizing the segmentation process, which gives a good results for segmentation of characters and numbers, having great impact on the recognition accuracy. Using block-based recognition process which extract only particular features of the characters and numbers, by processing only useful pixels of character images, instead of using pixels for the whole image. The presented system in this paper provides a good

recognition accuracy of 98.2%, which is the main target of the proposed system This system also works well for joined or broken characters, dirty images, can handle some degree of inclination and as well as have good results with the bad quality images, which the other ANPR systems have problem with these images.

This system can be further improved to recognize different shapes of number plates like square plates and having plates with coloured backgrounds. More improvement in system can be, done in recognizing of shadow images and images have glare.

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Synthesis and characterization of new unsymmetrical macrocyclic trinuclear Cu(II) complex and its electrochemical behaviour and DNA binding studies:

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Abstract- Trinuclear Cu(II) complex was designed and synthesized. The binuclear Cu(II) complex was prepared and then condensed with a mononuclear Cu(II) complex to form trinuclear complex as shown below. All the complexes were characterized by using FT-IR and UV-Visible spectral studies. ESR spectra and magnetic moments of the trinuclear Cu(II) complex show the presence of antiferromagnetic coupling.The electrochemical properties of these complexes were studied in the range of 0 V to -1.4 V. The mononuclear Cu(II) complex shows single electron reduction potential at (E_{pc}= - 1.22V), the binuclear Cu(II) complex shows two quasireversible single electron reduction potentials at (E^1_{pc}= - 0.76 V and E^2_{pc} = -1.23 V) whereas, the trinuclear Cu(II) complex shows three quasireversible single electron reduction potentials at (E^1_{pc} = -0.67 V , E^2_{pc}= -0.935 V and E^3_{pc}= -1.17 V). The binding interaction of the complexes with calf thymus-DNA was studied using absorption and fluorescence spectral techniques.

I. INTRODUCTION

The interaction of coordination compounds with DNA has been of interest due to their possible application in cancer therapy [1-5] and molecular biology [6-7]. Transition metal ions are known to play very important roles in biological processes in the human body. Copper complexes have found possible medical uses in the treatment of many diseases including cancer [8-9]. Also copper complexes have been known to cleave DNA by different mechanisms like, hydrolytic [10] and oxidative pathways [11]. The chemistry of 2,6 diformyl-4-methylphenol and its derivatives is of a great interest in designing the compartmental ligands which can form polynuclear complex system having magnetic communication between the metal centers. The study of their stereochemical electronic, magnetic, catalytic spectroscopic and also biological properties have allowed the proposal of probes for many important applications [12,13]. A quantitative evaluation of the binding of these complexes with calf thymus DNA in solution and the damage to DNA in the presence of the complex compounds were studied. Transition metal complexes have been widely exploited for the purposes not only because of their unique spectral and electrochemical signatures but also due to the fact that by changing the ligand environment, one can tune the DNA binding and cleaving ability of a metal complex [14-16].The present work describes the synthesis and characterization of trinuclear Copper(II) and Nickel(II) complexes and derived from tricompartmental ligands. These ligands are capable of binding upto three metal centers in close proximity.

II. EXPERIMENTAL

2.1 Materials and instrumentation

Elemental analysis was carried out on a Carlo Erba Model 1106 elemental analyzer. IR spectra were recorded using Perkin Elmer FTIR model SPECTRUM 1, using simple dispersed in KBR pellet. Cyclic voltammograms were obtained on a CHI instruments electrochemical analyzer. The measurements were carried out under oxygen free condition using three electrode cell in which glassy carbon electrode serves as working electrode, platinum wire was used as auxiliary electrode and saturated Ag/AgCl electrode was the reference electrode. Tetra (n-butyl) ammonium perchlorate (TBAP) used as the supporting electrode was purchased from fluka and recrystallized from hot methanol in electrochemical measurements, (Warning -perchlorate salts are potentially explosive; hence care should be taken in handling TBAP). UV-Vis spectra were recorded using a Perkin Elmer Lambda 35 spectrophotometer operating in the range 200-1000 nm with quartz cell and ε is given in $M^{-1}cm^{-1}$. The emission spectra were recorded on a Perkin Elmer LS-45 fluorescence spectrometer. X-band ESR spectra were recorded at 25°C on a Varian EPR-E 112 spectrometer using diphenylpicrylhydrazine (DPPH) as a reference.

III. SYNTHESIS

Synthesis of ligands L^1

Benzil (benzil)ethylenediamine was prepared from ethanolic solution (35 mL) of benzil (5.35 g, 25.4 mmol) and 25 ml solution of ethylenediamine (0.76 g, 12.7 mmol) in ethanol. The whole reaction mixture was refluxed for 3 hrs. After reducing the solvent, the solution was cooled and the reddish yellow crystalline compound thus obtained was recrystallized from ethanol, collected and the product was dried in vacuum. Yield: 4.2g (81%), M.P: 86 - 89 °C

Synthesis of ligand L^2

An ethanolic solution of ligand L^1 (0.02 mol) was refluxed with excess of hydrazine hydrate and cooled to room temperature. The white solid product formed on evaporation was filtered off, collected and the product was dried under vacuum and recrystallized using ethanol. Yield: 2.5g (75%), M.P:150- 155 °C

Synthesis of ligand L^3

To the solution of precursor L^2 (0.01 mol) dissolved in chloroform was added the acetonitrile solution of 2,6-diformyl-4-methylphenol (0.02 mol) at 0 °C and it is allowed to stirred for overnight at room temperature. The resulting solid that separated out on evaporating the solution at room temperature was washed with ethanol and dried in vacuum. Yield: 1.2g (60%), Elemental Anal.; $C_{48}H_{40}N_6O_4$; Cal. for C, 75.37; H, 5.27; N, 10.99; O, 8.37; Found ; C, 75.32; H, 5.20; N, 10.80; O, 8.35.

Synthesis of binuclear Cu(II) complex ML^4

ML^3 (1.119 g, 1.8 mmol) dissolved in acetonitrile was added to the acetronitrile solution of Cu(II) perchloratehexahydrate (0.676 g, 1.8 mmol) and it is allowed to reflux for 24 hrs. After the reaction was completed, the reaction mixture was filtered and allowed to stand at room temperature (25 °C). After slow evaporation of the solvent at 25 °C, the brown solid compound obtained was washed with methanol and dried in vacuum.Yield:1.55g (70%).Elemental Anal; $C_{54}H_{56}Cu_2N_6O_4$; Cal. for C, 66.17; H, 5.76; Cu, 12.97; N, 8.57; O, 6.53; Found; C, 66.15; H, 5.75, Cu, 12.92, N, 8.53, O, 6.49.

Synthesis of trinuclear Cu(II) complex ML^5

ML^4 (1.085 g, 1.7 mmol) dissolved in acetonitrile was added to an acetonitrile solution of Cu(II) perchlorate hexahydrate (0.632 g, 1.7 mmol) followed by the addition of 1,2-diaminopropane (0.102 g, 1.7 mmol) in ethanol. The solution was refluxed on water bath for 24 hrs. After the reaction was completed, the solution was filtered at hot condition and allowed to stand at room temperature. After slow evaporation of the solvent at 25°C, the brown solid obtained was washed with methanol and dried in vacuum

Yield: 1.7 g, (80%), Elemantal Anal; $C_{61}H_{74}Cu_3N_8O_2$; Cal. for C, 64.16; H, 6.53; Cu, 16.69; N, 9.81; O, 2.80; Found; C, 64.13; H, 6.50; Cu, 16.66; N, 9.78; O, 2.75
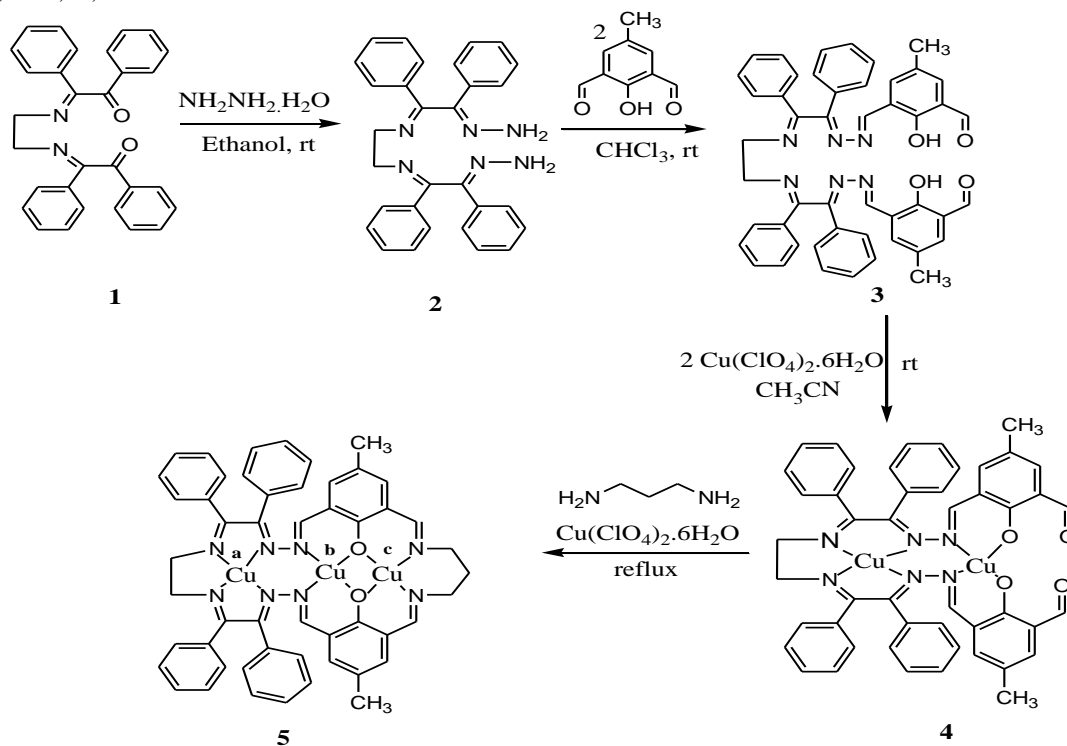
(**Scheme 1**).

1 - L^1, **2** - L^2, **3** - L^3, **4** - ML^4, **5**-ML^5

IV.   DNA Binding experiments

Absorption spectral studies

Absorption spectral titrations were carried out in (50 mM Tris-HCI buffer, pH 7.5) buffer at room temperature to investigate the binding affinity between CT-DNA and complex. The concentration of CT- DNA was determined from the absorption intensity at 260 nm with a ε value [18] of 6600 $M^{-1}cm^{-1}$. Absorption titration experiments were carried out using various concentrations of CT- DNA, keeping the complex concentration constant, with due correction for the absorbance of the CT-DNA itself. The intrinsic binding constant, K_b for the complexes of [CuL] and [NiL] was determined from the spectral titration data using the following equation [19].

$$[DNA]/(\varepsilon_\alpha-\varepsilon_f) = [DNA]/(\varepsilon_a-\varepsilon_f) + 1/K_b(\varepsilon_b-\varepsilon_f)$$

where ε_a, ε_f and ε_b corresponds to A_{obsd}/ [complex], the absorbance for the free copper (II) complex, and the absorption for the copper (II) complex in the fully bound form, respectively.

Fluorescence spectral studies

The fluorescence spectral method using EB as a reference was used to determine the relative DNA binding properties of the complex to CT-DNA in 50 mM Tris-HCl / 1 mM NaCl buffer, pH 7.5. Flourescence intensities at 610 nm (excited at 510 nm) were measured after addition of complex. Stern- Volmer quenching constant K_{sv} of the complex [CuL], CT-DNA were determined from the equation $I_o/I = 1+K_{sv}$. The apparent binding constant (K_{app}) was calculated using the equation $K_{EB}[EB]/ K_{app}[compex]$, where the complex concentration was observed to be equal to the value at a 50% reduction of the fluorescence intensity of EB and $K_{EB} = 1x10^7$ M^{-1} ([EB] = 2 μM [20]).

V.   Result and Discussion

IR Spectral studies

All the complexes were characterized by spectral studies. In IR spectra of the copper (II) complexes, (C=N) stretching frequency was observed [21] at 1620-1640 cm^{-1}. All the complexes showed two sharp peaks near 1,100 cm^{-1} and 629 cm^{-1} for perchlorate ions [22-24].

Electrochemical studies

The electrochemical behavior of the complexes was studied by cyclic voltammetry in DMF containing 10^{-1} M tetra (n-butyl) ammonium perchlorate over the range of (0 to -1.4 V). The copper (II) complex show three irreversible reduction waves in the cathodic potential region in the range (-0.43 to -0.70 V), and (-0.78 to -1.03 V) and (-1.10 to -1.33V). The copper (II) complex show three irreversible reduction waves in the anodic potential region in the range (-1.10 to -0.95 V), and (-0.82 to -0.62 V), and (-0.50 to -0.13V). Controlled potential electrolysis was also carried out at 100 mV more negative to the cathodic peak, and the results show that each wave corresponds to one electron transfer process, as follows.

$$Cu^{II}Cu^{II}Cu^{II} \rightleftharpoons Cu^{I}Cu^{II}Cu^{II} \rightleftharpoons Cu^{I}Cu^{I}Cu^{II} \rightleftharpoons Cu^{I}Cu^{I}Cu^{I}$$

The first and second reduction potential in the range of (E^1_{pc} -0.43 to -0.70 and E^2_{pc} -0.78 to -1.03 V) are attributed to the reduction of copper (II) placed in the left (a) and right corner (b) of the complex while the third reduction wave in the range of E^3_{pc} -1.10 to -1.03 V, is attributed to the reduction of copper (II) in central (c) compartment (Scheme 1). The cyclic voltammetric behaviour of the

complex in presence of DNA in the same conditions showed slight positive shift in the redox potentials and the ip_c / ip_a value was found to decrease with the increase in DNA concentration.
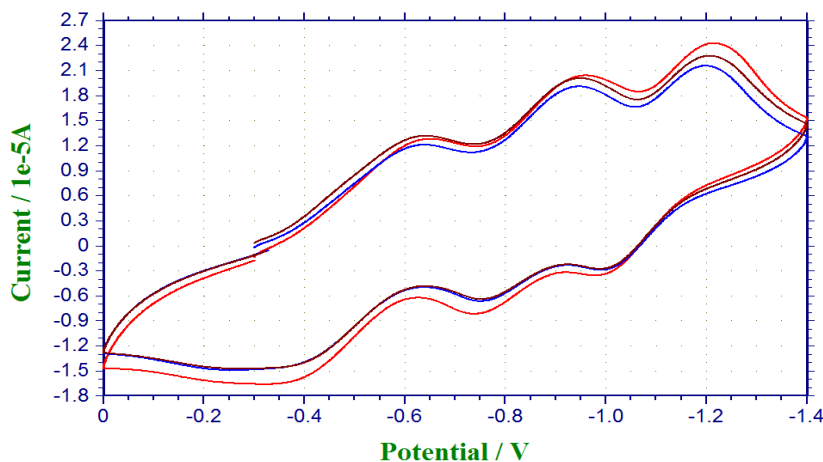
Figure:1 **Cyclic voltammogram of complex in the absence and presence of CT-DNA**

Absorption spectral studies

        The binding ability of the complex with CT-DNA was characterized by measuring the effects on electronic spectroscopy. In the present investigation, the interaction of macrocyclic trinuclear Cu(II) complex in DMF solution (10%) with CT-DNA has been investigated. Complex binding with DNA through intercalation usually results in hypochromism and bathochromism due to the intercalative mode involving a strong stacking interaction between an aromatic chromophore and the base pairs of DNA [25]. The binding of Cu(II) complex to duplex DNA led to decrease in the absorption intensities with a small amount of red shift in the UV-Visibe absorption spectrum (**Figure:2**). To compare quantitatively the affinity of the complex towards the CT-DNA, the binding constant was calculated and it is found to be 1.9×10^4 M^{-1}. Complex due to the minor bathochromic shift and hypochromism is expected to have groove binding with CT-DNA.
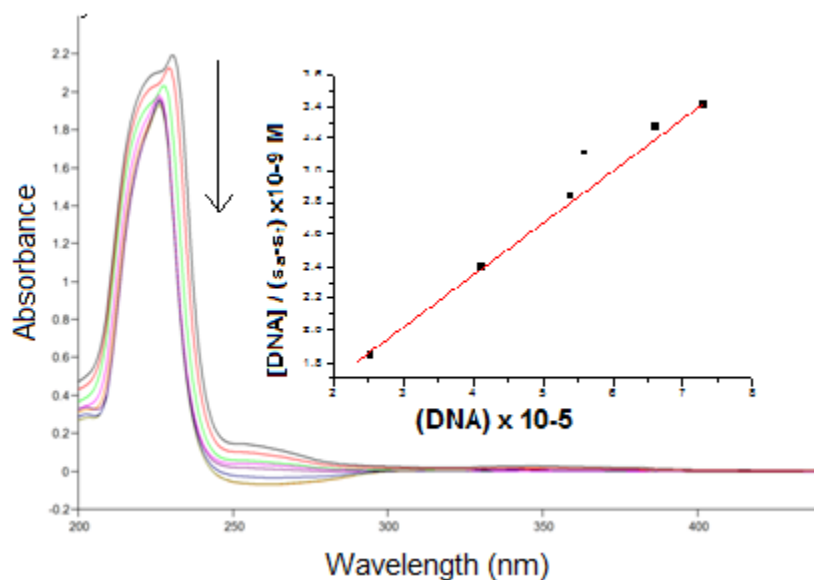
Figure 2: Absorption spectrum of complex in the absence and presence of CT-DNA (0-250 μM) at room temperature in 50 mM Tris-HCl buffer (pH 7.5). The arrow shows the absorbance change upon increasing addition of DNA. Inset shows the plot of $(\varepsilon_a-\varepsilon_f) / (\varepsilon_b-\varepsilon_f)$ Vs [DNA]

Fluorescence spectral studies

The fluorescence spectroscopy technique is an effective method to study metal interaction with DNA. EB is one of the most sensitive fluorescence probes that can bind with DNA [26]. The fluorescence of EB increases after intercalating into DNA. If the metal intercalates into DNA, it leads to a decrease in the binding sites of DNA available for EB resulting in a decrease in the fluorescence intensity of the EB-DNA system [27]. The EB bound DNA quenching curve is shown in **Figure 3**. In the linear fit plot of I_o/I Vs [complex]/[DNA], K is given by the ratio of slope /Intercept. The stern-volmer quenching constant K value for complex is 2.1. The apparent DNA binding constant of $2.9x\ 10^4\,M^{-1}$ was derived for the complex.
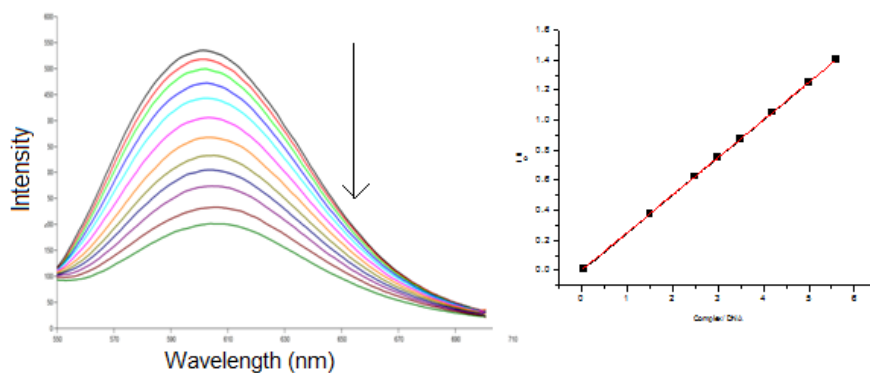
Figure 3**: Fluorescence titration spectrum in the absence and presence of CT-DNA. The inset is the plot of Io/I Vs [complex] / [DNA**

EPR Spectra

The EPR spectra of the complex at 298K were obtained in the X-band region. The EPR spectra of the copper complexes consists of a broad band centered at g = 2.06. The g values were calculated using the equation $h\nu = g\beta H$. The hyperfine splitting was not observed due to spin-spin coupling indicating the presence of anti-ferromagnetic interaction in the complex.
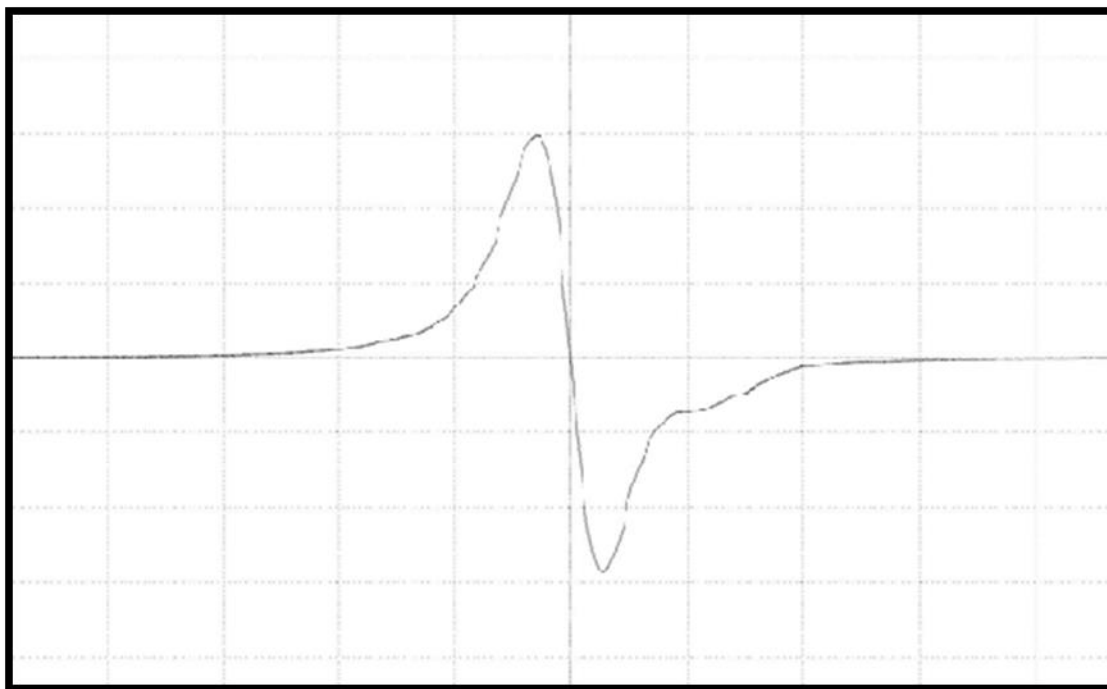
V.   Conclusion:

The trinucleating ligand L and its Copper(II) trinuclear complex were synthesized and characterized by elemental analysis and spectroscopic techniques. The binding properties of the complex with CT-DNA were investigated by spectroscopic titrations like Absorption and Emission studies. The intrinsic binding constant K_b of the complex was found as 1.9×10^4 M^{-1} through UV absorption spectroscopic titration studies.

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Division Perception; Mental Processes; Past and a Need for Energizing to Cater for Betterment

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Abstract- Today's social scientists study caste religion, race, education, industrialization and trauma as different areas to improve the existing scientific knowledge   whereas such 'divisions' in the past affected humanity differently and because of certain human mental features the need to minimize the probability of reoccurrence is a challenging situation.

Index Terms- Division Perceptions, vitalization, Improvements

I.   INTRODUCTION

Jaen-Jaques Roussueau (1754) many centuries ego introduced 'chained human beings' in human society and to him the solution was "you are undone if you once forget that the fruits of the earth belong to us all, and the earth itself to nobody" but till today in 21st century that claims to be the era of global society human 'competitiveness still exists' (Bob 2000) because social issues ethnic values etc are not easy to address in corporate culture(Professor Richard 2002) so researchers like John (2000) considers 'local distinctiveness' 'legitimate' Perhaps such reasons leads to the feelings where scholars feel that "structuration" and 'millieu' concepts needed to be extended (Martin et al 1994).

But how such is possible, when according to UNICEF and Human Rights Watch 250 million people around the world that are subject to social stratification based on caste system (RV Russile) and (Scott, Marshall, Godon 2005). Such stratification is usually related with 'purity characterized by endogamy' (Winthrop, Robert 1991) and in Indian society it is a prominent social feature (de Zwart, Frank 2000) and its permanence in India is established (Geral 1972) and such stratification revolves around the castes like, "Brahmins", "Kshatriyas", "Vaihyas" and "Shudras" or "Dalits" (Sadangi 2008) "Brahmins" are rated as top caste or relatives of Hindu deities whereas "Dalits" is the lowest caste (Jaffrlot, Christophe 2006).and is considered to be "untouchable" (Sadangi 2008).According to Hindu religion teachings Dalits are not suppose to touch or shake hand with upper caste Hindus(de Zwart, Frank 2000). Followers of religions other than Hinduism like Christianity, Buddhism, Islam and Sikhism also live in India(Barth, Fredrik 1962) and under majority influence(Mills, Martin 2002) the followers of these religion are also under the influence of caste system to a varying degree(Ballhatchet, Kenneth1998).

It is not easy to answer that how do Janis GT 8 symptoms or groupthink (Janis 1982) operates behind various social class and caste based stratifications and what makes human beings to react differently in case of 'illusion of invulnerability (Brad et al 2002)? Because victims subject to victimizations talked at first about 'personal invulnerability' while reporting victimization (Dr. Ronnie Janoff, Irene Hanson 1983). Whereas traumatizing in any form is capable of changing the views of subjects about the world. (A.S. Magwaza, 1999) moreover during work performance studies it was found that 'bulling' increase negative views about self and world (Germz, Mikelsen , Stale 2006) but Ronnie (1989) reported benefits of 'illusion' as well

Human divisions based on religion are also a common feature of human society of 21st century and scientific studies of religion are also there(Grim Finke, 2006) however Marie (2006) observed the religion is studied less as compared with 'political tolerance' Although religious identity is 'positively' related with 'satisfaction" (Martz , David   2009). Jonothan (2006) after thoroughly studying various states around the world concluded that US is the only state where (SRAS) separation of state with religion exists, he also reviewed the relationship of economy and religion in case of 'state involvement in religion (GIR). It was also found that fundamental Christians are punitive than non fundamentalists (David 1996) moreover, modern trends in case of religiosity are also gradually becoming the focus of studies (Graham   2006) in that context relationship of ' world peace' with religion (Muhammad 2001), it has also been found cultural groups are less cohesive as compared with religious groups(Ruth et al 1990). On the other hand in subcontinent a region of Hindu and Muslim majority women exploitation in case of religion has also been reported (Shireem   2004). It is also found   that although Hinduism and Islam both are having different beliefs about suicide yet followers of both religions hold 'similarity' of ideation about suicide. (Bernard 1998). However some other studies observed pro-social behavior and its relationship with religion (G Randhawa 1998) the positive relationship of religion with marketing has also been reported (Kim et al 2004) although Cassirer rates religion as a product of human community.

Racism is another grouping that divides human race, although certain researchers discussed as well as criticized the existing racial theories (Eric Douglas 2008) however racists believe that human beings are subdivided in distinct groups that are different in social behaviors and innate capabilities and are inferior or superior on the basis of belongingness to some racial group (Newman2012) Richard T Schaefer (2008) in a recent study elaborated various aspects in that context moreover Farah (1991) proposed counseling probabilities for social issues, however it is also establish that ethnic reasons help to understand the culture (Betancourt et al 1993). Furthermore James (2004) and his associates recently studied various ethnic groups in case of mental health (Betancourt et al 1993). Interestingly race based inter-group development among children have also been studied (Stephen 2006)

Advanced education has made 21st century an era of educational classifications and education affects self efficacy (Dale 1989) and education is no more an individual affair and it is influenced by parents (Lareau 1989). Moreover, industrialized modern society has influenced various aspects of human life and emotions are not an exception. It is established that emotions affect personality positively and negatively (Reinhar 1992) and positive personality traits are positively related with organizations citizenship (Fred positive affects than negative(Gable et al 2000) and presence of 'revenge' observed in workplaces (Sung 1998) Moreover majority of young people is seen in work assemblies and achievements and moral conditions are related with age (Weiner, Bernard, Perter 1973) Furthermore, mechanisms of forgiveness have yet not finalized (Everett. Wade 1999) and unfavorable perception of justice (Karl, Lewis, Bradfield 1999) is also an issue because anger responses vary is various situations at work places (Julie 2000) as well as anger influence more than mood in workplaces, (Keith et al 1997) and researchers are studying anti social behavior and workplace environment by addressing both (Clocalone 2001) and issues like higher level of aspiration is related with high expectancies for performances (Burger, Jerry 1985) are studied.

Manifestations of past human divisions even today well justified and defined still exit in the back of human mind even today like race, religion, education, wealth as described above paragraphs and human past has observed 'serious kind of influences ' on human race, in the past due to the original presence of such divisions in human mind like Hitler's ideas about German racial superiority (Adamthwaite, Anthony 1992) and resultant sufferings of Jews in the form of Holocaust, the use of religion classification in Crusades (Riley-Smith, Johnathan 1995) and superiority authority and discrimination on the basis of religious knowledge in middle ages (Alexander 2004) moreover major in and out grouping on the basis of wealth or industrial might in case of Russian revolution is also the part of history (Acton et al) and still visible in case of Ukraine situation recent matters related with race in case of before and after Mandela are part of recent human history (Mandela 1994) and Michael Jackson's white shocks before and after his death and even today are a media topic. Whereas United States of America the top nation of the world after cold war witnessed a 'change' when sitting President of United States of America Mr. Barrack Obama won (Nagourney 2008). In the similar manner caste based Hindu society in the largest democracy of the world India has defeated a political party that was the established party of upper caste Hindus the density of Hindu deities a paradigm shift so far the teachings of Hindu religion are concerned. And in today's world atomic bomb and other destructive weapons are not a monopoly that ended 2nd Great War. Moreover, human being is a thinking animal and psychological terminology like unconscious mind collective unconscious groupthink territorial aggression and other forms of aggression are established reality? So unlike past entire humanity especially social scientists needed to exercise brain storming to minimize the repetitions of past to energize and re educate human race.

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Comparison of Thermal Storage Efficiency of Solar Pond with and without a Polyethene Membrane.

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Abstract- This paper presents the concept of using a polyethene film to address the shortcomings of the conventional solar pond which are low efficiency, short operation time among others. The thermal behavior of a solar pond with a polyethene has been analyzed and compared with that without a polyethene film. The experiments show that: the heat storage layer (LCZ) temperature rising rate was significantly higher than that of single layer porous media solar pond. The polyethene film of thickness 100µm was used. The polyethene film brings about the greenhouse effect where the solar energy that penetrates the film is trapped and improves the efficiency of the storage zone. Results show that the efficiency of a polyethene stabilized pond rises to about 69 % compared to the conventional solar pond with about 52 %.

Index Terms- Efficiency, Membrane, Polyethene, Solar pond, Thermal.

I. INTRODUCTION

Solar radiation constitutes a vast energy source which is abundantly available on all parts of the earth. Solar energy is in many regards one of the best alternatives to non-renewable sources of energy. One way to collect and store solar energy is through the use of solar ponds which can be employed to supply thermal energy for various applications, such as process and space heating, water desalination, refrigeration, drying and power generation. Thermal energy storage has always been the most significant method of energy storage. Solar ponds are a classical application of the thermal energy storage and their performance depends essentially on the storage capacity of the fluid, thermo physical properties of the pond, surroundings conditions, its thermal energy storage capacity, and on its construction and maintenance costs[1] [2]. Numerous experimental and theoretical studies have been undertaken. Most of the experimental work [3] [4] [7] concentrates on design, application, thermal measurements, efficiency and investigations of the thermal performance of various types of solar ponds of different dimensions. Many experimental studies focus on determining the efficiency of inner zones in solar ponds, and determining the zone performance that yields the best solar pond system[5] [6].

The solar ponds which are conventionally referred to as salt gradient solar ponds (SGSP) consists of three distinct zones, the Upper Convective Zone (UCZ) the thinnest and which has a low and nearly uniform salt concentration. Beneath the (UCZ) is the Non-Convective Zone (NCZ) of medium thickness and has a salt concentration increasing with depth, and it is therefore a zone of variable properties. The bottom layer is the Lower Convective Zone (LCZ), also called the storage zone, which has the maximum thickness and has a nearly uniform high salt concentration. The Non convective zone (NCZ) also referred to as salt gradient zone (GZ) is the key to the working of a SGSP. It allows solar radiation to penetrate into the storage zone while prohibiting the propagation of long wave radiation because water is opaque to infrared radiation. The zone suppresses global convection due to the imposed density stratification. It offers an effective conduction barrier because of the low thermal conductivity and the zone thickness. This makes the GZ essentially a double-diffusive layer of salt and temperature. Maintaining the stability of the GZ is, therefore, crucial in its functionality.

Despite numerous studies on solar ponds, there are a number of difficulties and limitations that affect the performance of solar ponds and in some locations limit their use, many of them were recognized and several schemes for solution have been proposed to eliminate or minimize their effect. These problems include, among others, salt diffusion from LCZ to UCZ, wind mixing, evaporation, dust and dirt falling on pond surface. Some of these problems were first investigated by Tabor[8]. Weinberger[10] and Tabor[9] addressed the physics of pond's stability. Later, Hassab[11] presented a field report on a solar pond constructed in the State of Qatar. They reported the problems encountered in operating SGSPs in the Arabian Gulf region, characterized as a windy and dusty environment. Other problems are excessive erosion of the gradient zone, the formation of sizable localized convective zones, the deterioration of pond water clarity and high rates of surface evaporation. This weather related problems severely impair the pond operation and performance. The salinity in the UCZ increases due to convective mixing (wind, evaporation) with NCZ and salt diffusion from the bottom. In a typical case this diffusion amounts to about 60 tons/km^2/Day. Weinberger [10] estimated the annual rate of this natural diffusion of salts, to be in the range of 20 – 30 Kg/m^2, depending on the thickness of NCZ, the temperature profile and the concentration difference between the UCZ and the LCZ. Newell *et al.,*[4] estimated the salt transported per year from the LCZ to the UCZ for 2000 m^2 solar pond at the University of Illinois, in the range of 25 to 50 tons. Therefore, turbidity of water[12], the wall design[13], keeping of salt gradient, wall insulation as well as environment and climate will have an important impact on the solar pond performance. With these problems, LCZ temperature of the conventional solar pond is difficult to achieve a higher temperature. Since efficiency of the solar pond is measured by

how much energy is stored in LCZ, increasing LCZ temperature of the solar pond has important significance.

Many innovations have been devised to improve solar pond efficiency among them is the use of multi layered porous media. The porous media solar pond is a four-layer model and added a layer of porous media at the bottom of the traditional solar pond. Porous media has a smaller thermal diffusivity with low thermal diffusion coefficient which has good thermal insulation performance. Sun Wence[14] proved that adding porous materials at the bottom of solar pond is favorable to raise LCZ temperature. Porous media is suitable to be selected as the colour black and low thermal diffusion coefficient materials, so cheap factory wastes, boiler slag [15] is a good alternative material, however adding too much boiler slag in solar pond leads to the pond not receiving enough solar radiation, resulting in a waste of porous media to a certain extent, and LCZ may not still reach the highest value. The bottom of SGSP is added two or more porous media layers, using different porous media properties to achieve the best thermal storage effect. Its advantages are that the darker porous media has strong ability to receive thermal radiation and weak ability to reflect heat radiation, which is conducive to the increase of LCZ temperature while glass balls have up to 90 % transmittance, and reflect about 8 % while absorb about 2 % [18].

Another means of improving the thermal performance of conventional SGSP is to increase the bottom surface area by making the surface corrugated wavy shaped, which increases the heat transfer capability to the fluid (water) and consequently increases the performance of the solar pond. Rubin *et al.*, [17] performed several numerical and experimental simulation of the solar pond mechanism; they eventually demonstrated that one of the most significant design modifications for increasing the solar pond thermal efficiency was the increased stability of the surface layer. The effect of the various parameters on the thermal behavior with a consideration of the stability criteria in a SGSP are studied results of the steady state indicates that the thickness of the NCZ has a significant effect on the performance of the SGSP.

Ebtism and Tac [19] discussed about the inherent problems encountered with the conventional salt gradient pond leading to the concept of the Solar Gel Pond in which the salt gradient (NCZ) is replaced by the transparent gel layer. They discussed about the relevant properties of the gel. Ebtism [20] discussed the design, construction and operation of trapezoidal 400 m² and 5 m deep gel pond. The pond obtained maximum temperature of 60⁰C with optimal gel thickness of 60 cm. The concept of Solar Gel Pond is based on the presence of a Non Convective Zone to trap the solar energy. In a salt gradient pond, the variation in density as a function of salinity and temperature gives rise to the NCZ. By contrast, in the Solar Gel Pond the optical and thermal insulating properties of polymer gels are utilized in forming the NCZ. In a solar gel pond, the gel floats on the storage zone, which acts as the NCZ. At present, 3 to 8 % of salt solution is used in the storage zone to keep the gel layer to float on the top. The gel used in the upper layer comprises of 98 % water and 2 % of the appropriate polymer gel. The advantages of the solar gel pond are the elimination of evaporation and heat loss from the surface. The dirt and debris falling into the pond are retained by the surface and can be cleaned off periodically. There are only two zones, lower zone being the saline water and the gel layer

floats above the salt water hence no salt gradient layers need be maintained as in the case of solar pond, leading to low maintenance requirements. If an appropriate gel is developed to float on water, then the environment hazard of salt handling can be eliminated. The salt requirements are less in solar gel pond when compared to salt gradient ponds thereby reducing cost and environmental hazard. The disadvantage is the cost of the chemicals required for making the gel is high. Experimental Collection efficiency for 0.25 m² model for the maximum storage temperature of 60 ⁰C is 19.73 %. From the above investigations, the Solar Gel Pond is technically feasible and comparable to the performance of the Salt Gradient Solar Pond[21].

This study aims at improving efficiency of a salt gradient solar pond but with the use of a transparent polyethylene to separate the LCZ and the NCZ. The use of polyethylene proves to be effective because it brings in the greenhouse effect where the trapped solar energy is concentrated in the LCZ and minimizes salt and thermodiffusion. However, it must satisfy the following conditions;

- Transparent to visible radiation with very little absorption in all ranges of the solar spectrum.
- Chemically and physical stable with respect to a hot saline solution up to 100 ⁰C or more
- Inexpensive
- High specific heat and low coefficient of volumetric expansion over the operating temperature range of the pond.
- Inert and nontoxic
- Non-degradable over repeated freezing melting cycles, and by ultraviolet radiation. Apart from that they are
- Mechanically strong and have stable structure.

The thermal performance and efficiency of a SGSP has been shown by Srinivasan [22] assuming steady state condition as;

$$Q_u = Q_a - Q_e$$

Where; Q_u = Useful heat extracted, Q_a = Solar energy absorbed and Q_e = Heat losses.
The thermal efficiency is defined by:

$$\eta = Q_u/I$$

Where I is the solar incident on the pond.

Therefore; $\eta = \eta_0 = Q_e/I$

Where $\eta_0 = Q_a/I$ = Optical efficiency of the pond.
Again, $Q_e = U_0 (T_s - T_a)$

Where T_a = Ambient temperature and U_0 = Overall heat loss coefficient

Neglecting heat losses from bottom and sides of the pond and assuming the temperature of the upper mixed layer to be the same as the ambient,

$$U_0 = K_w/b$$

Where K_w = Thermal conductivity of water and b = Thickness of the gradient zone.

II. MATERIALS AND METHODS

Model solar ponds rectangular in shape of dimension (0.6 x 0.4 x 0.2) m^3 were made. The walls and base were made of transparent float glass of 6 mm thick pasted with silicon. Inner surface of the glass plate were painted with matt black to absorb solar radiation. The models were insulated with saw dust of thickness 10 cm."K" type thermocouples made of Chromel alumel were used to measure the temperatures. Thermocouples were fixed at the middle of the three layers and one was used to measure the ambient temperature. A 12 channel temperature indicator was used to measure the temperature of the thermocouples with an accuracy of $\pm 0.1^0 c$ however a thermometer was used to confirm the values indicated by the digital thermometer. Known concentration of sodium chloride salt was used for the three zones. Mixing was carried out in order to ensure that the salt had completely dissolved in the water to obtain a homogeneous mixture. Polyethylene was used in one of the ponds to separate the NCZ and the LCZ. The polyethylene had to be suitable as it satisfied the requirement of the following properties like uniformity, specific gravity, transmissivity, cost, and resistance to corrosion and anti bacterial nature. In order to study the effect of climate and operational parameters on the performance of solar pond, experiment had to be carried on a daily basis varying the concentrations of the zones.

III. RESULTS AND DISCUSSIONS

In this section emphasis was put on thermal efficiency of the storage zone in both ponds; with a polyethene film and without a polythene film.

Temperature profile for LCZ (25 % salt) in solar ponds with polyethene and without polyethene
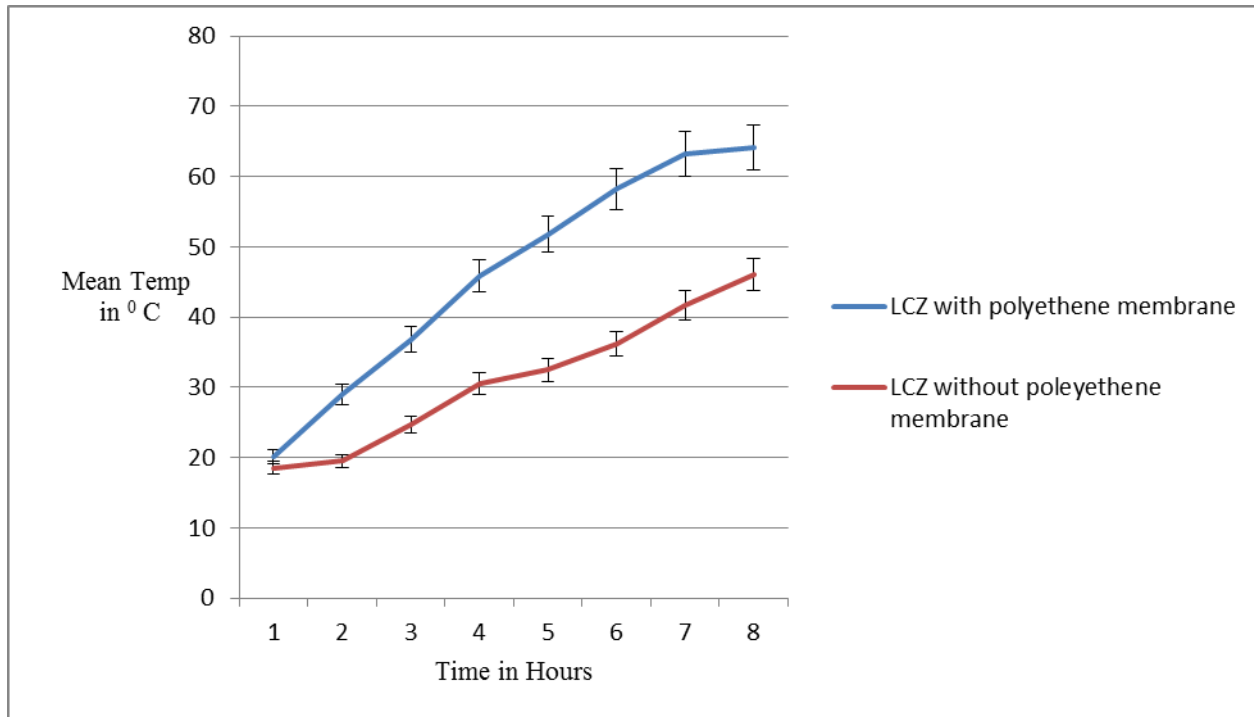
Figure 3.1 Graph of temperature profile for LCZ at 25 % salt concentration.

From figure 3.1, it is evident that a solar pond with a polyethene film as a membrane separating the LCZ and NCZ has a capacity to hold or accumulate more thermal energy as compared to a solar pond without a polyethene film. At 25 % salt concentration of the LCZ, after just 7 hours, the solar pond with a polyethene film had rose to 64.1^0C which represents 69 % efficiency as compared to that without with only 44.1^0C which is about 52 % efficiency.

Temperature profile for LCZ (20 % salt) in solar ponds with polyethene and without polyethene

Figure 3.2 gives a summary of the variation of temperature against time at 20 % salt concentration. Though the thermal storage efficiency for the two is low, it is clear that a solar pond with a polyethene film has a higher efficiency as compared to that without a polyethene film.
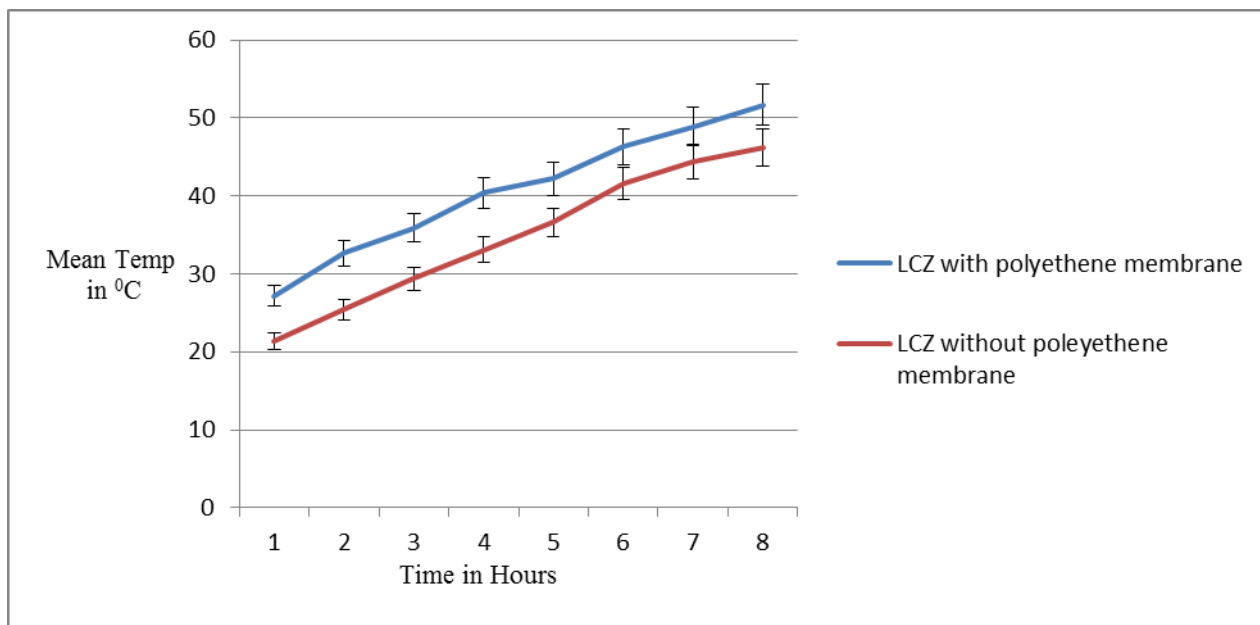
Figure 3.2: Graph of temperature profile of LCZ at 20 % salt concentration.

Temperature profile for LCZ (22 % salt) in solar ponds with polyethene and without polyethene
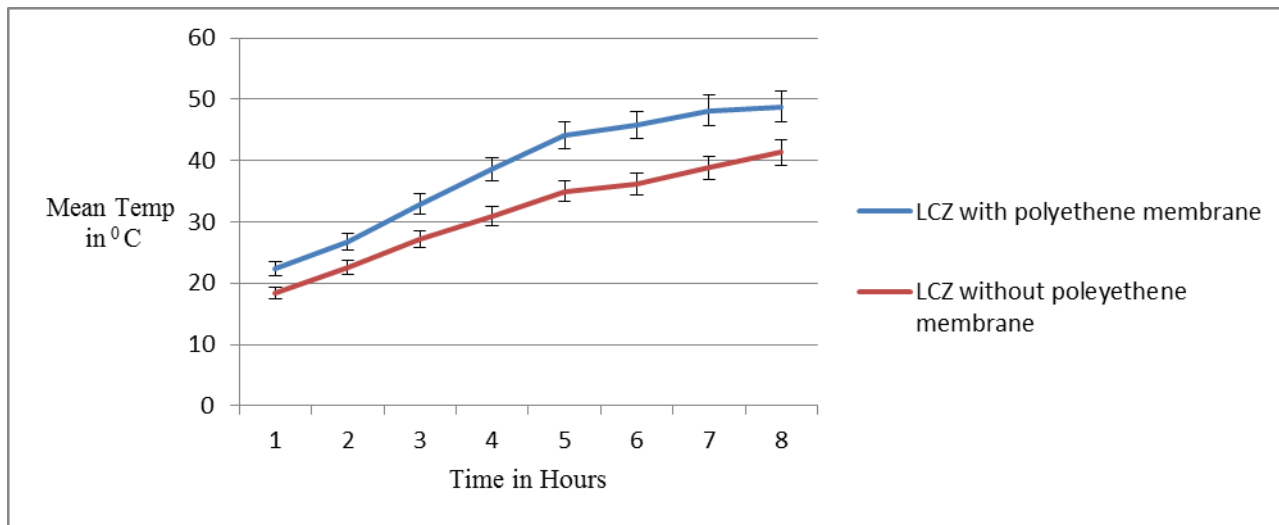
Figure 3.3: Temperature profile for LCZ at 22 % salt concentration

The graph shows the variation of temperature with time. In both cases, the variation is linear. Comparatively the solar pond with a polyethene film gains more thermal energy and thus the temperature rise is higher than that without a polyethene film.

IV. CONCLUSION

From the experimental study on the solar pond with and without a polyethene, the following conclusions can be made. Polyethene transmits solar energy and the energy is trapped in the storage zone thus heats up the zone. With respect to the concentration of the LCZ these results were obtained. It was found that, as the salinity of the LCZ increases, the temperature of the LCZ and efficiency of the pond increases. The maximum storage temperature was observed after 7 hours which was found to increase from 21^0C to 64^0C in a layer with saturated salt concentration of 25 % in a pond with a polyethene film as compared to that without polyethene at 46 ^{0}C. . The average temperature difference between storage zone and the ambient temperature was about 30^0C. Experimental Collection efficiency for the maximum storage temperature of 64 ^{0}C is 69 % in solar pond with the polyethene membrane and 52 % in that without a membrane. From the above investigations, the Solar Pond with a polyethene is technically feasible compared to the conventional solar pond.

NOMENCLATURE

GZ   Gradient Zone
LCZ   Lower Convective Zone
NCZ   Non Convective Zone
SGSP   Salt Gradient Solar Pond
UCZ   Upper Convective Zone

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Automatic Water Level Controller with Short Messaging Service (SMS) Notification

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Abstract- Having the hydropower potential of 42000 MW and other immense source of electrical energy, Nepal still faces the problem of load shedding. And this problem has catastrophic consequences as electricity rules the routine of our busy lives from micro to macro level; say to charge a cell phone (essence of today's lives) or to fill tank by water for numerous purposes. However, the situation, when the daily busy schedule and the problem of load shedding intersect, can be addressed.

The paper presents a system of an automatic water level controller with SMS notification. The project was carried out to assist user in load shedding based country like Nepal. SMS notification was added to automatic controller system so that water can be managed by user during load shedding. Two systems work synergistically; automatic level controller system and SMS system. The program was developed in Arduino program developing environment and uploaded to the Microcontroller. Water level in the system is controlled automatically. The controller operates on a battery power. Whenever the system encounters empty level and the status of load shedding, the SMS notification is sent to the user.

Index Terms- Load shedding, Short Messaging Service (SMS), Arduino Uno

I. INTRODUCTION

Automation of smart system is the essence of today's world. The 'Automatic Water Level Controller with SMS Notification' can be the appropriate example for smart system. It, not only avoids the empty tank condition, but also continuously updates the level of water with SMS. This project efficiently reflects the principles of Control Engineering.

The system will automate the process by placing a single sensor unit in the tank that will periodically take measurements of the water level and will control the motor automatically. This system eliminates the efforts of people for daily filling of the tank and checks for overflow. The problem like overflow of water in the tank of interest, empty tank condition and motor overheating due to continuous usage is avoided. Despite its smartness, this project does not explain the update water level of source tank. Moreover, during no lighting condition, SMS notification is sent to user. This assists user to manage the water demand with municipal water supply system. Simply, the reservoir tank and tank of interest holds no any communication.

II. DISCUSSION

Overall system runs on battery power and comprises of four sub circuits working synchronously; sensor circuit, controller circuit, SMS circuit and relay driver circuit. Sensor senses the level of the water in tank which is continuously fed to controller system. As the system encounters the empty level (A_0) condition, status of load shedding is checked. Relay coil is energized and the pump operates when there is no load shedding. SMS is only delivered if status of load shedding is encountered by the controller. Pump stop when the tank is full (A_1). Figure 1 shows the flowchart of the system.

A. Sensor circuit

Water being good conductor of electricity, conductive sensor was found to be appropriate choice for the system. Two levels are checked; A_0 and A_1. This system is powered by 12 V battery. Voltage divider in the circuits delivers voltage of 6 V as an output to the Arduino. Figure 2 shows sensor circuit.

B. Controller circuit

Arduino Uno, an open-source electronics, was used as controller of the system [1]. The program was developed in Arduino development environment and was burned to the microcontroller. Digital pins 2 and 3 were used for serial communication with the cell phone (Motorola c261), pin 8 and pin 9 for connection with sensor output A_0 and A_1 respectively and pin 7 for indicating status of pump.
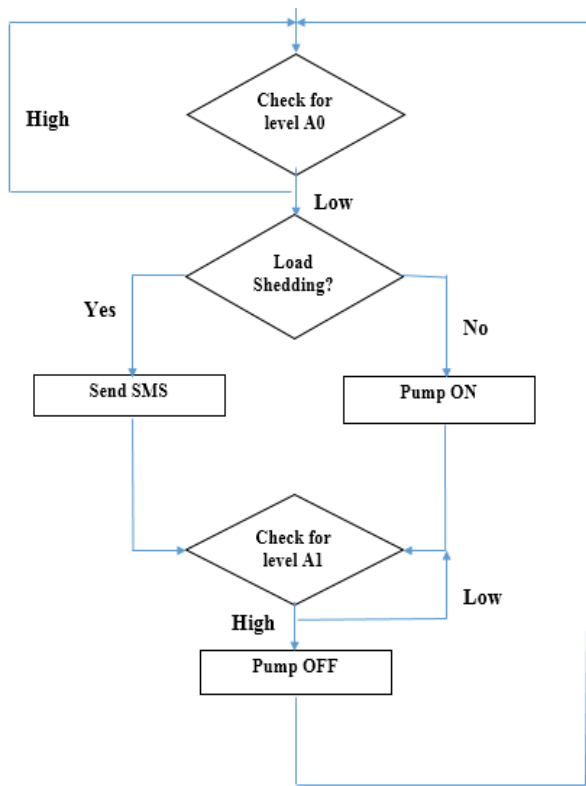
Figure 8: Flowchart of the system
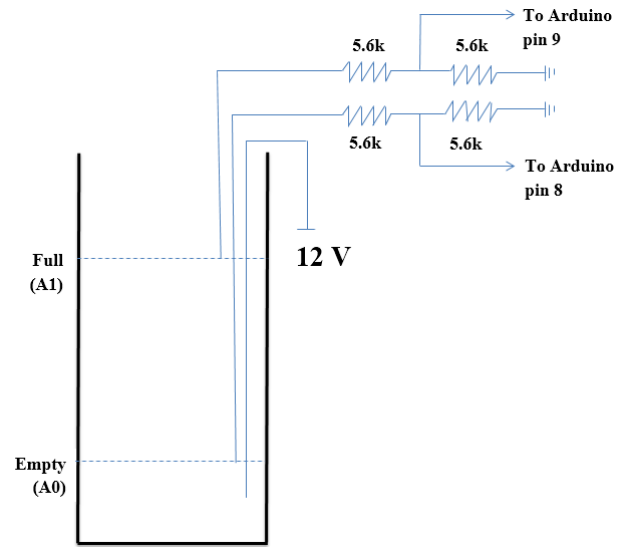
Figure 2: Sensor circuit

C. SMS circuit

Unlike many cell phones, Motorola c261 model supports serial communication with headset plug i.e. with 3/32 mini stereo jack [2]. Moreover it supports AT commands which can be used for Global System for Mobile (GSM) control system. The pin layout with their functions and code representation for Arduino is shown in Table 1. AT commands used in the system is shown in Table 2 [3].

D. Relay driver circuit

Figure 4 shows relay driver circuit using the NPN transistor BC548 with forward current gain (H_{fe}) of 110 [4]. The 12V relay (JQC-3FC/T73 model) was connected between the collector and positive rail of the transistor. The relay can handle the pump with rating of 220 V ac with maximum current of 7 A. 470 uF electrolytic capacitor was added at the base of transistor to avoid clicking of relay. Moreover clean switching of the relay was obtained. Another 470uF capacitor is added parallel to the relay coil. Steady current was maintained through the relay coil to avoid relay clicking during momentarily variation of signal.
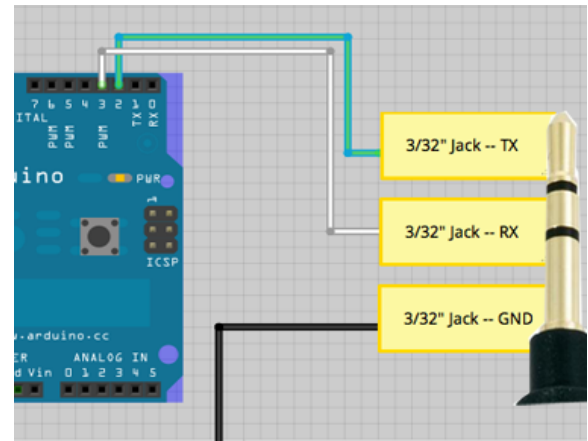
Figure 3: 3/32 mini stereo jack connected

IN4007 diode protects the transistor by eliminating back e.m.f when the relay switches off [5]. LED indicates status of the relay. Value of resistor R_1 was calculated to 13.5 kΩ for base voltage (V_b) of 5 V, supply voltage (V) of 12 V, 0.7 V of transistor biasing and relay resistance(R) of 350 Ω. But R1 was set to 1 kΩ to pull collector to ground as transistor goes in saturation and to achieve effective switching. Figure 4 shows relay driving circuit.

$$\text{Relay current (I)} = \frac{V}{R} \qquad \text{Equation 1}$$

$$R_1 = \frac{(V_b - 0.7) \times H_{fe}}{I} \qquad \text{Equation 2}$$
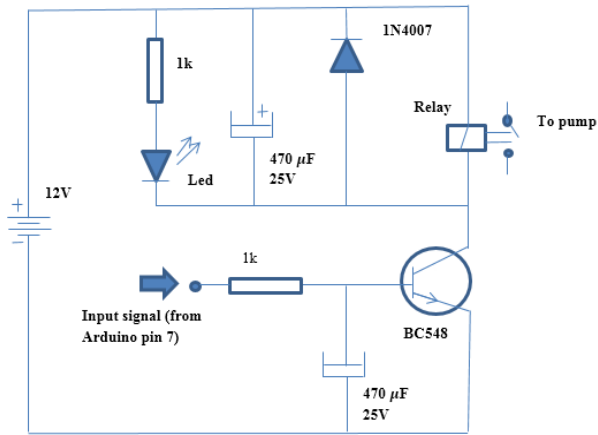
Figure 4: Relay driver circuit
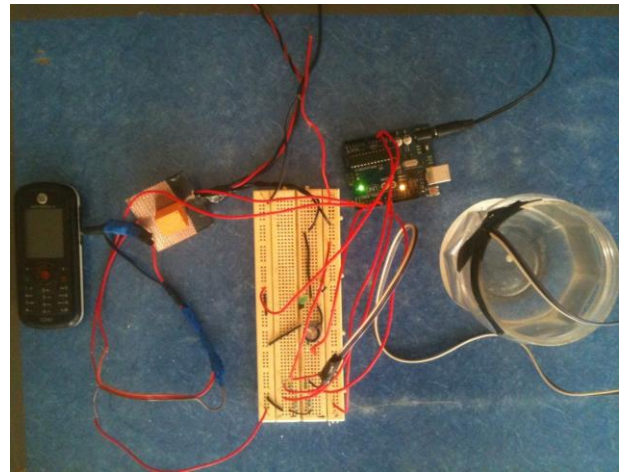
Figure 5: Working system

Table 1: Pin layout, function and code representation for 3/32 mini stereo jack

Plug	Function	Represented in code
Sleeve	Ground	NA
Ring	Phone TX/Arduino RX	SSerial2Mobile(<Arduino pin>,X)
Tip	Phone RX/Arduino TX	SSerial2Mobile(X,<Arduino Pin>)

Table 2: AT commands used in Arduino

S.N	Code	Function
1	mySerial.println("AT");	Wake up cell phone
2	mySerial.println("AT+CMGF=1");	Put phone into SMS mode
3	mySerial.println("AT+CMGW=\"+977984162**99\"");	Creates new message to user number
4	mySerial.print("tank is empty");	Message contents
5	mySerial.write(byte(26));	Signals end of message
6	mySerial.println("AT+CMSS=1");	Sends message at SIM index of 1

III. CONCLUSION

The automatic water level controller is Smart system as all processes occur automatically with continuous updates by controller, to the user, via GSM technique i.e. SMS Notification. This system is deprived of any sort of noise and has effective switching action. To widen the application to this project work, security home alarm system can be matching application. The automatic water level controller system can be used in home, office sectors, swimming pool and even in industrial areas. As mentioned earlier there is no link between reservoir tank and tank of interest; henceforth, communication between the two can take this project to another level. Furthermore, extra care needs to be given as water is used as conducting media. Moreover, GSM module can be replacement to cell phone. The system also can be modified to two tank system with wireless communication between tank of interest and reservoir tank. All in all , despite being the smart system there are many rooms for improvement, which when considered, this system can be more smart ultimately user being smarter.

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Cloud Computing an Emerging Technology to Save Money, Time and Resources

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Abstract- This paper is highlighting the trend of use of cloud computing. Cloud Computing gives range of computing resources like servers and storage of emails, documents, voice, etc. over the internet. It provides hosting environment which is instant, secure, scalable, flexible, and helps to save money, time and resources. Because of metaphor for the internet it's called cloud computing where internet is cloud. In simplest words, cloud computing means keeping and retrieving data and programs over the Internet instead of our secondary memory of computer.This paper describing about the use of Cloud Computing in Organization, Advantage of Cloud Computing, Problems with Cloud Computing, Stack of Cloud Computing, Leaders of Cloud Computing and Future Forecast.

Index Terms- Advantage of Cloud Computing, Cloud Computing, Future Forecast of Cloud Computing, Problems with Cloud Computing

I. INTRODUCTION

Because of metaphor for the internet it's called cloud computing where internet is cloud. In simplest words, cloud computing means keeping and retrieving data and programs over the internet instead of our secondary memory of computer. When we store data on or run programs from the computer's secondary memory, that's called local storage and computing. Everything we need is physically close to us, which means accessing data is fast and easy for that single computer, or others on the local network. The cloud is not to have a dedicated hardware server in residence. Storing data on a home or office network does not count as utilizing the cloud. Cloud Computing means we need to access our data or programs over the Internet, or the synchronization of data with other information over the Net.Cloud computing is the provision of computing services over the Internet. Cloud services is for both individuals and businesses to use software and hardware resource that are managed by third parties at remote locations. Now a days cloud computing is used in several waysit is used as social networking, webmail, file storage, and online business applications. The cloud computing gives access to information and computer resources from anywhere that a network connection is available. Cloud computing provides a shared pool of resources, including data storage space, computer processing power, networks, and specialized corporate and user applications.

II. RESEARCH ELABORATIONS

Use of Cloud Computing in Organization

For a big organization it is important to know about what's on the other side of the connection, but as an individual user, we may never have any idea what kind of massive data-processing is happening on the other end. The end result is the same with an online connection, cloud computing can be done anywhere, anytime. Some organization goes for Software-as-a-Service (SaaS), where the business subscribes to an application it accesses over the Internet. Some opted Platform-as-a-Service (PaaS), where an organization can create its own custom applications for use by all in the company. Infrastructure-as-a-Service (IaaS) is another choice, where players like Amazon, Google, and Microsoft provide a backbone that can be hired by other companies. Cloud Computing is becoming giant business. The market is on its way to generating $100 billion a year.

The deference between local computing and cloud computing sometimes indistinct because the cloud is part of almost everything on our computers these days. We can easily have Microsoft Office 365, one of the versions of Office 2013 that utilizes a form of cloud computing for storage Microsoft SkyDrive. Microsoft also offers a set of Web apps that are close versions of Word, Excel, PowerPoint, and OneNote that we can access via our Web browser without installing anything.

Cloud computing is assuring access to computing services from any place in an economical, adaptable and upgradable way, that is why organizations processing personal data are interested in its use. In cloud computing the service providers are third party. The essence of fairness practical acceptability of the service is therefore trust. The client, or the data controller, is the one who has to make a risk assessment, alone or with the assistance of adequately qualified third parties. Based on the results the client has to make a decision whether or not to trust a certain cloud provider in modern era we all want to store a large amount of data, but due to limited storage capacity of data storing, that is cloud computing, which focuses on those techniques that provide data security in cloud environment. Cloud computing delivers computing power, software services, storage services and even a distributed data center infrastructure on demand. With the development of parallel computing, distributed computing, grid computing, a new computing model appeared. The concept of computing comes from grid, public computing and Software as a Service. It is a new method that shares basic framework. The basic principles of cloud computing is to make the computing be assigned in a great number of distributed computers, rather than local computer or remoter

server. The running of the enterprise's data center is just like Internet. This makes the enterprise use the resource in the application that is needed, and access computer and storage system according to the requirement.

Some research work introduces the background and principle of cloud computing, style and actuality. Also introduces the application field the merit of cloud computing such as to do not need user's high level equipment, so it reduces the user's cost. It provides secure and dependable data storage center, so user needn't do the awful things such storing data and killing virus, this kind of task can be done by professionals. It can realize data share through different equipment. Cloud computing is a computing style that provide power referenced with IT as a service. Users can enjoy the service even he knows nothing about the technology of cloud computing and the professional knowledge in this field and the power to control it. Some of major security issues faced by the customers or users we have highlighted the major problems pertaining to cloud computing like confidentiality, integrity and availability and the like. Players across the IT industry have announced cloud computing efforts of varying shapes and sizes, leading analysis to attempt to attempt to identify various characteristics, such as infrastructure outsourcing, software as a service, and next generation distributed computing, to describe these efforts.

III. ADVANTAGE OF CLOUD COMPUTING

There are lots of benefits of cloud computing like Increase volume output or productivity with lesser manpower. Which reduces cost per unit of project or product. It help to access to our information with minimal spending on technology infrastructure. It gives access of out information worldwide where they have an Internet connection. It help to get more work done in less time with less manpower. It saves money sending on hardware, software or licensing fees. Cloud is accessible 24X7 and 365 days from anywhere which makes our life much easier! It is cost saving because we pay for what we use. Easy on installation and maintenance, we can get almost unlimited storage, it is highly automated and Flexible with better mobility. Resources are shared and back up and restoration is available in both automatic and manual mode. Cloud computing increases collaboration by allowing all employees wherever they are to sync up and work on documents and shared apps simultaneously, and follow colleagues and records to receive critical updates in real time.Businesses using cloud computing only use the server space they need, which decreases their carbon footprint. Using the cloud results in at least 30% less energy consumption and carbon emissions than using on-site servers. And again, SMEs get the most benefit: for small companies, the cut in energy use and carbon emissions is likely to be 90%.

IV. PROBLEMS WITH CLOUD COMPUTING

Cloud computing is having certain issues, problems & risk associated with it. Some problems with clouds are Information Security, Compatibility, Standardizing Cloud Technology, and Monitoring.

Information Security is one of the most major issues of cloud computing. It is completely based on the internet which makes it at risk of hack attacks. But it's also true that now a days all the modern IT systems are connected to the internet. In cloud computing it's easier for companies to quickly recover from such attacks because of its distributed network system.

Compatibility with all IT systems in a company is another issue with cloud computing. Cloud Computing is most cost efficient option for companies. But problem is to replace much of its existing IT infrastructures in order to make the system compatible on the cloud. Hybrid cloud is one of solution for this problem.

Lack of standardization in the system is another issue of cloud computing. There is no proper standards for cloud computing are set yet so it's almost impossible for a company to find out the quality of services.

All the data is handled by service provider when cloud computing responsibility is taken by service provider. Monitoring of processes is another issue of cloud computing.

V. STACK OF CLOUD COMPUTING

SaaS   •Software as a Service

PaaS   •Platform as a Service

IaaS   •Infrastructure as a Service
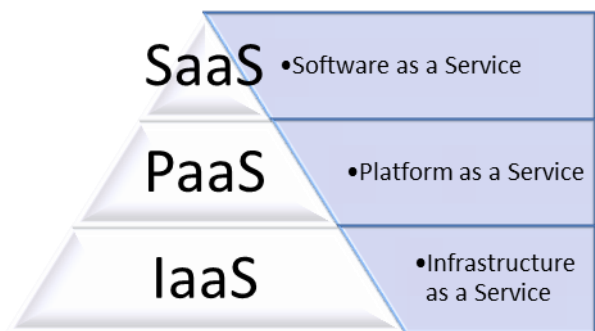
Figure 9: Stack of Cloud Computing

Software as a Service (SaaS). This type of cloud computing is also referred to as software on demand. A popular example of SaaS is Google docs. SaaS allows people to access the functionality of a particular software without worrying about storage or other issues.

Platform as a Service (PaaS). With this, organizations can run their own software without having to worry about maintaining hard drives and servers. Instead, they can run their own applications on the cloud service's platform.

Infrastructure as a Service (IaaS). With IaaS, organizations have access to the unlimited storage potential of the cloud. They can grow and shirk their storage space as needed. This means that they do not have to worry about having dedicated servers on site. It also means that they can weather increased use of their sites or applications as needed.

Network as a Service (Naas): The least common model, where the user is provided with network connectivity services, such as VPN and bandwidth on demand.

VI. FINDINGS

Leaders of Cloud Computing and Future Forecast
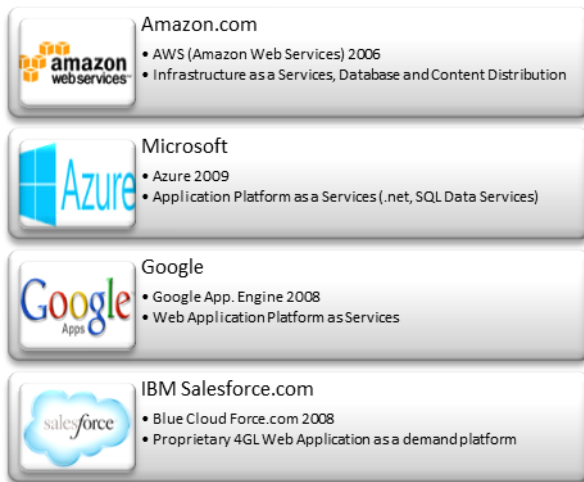
Figure 10: Leaders of Cloud Computing

Amazon, Microsoft, Google, IBM are biggest leaders of cloud services. Amazon is providing Infrastructure as a Services, Database and Content Distribution since 2006 as Amazon Web Services. Microsoft is providing Application Platform as a Services like .net, SQL Data Services since 2009 as Windows Azure but from 3rd April 2014 it's renamed as Microsoft Azure. Google is providing Web Application Platform as Services since 2008 as Google App. Engine. IBM Salesforce.com is providing Proprietary 4GL Web Application as a demand platform since 2008 as Blue Cloud Force.com.
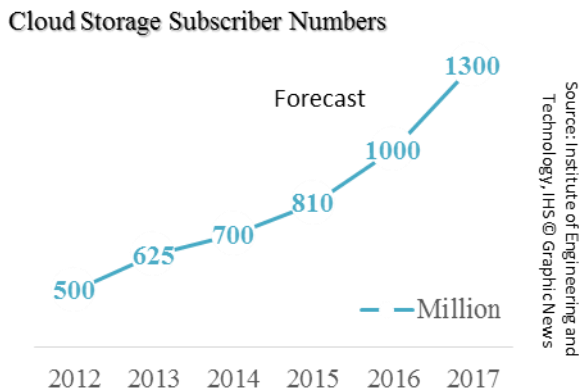
Figure 11: Cloud Storage Subscriber Numbers

Figure 1 is showing cloud storage subscriber numbers. In 2012 it was 500 million subscriber, in 2013 it was 625 million, and there is a chance to be 700 million subscriber in 2014. Forecast of Institute of Engineering and Technology is that it's going to be 810 million in 2015, 1000 million in 2016 and it will touch 1300 million in 2017. So we can see market growth of cloud computing is going to be very high.

According to International Data Corporation, Indian Cloud Computing market was estimated at $535 million in 2011, is likely to grow by mote the 70%. Cloud computing refers to pay-per-use model of computing where applications and software are accessed over the internet and not owned by users. Research firm Zinnov has estimated market growth will reach $1.8 billion by 2015. Software as a Services (SaaS) is expected to reach $650million of that revenue rest will be achieved by Infrastructure as a Services (IaaS) and Platform as a Services (PaaS).

VII. CONCLUSION

The future of cloud computing is bright for the companies that implement the technology now but, like everything else, cloud computing too has its pros and cons. While the technology can prove to be a great asset to companies, it could also cause harm if not understood and used properly. For good service it require technology to ensure uptime, and robust in other word more powerful & healthy. Centralization of data is required with more capability. Hybrid Cloud Computing, commodity hardware, low power processors, and modular and social software are going to be solutions to increase efficiency of cloud computing. Right now we are in the early days of cloud computing, with many organizations taking their first, tentative steps. But by 2020 cloud is going to be a major and permanent part of the enterprise computing infrastructure. It opens doors by making applications and technology more accessible than in previous years. Companies that would normally require enormous amounts of startup capital may only need a fraction of what was previously required to succeed.

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Genetic Algorithm for Wireless Sensor Network with Localization Based Techniques

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Abstract-In wireless sensor network nodes position estimation in space is known as localization. Node localization in wireless sensor network is important for many applications and to find the position with Received Signal Strength Indicator requires a number of anchor nodes. However the estimation of distance from signal strength decay in not very accurate especially in time varying environmental conditions and the estimation of exact direction required highly directive antenna but, may still affected by multipath fading. A Genetic Algorithm for wireless sensor network localization is proposed in this paper to solve the issue that the positioning accuracy is low with minimum anchor nodes. Hence in this paper we are presenting a Genetic algorithm for optimization approach which tries to find the optimal location by satisfying both the criteria with minimal error. The simulation results also shows effectively outperform both the techniques.

Index Terms- WSN, Localization, Optimization, Genetic Algorithm (GA).

I. INTRODUCTION

W SN Sensor network node location information is important for numerous reasons. In many cases the sensed data has no value without the location information. The location information can be used by routing and other protocols, algorithms and services. The straightforward solution to the localization problem of equipping nodes with GPS receivers is not a suitable option because GPS receivers require line of sight to GPS satellites. Moreover GPS is costly and power hungry. Therefore for the randomly deployed sensor networks various localization algorithms has been introduced where only a small number of sensor nodes are equipped with GPS receivers and other sensor nodes derive their locations by using the localizations techniques [1]. Though localization is not a recent topic it still has issues and challenges to handle because some solutions are not cheap and some have unexpected level of errors. WSN Localization techniques are largely categorized into range-based and range-free localizations. The range-based technique involves in deriving absolute distances or angles whereas the range free technique involves in deriving distances from non-anchor nodes to anchor nodes. Well known range-based localization techniques are receive signal strength indicator (RSSI), angle-of-arrival (AoA), time of arrival (ToA) or time difference of arrival (TDoA) etc. Ideally distance can be measured from transmit and receive signal strengths of radios. If transmit and receive signal strengths are pi and pj than the distance can be measured as d ij = β √pi/pj. Where β is known as path loss exponent and can be calculated by measuring power at unit distance.

Since the estimation of distance on the basis of received signal strength (RSS) in not very accurate because of the fading characteristics of the path greatly varies with time and weather also the angle of arrival (AOA) estimation either required a highly directional antenna or array antenna structure with complex processing algorithm but still error cannot be neglected. The other problem is with localization is it required higher numbers of anchor points to exactly estimate the position in three dimensional space of node. The methods discusses above are fall in the range based techniques however there exist another approach which uses only the connectivity information between unknown nodes and landmarks. These techniques can be further divided into two categories: local techniques and hop counting technique. In hop counting technique node estimates the distances to its neighbor anchor nodes by the hop counts and the hop size for the closest anchor node and then estimate its own position, while the local technique node collects the position information of its neighbor anchor nodes to estimate its position. In this paper we are focusing on the range based technique because of its accuracy and adaptability to any protocol and presented a combine RSS and AOA based optimization approach to accurately estimate the location of node.

This rest of paper is organized as follow, section II presents a brief review of the related literature work while the III and IV section explains the General localization method using RSS and AOA techniques respectively for location estimation. The section V explains the genetic algorithm and section VI explains the proposed algorithm follower by the simulation results and conclusion with future scope in VII and VIII respectively.

II. RELATED WORK

A survey on different localization techniques available is presented by Guangjie Han et al [2], they also reclassify the localization algorithms on the mobility state of landmarks and unknown nodes point of view with a detailed analysis. Distributed Angle Estimation based approach is presented in [3]. In the literature two antenna anchor are used to transmit linear chirp waves simultaneously, and the

angle of departure (AOD) of the emitted waves at each receiving node is estimated via frequency measurement of the local received signal strength indication (RSSI) signal. Estimation method is also improved with the adaption of multiple parallel arrays to provide the space diversity. The other advantage of the technique is relying only on radio transceivers and synchronization is needed. Zero-configuration indoor localization to estimate a relationships between RSSI samples and the distance between nodes is presented in [4]. A localization approach specifically for the mine environments proposed in [5].

A. OVERVIEW OF LOCALIZATION   ALGORITHMS

The various positioning algorithms that are reported in the literature can be categorized as follows:

• **Centralized schemes** [6] in which every node sends its neighborhood table to a base station. This may cause congestion in a large-scale network.
• **Multi-hop progress schemes** [7] in which horizontal data flow is required. This is not feasible because of the first constraint. Also, most of these algorithms are not scalable.
• **Recursive Localization Algorithms** [8] require that all nodes can function as anchors and send their own beacons after estimating their position. In EMMON the architecture anchors are predetermined and are the only nodes that can broadcast beacon signals (constraint A), therefore the implementation of this scheme is not feasible.
• **Range-based algorithms** include distance estimation between communicating nodes by taking advantage of some characteristic of the signals exchanged such as Time of Arrival (TOA), Time Difference of Arrival (TDoA), Angle of Arrival (AoA), Received Signal Strength Indicator (RSSI) or Link Quality Indicator(LQI),Generally they require the use of extra hardware such as ultrasound hardware, sophisticated synchronization mechanisms or special antenna equipment [9].

III. LOCALIZATION BASED ALGORITHMS

A. General Localization Method Using Received Signal Strength

By definition, the received signal strength is the voltage or power measured at the receiver end using signal strength indicator (RSSI) circuit. Many algorithms take advantage of the power level at the receivers to infer their distance from the sender. In a wireless sensor network, where nodes apply this mechanism to self-localize, anchors include their power level in the transmitted packet and receivers subtract it from the received power. This approach is very attractive in terms of device complexity and cost, but the achieved accuracy is its major drawback; accuracy decreases when the distance increases.

Following derivation are used for finding distance from signal strength:

$$\text{Let the transmission power of anchor node } = P_{tx}$$

$$\text{The strength estimated at receiver node } = P_{rx}$$

$$\text{Assuming that path} - \text{loss model is known}$$

$$\text{The path} - \text{loss coefficient } = \alpha$$

Then the following equation can be used for estimation of distance between anchor node and the receiver nodes:

$$P_{rx} = c * \frac{P_{tx}}{d^{\alpha}}$$

$$d = \sqrt[\alpha]{c * \frac{P_{tx}}{P_{rx}}} \dots\dots\dots\dots\dots.(1)$$

Where
$c = \text{constant dependent on the path} - \text{loss.}$

$\alpha = 2, \text{since received power is inversaly proportonal to}$

distance.

$2 \leq \alpha \leq 4 = \text{for the multipath fading channel and}$

spreadi spectrum transmistion technique

Ones the node estimates the distance from different anchor nodes it utilizes the following algorithm to estimate its location

Let the total number of anchor nodes = n
let the coordinates of these nodes = $(x_i, y_i, z_i), i \in n$
let the coordinates of the node to be estimated = (x_u, y_u, z_u)
Estimated distances from each anchor node using RSS = $d_{i,est}, i \in n$

Writing the equalities

$$\sqrt{(x_i - x_u)^2 + (y_i - y_u)^2 + (z_i - z_u)^2} = d_{i,est}$$
for each $i \in n$

…………..(2)

$$obj_{fun} = \sum_{i=1}^{n} \left| \sqrt{(x_i - x_u)^2 + (y_i - y_u)^2 + (z_i - z_u)^2} - d_{i,est} \right|$$

………….(3)

Hence the location of node can be estimated by searching the values of (x_u, y_u, z_u) which satisfies the equation (2) or minimizing the value of objective function (equation (3)).

B. General Localization Method Using Angle-Of-Arrival

Range-based system refers to the Angle of Arrival of a signal to a receiver. This method usually provides corresponding information to ToA and RSS by signifying the direction of adjacent sensors. There are two ways to obtain AoA measurements and both require multiple antenna rudiments: the first one is to use a sensor array and array signal processing techniques and the second one is to use the RSS ratio between two directional antennas located on the sensor. AOA (Angle-of-Arrival) measures local angle information to neighboring nodes, which can either be used as corresponding to other distance measurements (such as RSSI) , or be used to compute the locations of nodes with the help of connectivity information, which can be achieved in any WSNs.

At the moment two different techniques are used for the estimation of AOA.
AT first technique receiver utilizes the array antenna parameter and the received signal from each elements of the array is then processed to estimate the AOA utilizing the array antenna properties.
The second technique for measuring the source signal's AOA, utilizes the rotating, directional antennas, and the angle is estimated by observing the peaks. The rotational angle between two peaks represents the relative angle between for the receiver's point of view.

The relation between relative angles and the coordinates is given as follows

$$\theta = 2 * \text{atan} \left(\frac{norm(v_u * norm(v_i) - norm(v_u) * v_i)}{norm(v_u * norm(v_i) + norm(v_u) * v_i)} \right)$$

……………..(4)

Now ones the angle is estimated from all anchor points the location vector can be calculated by minimizing the equation (5)

$$obj_{fun} = \sum_{i=1}^{n} \left| 2 * \text{atan} \left(\frac{norm(v_u * norm(v_i) - norm(v_u) * v_i)}{norm(v_u * norm(v_i) + norm(v_u) * v_i)} \right) - \theta_{i,est} \right|$$

……………………………..…………….(6)

where $\theta_{i,est}$ = *estimated angles with the ith anchor node*

IV. GENETIC ALGORITHM

Genetic algorithms (GA) are search algorithms based on the mechanics of natural selection and natural genetics, which maintains a invariable size population P of candidate solutions. During each iteration step (generation) three genetic operators (reproduction, crossover, and mutation) are performing to generate new populations (offspring), and the chromosomes of the new populations are evaluated via the value of the fitness which is related to cost function. Based on these genetic operators and the evaluations, the better new populations of candidate solution are formed. With the above description, a simple genetic algorithm is given as follow [14]:
The algorithm flowchart is shown as figure 1 and implementation steps are as follows:

Step 1 Initialize the network, nodes obtain the information of their neighbor nodes.
Step 2. Create arbitrarily a population of binary string.

Step 3. Use arithmetic crossover in formula as crossover operator.

Step 4. Use uniform mutation in formula as mutation operator.

Step 5. If all nodes are localized, output the localization result and end the program. Otherwise turn to Step 2, positioning the next unknown node.
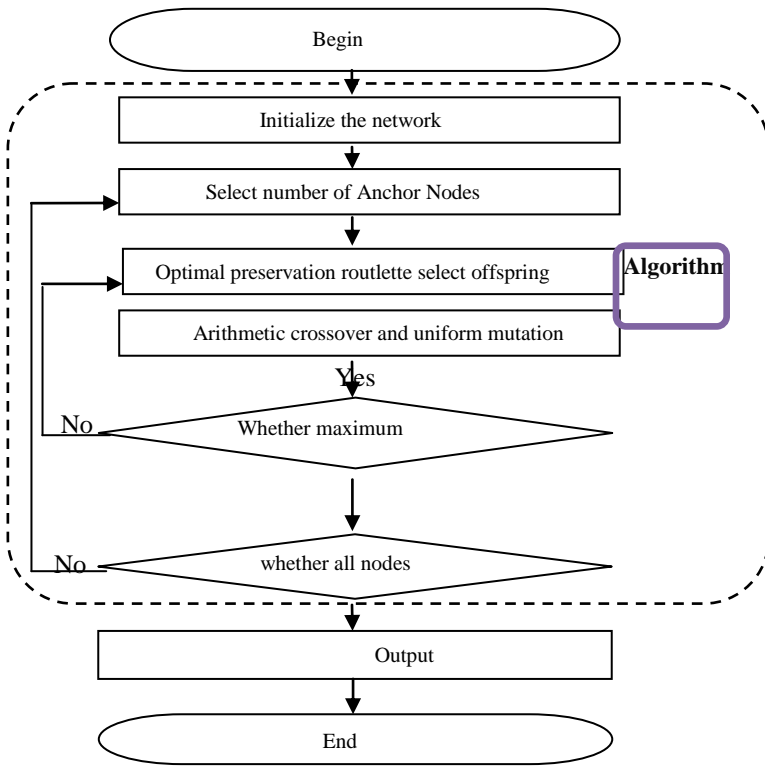
Fig 1: GA Algorithm Flow chart

V. PROPOSED METHOD

The proposed system estimates the optimal location of node from the existing anchor nodes by using RSS and AOA and finding the optimal solution for both at the same time. The proposed algorithm can be described in following steps

Step 1: let in the present topology of the network N-anchor nodes with their known location are present and all of them are transmitting their locations and the power and if they are not transmitting these information it is assumed that the nodes already have these information.

Step 2: know the node wants to locate estimates the signal strength of the signal received form each anchor nodes separately and uses the equation (1) to estimate the approximate distance from each of the anchor nodes.

Step 3: Ones the node estimates the distance from all the anchor nodes it starts finding the angle of arrival from each nodes by either using array antenna processing or by simple directional rotating antenna.

Step 4: After calculating the information of distance and angles the node uses the genetic algorithm to find its coordinates such that in minimizes the objective function given in equation (7

$$obj_{fun} = \sum_{i=1}^{n} \left| \sqrt{(x_i - x_u)^2 + (y_i - y_u)^2 + (z_i - z_u)^2} - d_{i,est} \right|$$
$$+ \left| 2 * \text{atan} \left(\frac{norm(v_u * norm(v_i) - norm(v_u) * v_i)}{norm(v_u * norm(v_i) + norm(v_u) * v_i)} \right) - \theta_{i,est} \right|$$

$$\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

Step 5: if the genetic algorithm finds a solution for the equation 8 it terminates and the returns the solution otherwise it gives the best fitted solution achieved within the given iterations.

VI. SIMULATION ANALYSIS RESULTS

The evaluation of the proposed work is done by simulating it for different scenarios and configurations

Scenario 1: Table 1: Configuration used for scenario 1 to assessment of the proposed algorithm.

Properties	Value
Width	100 m
Height	100 m
Length	100 m
Number of Anchor Nodes	2
Error in Distance Calc. (%)	5
Error in Angle Calc. (%)	5
GA Population Size	64
Maximum Iterations	100

Technique	X	y	z	% Error	Time (Sec.)
Original	38.6947	6.9457	69.6513	0	0
RSS	12.2719	19.4490	78.3378	26.6736	32.3487
AOA	63.2834	1.9821	58.1087	27.9844	34.8704
Proposed	38.1291	15.9873	85.3985	16.7894	52.5912

Scenario 2:
Table 2: Configuration used for scenario 2 to assessment of the proposed algorithm.

Properties	Value
Width	100 m
Height	100 m
Length	100 m
Number of Anchor Nodes	3
Error in Distance Calc. (%)	5
Error in Angle Calc. (%)	5
GA Population Size	64
Maximum Iterations	100

Technique	X	y	z	% Error	Time (Sec.)
Original	58.9748	31.7321	31.754	0	0
RSS	54.4659	33.3654	34.857	4.7573	29.6546
AOA	58.7548	30.8644	31.54375	1.5703	28.7545
Proposed	58.3621	31.4743	31.53695	1.5357	46.8429

Scenario 3:

Table 3: Configuration used for scenario 3 to assessment of the proposed algorithm.

Properties	Value
Width	100 m
Height	100 m
Length	100 m
Number of Anchor Nodes	4
Error in Distance Calc. (%)	5
Error in Angle Calc. (%)	5
GA Population Size	64

Maximum Iterations	100

Technique	x	y	z	% Error	Time (Sec.)
Original	38.3916	43.7531	57.1443	0	0
RSS	35.9326	46.4714	64.7759	5.7643	38.3542
AOA	52.7825	43.1534	63.6359	3.9976	39.7214
Proposed	51.9804	45.1531	63.8629	2.1097	58.7863

Scenario 4:**Table 4: Configuration used for scenario 4 to assessment of the proposed algorithm**.

Properties	Value
Width	100 m
Height	100 m
Length	100 m
Number of Anchor Nodes	5
Error in Distance Calc. (%)	5
Error in Angle Calc. (%)	5
GA Population Size	64
Maximum Iterations	100

Technique	x	y	z	% Error	Time (Sec.)
Original	26.6574	47.9974	44.7701	0	0
RSS	28.7584	43.2561	41.3302	3.226	38.8435
AOA	27.0584	48.0134	46.3366	2.2275	37.8841
Proposed	25.7897	48.0285	47.3343	2.226	55.6648
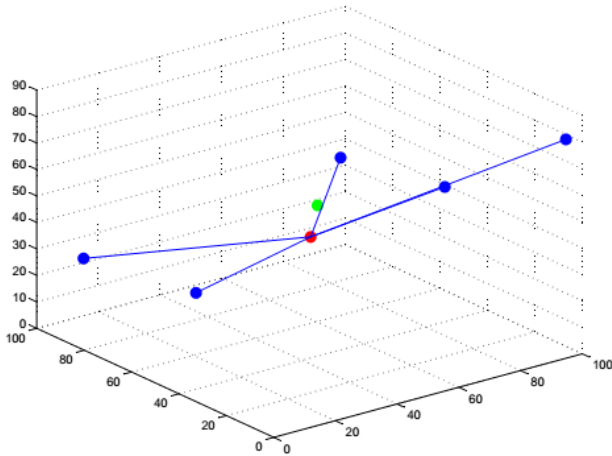
F**ig 2 : Proposed Algorithm (RSS+AOA) With RSS And AOA For The Location Estimation For Anchor Node**
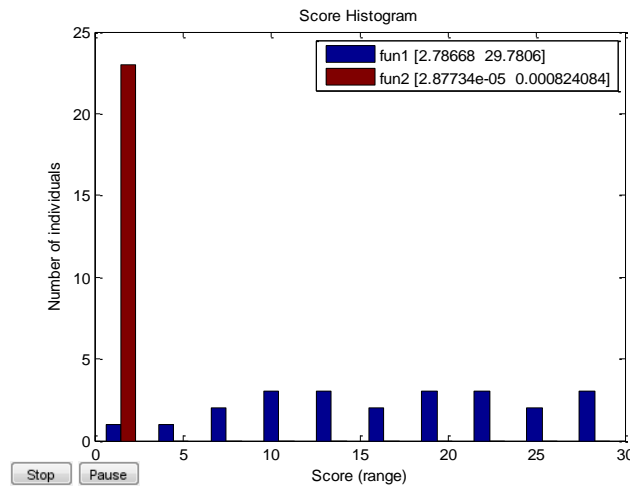
Fig 3 : Proposed Algorithms Score Histogram Graph Between Number of Individuals and Score (range) for Anchor Node

VII. CONCLUSION AND FUTURE ASPECTS

In this paper, a GA localization algorithm with Localization based algorithm which are at the same time optimized by the genetic algorithm to find the optimal solution of the location of the sensor node using some anchor nodes. GA localization algorithm is used to estimate the position with the measured by RSS + AoA . The simulation results with different scenario shows that the present algorithm gives the highest accuracy with a minimum error of 1% with is twice better than the closest competitor AOA. The result also indicates that only three anchor node are sufficient to provide best estimation the further increase in anchor node leads to increase in time but does not improves accuracy. The simulation results show that the algorithm in this paper can estimate the position of the unknown node with less anchor nodes and improve the positioning accuracy efficiently because standard genetic algorithm is used. In summary, we can say that sensor network localization continues to be an important research challenge. Despite, many methods and systems to estimate the location of nodes in WSN are proposed and optimization technique can be developed but right now its depart for future proposed work.

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Efficient Framework for Video Copy Detection Using Segmentation and Graph-Based Video Sequence Matching

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Abstract- A segmentation and graph-based video sequence matching method specifically, due to the good stability and discriminative ability of local features, we use SIFT descriptor for video content description. However, matching based on SIFT descriptor is computationally expensive for large number of points and the high dimension. Thus, to reduce the computational complexity, we first use the dual-threshold method to segment the videos into segments with homogeneous content and extract Keyframes from each segment. SIFT features are extracted from the Keyframes of the segments. Then, we propose an SVD-based method to match two video frames with SIFT point set descriptors. To obtain the video sequence matching result, we propose a graph-based method. It can convert the video sequence matching into finding the longest path in the frame matching-result graph with time constraint. Experimental results demonstrate that the segmentation and graph-based video sequence matching method can detect video copies effectively. Also, the proposed method has advantages. Specifically, it can automatically find optimal sequence matching result from the disordered matching results based on spatial feature. It can also reduce the noise caused by spatial feature matching. And it is adaptive to video frame rate changes. Experimental results also demonstrate that the proposed method can obtain a better tradeoff between the effectiveness and the efficiency of video copy detection.

Index Terms- Video copy detection, graph, SIFT feature, dual-threshold method, SVD.

I. INTRODUCTION

The rapid development and wide application of multimedia hardware and software technologies, the cost of image and video data collection, creation, and storage is becoming increasingly low. Each day tens of thousands of video data are generated and published. Among these huge volumes of videos, there exist large numbers of copies or near-duplicate videos. According to the statistics of, on average, there are 27 percent redundant videos that are duplicate or nearly duplicate to the most popular version of a video in the search results from Google video, YouTube, and Yahoo! video search engines. As a consequence, an effective and efficient method for video copy detection has become more and more important. A valid video copy detection method is based on the fact that "video itself is watermark" and makes full use of the video content to detect copies. To facilitate the discussion of "video copy" in this paper, we use the definition of video copy in TRECVID 2008 tasks. Definition of copy video: A video V1, by means of various transformations such as addition, deletion, modification (of aspect, color, contrast, encoding, and so on), cam-cording, and so on, is transformed into another video V2, then video V2 is called a copy of video V1. The objective of video copy detection is to decide whether a query video segment is a copy of a video from the video data set. A copy can be obtained by various transformations. If a video copy

Detection system finds a matching video segment, it returns the name of copy video in the video database and the time stamp where the query was copied from. Fig. 1 shows the framework of content-based video copy detection.

It is composed of two parts:

1) An offline step. Keyframes are extracted from the reference video database and features are extracted from these Keyframes. The extracted features should be robust and effective to transformations by which the video may undergo. Also, the features can be stored in an indexing structure to make similarity comparison efficient.

2) An online step. Query videos are analyzed. Features are extracted from these videos and compared to those stored in the reference database. The matching results are then analyzed and the detection results are returned.

TABLE 1

Based on the study, in these transformations, picture in picture is especially difficult to be detected. And for detecting this kind of video copies, local feature of SIFT is normally valid. However, matching based on local features of each frames in two videos is in high computational complexity.

Examples of Five Single Transformations

T1. Cam-cording; T2. Picture in picture; T3. Insertions of pattern: Different patterns are inserted randomly: captions,subtitles, logo, sliding captions; T4. Strong re-encoding; T5.Change of gamma; T6, T7. Decrease in quality: Blur, change of gamma (T5), frame dropping, contrast, compression (T4), ratio, white noise; T8, T9. Post production: Crop, Shift, Contrast,caption (text insertion), flip (vertical mirroring), Insertion of pattern (T3), Picture in picture (the original video is in the background); T10. Combination of random five transformations among all the transformations described above.

II.   RELATED WORKS

As reviewed in many content-based video copy detection methods have been proposed. Furthermore, copy is a subset of near duplicate. Copies have an origin, while near-duplicates may not. Specifically, two news videos on the same event from two broadcasting corporations are not copies, but near duplicates since they deliver the same information to audience, although some variations on the scenes may exist. Also, there are many methods proposed on near-duplicate detection. The methods on copy and near duplicate detection can be grouped into two types. One type of copy detection methods uses global descriptor. Specifically, Hampapur et al. compared distance measures and video sequence matching methods for video copy detection. They employed convolution for motion direction feature, L1 distance for ordinal intensity signature (OIS), and histogram intersection for color histogram feature. The results show that the method using OIS performs better. Yuan et al. combined OIS with color histogram feature as a tool for describing video sequence.
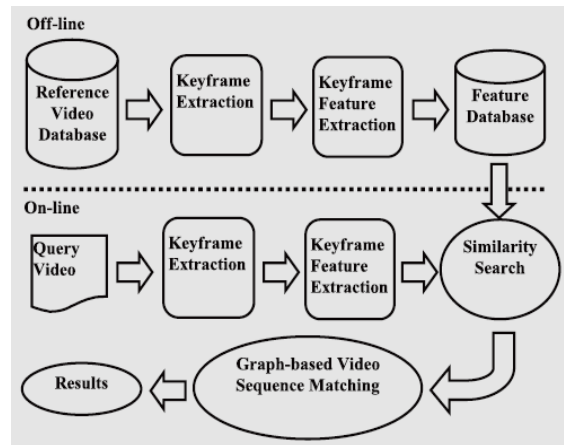
Fig. 1. A framework of video copy detection system

As the basis, designed region intensity rank signature along time sequence. Specifically, they divided each video frames along the time sequence into several blocks and proposed average gray values for each block. Then, they linked gray values of these divided blocks separately along the time direction before they use those sequence information to describe the video content. Shen et al. Introduced a real-time near-duplicate video detection system, UQLIPS, which globally summarized each video to a single vector.

Huang et al. used global image feature such as color histogram and texture to represent each video frame. Wu et al. adopted the color histogram in HSV color space to detect and remove the majority of duplicates of web videos.

(a) OIS (query image)
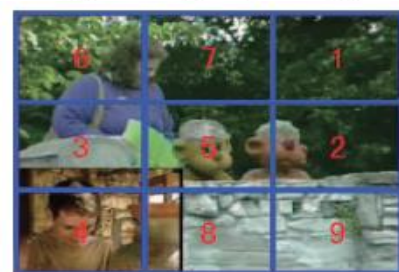
(b) OIS (PiP image)

As SIFT descriptor has good stability and discriminative ability, we choose SIFT descriptor to describe video characteristics. Meanwhile, we suggest two solutions to the lack of high computational cost in the process of copy detection: 1) dual-threshold method to eliminate video redundant frames; 2) using singular value decomposition (SVD) for matching two feature sets of SIFT features on key points.
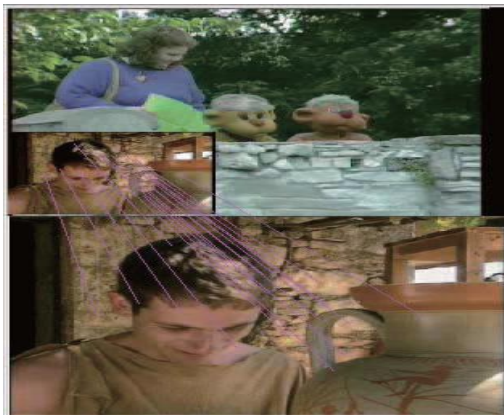
c) The Matching Result Using SIFT

III. USING AUTO DUAL-THRESHOLD METHOD TO ELIMINATE REDUNDANT VIDEO FRAMES

Normally, visual information of video frames is temporally redundant. So, video sequence matching is not necessarily to be carried out using all the video frames. An effective way of reducing non necessary matching is to extract certain Keyframes to represent the video content. And the matching of two video sequences can be first performed by matching the Keyframes.

Specifically, Guil et al. proposed to cluster video frames by computing the similarity between neighboring frames and choose a keyframe from each cluster to represent it. However, the extracted Keyframes cannot represent the temporal information among frames. On the other hand, some methods were proposed to detect video shots and extract Keyframes from each shot to represent the video content.

Since there are some camera motion and object motion, the content within one shot will still has much variance. Then, we propose to detect video segments, which is an intermediate representation between video frames and video shots. Furthermore, matching two video sequences based on extracted Keyframes from the segments can meet the requirement of two videos being in different frame rates.

a) The Segmentation result using shot segmentation method
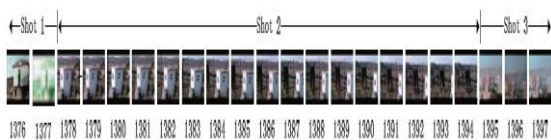
a) The Segmentation result using auto dual - threshold method
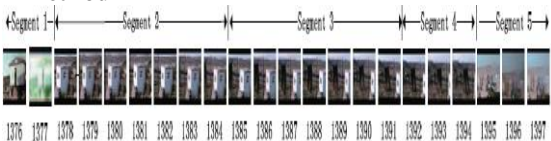
IV. MATCHING SIFT FEATURE POINT SETS BASED ON SVD

To better represent the local content of video frames, we choose SIFT descriptors to present the video sequences. On the other hand, since the number of SIFT feature points in video sequences is large, it thus exists high computational cost for video copy detection. Matching the SIFT feature points in two frames with the BBF-Tree method needs about several seconds. And the computational cost for matching the whole video sequences is high.

Thus, many methods, such as bag of features (BoFs) or visual word for video copy detection, locality sensitive hashing (LSH), and hierarchical indexing structure for efficient video retrieval, and so on, have been proposed for efficient video search. However, by using these indexing methods, the temporal information of the SIFT feature points in different frames will be lost. Thus, our motivation is to match the two SIFT feature sets in two video frames and make use of the temporal information of video frames.

The matrix singular value has the following characteristics: Characteristic 1: transposition and replacement invariance. That is to say, after transposition or row-column replacement operation of the matrix, its singular value remains unchanged. This characteristic can be directly proved according to the definition of singular value and the characteristic of elementary matrix. Characteristic 2: energy concentricity. The matrix A can be approximately restructured by the first k largest singular values of A. It can be proved that the matrix corresponding to the first k largest singular values of A is the closest to matrix A under the Frobenius norm.

V. GRAPH-BASED VIDEO SEQUENCE MATCHING METHOD FOR VIDEO COPY DETECTION

Step 1: Segment the video frames and extract features of the Keyframes.

Step 2: Match the query video and target video.

Step 3: Generate the matching result graph according to the matching results.

Step 4: Search the longest path in the matching result graph.

Step 5: Output the result of detection.

VI. ADVANTAGES OF THE GRAPH-BASED VIDEO SEQUENCE MATCHING METHOD

Since the matching results based on visual features of the video frames do not incorporate the videos' temporal characteristics, the goal of the proposed graph-based video sequence matching method is to refine and order the segment matching results by incorporating the temporal information. The proposed methods demonstrate the following advantages:

1. It can automatically find optimal sequence matching result.

2. It can automatically remove the noise caused by visual feature matching.

3. It is adaptive to video frame rate change.

4. It can detect multiple copies existed in the detected video.

VII. CONCLUSIONS

This paper first analyzes different video copy types and the features used for copy detection. Based on the analysis, we use local feature of SIFT to describe video frames. Since the number of SIFT points extracted from a video is large, so the copy detection using SIFT features has high computational cost. Then, we use a dual-threshold method to eliminate redundant video frames and use the SVD-based method to compute the similarity of two SIFT feature point sets. Experimental results show that this method can obtain a better tradeoff between the detection effectiveness and time cost. Furthermore, for video sequence matching, we propose a graph-based video sequence matching method. It skilfully converts the video sequence matching result to a matching result graph. Thus, detecting the copy video becomes finding the longest path in the matching result graph. Experimental results show that the proposed graph-based video sequence matching method has several advantages:

1. The graph-based method can find the best matching sequence in many messy match results, which effectively excludes false "high similarity" noise and compensate the limited description of image low-level visual features.

2. The graph-based method takes fully into account the spatiotemporal characteristic of video sequence, and has high copy location accuracy.

3. The graph-based sequence matching method can automatically detect the discrete paths in the matching result graph. Thus, it can detect more than one copies.

4. Compared to exhaustive search method, graph based method can also reduce detection time.

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Challenges Facing Effective Implementation of Free Primary Education in Public Primary Schools: A Case Study of Githunguri District Kiambu County

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Abstract- The purpose of the study was to determine the challenges facing implementation of free primary education in Kenya today using Githunguri district in Kiambu County as a case study. The study sought to identify the factors that have lead to poor implementation of the free primary education. The target population is the 30 public primary schools in the district. A census method of data collection was used. The study revealed that public primary schools in Githunguri district are facing numerous challenges in terms of performance, administrative, and financial. This have in turn impacted negatively on the smooth implantation of the program.

Index Terms- Free primary education, public primary school

I. INTRODUCTION

Education forms the basis upon which economic, social and political development of any nation is founded. Investment in education can help to foster economic growth, enhance productivity, contribute to national and social development, and reduce social inequality (World Bank, 2004). UNESCO (2005) argues that the level of a country's education is one of the key indicators of its level of development. Globally, education is recognized as a basic human right.

Education has been defined as the process through which knowledge; skills, attitudes and values are imparted for the purpose of integrating the individual in a given society, or changing the values and norms of a society. For individuals, this process is lifelong. It begins at birth and ends with death. The UNESCO International standard classification of education defines education as comprising organized and sustained communication designed to bring about learning (UNESCO, 2005). In Kenya, as in any other country, this sustained communication is organized and managed through a coherent system put in place by the Government.

Education in its general sense is a form of learning in which the knowledge, skills and habits of a group of people are transferred from one generation to the next trough teaching, training or research (www.wikipedia/wiki/education).Education is often viewed as one of the primary drivers of economic development. In conjunction with donors and non-governmental organizations, developing countries have invested heavily in efforts aimed at achieving the Millennium Development Goal of universal primary education by 2015.School fees have often been found to be a major deterrent to educational access, and to have large negative effects on take-up of educational services in a variety of settings (Holla and Kremer 2008).

One of the millennium goals is to achieve universal primary education, more specifically to ensure that by 2015, children everywhere, boys and girls alike will be able to complete a full course of primary schooling. Currently there are more than 75million children around the world of primary school age who are not in school. The majority of these children are in regions of sub- Sahara Africa and south Asia and within these countries, girls are at the greatest disadvantage in receiving access to education at the primary school age. Since the millennium development goals were launched, many developing countries, such as china, Chile, Cuba, Singapore and Sri Lanka, have successfully completed a campaign towards universal primary education (UNESCO, 2005)

Most governments believe that educating the population of a country is one way of combating poverty in their countries yet many children not have access to education due to lack of schools fees. Hence schools fees is viewed as a hindrance to access in quality education, due to this the government of Kenya in 2003 under the leadership of the third president of Kenya Mwai Kibaki announced the introduction of free primary education in Kenya.

II. RESEARCH ELABORATIONS

Free Primary Education refers to the waiver of all forms of contributions to education by the parents in the primary school level. The government shoulders the financing of education. This applies to the public primary schools only. Free primary education was introduced in January 2003 by the National Rainbow Coalition (NARC) under the leadership of the former president of Kenya Mwai Kibaki. It is aim was to provide more opportunities to the disadvantaged school age children. The program created a positive outcome because it resulted in significant increase in enrolment in a majority of the schools. (Otach, 2008)

The free primary education had an impact on the gross enrolment rate (GER) which increased from 92% in 2002 to 104% in 2003 of the school age children population, resulting in more than 1.5 million children who were previously out- of – school joining primary schools. (UNESCO)

Not all children learn at the same pace or in the same way (Hetherington and Parke 1999). Some learn faster than their classmates but others, some of whom have various mental, emotional and physical handicaps, learn more slowly. Of the more than 5 million United States children classified as disabled (about 11% of all students), a little more than 50% are considered learning disabled, about 20% have speech or language difficulties, almost 12% are mentally retarded, 9% are emotionally disturbed and another 8% have various other kinds of handicaps (US Department of Education1997).

A major question in recent years has been whether these "special'' children should be placed in separate classes or integrated into regular classrooms. Statistics showed in 1997 that 44% of the United States pupils spend most of their school days in regular classrooms, whereas 56% are generally relegated to "special education'' classes (US Department of Education 1997). Advocates of human rights argue that any practice that restricts a person's equal access to an opportunity is detrimental to equal rights. Arguments cited for the defense of mainstreaming are that the handicapped children (particularly the mentally retarded) are likely to learn from the interaction with classmates who are brighter than they are (Taylor *et al.* 1987).

However, skeptics argue that handicapped children who are "mainstreamed'' will suffer serious loss of self-esteem (not to mention an undermining of their achievement motivation) should they fail to keep pace with their non-handicapped classmates and post-poor score (ibid). Researchers have found relatively small differences in academic achievements between students who have been included in regular classrooms and pupils in special classes (McMillan *et al.* 1986). Integration of children with mild retardation into regular classrooms can lead to increased rather than decreased social rejection (Taylor *et al.* 1987). Although the causes of this rejection may vary – for example, mildly retarded children are shy and avoid people, whereas others are aggressive and disruptive – the children who are rejected are lonelier and more dissatisfied

Free education posed a great challenge on teachers shortage in public primary schools since FPE worsen the working conditions of teachers since it increased the workload of teachers due to increase in enrollment levels in public primary schools yet salaries remained the same. According to Sanders (2007) free primary education caused qualified teachers to transfer to private primary schools due to deteriorating working conditions in public primary schools and hence public primary schools were left with few number of qualified teachers hence causing a shortage of teachers in public primary schools. According to Mills (2009), some qualified teachers were moved to secondary schools where shortage of teachers was more acute.

According to a study by Bold et al (2009) reports that while inequality in education access declined with introduction of FPE in 2003, there has been massive transfer of pupils from public to public schools due to decline in the quality of education in public schools. Studies by Tooley et al (2008) parents are opting to enroll their children in private schools where they are required to tuition.

The researcher support Bold et al (2009) report that FPE caused massive transfer pupils from private schools due to poor performance in public schools but the report ignored the fact that some parents are transferring their children from private primary schools to public primary schools since some public primary schools perform well than private primary schools

This study adopted descriptive research design and utilized structured questionnaire in collection of primary data from all head teacher.

III. RESULTS OR FINDING

It was established that the performance of the schools before introduction of the Free Primary Education in2003 was average, 70% of the respondents indicated most of the schools had an average performance before the introduction of the free Primary Education, 25% of the respondent agreed that the performance was good while 5% of the respondent agreed that the performance was poor. After adoption of free primary education it was established that performance of the public primary schools rapidly deteriorated, 67% of the respondents strongly agreed that the performance was poor. 30% of the respondent indicated that the performance was average, while the lowest percentage of the respondents at 3% indicated that the performance was good. It was also established that significant change in the performance of the schools was attributed to increase in teacher pupil ratio, 93% of the head teachers.

Majority of the respondents at 83% indicated that the enrolment caused administrative challenges while 17% of the respondent indicated that the enrolment caused no administrative challenges. The respondents were asked to list the administrative challenges they encountered, inadequate facilities was the major challenge followed by increased student teacher ratio then student mobility from public to private and within private .

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Spatial distribution of the pit builders antlion's larvae (Neuroptera: Myrmeleontidae) in the septentrional regions of Cameroon (Central Africa)

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Abstract- Antlions (Insecta: Neuroptera) are xerophilous insects adapt to arid conditions that perform some resilent behaviours to overcome some noxious effects of the global warming. This paper focuses on the determination of the diversity of the antlion in the Soudano-guinean and Soudano-sahelian area of Cameroon analyzes the distribution of antlion larvae in these regions. After 3 years of survey, 3 antlions species dominate in the North of Cameroon especially in the dry season. Pits distribution under four tropical trees species is irregular, there is higher density of pits close to the trunk at the shade. This decreases from the shade to open space. At the regional level, the antlion's pit site is influenced by the chemical composition of the soil: higher acidity, salinity, calcium and magnesium content are suppressive to larval development in one hand. In the other hand, potassium, sulfates and chloride amount are favorable to their development. *Myrmeleon quinquemaculatus* (Hagen,1853), is endemic to Guinean higher savannah of the Adamaoua region; *Myrmeleon obscurus* (Rambur, 1842) is a species widely spread in the 3 sampled regions, and *Hagenomya tristicis* (Walker, 1853) is restricted to the Soudano-sahelian zone.

Index Terms- Antlion, soil, biogeography, biodiversity, Cameroun.

I. INTRODUCTION

Adult Antlions (Insecta: Neuroptera) are characterized by their large membranous wings with a dense network of veins. They have long, slender bodies and delicate outstretched wings (ranging between 30 – 170 mm), resemble damselflies (Mansell, 1999) [1]. They are nocturnal and feeble flyers (Farji-Brenner, 2003) [2]. Antlion larvae are carnivorous and eat small terrestrial insects. Adults are generally pollinivores or predators of small insects (Cain, 1987; Stelzl and Gepp, 1990) [3; 4]. Antlion larva is sit-and-wait predators (Séméria and Berland, 1987, Badano and Pantaleoni, 2014) [5; 6]. It constructs its pit using its mandibles as shovels to flick the excavated sand (Tauber *et al.,* 2003; Mansell, 1999) [7; 1]. For overall construction, finer grain soils are preferred by antlions because these more readily dislodge prey (Farji-Brener, 2003) [2]. Pits are typically built in areas that are sheltered from rain and other elements to minimize disturbance (Youthed and Moran, 1969; Gotelli, 1993) [8; 9]. They detect approaching prey to the funnel using mechanoreceptor setae located on their bodies (Devetak, 1985) [10]. The funnels are a trapping system in fine soil causing prey to the background in the manner of quicksand. In this case, the agitations of the trapped prey contribute more to swallow it than to facilitate his escape.

The distribution of living organisms is strongly influenced by biotic and abiotic factors. Climate is the main factor responsible for the distribution of living organisms in the biosphere. Northern Cameroon is characterized by a dry climate with a long dry season and low rainfall (Suchel, 1987) [11]. This work is focused on the abiotic conditions in this region that are favorable to the installation of ant lions to investigate the influence of the chemical composition of soils over large areas and more locally the impact of the shadow of some trees to understand the spatial distribution of ant lion larvae in the dry season.

II. MATERIAL AND METHODS

2.1. Presentation of the study area

In Africa, Cameroon is located at the bottom of the Gulf of Guinea and is in pivotal position between West and Central Africa. The country runs from south to north between 1°40 to 13 ° north of latitude to about 1250 km. From West to East, it stretches between 8°30 to 16°10 East of longitude, about 860 km. The study area started from the Adamawa plateau and plains and Mandara Mountains, this area is between 6° to 13° North of latitude and between 11° to 15° East longitude. In northern Cameroon, the climate is dominated by tropical Sahelian climate and divided in two seasons. Adamawa covers the whole of the Adamaoua Plateau; it extends in the north by a dry tropical climate. This climate is characterized by at least seven months of drought; the annual rainfall varies from 1,600 to 500 mm (Table 1). The period of plant growth (PPG) is influenced by the rains period. In high Guinea savannah, it rains up to 250 days, while in the drier Sahelian zones, it hardly reaches 100 days. The annual average temperature is 28°C±7.7°C (Djoufack Manetsa *et al.,* 2011) [12]. The Sudano-Sahelian zone of West Cameroon is characterized by the thorny steppes and grasslands periodically flooded (Lienou *et al.,* 2003) [13]. These formations have degraded due to intensive grazing bushfires (Braband, 1991) [14]. High Guinean savannah is a vast plateau essentially pastoral use, which ensures the transition between forest regions of southern and northern Sahelian formations.

Table 1. Presentation of the ecologiccal zones sampled in the northern Cameroon

Agro-ecological Zones	Regions	Divisions	Localities sampled
AREA II : *Guinean higher savannah* - 240 to 180 days (PGP) - 1600 to 1200mm de pluies/an	**Adamawa** **(63 701 km^2)**	*Djérem* *Faro et Déo* *Mayo Banyo* *Mbéré* *Vina*	*Tibati* *Tignère* *Banyo* *Meiganga* *Ngaoundéré*
AREA I : *Soudano-sahelian* - 180 to 110 days (PGP) - 1200 to 500mm de pluies/an	**Far North** **(34 263 km^2)**	*Diamaré* *Logone & Chari* *Mayo Danay* *Mayo Kani* *Mayo Sava* *Mayo Tsanaga*	*Maroua* *Kousseri* *Yagoua* *Kaélé* *Mora* *Mokolo*
	North **(68 090 km^2)**	*Bénoué* *Faro* *Mayo Louti* *Mayo Rey*	*Garoua* *Poli* *Guider* *Tcholiré*

* *Surface of Cameroon 475 650 km2, which 466 050 km2 is the continental surface*
 PGP: Plant Growth Period

The soils of the study area are red, deeper, loose, clayey, porous and favourable to the development of the forest. These soils are poor, acid and vulnerable to erosion (Onguene, 1993) [15].

2.2. Collection and rearing the larvae in the laboratory

Antlion larvae have been collected in 15 divisions of the northern regions, each year around March and April. This collection was made during three years 2011, 2012 and 2013. These larvae were extracted from their traps well with a spatula and were introduced individually in plastic cups prefilled 2/3 of fine and dry soil. Bringing back to laboratory, at first, the larvae have been reared individually in plastic cups 25cl capacity filled with fine soil sieved with a 500 micron sieve mesh, were followed until the construction of wells trap. In a second time, they were fed by termites at the rate of two preys per day, one in the morning and the other in the afternoon. The fact is noted primarily to the development of the funnel. If the funnel is not maintained, it means that the larva is feeding off and is preparing to molt, or to form the silk cocoon which marks the end of the larval life. When in three days the funnel is not maintained, the contents of the cup is made and either a more advanced stage larvae and exuviate output is present, or a silk cocoon is formed. The observation date of the change is noted. The larva of the more advanced stage is given observation in the same cup and followed until the formation of silk cocoon. The cocoons are observed in isolation until the emergence of the adult. Adults sample are stored dry, prepared and sent for identification to Dr. André Prost. They are identified at the Museum of Natural History in Paris. Thereafter, the confirmation of the identification the sample is carried out at the Royal Museum for Central Africa in Tervuren, Belgium.

2.3. Analysis of the pit distribution of *Myrmeleon obscurus* under four trees

Four species of trees with dense foliage and present in the study area were targeted in dry season: *Azadirachta indica* (Meliacae); *Khaya senegalensis* (Meliacée); *Manguifera indica*

(Anacardiacae); *Acacia seyal* (Mimosaceae). *A. indica* is an evergreen tree, native to India and introduced as an ornamental plant, for its shade and firewood. It is widespread in tropical and subtropical regions. *K. senegalensis,* is a typical savannah tree, it is also planted in the streets on the roadside. It is a large tree that provides a hard red wood used in woodworking and the manufacture of charcoal. *M. indica* is a big tree that can reach 30m high. It is grown in almost all tropical countries. Its foliage is dense and rounded evergreen. Finally, *A. seyal* is a tree crown least lowered. Trees under which more than 25 funnels were present were considered. Under each tree concentric circles from the trunk were drawn at the following distances from the trunk: 100 cm; 200 cm and 300 cm. The number of funnels in defined intervals was established. Five replicates per plant species were made. At this time of the year, *M. indica* and *A. seyal* are dormant while *A. indica* and *K. senegalensis* bear flowers or fruit.

2.4. Analysis of larvae's survival of antlion in various soils

Larvae collected in the 15 divisions (Table 1) were reared on the soil of the campus of the University of Ngaoundere in one hand, and on the ground taken from their place of gathering in the other. For each case, 30 larvae were collected and monitored by location. Success of larval development is evaluated. It involves the formation of a silk cocoon at the end of larval life and the emergence of the adult insect. A parallel was drawn between the origin of the breeding ground of the larva and the success rate. The success rate is the ratio obtained by the number of adult time 100. The analysis of the chemical composition of the soil where the larvae were sampled was made. Subsequently, a relationship was made between chemical composition and survival of larvae and finally a spatial difference species is made for the entire study area.

2.5. Chemical characterization of the soils

The soils were collected from harvest sites larvae were analyzed to determine their levels of phosphore, calcium, magnesium, nitrogen, sulfate, potassium and chloride. In addition, pH and salinity were estimated. A preliminary

treatment to remove the organic matter of each floor consisted of calcination. In fact, 15 g of soil was heated in an oven at 500°C for 24 hours. After calcination, there was a mineral extraction in aqueous medium. To do this, 10 g of each calcined soil were introduced in beakers of 400 ml capacity. 100ml of distilled water was added there too. After 30 minutes of homogenization and filtration, the solution was left to stand for 1 hour. The following measurements were made in these solutions:

-The pH and salinity using a pH meter multifunction HANNA;
-Phosphorus content (Rodier, 1978) [16];
-The content of calcium and the magnesium (NF-T 90-003, AFNOR, 1986) [17];
-The total nitrogen content (Kjeldahl method: AFNOR, 1984) [18], and determination of nitrogen (Devani *et al.,* 1989) [19].
-The sulfate content Rodier (1978) [16];
-Potassium content;
-Chloride content.

2.6. Statistical analysis

At the local level, analysis of the distribution of antlions funnels under the trees was observed. The null hypothesis states that the distribution of larvae under the trees is uniform; to test this hypothesis, the Chi^2 test was used to compare the average number of funnel counted by distance interval established. This in order to determine the existence of a gradient distribution funnels function of the intensity of the shade trees. In addition, ANOVA under software Stat Graphics Plus version 5.0 was used to compare the diameters of cocoons and sizes of larvae, adults, wings and durations of cocoons.

At the regional level, the distribution of antlion larvae was made according to the chemical composition of soils. The success rate of breeding antlion larvae was analyzed in relation to the content of soils targeted seven major minerals. Discriminating analysis such as principal component analysis (PCA) and hierarchical ascending classification (HAC) were used with the XLSTAT software.

III. RESULTS AND DISCUSSIONS

3.1. Diversity of the antlions species sampled

During the three years of data collection, more than 500 larvae ant lions mainly stages two and three were collected and reared in laboratory. From this rearing, more than 300 adults emerged. These adults belong to two different morphological complexes of pit building antlions that occur during the dry season in the northern regions of Cameroon. Identifications of adults were carried out at the Museum of Natural History in Paris and the Royal Museum for Central Africa in Tervuren. The complex of large individuals with the largest cocoons is represented by *M. quinquemaculatus*. Their cocoons measured 14.33 ± 0.35 mm, twice as large as that of the smaller forms. The second morphotype consists of small adults with smaller cocoons observed two main representatives: *H. tristis* 6.83 ± 0.21 mm in diameter and cocoon *M. obscurus* 7.05 ± 0.16 mm.

It becomes clear that three species of ant lions dominate among the species that build funnels during the dry season in the upper Guinean savannah and Sudano-Sahelian region of Cameroon. In these regions even in the rainy season, the funnels are near houses, the biodiversity of this region is much more important and these three species can not be representative of the entire insect fauna of ant lions in this region.

3.2. Distribution of antlions funnels under the shade of some tropical trees

The antlions are subservient to both flowering trees and fruit-bearing trees. Funnels are sometimes observed at the base of the tree or even far away. Whatever the phenological stage of the tree, the funnels are present during the observation period. The densities of the funnels described in the circles were not the same for the four trees observed. There are two trends in the variation of the density of the funnels according to the distance from the trunk of the tree (Table 2). There is a positive gradient with distance from the trunk: *A. sehyala* and *K. senegalensis*, the further from the trunk, funnels are scares whereas *A. indica M. indica* are denser near the trunk of the tree.

Table 2. Distribution of the funnels of larvae of *Myrmeleon obscurus* in the dry season in four frequent tropical trees in the northern regions of Cameroon.

	Distances (concentric circles) from the trees trunk				
	0 to 1 m	1 to 2 m	2 to 3 m	Plus de 3 m	
Acacia	31,5	30,16	24,48	13,82	99,96
Azadirachta	12,9	21,23	27,87	37,8	79,8
Khaya	18,4	23,15	26,16	32,26	99,97
Manguifera	74,67	19,07	5,09	2,03	100,86
	137,47 (34,31%)	93,61 (23,37 %)	83,6 (20,85 %)	85,91 (21,47%)	*T=400,59*

Under *A. indica* and *M. indica,* funnels are more close to the trunk, almost 75 funnels in the first meter of the trunk for *M. indica. K. senegalensis* and under *A. seyal*, near the trunk, funnel density is low about 13 funnels in the first meter for *A. indica*. Further from the trunk, the density increases. At sampling period,

K. senegalensis was in bloom. Under *A. sehyal* flowers, distribution of pits decreases from the trunk to the periphery. Chi2 test shows that there is a very high significant difference (X2cal = 60.05> 16.2662, p <0.001) between the distribution rate funnels on different distances.
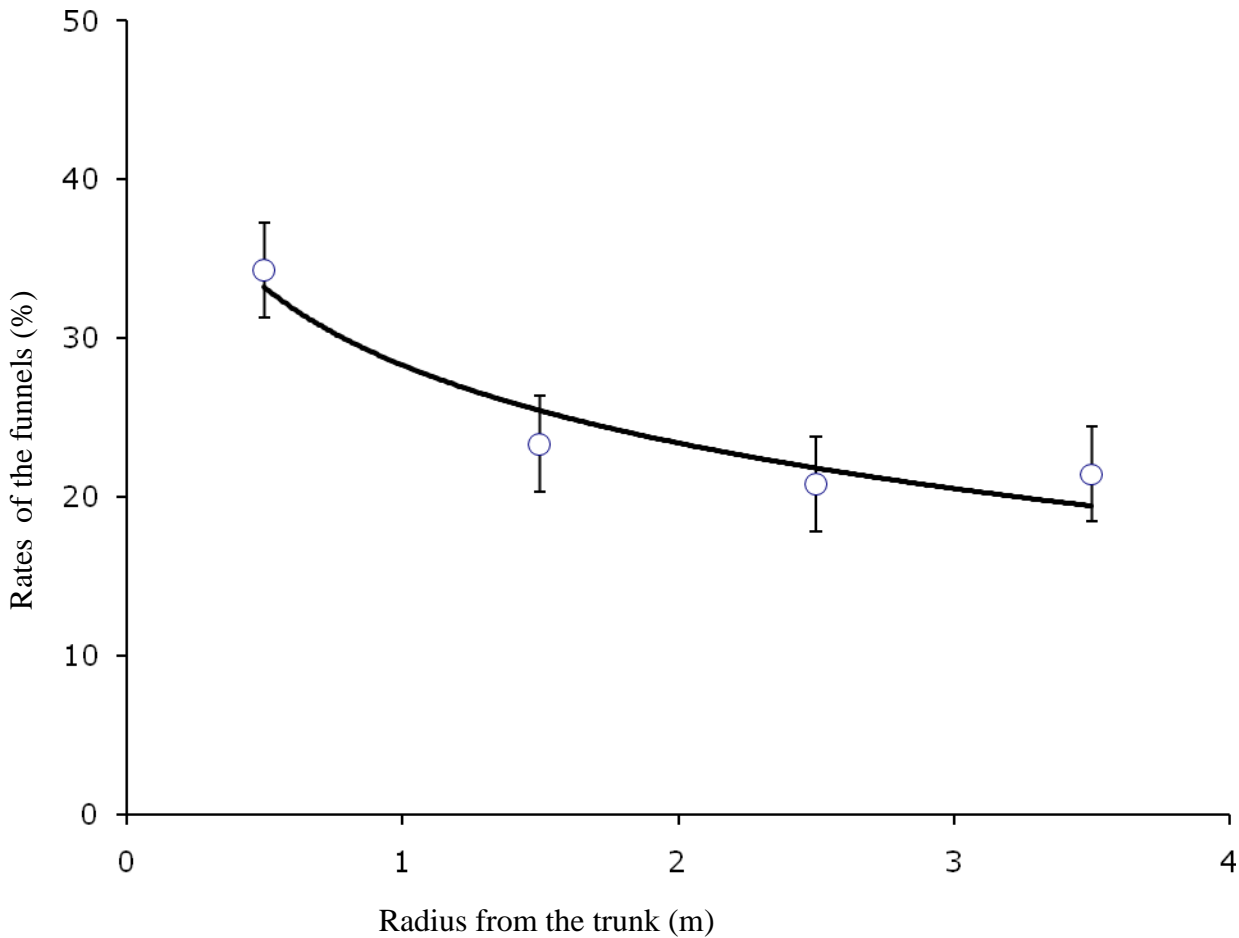
Figure 1. Variation of the density antlion larvae funnels from the trunk on the outskirts of four frequent tropical trees in the northern regions of Cameroon.

A comprehensive analysis of the density of funnels in the shade of trees shows a trend towards a negative gradient with distance from the trunk of the tree (Figure 1). The funnels are built near the trunk. As a result, antlions settle more in the shade of trees in open areas. These hunters also settle where their chance of catching prey is high. Settle near the trunk of a tree is dormant maximizes the chances of prey capture. Indeed, ants and other antlions prey pass by the trunk to look for resources in the foliage. (McClure, 1976; Gatti and Farji-Brener, 2002) [20; 21] . When the tree is flowering or fruiting, funnels would be constructed fart from the trunk. It may maximize to catch prey.

3.3. Larval survival on the original ground and in Ngaoundere's ground.

Larvae might survive efficiently once they are reared on their native soil. When reared in the soil of the university campus, a variation related to soil is observed. Soils have a beneficial or negative effect on the efficient larval survival. The lonely exception comes from Tibati where 100% of larvae survive on a soil which is not their native one (Table 3). Soil of Ngaounderé has nagative effect on the survival of larvae from nine sites. Larvae collected in Tignère (-70.83%), Kaélé (-75%), Guider (-42.85%) are the most sensitive to soil quality in Ngaoundere. Conversely, larvae collected in five localities survived better on the Ngaoundere's ground (Table 3). The soil of the campus has a beneficial effect on the development of larvae collected in Poli (57.14%), Mokolo (+ 66.67%) and Mora (50%).

Table 3. Survival of antlions' larva collected in different regions.

Localities	Survival rates (%)		
	Soil of sampling area	soil of Ngaoundéré	Effect of soil
Banyo	100	70	- 30 %
Meiganga	60	80	+ 25 %
Ngaoundéré*	90	90	0
Tibati	100	100	0
Tignère	60	17,5	- 70,83 %

Garoua	90	75	- 16,7 %
Guider	70	40	- 42,85 %
Poli	30	70	+ 57,14 %
Tcholiré	80	85	+ 5,88 %
Kaélé	60	15	- 75%
Kousséri	50	40	- 20 %
Maroua	80	70	- 12,5 %
Mokolo	10	30	+ 66,67 %
Mora	30	60	+ 50 %
Yagoua	80	55	- 31,25 %
Moyenne	66	59,83	

* = control

3.4. Analysis of the chemical composition of soil of sampling localities

The different analysis of the chemical composition of soil show large variability. Major trends analyzes show that the soil of Guider is more acidic with a PH = 5.19. In general, the soils of the study area vary from neutral to weakly basic. Soils with high salinity are those of Mokolo, Kaélé and Guider. Compared to ammonia nitrogen, the soil of Tignère is one that has the highest content and a significant amount of magnesium and calcium. Mineral is present in the soil of Kousséri. The richest soil potassium and phosphorus is the one of Mokolo (Table 4). As to the content of calcium, it is almost zero in the ground of Tignère, high in the soil Kousséri and low in soils of Mokolo and Kaélé.

Table 4. Chemical composition of soil in some division of Cameroon where larvae's of antlions were sampled in 2011, 2012 and 2013.

Localité	PH	salinité	Azote	P	K	Sulfates	Mg	Ca	Cl
Ngaoundéré	7,15de	**8,09d**	0,83ef	2,31c	0,41b	15,19c	0,17ef	0,23d	0,40e
Meiganga	**8,30h**	<u>0a</u>	0,52bc	1,37b	**13,95l**	**61,36k**	0,11c	0,38h	0,53g
Banyo	6,60bc	6,09c	0,65cde	**198,85l**	4,27f	15,33cd	0,34i	0,26e	0,28c
Tignère	7,22de	0,30b	**51,96h**	26,58j	3,62e	17,87fg	<u>0a</u>	<u>0a</u>	<u>0,23ab</u>
Tibati	6,19b	0,06a	<u>0,25a</u>	<u>0a</u>	6,57h	17,35f	0,2ghe	0,22d	0,24b
Maroua	6,52b	0,25b	0,69cde	13,25g	0,69b	16,34e	0,25h	0,30f	0,46f
Mokolo	7,66efg	0,01a	0,44ab	1,19b	<u>0a</u>	18,31g	0,22g	0,13c	0,21a
Kaélé	7,31de	0,00a	0,43ab	5,27f	1,20c	15,17c	0,19f	0,13c	0,25b
Yagoua	7,63ef	0,01a	0,31a	2,77d	2,11d	16,15de	0,02a	0,02b	0,25b
Kousséri	7,29de	0,30b	0,63bcde	17,45h	8,14i	13,65b	0,15d	0,33g	0,37d
Mora	7,09cd	0,41b	0,81def	23,28i	8,52j	23,66i	0,08b	0,74i	**0,77h**
Guider	<u>5,19a</u>	0,06a	0,61bcd	3,99[e]	9,12k	15,18c	0,17def	0,26e	0,30c
Garoua	8,17gh	0,03a	0,81def	1,14b	0,61b	12,09a	0,16de	**1,46h**	0,24b
Poli	8,16gh	0,05a	4,31g	4,00[e]	5,26g	39,55j	**0,63j**	0,93j	0,38d
Tcholiré	8,14fgh	0,0a	0,90f	0,13a	0,52b	<u>2,63h</u>	0,62j	<u>0a</u>	0,28c

For each parameter the maximal values are in bold type and the minimal values are underline.

Communities which larva survival was lower can be considered suppressive soils are characterized by high levels of nitrogen, absence of calcium and magnesium. Soil of Ngaoundere has high salinity and the one of Guider is acidic. These criteria explain rates above 40%. Soils that are more favorable for larva development are rich in potassium, magnesium and sulfates. In addition, the soils of the Sudano-Sahelian zone have salinity almost zero compared to Adamawa. The discriminant analysis of the data obtained (table 4) was used to determine the elements that are strongly correlated with hatchability. Chemical elements that are positively correlated with the outbreak are potassium (0.329), sulfates (0.228) and magnesium (0.297). The element that adversely affects the development of antlions is nitrogen (N = -0.234). The other elements are negligible because their very small values show that they have no significant effect on the survival of antlions.

3.5. Biogeography of antlion's larvae

The map on the distribution of different species of larvae of antlions in the northern regions of Cameroon shows that *M. quinquemaculatus* is confined in the Adamawa. This specie is found only in this agro-ecological zone and is found in Mbéré and vina division. Adults were observed in Djérem and Mayo-Banyo division. *M. quinquemaculatus* could be an indicator of a specific agro-ecological zone. This shows that Adamawa region has almost the same climate with a long rainy season which starts in March and a short dry season which begins in December. The vegetation is a shrub savannah with tall grass (Griffiths, 1985) [22]. Larvae of *H. tristis* are present in the two agro-ecological zones, but in a single division in the Adamawa region. Figure 5 shows that this species is distributed along the western part of the study area. It extends from Faro and Deo division of Mayo-Sava

through the Benoue, Mayo-Louti, Mayo-Kani and Mayo-Tsanaga.

According to larvae of *M. obscurus*, it is present in all localities (Figure 2). This species can be considered as generalist as it is adapt to all weather conditions. This confirms the work of Mansell (2002) [23] and Michel and Letourmy (2007) [24] which showed that *M. obscurus* is the most widespread species in Africa.
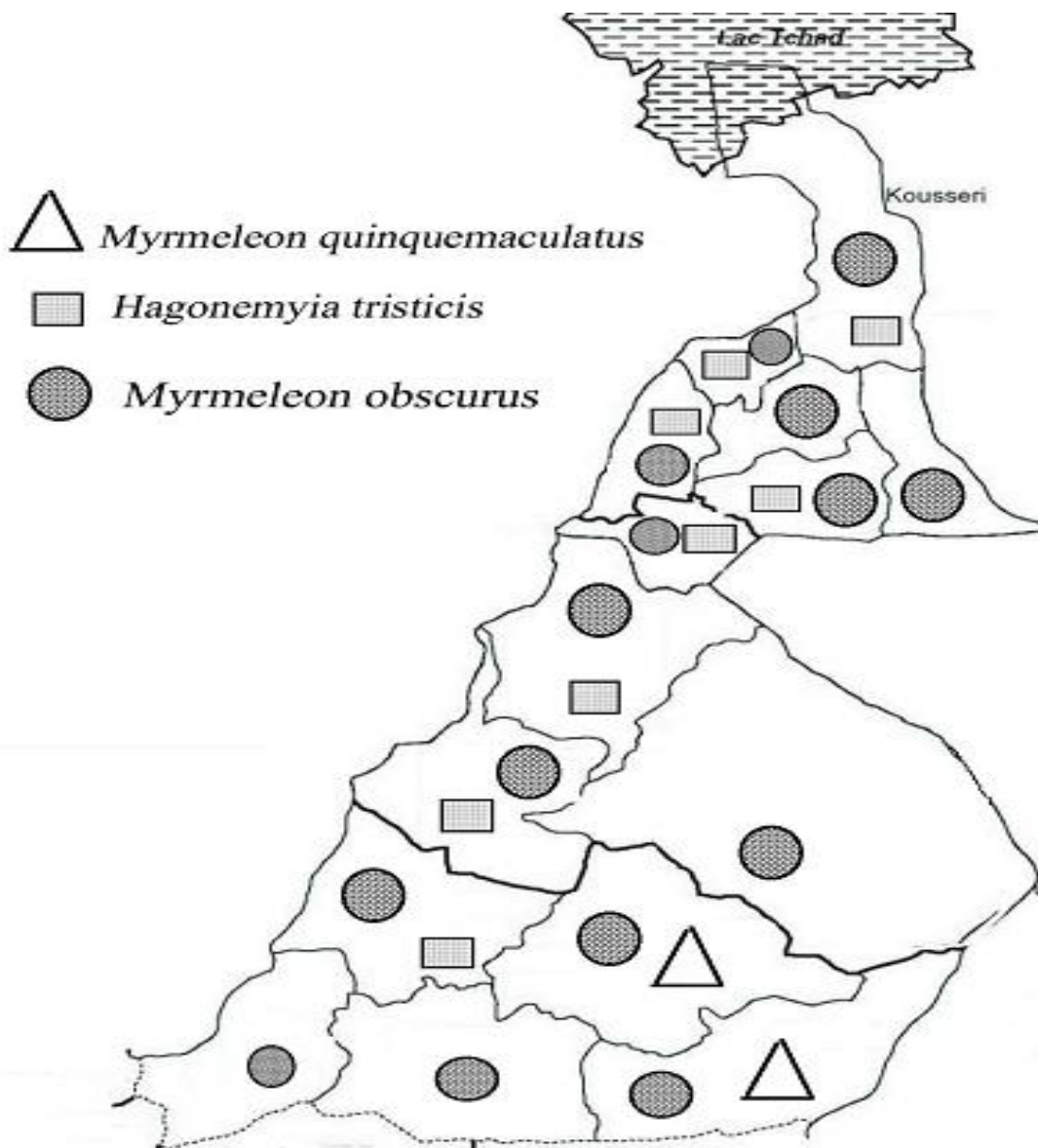
Figure 1. Distribution map of the pits of larvae of *M. quinquemaculatus, M. obscurus* and *H. tristis* collected in the northern regions of Cameroon (2011, 2012 and 2013)

3.6. Correlation between localities and different variables
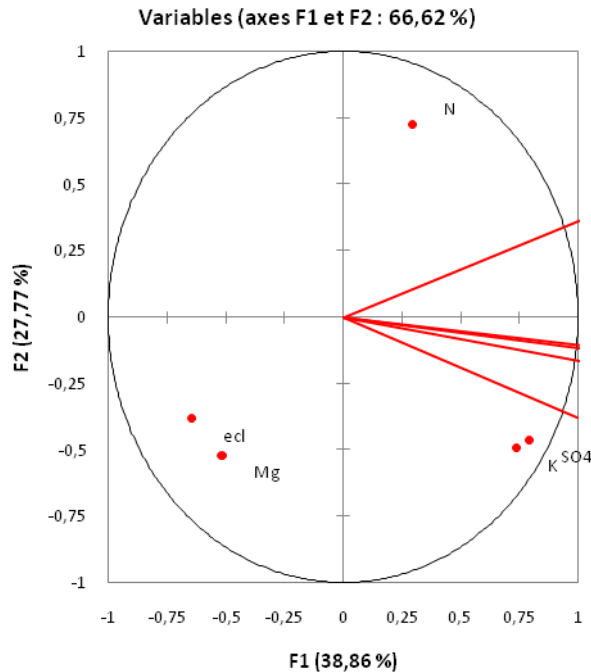
Figure 3. Variables correlation in circle on the axis system F1xF2

Figure 4. Correlation between differents localities and soils chemical composition.

The result obtained from the ACP shows that four variables used to assess the survival of larvae of antlions can be organized into two main components (F1 and F2) that express approximately 66.62% of the variation. The first principal component (F1) explains 38.86% of the variations and the second principal component (F2) 27.77%. F1 is represented by the potassium (K), sulphate (SO4), magnesium (Mg) and then hatching that F2 is represented by the nitrogen (N). It can be seen, according to this circle, a correlation between the emergence and magnesium variables ($r = 0.32$, P <0.05) on the one hand and between the potassium and the sulfates ($r = 0.67$; P <0.05) on the other. For the principal component F1, the most correlated variables are hatching (64.5%), magnesium (51.7%), sulfate (79.3%) and potassium (73.8%). The reconciliation between the different parameters shows a relationship between survival and soil chemical compounds. As to the component F2, the most correlated variables are: nitrogen (72.6%) and magnesium (51.7%).

The HPC has brought together the various localities in 4 classes (Figure: 4) based on hatchability and chemicals that affect the survival of antlions. Class I consists of Guider, Maroua and Ngaoundere with a hatching rate of 80%; Class II consists of Garoua, Kousséri Meiganga and bound by a survival rate that varies between 60 and 70%. Class III consists of Banyo, Tibati and Tcholiré whose emergence rate of ant lions is 100%; low nitrogen content of soils in these areas warrant the survival of antlions. Furthermore, these soils have high levels of magnesium. This element would be the main responsible for the survival of antlions as it is highly correlated with the outbreak (Figure 3). Class IV is formed by Kaélé, Mora, Poli and Tignère, with a survival rate which varies between 30 and 50%. This low hatching rate is justified by the high content of these soils in nitrogen. This confirms the results obtained with the ACP (Figure 3) where the two axes form a right angle of correlation.

3.7. Commons factors to different localities
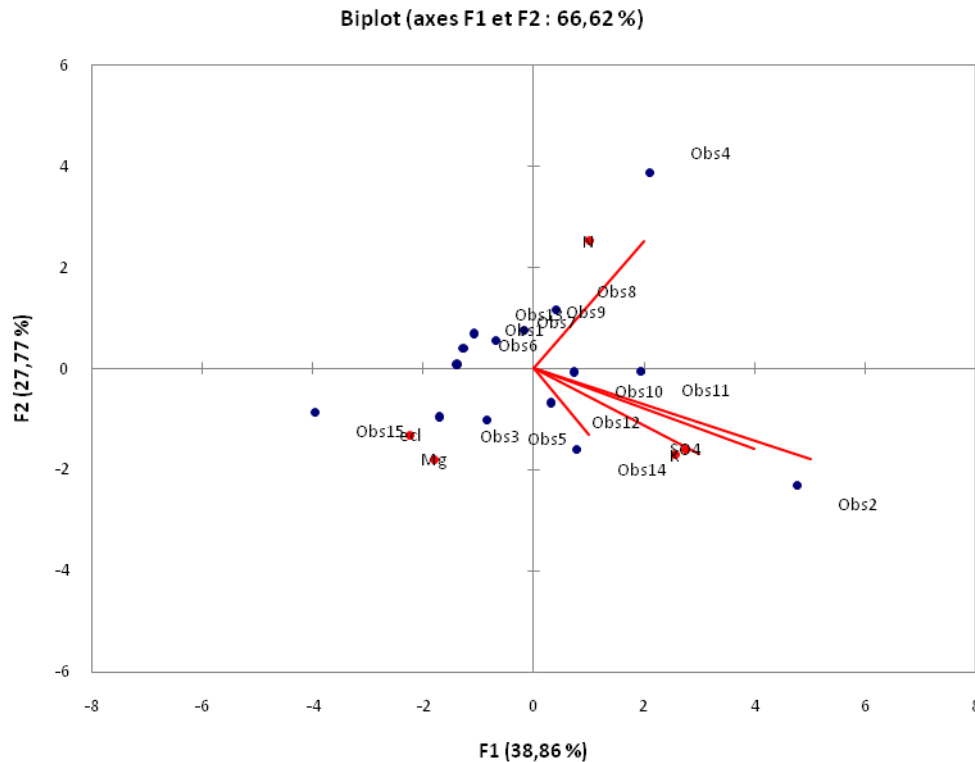
Figure 5. Locality and variables distribution on the axis system F1xF2

Different locations shown in F1xF2 axis system (Figure 5), explain that the component 1 corresponds to those with the same content and potassium sulphate on the one hand and those of the same magnesium content and the rate of survival, while the component 2 corresponds to those having the high content of nitrogen in their floors. We also observe the correlation circles illustrate between the analyzed variables and localities. These results confirm those of CAH (Figure: 4) where different classes are formed, based on hatching rate and the chemical composition of soils of different localities. Soils very close to the center of the marker locations will possess very low concentrations of the different variables.

The climatic reheating entails the ground acidification which is not convenient to the survival of insects. The antlion larvae concentrate their pitfall traps under trees shielded from this phenomenon. The leaves which fall of these trees would reduce this sourness and would serve as food for their preys. This would explain the adaptation of these insects in these dry circles and explained the rough climatic conditions.

IV. CONCLUSION

At the end of this study, three species of antlions were identified. It is respectively *H. tristicis*, *M. obscurus* and *M. quinquemaculatus*. Their distribution was studied at local and regional level. Under the trees, the gradient distribution funnels respect the tree trunk to the periphery, while under the trees without flowers, this density decreases from the trunk center to the periphery. At the regional level, *H. tristis* is a species present in the two agro-ecological zones; *H. tristicis* is more concentrated in the Sudano-Sahelian zone while *M. quinquemaculatus* is confined to the area of high Guinean savannah. The parameters that influence the survival rate of larvae collected in different localities were identified. These are: magnesium, potassium, sulfate, nitrogens, low temperature and rainfall.

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Development of starter culture with dried Malabar tamarind (*Garcinia gummi-gutta*) fruits for buffalo milk curd

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Abstract- Nowadays typical starter cultures are very expensive and because of this reason people tend to use a small amount of curd from a previous batch as the starter culture. But doing this continuously causes quality reduction of curds. When consecutive curds are used as starter cultures, wild cultures can be prominent because of dilution of Lactic Acid Bacterial concentration. Therefore, major objective of this study was to prepare a freeze dried starter culture using dried Malabar tamarind (*Garcinia gummi-gutta*) fruits to avoid such situations. In addition, there was a necessity to check whether there is a difference between curds prepared with commercial culture and newly developed culture regarding consumer preference for sensory attributes. And also it was important to know the microbial composition of the end product. From the first sensory evaluation, the best inoculation rate of Malabar tamarind pulp was chosen and the curd made from it was compared with curd made from commercial starter culture in the second sensory evaluation. For chemical analysis, pH and titratable acidity were determined for three successive days. Microbial identification procedures were used in addition to the determination of total plate count (TPC), yeasts & molds counts and coliform counts. Data were appropriately analyzed statistically. Consumer preference was higher for the curd made from highest concentration of Malabar tamarind pulp; therefore it was compared with the curd made from the commercial starter culture. Three species of *Leuconostoc* and four species of *Candida* were identified in the end product made from 5% of Malabar tamarind pulp inoculated starter culture. Therefore, results suggested that the Malabar tamarind can be used to prepare a starter culture successfully which can be freeze dried for further usage.

Index Terms- curd, sensory evaluation, Malabar tamarind, *Leuconostoc*

I. INTRODUCTION

A starter culture can be defined as a microbial preparation of a large number of cells of at least one microorganism that can be added in to a raw material to produce a fermented food by accelerating and steering its fermentation process. Starter cultures have a multifunctional role in dairy fermentations. The production of lactic acid by fermenting lactose is the major role. Lactose is responsible to develop the characteristic texture and overall flavor of the fermented milk products, and enhances preservation [1]. Curd is a popular dairy product which possesses a great history that is prepared by inoculating a starter culture for milk fermentation as many other fermented dairy products.

Mainly in South Asian countries like India, Sri Lanka, Pakistan and Nepal curd is an ordinarily consumed food usually as a dessert. India remains at the top in buffalo curd production followed by Pakistan. On the other hand, milk obtained from dairy animals such as goat, sheep and mare is used for curd preparation in Russia. Customarily Westerners do not prefer consumption of curd apart from Italians.

It is considered as a nutritious food which contains adequate amounts of proteins, carbohydrates, vitamins and minerals plus ample amount of fat for the wellbeing of life. Additionally, curd itself contains less cholesterol and high amount of calories. Nutritional composition, specially the amounts of fat can vary slightly with the buffalo breed that is used to obtain the milk. Curd is reflected to be more nutritious than milk as it is highly digestible while calcium and phosphorous become more bio-available in addition to the enhanced probiotic effect of Lactic Acid Bacteria (LAB).

Lactose fermentation is the technique of curd preparation which is performed by LAB. In other words, this is known as sour milk preparation or milk acidification which has become easy to be prepared by adding a small amount of inoculum. An alternative approach to attain milk acidification is the addition of acidogens, such as citric acid, hydrochloric acid, propionic anhydride or lactide [2]. Lactose fermentation of food is the widely accepted method of preservation, which may also impart desirable sensory & nutritional properties to the fermented milk products [3]. Although there are various fermentation methods, very few studies have carried out for buffalo milk curd as it is not a popular international dairy product rather a mouth feeling dessert consumed in parish level. Milk can be fermented solely by acid provision or adding acid together with Lactic Acid Bacterial strains. Basically, *Streptococcus lactis, Streptococcus diacetylactis*, *Streptococcus cremoris, Lactobacillus bulgaricus* and *Streptococcus thermophillus* are the strains using in commercial starter cultures for fermented dairy products according to the standards established by Sri Lanka Standard Institution (SLSI) [4]. Mostly quality curds are prepared by rural community as they maintain a traditional mother culture.

Apart from these cultures, Malabar tamarind has been using in southern Sri Lanka as a milk fermenter since ancient years while tamarind (*Tamarindus indica*) is used in Mexico as North American countries do not have specific starter cultures for curd as it is not a widespread dairy product in western republics. *Garcinia gummi-gutta* trees which belong to Family Guttiferae, grown in Southeast Asia, bear fruits which contains 30% acid. Objective of this study was to develop a starter culture for curd using *Garcinia gummi-gutta* in a cost effective way and to determine the microbial composition of the end product made using the newly developed starter culture.

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II. MATERIALS & METHODS

Preparation of curd

Curd preparation is an easy process that has been used since ancient times which has passed forward generation by generation. It can be implemented in house hold level very easily alike commercial and large scale manufacturing. A quality curd can be prepared by involvement of few steps that a majority of people learnt through their experience or as they were taught by cohorts. Ordinarily full fat milk is used for curd making which adds natural quality to its texture being a high fat food. The production steps are illustrated in the Figure 01 as stated in Dassana (2014) [5].

Boil the milk & heat it until about 20% of water evaporates

↓

Cool the heated milk little above the room temperature (about 40 ^{0}C)

↓

Add the inoculum

↓

Mix properly

↓

Pour into individual containers (clay pots)

↓

Keep in room temperature to set (at 25 $^\circ$C – 35 $^\circ$C)
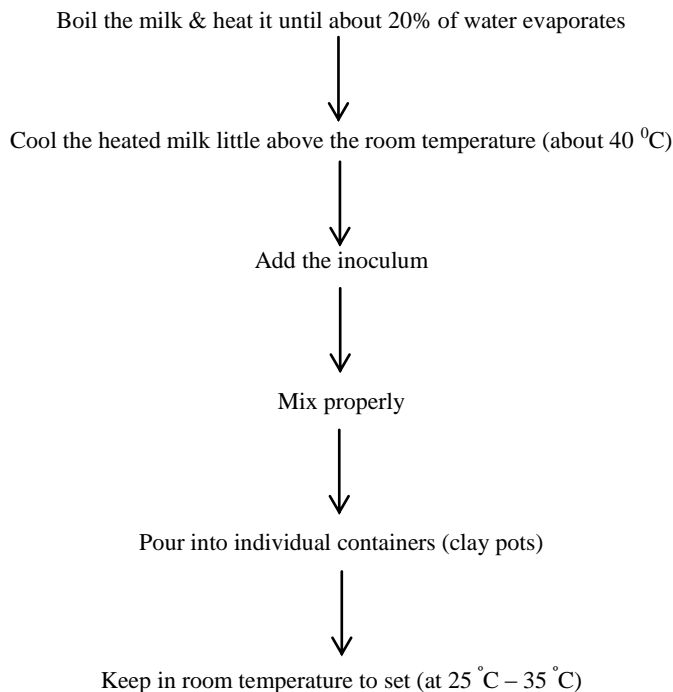
Figure 01: Production process of curd.

Development of starter culture with Malabar tamarind

A pulp of Malabar tamarind was prepared by grinding 100 g of dried fruits with 200 mL of distilled water. The dried fruits were soaked in water for several days prior to the pulp preparation. A small quantity of Malabar tamarind pulp was added into boiled milk to form mother culture which causes milk curdling with higher amount of syneresis. A small quantity of that was used as the starter culture for the next curd series. Likewise, four consecutive curd series were prepared as intermediate cultures until to a point where the syneresis stops. Therefore, the 4th stage was identified as the starter culture which was freeze dried and the curds in 5th stage were used for sensory evaluations and other testing purposes, assuming that if it is in a better condition that provides evidence for goodness of its starter culture.

Sensory evaluations for the product

Two sensory evaluations were carried out appropriately for thirty panelists. They were instructed to rinse the palate with water and to wait at least thirty seconds between samples. The first sensory evaluation was done to find out the best curd made using the starter cultures which were prepared from three concentrations of Malabar tamarind pulp as 0.5%, 2.5% and 5%. The pulp was inoculated into boiled milk & the cultures were prepared as stated above. Odour, texture, sourness, after-taste and overall acceptability were ranked according to the preference. Best curd, out of three products was selected from first sensory and that was compared with the commercial product in the second sensory evaluation. The sensory attributes of curd were evaluated by consuming curd without sugar and later three spoonful of sugar was provided to check whether overall acceptability will be changed.

Chemical parameters

Analysis of titratable acidity

The titratable acidity of the products was determined according to the guidelines provided in the SLSI 824: part 2: 1988 [4].

pH analysis

The pH of the products was determined according to the guidelines provided in the SLSI 824: part 2: 1988 [4] by 510 cyber scan digital pH meter.

Identification of microorganisms

Identification of microorganisms could be done up to the Genera level. Microorganisms present in the product were determined by inoculating samples onto different media. Loop full of curd samples were inoculated onto Sabouraud agar (Oxoid Ltd., Hampshire, UK) to isolate fungi which were incubated at 37 $^{\circ}$C. The samples spread on MRS agar (Oxoid Ltd., Hampshire, UK) incubated anaerobically for 48 h at 35°C in order to isolate mesophilic Lactobacilli and *Leuconostoc* which is a method previously discussed by Aly Savadogo, (2004) [6]. Samples spread on Rogosa agar (Oxoid Ltd., Hampshire, UK) were incubated anaerobically for 48 h at 35°C for the isolation of lactobacilli as described by De Man J. C., (1960) [7]. Firstly, LAB was grown in MRS broth (Oxoid Ltd., Hampshire, UK) and small amount of it was inoculated onto MRS agar medium aseptically. Colonies which grew in different media were

identified by different colony morphologies; whereas Gram's staining was done to observe the cell morphology. Isolated colonies were sub cultured by streaking on agar plates in order to obtain pure cultures. Pure cultures were initially Gram's stained. For Gram-positive cocci, catalase test was performed to differentiate *Staphylococcus* from *Streptococcus*. The presence of *Staphylococcus* is usually determined by addition of a drop of 3% H_2O_2 to a heavy bacterial suspension and observation of effervescence due to the release of Oxygen. *Streptococcus* and *Leuconostoc* were differentiated by gas production in MRS broth with inverted Durham tubes. Growth in 6.5% NaCl was observed, hemolysis test was performed for the isolated colonies of *Leuconostoc* for further confirmation [8]. For *Candida* species, blood serum test was performed to check the germ tube to confirm the presence of *Candida albicans* which is known as a causative agent for opportunistic human infection.

Bacteriological parameters

Total yeast & mold count

Plate counts for yeasts and molds were taken separately by performing spread plate method on acidified potato dextrose agar. Counts were taken by STUART SC6PLUS colony counter (Bibby Scientific Limited, Staffordshire, ST15 OSA, UK) according to the method previously described by Food and Drug Administration, (2001) [9].

Total Plate Count (TPC)

Total plate counts were taken by inoculating 1 mL of diluted samples on solid total plate count agar by spread plate method as described by Munsch-Alatossava, (2007) [10]. Colonies were counted by STUART SC6PLUS colony counter (Bibby Scientific Limited, Staffordshire, ST15 OSA, UK).

Number of coliforms

Three-tube method was performed with MacConkey agar as discussed in Harrigen, W. F., (1998) [11].

Statistical analysis

Statistical analysis was done basically by Minitab 15.0 statistical software at 95% confidence level & MS Excel 2010. Data which were obtained from the first sensory evaluation were analyzed by Friedman non parametric test for ranking. Data obtained from the second sensory evaluation were analyzed by Mann-Whitney Test and chi – square goodness of fit test. Data from the Chemical Analysis were analyzed by Tukey's Comparison Test for mean comparison.

III. RESULTS & DISCUSSION

The ranks given by the panelists for the products are summarized in the Figure 02.
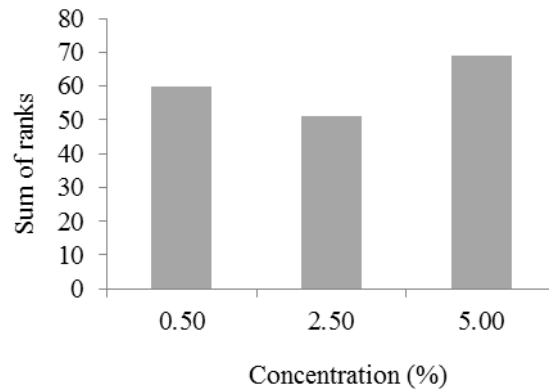
Figure 02: Sum of ranks of overall acceptability in the first sensory evaluation

There were no difference (p>0.05) observed for texture, sourness, after-taste and overall acceptability among the products made of three inoculation levels of Malabar tamarind (0.5%, 2.5% and 5.0%). However, the odour was varied significantly among the products (p<0.05). Highest sum of ranks were obtained for the curd made from the highest concentration of Malabar tamarind pulp (5%) inoculated starter culture. However, the values were not significant (p>0.05).

Based on the verbal communications done with the panelists, it was found that when consume with sugar, the curd made from highest concentration of Malabar tamarind pulp inoculated starter culture, gave a better taste. Therefore, it was compared with a curd made from commercial starter culture in the second sensory evaluation. Mean scores for the sensory attributes tested in newly developed product using 5% Malabar tamarind pulp inoculated starter culture and curd made using commercial starter culture were summarized in the Table 01.

Table 01: Mean score for tasting panelists for sensory properties of curd.

Criteria	Curd made from commercial starter culture	Curd made from newly developed starter culture
Odor	3.43	3.90
Texture	4.00	3.67
Sourness	2.97	3.23
After taste	3.70	3.70
Overall acceptability	3.73	3.83

Values are presented as mean values, n=30, 1-5 hedonic scale (1=Dislike very much, 2=Dislike, 3=Neither like nor dislike, 4=Like, 5=Like very much)

The preference of the panelists for the curds made with the commercial starter culture and 5% Malabar tamarind pulp inoculated starter culture is displayed in the Figure 03.
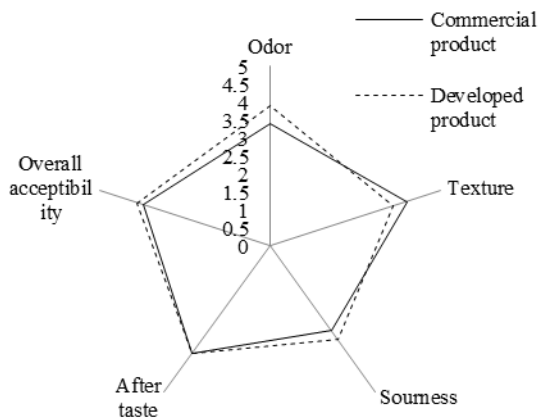
Figure 03: Mean scores for sensory properties of curds

Consumer preference (p>0.05) was not different for two curds made from newly developed starter culture and curd made from commercial starter culture when they were consumed with sugar. Furthermore, 96.67% people consider cost when buying curds. Only 3.45% people do not like to buy curds made from newly developed starter culture even its price is 33% less than the commercial product.

pH and titratable acidity were measured in triplicates in 3 consecutive days (Table 02).

Table 02: pH and titratable acidity of curds.

	pH			Titratable Acidity		
	1st day	2nd day	3rd day	1st day	2nd day	3rd day
CSCFC	4.47± 0.01	4.07± 0.010	3.72±0 .015	1.19±0 .035	1.30±0 .0485	1.65± 0.041
MTFC	3.98± 0.0057	4.33± 0.0173	4.26±0 .036	1.47± 0.1124	1.16± 0.1003	1.07± 0.0271

Note: CSCFC = Commercial Starter Culture Fermented Curd; MTFC = Malabar Tamarind Fermented Curd

pH was quite higher in the curd made from commercial starter culture rather than the curd made from newly developed starter culture; however, But not significant (p>0.05). pH fulfilled the SLSI standards which should be <4.5 in curd. There are no standards established for titratable acidity of curd. When time passes, pH of the curds made from newly developed starter culture was gradually decreased and again increased, probably due to the treatment applied, but still within the limits established by SLSI [4]. pH of curds made from commercial starter cultures was drastically decreased.

When it comes to microbial composition, microorganisms cultured in MRS broth were stained. Gram+ bacilli were clearly shown under light microscope. Catalase test, Endospore staining

and motility test which are the confirmation tests for lactobacilli could not perform because the culture was not pure. Therefore, loop full of sample and broth were inoculated into separate solid MRS agar media and Rugosa agar media; however, Gram + bacilli were not grown. When little amount of diluted sample was spread on solid MRS agar and incubated for 24 hours at 37 ^{0}C three colonies were identified with different morphologies. On the spread plate of Sabouraud agar, four different colonies were there. Those were streaked to obtain pure cultures on the same media and incubate under same conditions as previous. Those were then Gram stained and observed under light microscope. Two Gram + cocci and yeast spp. could be isolated on MRS agar and one Gram + cocci, three yeasts spp. were isolated on Sabouraud agar plates. Gram + cocci could be *Staphylococci*, *Streptocooci* or *Leuconostoc* spp. which appear in same morphology in Gram staining. To identify whether *Staphylococcus* was present catalase test was performed which possibly give positive results for *Staphylococcus*. All three species gave negative results for the catalase test. To differentiate between *Streptococcus* and *Leuconostoc* genera, gas production in MRS broth was observed. One species showed gas production in 24 hours of incubation, the other after 48 hours of incubation and the next when the lid was opened in the culture tubes after 72 hours of incubation, all at 37 ^{0}C. Then as confirmation tests growth in 6.5% NaCl broth was observed. As it was *Leuconostoc* no growth could be seen. When streaked on blood agar, *Leuconostoc* commonly shows α hemolysis or no hemolysis. Two species showed α-hemolysis and the other didn't show any hemolysis. Yeasts grown on both plates possess whitish, round colonies which were more or less same to colony morphology of *Candida*. None of the species did not show growth of germ tube in blood serum which proved that the *Candida albicans* were absent. TPC, yeast and mold counts and Coliform counts obtained for two products are summarized in the Table 03.

Table 03: Total plate counts, yeast and mold counts and Coliform counts for two curds.

Factor	Curd made from commercial starter culture	Curd made from newly developed starter culture
(TPC) $10^5 \times$ CFU/g	1.95 ± 0.16	4.92 ± 0.21
Yeasts & molds	NC	NC
Coliforms	Nil	Nil

Note: NC – Not considerable, Values are presented as mean ± SD.

TPC for curd made from newly developed starter culture was considerably higher than the curd made from commercial starter culture. Normally only the plates that possess colonies around 30 – 300 were counted. Yeasts colonies & molds were less than 30 in all plates, therefore not counted. Furthermore, culture tubes which contained MacConkey agar didn't show any positive results therefore the Brilliant Green Bile broth test was not performed. Molds should be < 1 per gram, yeasts should be <

1000 per gram and Coliforms should be absent in a 1 gram portion [4].

IV. CONCLUSION

The results of this study reveal that the *Garcinia gummi-gutta* can be used to make a curd starter culture successfully for milk fermentation as an alternative to expensive commercial starter cultures. Moreover, results showed that the sensory attributes of both curds: curds made using newly developed starter culture and commercial starter culture, are more or less the same in sensory properties. Therefore, it can be concluded that the Malabar tamarind pulp inoculated starter culture can be used to produce a curd with the same sensory qualities comparatively to that of the commercial curd. Furthermore, the consumer preferences observed for both curds were not different to each other with or without sugar. In addition, it is concluded that the microbial composition of the curd made with Malabar tamarind pulp inoculated starter culture contains sufficient amounts of LAB such as *Leuconostoc* for lactic acid fermentation.

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Performance of Summer Tomato in Response to Maleic Hydrazide

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Abstract- The experiment was conducted at the Horticulture farm, Sher-e-Bangla Agricultural University, Dhaka, Bangladesh, during the period from May 2012 to August 2012. Summer tomato seedlings were sprayed with four levels of maleic hydrazide viz. 0, 20, 40 and 60 ppm were arranged in Randomized Complete Block Design with three replications. Plant growth retardant- maleic hydrazide @ 60 ppm decrease plant height, increases number of leaves, branch, flowers (33%) and fruits (35%) plant^{-1}. It also increases individual fruit weight and yield of tomato ha^{-1} about 32% and 57%, respectively but it did not affect the fruit length and diameter.

Index Terms- Gibberellin biosynthesis, morphological features, plant growth retardant

I. INTRODUCTION

Tomato (*Lycopersicon esculentum*) is the most important and popular vegetable among the fruit crops in Bangladesh. It is receiving increased attention of the growers and consumers in Bangladesh. Winter season is the most suitable time for growing tomato in Bangladesh. When tomatoes are grown during summer in tropical countries to a high temperature and high humidity which reduces stem diameter, pollination, fruit set and, it also causes stem elongation and less tolerant to environmental stress. Plant growth retardants are synthetic compounds which inhibit the plant growth by reducing cell elongation and rate of cell division in plant without changing developmental patterns and obvious phytotoxicity (Davis and Curry, 1991; Rademacher, 2000). It accelerate and uniform the fruits ripening, can promote the defoliation and promote the abscission of fruits, so allowing the mechanical harvesting to be made more efficiently, reducing the losses on varieties which have a tendency to shatter and improving the quality of the obtained products (Neamțu and Irimie, 1991). Maleic hydrazide is a wide spectrum growth retardant that shows a response over many species and the treated plants typically have shorter internodes and thicker green leaves. In Bangladesh, use of plant growth retardant is not a common practice. Therefore, the study was undertaken in order to know the impact of maleic hydrazide on tomato production during summer season.

II. MATERIALS AND METHOD

The experiment was conducted at the Horticulture Farm of Sher-e-Bangla Agricultural University, Dhaka-1207, Bangladesh during May 2012 to August 2012. The location of the experimental site was at 24.09° N latitude and 90.26°E longitude with an elevation of 8.20 meter from sea level. Soil of the experimental field was silty loam in texture under the Agro-Ecological Zone of Madhupur tract (AEZ No. 28). The variety of summer tomato, BARI hybrid tomato - 3 was used. Four levels of maleic hydrazide viz. 0, 20, 40 and 60 ppm as represented by MH_0, MH_1, MH_2 and MH_3, respectively were arranged in Randomized Complete Block Design with three replications. The total area of the experimental plot was divided into three equal blocks where each plot was 1.8 m × 2 m in size. Fertilizers were applied at 80, 25, 50 and 10000 kg ha^{-1} for N, P, K and cowdung, respectively (FRG, 2012). Seedlings about 30 days aged were transplanted to the experimental field on 10th June, 2012 at a spacing of 60 cm × 40 cm. Intercultural operations were furnished for proper growth and development of the crop. The required amount of maleic hydrazide was taken using electronic balance and a stock solution was prepared by dissolving in 1 ml ethanol. Then the stock solution was diluted in distilled water to prepare the working solutions, just before spraying. The solution was directly sprayed on the roots of plant before transplanting and sprayed entire plants three times after transplanting in the main field. Spraying was done using hand sprayer in the early morning to avoid rapid drying-off of the spray solution. Collected data includes plant height, number of leaves, branch, flower clusters, flowers, fruit clusters, fruits and also length, diameter, individual weight and, yield of fruits were analyzed and mean values of all the parameters were adjudged by Duncan's Multiple Range Test (DMRT) at 5% level of probability.

III. RESULTS AND DISCUSSION

III.1. Plant height

Different concentrations of maleic hydrazide significantly influence the plant height of tomato. Plant height was increased gradually with the lower concentrations of maleic hydrazide and the tallest plant was found in control compared with the growth retardant treated plants (Table 1). The inhibitory effect on plant height might be due to the inhibition of cell division and reduction in cell expansion. Plant growth retardants inhibit the conversion of geranyl pyrophosphate to copalyl pyrophosphate of gibberellins biosynthesis which is responsible for shoot elongation and thus maleic hydrazide reduces plant height. This result is compatible with other findings (Singh 2004, Mansuroglu et al. 2009, Caprita and Caprita 2005) where they reported that plant growth retardants inhibit gibberellins biosynthesis, stem and shoot elongation without irreversible blocking of metabolic and developmental processes in plants. It was also demonstrated for other growth retardants like: chlorocholine chloride (CCC) on

sunflower (Lovett and Orchard 1981) and 2,3,5 tri-iodobenzoic acid (TIBA), maleic hydrazide (MH) on sorghum (Hatley et al. 1985, Mehetre and Lad 1995).

III.2. Number of leaves and branch plant^{-1}

Plant growth retardant- maleic hydrazide @ 20-60 ppm on summer tomato significantly increases number of leaves and branch over control (Table 1). The mechanism of increasing the number of leaves and branch due to application of maleic hydrazide @ 60 ppm that lead to slowing down of cell division and reduction in cell expansion as well as reduce plant height but partially increases the number of branches ultimately increases the leaf number. Whipker and McCall (2000) and Hanchinamath (2005) reported that foliar application of mepiquat chloride (1000 ppm) and lihocin (1000 ppm) significantly decreased plant height and increased the number of leaves in cluster bean.

III.3. Number of flowers and fruits plant^{-1}

Plant growth retardant influenced significantly on number of flowers and fruits plant^{-1}. Number of flowers and fruits plant^{-1} was increased about 33% and 35%, respectively when maleic hydrazide applied @ 60 ppm compared with the control (Table 1).

Table 1. Effect of maleic hydrazide on plant height, number of leaves, branch, flowers and fruits plant^{-1}

Treatments	Plant height (cm)	Number of leaves plant^{-1}	Number of branch plant^{-1}	Number of flowers plant^{-1}	Number of fruits plant^{-1}
MH_0	78.98 a	19.43 c	3.083 c	14.60 c	10.68 d
MH_1	73.77 b	21.92 b	3.47 b	15.53 c	12.95 c
MH_2	69.20 c	22.27 b	3.77 b	19.08 b	15.12 b
MH_3	66.17 d	28.43 a	4.72 a	21.92 a	16.50 a
LSD $_{(0.05)}$	2.51	2.42	0.36	1.58	1.30
LSD $_{(0.01)}$	3.48	3.36	0.50	2.20	1.80
CV%	2.81	8.49	7.79	7.18	7.59

In a column, means followed by same letter (s) do not differ significantly at 5% level of probability, MH_0= Control, MH_1= 20 ppm, MH_2= 40 ppm and MH_3= 60 ppm

III.4. Fruit length and diameter

Maleic hydrazide insignificantly affects the fruit length and fruit diameter (Table 2) of summer tomato.

III.5. Individual fruit weight and yield of tomato

Individual fruit weight and yield of tomato ha^{-1} significantly increased about 32% and 57%, respectively with 60 ppm concentration of maleic hydrazide compared to the control (Table 2). The regulatory effect of 60 ppm concentration of maleic hydrazide on fruit weight and yield of tomato might be due to the enhancement of vigorous growth and root system of plants, as a result higher mineral absorption may be stimulated in the root zone and this pursue on the growth, fruit weight and yield of tomato. Chetti (1991) reported that growth retardants like cycocel when applied in groundnut (*Arachis hypogaea*) genotypes, significantly increased chlorophyll content compared to the control. Foliar spray of TIBA @ 50-100 ppm, mepiquat chloride @ 500–100 ppm and lihocin @ 500–1000 ppm increased chlorophyll a, b and total chlorophyll in potato.

Table 2. Effect of maleic hydrazide on fruit length, fruit diameter, individual fruit weight and yield of tomato ha^{-1}

Treatments	Fruit length (cm)	Fruit diameter (cm)	Individual fruit weight (g)	Yiled (t ha^{-1})
MH_0	3.07 a	3.01 a	22.10 b	9.85 d
MH_1	3.25 a	3.20 a	23.77 b	12.83 c
MH_2	3.30 a	3.27 a	31.87 a	20.28 b
MH_3	3.33 a	3.37 a	32.50 a	23.20 a
LSD $_{(0.05)}$	0.32	0.37	2.23	2.19
LSD $_{(0.01)}$	0.44	0.52	3.10	3.05
CV%	7.37	8.59	6.54	10.71

In a column, means followed by same letter (s) do not differ significantly at 5% level of probability, MH_0= Control, MH_1= 20 ppm, MH_2= 40 ppm and MH_3= 60 ppm

IV. CONCLUSION

Growth retardant maleic hydrazide @ 60 ppm concentration was found adjuvant for regulating the growth of tomato plant during summer season. The growth retardant might have potential for adapting summer tomato seedlings to high temperature and high relative humidity at field conditions.

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Effects of Time on Water Uptake and Germination Characteristics of Scarified and Non Scarified Castor bean (Ricinus communis L.) Seeds.

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Abstract- A study was conducted at the University of Agriculture, Makurdi, to determine water uptake at 6 and 12 hour intervals, and germination characteristics of scarified and non scarified seeds of castor bean accessions in 2008 and 2009. Two hundred seeds were selected from each accession: one hundred seeds were scarified mechanically by caruncle removal using knife (seed lot 1), one hundred seeds were not scarified (seed lot 2). Each seed lot was immersed in 10ml of distilled water contained in 9cm-diameter petridish. Thereafter, seed lots were weighed at every 6 h starting from 0 to 24 h, and at every 12 h up to 108 h. Water uptake in scarified and non scarified seeds was determined by seed mass increase, and expressed as percentage increase in mass of seeds. Germination test of two hundred seeds of each accession was done by planting seeds 2cm deep in moist sandy loam soil contained in plastic containers to determine germination characteristics .Results showed that the weight and percentage weight increase of seeds at 6 and 12 hour intervals were significantly higher in scarified seeds than in non scarified seeds. Scarified seeds attained maximum saturation at 60 h and non scarified seeds at 84 h. Scarified and non scarified seeds differed significantly in water uptake and germination characteristics at 6 and 12 hour intervals, being higher in scarified seeds. Mechanical scarification improved water uptake, germination characteristics and the planting value of seeds.

Index Terms- water uptake, germination characteristics, scarified seeds, non Scarified seeds, castor bean.

I. INTRODUCTION

Castor bean *(Ricinus communis L.)* is an industrial crop grown for its economic seeds exploited mainly for producing oil (Onwueme and Sinha, 2001), for the manufacture of cosmetics, plastics, resins, dyes, paints, soaps, disinfectants ,lubricants, greases, hydraulic fluids, inks etc. One major limitation to its large scale production has been poor water uptake due to partial impermeability of the seed coat, manifested in slow, erratic and low germination of freshly harvested seeds. The problem of poor water uptake and germination in castor bean require systematic studies to ensure better germination characteristics and to improve the planting value of seed.

The seed testa and caruncle are reported to be the major cause of poor water uptake and germination in castor bean seeds (Lago et al., 2003). Several methods/techniques to break seed dormancy have been developed over the years depending on the seed type(Li,2000).Dormancy-breaking treatments for castor bean according to Baskin and Baskin(2000b)include:1-seeds soaked in hot water and allowed to cool at room temperature for 24h;2-mechanical scarification;3-mechanical scarification +soaking in cold water for 24h;4-seeds soaked in 15% of potassium nitrate for 24-48h;5-seeds soaked in gibberellic acid at 500-1000mg/L for 24h;6-seeds soaked in cytokinins at 100-200mg/L for 24h;7-high pressure treatments;8-ethylene bubbled into seeds for 12-24h etc . Removal of the caruncle from seeds improves water uptake and can increase the proportion of seeds germinating (Baskin and Baskin, 2005); it can also reduce fungal and bacteria growth during germination tests (Williams and Kittock, 2000).

Water uptake initiates the activation and synthesis of enzymes which function in the breakdown of storage material into simpler compounds such as sugars, which are utilized by the embryo for germination (Carneiro, 2004). According to Carneiro (2004), tropical seeds with hard seed coats have delayed and non uniform germination, causing 40% loss of genetic resources. Although the seed germination biology of many plant species has been investigated (Nikolaeva and Rasumova, 1985), however, there is paucity of information concerning water uptake and germination characteristics of castor bean seed. The objective of this study, therefore, was to determine water uptake and germination characteristics of scarified and non scarified castor bean seeds, aimed at improving the planting value of castor bean seed and at providing basic scientific knowledge.

II. MATERIALS AND METHODS

Three castor bean seeds were sown per hill on the ridge and spaced 90cmx50cm with a population density of 22,222 plants per hectare. Thinning to one seedling per stand was done three weeks after sowing(WAS).The experiment was laid out in Randomized Complete Block Design with three replications. The gross plot size was 8m x 10m (80m^2) with net plot size of 7.2m^2. The plots were weeded manually twice, before and after flowering at 30 and 60 days intervals respectively. Basal application of NPK fertilizer (15:15:15) at the rate of 100kg/ha was done at 40 days after sowing. The plants were sprayed fortnightly with Vetox 85 insecticide at the rate of 1.1kg chemical per 225 litres of water starting from 9WAS to minimize insect damage by weevils, leaf rollers, grass hoppers and aphids. The plants were harvested at physiological maturity(28WAS) for water uptake and germination experiments.

Scarified and non scarified seeds of four castor bean accessions (LAF-4, LAF-11, AKW-5, AKW-7) were used as treatments. The water uptake experiment was laid out in Completely Randomized Design with three replications. Two hundred seeds were selected from each accession: 100 seeds were not scarified (seed lot 1), 100 seeds were scarified (seed lot 2). Scarification was done mechanically with knife by removal of caruncle and seed coat at caruncle. Each seed lot was immersed in 10ml of distilled water contained in 9cm-diameter Petri dish. The seeds were 7% moisture content before immersion. The seed lots were weighed at every 6 h starting from 0 to 24 h and thereafter, at every 12h up to 108 h. Water uptake in scarified and non scarified seeds was determined by seed mass increase.

Data recorded were calculated according to Brasil (1992) and expressed as percentage increase in mass of seeds as follows:

$$\% \ Ws = [(Wi – Wd)/Wd] \ x \ 100$$

Ws = increase in mass of seeds.
Wi = mass of seeds after a given interval of water uptake
Wd = seed mass at t_o.

Two hundred non scarified seeds (seed lot 3) and two hundred scarified seeds (seed lot 4) from each castor bean accession were used to determine germination characteristics at 6 and 12 hour intervals of water uptake. The experiment was laid out in Completely Randomized Design with 3 replications. In-sand method of seed germination was adopted. The seed lots were planted 2cm deep in a uniform layer of moist sandy loam soil placed in plastic containers. Data were recorded ten (10) days after planting on: number of germinated seeds, length of radicle and plumule, percentage germination and germination speed index .

Data collected were analysed statistically using the Analysis of Variance Procedure described by Singh and Chaudhary,1979;Steel and Torrie,1980.Treatment effects were compared by the Fisher's Least Significant Difference (F-LSD) Procedure (Little and Hill,1979).The degree of precision of the experiments was estimated using coefficient of variability(Singh and Chaudhary,1979).GENSTAT Release,Version 2009 was used for analysis.

III. RESULTS

Results on weight and percentage weight increase of non scarified and scarified castor bean seeds due to water uptake at 6 and 12 hour intervals are presented in Table 1. Time of water uptake exhibited significant difference in weight and percentage weight increase of non scarified and scarified seeds. Water uptake at 6 hour intervals showed a steady increase in weight and percentage weight increase of seeds up to 24 h. At 12 hour intervals, the increase in weight and percentage weight of non scarified seeds was maximum at 84 h while it was maximum at 60 h for scarified seeds. Maximum imbibition or saturation point was attained at 84 h for non scarified seeds, and at 60 h for scarified seeds. The weight and percentage weight increase of seeds due to water uptake at 6 and 12 hour intervals was significantly higher in scarified seeds than in non scarified seeds.

The interactions between seed weight of castor bean accessions and time of water uptake at 6 and 12 hour intervals was significant (Table 2). At 6 hour interval, the interaction of 24 h and scarified seeds of LAF-11 and AKW-7 (17.70g and 17.10g respectively) produced significantly higher seed weights compared to other seed weight and time of water uptake interactions. At 12 hour intervals, 84 h and scarified seed weight of LAF-11 interaction (23.00g) was also significantly higher than other interactions.

Results on germination characteristics of non scarified and scarified castor bean seeds are summarized in Table 3. Scarified seeds were significantly higher in number of germinated seeds, percentage germination, length of radicle and plumule, and germination speed index (GSI), compared to non scarified seeds . Although, AKW-7 had tendency to produce longer radicle and plumule .

Table 4 shows effects of time of water uptake on germination characteristics of non scarified and scarified seeds of castor bean at 6 and 12 hour intervals.

Time of water uptake exhibited significant difference on germination characteristics of non scarified and scarified castor bean seeds. Germination characteristics were significantly higher in scarified than in non scarified seeds. There was an abrupt decline in values of germination characteristics(0.00) at 60h of water uptake till 84 h in scarified seeds.

IV. DISCUSSION

The increase in weight of scarified castor bean seeds at 6 and 12 hour intervals may be attributed to mechanical scarification of the seed coat and to proportional increase in the quantity of water uptake per unit time. The weight increase of non scarified seeds was low and negligible compared to that of scarified seeds indicating partial seed coat impermeability to water (Table 1). Water uptake of non scarified castor bean seeds was low leading to poor (low) germination characteristics while water uptake of scarified castor bean seeds produced better (higher) germination characteristics. Eira et al (1993) observed that water soaking of seeds of *Enterolobium contortisiliquum* for 24 hours was not effective to overcome seed dormancy. Toogood (1993) reported that mechanical scarification followed by water soaking were required for seeds of Goldenrain tree (Keelreuteria paniculata) to germinate. Mechanical scarification was also found to break dormancy of Redbud (Vercis california) seeds.

Maximum water uptake (saturation point) was attained earlier in scarified seeds (at 60 h after soaking), and later in non scarified seeds (at 84 h after soaking) due to partial seed coat impermeability to water.

The germination characteristics of scarified castor bean seeds in Table 3 recorded higher values and differed significantly from that of non scarified castor bean seeds, which could be attributed to mechanical scarification of the seed coat, increased water uptake and enzyme activation, and rapid breakdown of storage materials, which initiated early emergence of radicle and plumule. Number of germinated seeds, length of radicle, length of plumule, germination percentage and germination speed index were negligible in non scarified castor bean seeds than in scarified seeds (Table 3) indicating mechanical restraint by the coat of non scarified seeds.

Mechanical scarification of the seed coat is often used to overcome mechanical barrier in seeds with hard coat (Baskin and Baskin, 1998).

Table 4 shows that the state of germination characteristics is proportional to the quantity of water uptake per time interval and the magnitude of enzyme activation. Thus, the lower the water uptake, the lower the values of germination characteristics and enzyme activation.

V. CONCLUSION

Based on results of this study, it could be concluded that mechanical scarification of the castor bean seed coat facilitated water uptake, triggered rapid enzyme activation, produced better germination characteristics and improved the planting value of castor bean seed.

Table 1. Weight and Percentage Weight Increase of Non Scarified and Scarified Castor bean Seeds due to Water Uptake at 6 and 12 Hour Intervals in 2008 and 2009 (Combined Data).

6 hour intervals

time (Hours)	non scarified seeds			scarified seeds		
	weight (g)	weight (%)	increase	weight (g)	weight (%)	increase
0	10.60	0.00		10.50	0.00	
6	12.10	14.15		13.30	26.67	
12	12.60	18.86		14.30	36.19	
18	13.00	22.64		15.40	46.67	
24	13.30	25.47		16.40	56.19	
lsd (0.05)	**0.051**	**0.051**		**0.011**	**0.011**	
cv (%)	**3.6**	**3.6**		**1.1**	**1.1**	

12 hour intervals

time (Hours)	weight (g)	weight (%)	weight (g)	weight (%)
36	14.10	33.02	18.50	76.19
48	14.60	37.73	20.50	95.24
60	15.20	43.39	21.10	100.95
72	15.70	48.11	21.10	100.95
84	16.00	50.94	21.10	100.95
96	16.00	50.94	21.10	100.95
108	16.00	50.94	21.10	100.95
lsd (0.05)	**0.019**	**0.019**	**0.047**	**0.047**
cv (%)	**1.5**	**1.5**	**2.9**	**2.9**

Table 2. Interaction between Seed Weight of Castor bean Accessions and Time of Water Uptake in 2008 and 2009 (Combined Data).

6 hour intervals

Time (hours)	Castor Accession							
	LAF-4		LAF-11		AKW-5		AKW-7	
	NSC	SC	NSC	SC	NSC	SC	NSC	SC
0	10.00	10.00	11.00	11.50	10.60	10.60	11.00	11.00
6	10.80	12.50	13.50	14.40	12.10	13.30	12.70	13.90
12	11.10	13.40	13.80	15.50	12.70	14.40	13.20	15.00
18	11.60	14.60	14.10	16.50	13.00	15.40	13.50	16.00
24	12.20	15.70	14.50	17.70	13.30	16.50	13.80	17.10
LSD (0.05)			**0.04**					
CV (%)			**2.69**					

12 hour intervals

Time (hours)	LAF-4		LAF-11		AKW-5		AKW-7	
36	13.50	17.60	15.10	19.90	1.37	18.60	14.70	19.20
48	14.10	19.50	15.70	22.00	1.45	20.60	15.30	21.40
60	14.70	20.20	16.30	23.00	1.51	21.30	15.90	22.20
72	15.20	20.20	16.80	23.00	1.54	21.30	16.40	22.20
84	15.60	20.20	17.30	23.00	1.57	21.30	16.90	22.20
96	15.60	20.20	17.30	23.00	1.57	21.30	16.90	22.20
108	15.60	20.20	17.30	23.00	1.57	21.30	16.90	22.20
LSD (0.05)			**0.02**					
CV (%)			**0.66**					

Key

NSC	=	non scarified
NC	=	scarified

Table 3. Germination Characteristics of Non Scarified and Scarified Seeds of Castor Beans Accession in 2008 and 2009 (Combined Data).

Germination Characteristics	LAF-4		LAF-11		AKW- 5		AKW-7	
	NS	SC	NS	SC	NS	SC	NS	SC
Number of Germinated seeds	65.00	200.00	65.60	177.8	67.00	188.40	65.40	188.20
Percentage Germination	32.50	100.00	32.80	88.90	35.50	94.20	32.70	94.10
Length of radicle(cm)	3.61	7.87	3.60	7.79	3.59	7.80	3.62	7.88
Length of Plumule(cm)	3.17	6.37	3.16	6.36	3.15	6.35	3.18	6.38
Germination Speed index	25.00	35.17	25.00	35.14	25.00	35.16	25.00	35.18

LSD (0.05)	2.31	1.70	1.90	1.89

Key
NSC   =   non scarified
NC   =   scarified

Table 4. Effects of Time of Water Uptake on Germination Characteristics of non Scarified and Scarified Seeds of Castor bean at 6 and 12 hour intervals in 2008 and 2009 (Combined Data).

6 – hour intervals

Water uptake Germination (hours) (%)			Number of germinated seeds at day 10		Length of radicle (cm)		Length of plumule (cm)		Germination speed index	
	NS	SC	NS	SC	NS	SC	NS	SC	NS	SC
0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6	32.30	94.20	64.60	188.40	3.43	7.90	3.18	6.39	13.23	33.61
12	32.40	94.50	64.80	189.00	3.45	7.93	3.19	6.42	13.27	33.64
18	32.60	94.80	65.20	189.60	3.48	7.96	3.21	6.45	13.33	33.69
24	32.80	100.00	65.60	200.00	3.53	8.34	3.23	7.00	13.35	35.00
LSD(0.05)	0.32		0.32		0.84		0.82		4.44	

12 hour interval

Water uptake (hours)	NS	SC	NS	SC	NS	SC	NS	SC	NS	SC
36	33.00	95.70	66.00	191.40	3.61	8.40	3.27	6.34	13.40	35.00
48	33.30	96.20	66.60	192.40	3.65	8.50	3.30	6.37	13.45	35.45
60	33.50	0.00	67.00	0.00	3.68	0.00	3.33	0.00	13.55	0.00
72	34.00	0.00	68.00	0.00	3.70	0.00	3.37	0.00	13.60	0.00
84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
LSD (0.05)	0.32		0.31		0.83		0.82		4.41	

Key:
 NS =   Non scarified seeds
 SC =   Scarified seeds

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Yield gap analysis through Front Line Demonstration in Wheat crop

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Abstract- Front Line Demonstration is one of the most powerful tools for transfer of technology. The present study was undertaken to find out the yield gap through FLDs on wheat crop. Krishi Vigyan Kendra, JAU, Amreli(Gujarat) conducted 100 demonstration on wheat since 2006-07 to 2009-10 in different seven adopted villages. Prevailing farmers' practices were treated as control for comparison with recommended practices. The average four year data observed that an average yield of demonstrated plot was obtained 43.26 q/ha over control (36.59q/ha) with an additional yield of 6.67 q/ha and the increase average wheat productivity by 18.22 per cent. The average technology gap and index were found to be 6.74 and 13.48 per cent.

Index Terms- Front Line Demonstration; Transfer of Technology; Recommended practices; yield gap;

I. INTRODUCTION

Wheat *(Triticum)* is the second most important winter cereal in India after rice contributing substantially to the national food security by providing more than 50% of the calories to the people who mainly depend on it. In historical perspective India had made spectacular advancement in productivity and sustainability of wheat and wheat based cropping system. The scenario of the past ten years has clearly indicated that the wheat production in the country has soared ahead despite area remaining the same. The wheat programme has released 399 wheat varieties, comprising bread wheat (335),durum (54),dicoccum (5) and triticale (5), for cultivation under different production conditions in all the wheat growing zones. (Anonymous, 2012)

Wheat is an important food crop of Amreli district of Gujarat state. Amreli district has been considered as productively potential region of wheat crop due to assured irrigation facilities and favourable soil and climate conditions. However there is still a wide gap between the productions. Potential and the actual production realized by the farmers. This may be due to partial adoption of recommended package of practices by the wheat growers. Technology gap is a major problem in increasing wheat production in Amreli district of Gujarat State. So far, no systematic effort was made to study the technological gap existing in various components of wheat cultivation.

II. METHODOLOGY

The study was carried out by Krishi Vigyan Kendra, Junagadh Agricultural University, Amreli during *rabi* season from 2006-07 to 2009-10 (four consecutive years) in the farmers field of seven adopted villages.(Detad, Khambhaliya, Sajiyavadar, Hamapur, Gopalgram, Morzar and Bagoya) of Amreli district. During this four year of study, in area of 40 ha was covered with plot size 0.4 ha under Front-line demonstration with active participation of 100 farmers. Before conducting FLDs, a list of farmers was prepared from group meeting and specific skill training was given to the selected farmers regarding package of practices of wheat. The difference between demonstration package and existing farmers practices are given in Table 1.

In general the soils under study were medium black soil in texture with a PH range in between 6.8 to 8.0. The available nitrogen, phosphorous and potassium varied between 100-250, 26-60, 150-300 Kg/ha, respectively. However, the soils were deficient in micro nutrients particularly zinc, magnesium and ferrus.

In demonstration plots, use of quality seeds of improved varieties, timely weeding, need based of pesticides as well as balanced fertilization, irrigation were emphasized and comparison has been made with the existing practices. (Table 1). The necessary step for the selection of site and farmers, lay out of demonstration, etc were followed as suggest by Chaudhary (1999). The tradition practices were maintained in case of local check. The data output were collected from both FLD plots as well as control plot and finally the extension gap, technological gap, technological index along with the benefit-cost ratio were calculated. (Samui *et al.*,2000) as given below.

Technology gap = Potential yield- Demonstration yield
Extension gap = Demonstration yield- Farmers yield

$$\text{Technology index} = \frac{\text{Potential yield} - \text{Demonstration yield}}{\text{Potential yield}}$$

Table 1 : Comparison between demonstration packing and existing practices under wheat crop

Sr. No.	Particulars	Wheat	
		Demonstration	Farmer

			practice
1	Farming situation	Irrigated	Irrigated
2	Variety	GW-496	LOk-1
3	Time of sowing	November	Octo-Nov.
4	Method of sowing	Line sowing	Line sowing
5	Seed treatment	Thirum 3 g/kg of seed	Without seed treatment
6	Seed rate	120-125 kg/ha	130-140 kg/ha
7	Fertilizer dose	NPK (120-60-00)	NPK (100-80-00)
8	Plant protection	Application of mencozeb for control of black spot on seed	Injudicious use of pesticides and fungicides
9	Weed management	Pendimethalin @ 55 ml in 10 lit of water as a pre-emergence followed by Metsulfuron @ 0.8 g in 10 lit of water as a post emergence	No weeding

Table 2 Productivity, technology gap, extension gap and Technology index in Wheat (GW-496) under Front Line Demonstration

Sr. no.	Year	Area (ha)	No. of Farmers	Seed yield (q /ha)			% increase over control	Technology gap (q/ha)	Extension gap (q/ha)	Technology Index (%)	B. C. ratio	
				Potential	Demonstration	Control					Demonstration	Local check
1	2006-07	10	25	50	46.11	38.41	20.04	3.89	7.70	7.78	2.16	1.88
2	2007-08	10	25	50	37.04	31.70	16.85	12.96	5.34	25.92	1.81	1.79
3	2008-09	10	25	50	45.16	37.04	21.92	4.84	8.12	9.68	5.13	3.73
4	2009-10	10	25	50	44.72	39.20	14.08	5.28	5.52	10.56	3.19	2.57
	Average				43.26	36.59	18.22	6.74	6.67	13.48	3.12	2.49

III. RESULT AND DISCUSSION

The data showed in Table 2 that the yield of wheat fluctuated successively over the years in demonstration plot. The maximum yield was reported (46.11 q/ha) during the year 2006-07 and minimum yield was reported in the year 2007-08 (7.04 q/ha) and the average yield of four year was reported 43.26 q/ha over control (36.59 q/ha). During four year of study, the increase in per cent of yield was ranging between 14.08 to 21.92. The results are similar with the findings of Tomer *et al.*(2003), Tiwari and Saxena (2001) and Tiwari *et al.*(2003). The data indicated that the positive effect of Front line demonstration over the existing practices towards increasing the yield of wheat in Amreli district of Gujarat State. B. C. ratio was recorded to be higher under demonstration than the control during all the year.

The extension gap ranging between 5.34 to 8.12 q/ha. During the period of study emphasis the need to educate the farmers through various techniques for adoption of improved agricultural production reverse the trend of wide extension gap.

The technological gap i.e. the difference between potential yield and yield of demonstration plot (**yield)** were 3.89, 12.96, 4.84 and 5.28 during the year 2006-07, 2007-08, 2008-09 and 2009-10, respectively. The average technology gap in all the years was 6.74 q/ha. Technology gap imply researchable issues for realization of potential yield, while the extension gap imply what can be achieved by the transfer of existing technologies.

The technological index revealed the feasibility of the demonstration technology. As such variation in technology index (7.78 to 25.92 per cent) during the study period in certain area may be attributed to dissimilarity in the soil fertility condition, pest-diseases attack, non availability and poor quality of irrigation water and weather condition.

demonstration, etc. Technology index which shows the feasibility of the technology demonstrated has depicted good performance of the intervention.

IV. CONCLUSION

On the basis of the result obtained in present study it can be concluded that use of improved method of wheat cultivation can reduced the technology gap to a considerable extent thus leading to increase productivity of wheat in the district. Extension gap ranged between 5.34 to 8.12 q/ha which emphasis the need to educate the farmers through various means like village level training, on campus training, method demonstration, front line

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Viscous Dissipation and Mass Transfer Effects on Unsteady MHD Free Convective Flow along a moving Vertical Porous Plate in the presence of Internal Heat Generation and Variable Suction.

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Abstract- The objective of the paper is to analyze the unsteady free convective flow and mass transfer through a viscous, incompressible, electrically conducting fluid along a porous vertical isothermal non-conducting uniformly moving plate in the presence of exponentially decaying heat generation and transverse magnetic field with variable suction and viscous dissipation. The governing equations of motion, energy and concentration are transformed into ordinary differential equations using similarity parameter method. The ordinary differential equations are then solved numerically using Runge – Kutta method along with shooting technique. Numerical results for velocity, temperature and concentration are obtained for various values of physical parameter and presented graphically. Also the numerical values of skin-friction coefficient, Nusselt number and Sherwood number are obtained for various values of physical parameters discussed and presented through tables.

I. INTRODUCTION

Free convection flow is often encountered in cooling of nuclear reactors or in the study of structure of stars and planets. Along with the free convection flow, the phenomenon of mass transfer is also very common in the theories of steller structure. The study of convective flow with mass transfer along a vertical porous plate is receiving considerable attention of many researchers because of its varied applications in the field of cosmical and geophysical sciences. Gebhart and Mollendorf (1969) analyzed viscous dissipation in external natural convection flows. Soundalgekar (1972) studied viscous dissipative effects on unsteady free convective flow past a vertical porous plate with constant suction. Vajravelu (1979) investigated the natural convection at a heated semi infinite vertical plate with internal heat generation. Raptis and Tzivanidis (1981) studied mass transfer effect with variable heat transfer on accelerated vertical plate. Raptis et al. (1987) analyzed the unsteady free convective flow through a porous medium adjacent to a semi Infinite vertical plate using finite difference scheme. Sattar (1994) discussed the free convection and mass transfer flow through a porous medium past an infinite vertical porous plate with time dependent temperature and concentration. Crepeau and Clarksean (1997) obtained similarity solution of natural convention with internal heat generation which decays exponentially. Unsteady free convection flow past a vertical porous plate was investigated by Helmy (1998). Acharya et al.

(2000) studied free convection and mass transfer flow through a porous medium bounded by vertical infinite surface with constant suction and heat flux. Unsteady free convection flow with suction on an accelerating porous plate was discussed by Makinde et al. (2003). Ahmed (2007) observed effects of unsteady free convective MHD flow through a porous medium bounded by an infinite vertical porous plate. Sharma and Sharma (2009) analyzed effect of mass transfer on three- dimensional unsteady mixed convective flow past an infinite vertical moving porous plate with periodic suction . Atia and Ewis (2010) studied unsteady MHD Couette flow with heat transfer of a viscoelastic fluid under exponential decaying pressure gradient. Sharma et al. (2012) discussed mass transfer with chemical reaction in MHD mixed convection flow along a vertical stretching sheet. Venkateswarlu et al. (2013) analyzed unsteady MHD flow of a viscous fluid past a vertical porous plate under oscillatory suction velocity. Radiation and viscous dissipation effects on unsteady MHD free convective mass transfer flow past an infinite vertical porous plate with Hall current in the presence of chemical reaction was studied by Reddy (2014).

Aim of the paper is to investigate unsteady, laminar, two-dimensional, free convective boundary layer flow of an incompressible, viscous and electrically conducting fluid along a uniformly moving vertical non-conducting porous plate in presence of mass transfer and viscous dissipation effect with variable suction and exponentially decaying heat generation subjected to a uniform transverse magnetic field.

II. FORMULATION OF THE PORBLEM

The x-axis is taken along the vertical plate and y-axis is normal to the plate. Uniform temperature T_w at the plate and uniform species concentration C_w near the plate are maintained. Plate is moving with uniform velocity U. Magnetic field of intensity B_0 is applied in y-direction. It is assumed that the external electric field is zero, also electrical field due to polarization of charges and Hall effects are negligible. Under these assumptions along with the Boussinesq approximation, the governing equations of unsteady flow in the presence of viscous dissipation are given by

$$\frac{\partial v}{\partial y} = 0 \;\Rightarrow\; v \text{ is independent of } y \Rightarrow v = v(t)$$
…(1)

$$\frac{\partial u}{\partial t} + v\frac{\partial u}{\partial y} = \upsilon\frac{\partial^2 u}{\partial y^2} + g\beta(T - T_\infty)$$

$$+ g\beta_c(C - C_\infty) - \frac{\sigma B_0^2}{\rho}u$$
…(2)

$$\rho C_p\left[\frac{\partial T}{\partial t} + v\frac{\partial T}{\partial y}\right] = \kappa\frac{\partial^2 T}{\partial y^2} + Q + \mu\left(\frac{\partial u}{\partial y}\right)^2$$
…(3)

$$\frac{\partial C}{\partial t} + v\frac{\partial C}{\partial y} = D\frac{\partial^2 C}{\partial y^2}$$
…(4)

where u and v are velocity components in x- and y- directions respectively, t is time , υ the Kinematic viscosity, ρ the fluid density, g acceleration due to gravity of the earth, β and β_c are thermal and concentration expansion coefficients respectively, σ the electrical conductivity of the fluid, C_p specific heat at constant pressure, T the temperature of fluid in boundary layer, C the species concentration in boundary layer, T_∞ fluid temperature far away from the plate, C_∞ species concentration in the fluid far away from the plate, κ the thermal conductivity, Q the rate of heat generation/absorption, μ the coefficient of viscosity, and D the mass diffusion coefficient .

The boundary conditions are
$$y = 0 \quad : \quad u = U, \quad v = v(t),$$
$$\qquad\qquad T = T_w, \qquad C = C_w\,;$$
$$Y \to \infty \;:\quad u = 0, \qquad T = T_\infty,$$
$$\qquad\qquad C = C_\infty.$$
…(5)

III. METHOD OF SOLUTION

In order to obtain the similarity solutions, a similarity (Schlitchting and Gersten 1999) parameter h is introduced which is time dependent length scale as given below
$$h = h(\mathrm{t}) = 2\sqrt{\upsilon t},$$
…(6)
specially used for unsteady boundary layer problems. In terms of $h(\mathrm{t})$, a solution of (1) is given by

$$v = v(t) = -V_0\frac{\upsilon}{h(t)}$$
…(7)

where $V_0\,(>0)$ is suction parameter.

Introducing the following dimensionless quantities
$$\eta = \frac{y}{h}\;, \quad u = Uf(\eta)\,, \quad \theta(\eta) = \frac{T - T_\infty}{T_w - T_\infty}\;,$$

$$\phi(\eta) = \frac{C - C_\infty}{C_w - C_\infty},\; Gr = \frac{g\beta h^2(T_w - T_\infty)}{U\upsilon}$$

$$Gm = \frac{g\beta_c h^2(C_w - C_\infty)}{U\upsilon}, \qquad M = \frac{\sigma B_0^2 h^2}{\upsilon\rho},$$

$$\Pr = \frac{\mu C_p}{\kappa}, \qquad Q = \frac{S\kappa(T_w - T_\infty)}{h^2}e^{-\eta},$$

$$Ec = \frac{U^2}{C_p(T_w - T_\infty)}, \qquad Sc = \frac{\upsilon}{D}$$
…(8)

into the equations (2) to (4) , we obtain
$$f'' + (2\eta + V_0)f' + Gr\theta + GmC - MF = 0,$$
…(9)

$$\theta'' + \Pr(2\eta + V_0)\theta' + Se^{-\eta} + Ec\,\Pr f'^2 = 0,$$
…(10)

$$\phi'' + Sc(2\eta + V_0)\phi' = 0,$$
…(11)

where η is similarity variable, Gr is the Grashof number, Gm is modified Grashof number, M is the magnetic parameter, $\Pr$ is Prandtl number, Ec is Eckert number, Sc is Schmidt number.

Following Crepeau and Clarkseon (1997), the fluid has internal volumetric rate of heat generation Q as given below
$$Q = \frac{SK(T_w - T_\infty)}{h^2}e^{-\eta},$$
…(12)

where S is the rate of heat generation/absorption parameter.

The corresponding boundary conditions are reduced to
$$\eta = 0 \quad : \quad f = 1 \qquad \theta = 1 \qquad \phi = 1;$$
$$\eta \to \infty \;:\quad f = 0 \qquad \theta = 0 \qquad \phi = 0.$$
…(13)

The governing equations (9) to (11) are non – linear second order coupled differential equations and solved under the boundary conditions (13) using Runge –Kutta fourth order technique (Jain et al. 1985 ; Jain 2000) along with shooting technique (Conte and Boor 1981). Substituting the first order system as given below

$$f = f_1, \qquad f' = f_2, \qquad f'' = f_2{}'$$
$$\theta = f_3, \qquad \theta' = f_4, \qquad \theta'' = f_4{}'$$

$$\phi = f_5, \qquad \phi' = f_6 \qquad \phi'' = f_6$$
$$\dots(14)$$

$$f_2' = -\left(2\eta + V_0\right) f_2 - Gr f_3 - Gm f_5 + M f_1$$
$$\dots(15)$$

$$f_4' = -\Pr\left(2\eta + V_0\right) f_4 - Se^{-\eta} - Ec\,\Pr\left(f_2\right)^2$$
$$\dots(16)$$

$$f_6' = -Sc\left(2\eta + V_0\right) f_6$$
$$\dots(17)$$

with the boundary conditions

$$f_1(0) = 1, \qquad f_3(0) = 1, \qquad f_5(0) = 1,$$
$$f_1(\infty) = 0, \qquad f_3(\infty) = 0, \qquad f_5(\infty) = 0,$$
$$\dots(18)$$

To solve equations (15) to (17) with equation (18) as an initial value problem we also need the values of $f_2(0), f_4(0)\; and\; f_6(0)$ ie $f'(0), \theta'(0)$ and $\phi'(0)$, but no such values are available. The initial guess values for $f'(0), \theta'(0)\; and\; \phi'(0)$ are chosen and using the fourth-order Runge - Katta method, the solutions are obtained. We compare the calculated values of $f(\eta), \theta(\eta), and\; \phi(\eta)$ at a finite value of $\eta \to \infty$ with the given boundary conditions $f(\infty) = 0,\;\; \theta(\infty) = 0$ and $\phi(\infty) = 0,$ and adjust the values of $f'(0), \theta'(0), and\; \phi'(0)$ to give a better approximation for the solution. The step – size is taken as $\Delta\eta = 0.01$. The process is replaced until the results corrected up to the desired accuracy level of 10^{-4}.

IV. SKIN-FRICTION COEFFICIENT

Skin-friction coefficient at the plate is given by

$$C_f = \frac{2\upsilon}{Uh} f'(0) = 2\left(\mathrm{Re}\right)^{-1} f'(0)$$
$$\dots(19)$$

$$\mathrm{Re} = \frac{Uh}{\upsilon}$$

where υ is the Reynolds number.

NUSSELT NUMBER

The rate of heat transfer in terms of the Nusselt number at the plate is given by

$$Nu = \frac{2q\sqrt{\upsilon t}}{\kappa(T_w - T_\infty)} = -\theta'(0)$$
$$\dots(20)$$

$$q = -\kappa\left(\frac{\partial T}{\partial y}\right)_{y=0}$$
where   is heat flux per unit area.

SHERWOOD NUMBER

The rate of mass transfer in the terms of the Sherwood number is given by

$$Sh = \frac{2J\sqrt{\upsilon t}}{D(C_w - C_\infty)} = -\phi'(0)$$
$$\dots(21)$$

$$J = -D\left(\frac{\partial C}{\partial y}\right)_{y=0}$$
where   is rate of mass flux .

V. RESULT AND DISCUSSION

Numerical values have been carried out for velocity profiles, temperature profiles, species concentration profiles, skin – friction coefficient, rate of heat transfer in terms of Nusselt number and rate of mass transfer in terms of Sherwood number at the plate for various values of the parameters involved in the system. The calculated values are shown through figures and tables, discussed numerically and explained physically.

Figures 1 and 2, respectively represent that velocity increases due to increase in Grashof number or modified Grashof number. It is observed from figures 3 that fluid velocity decreases as the Hartmann number increase. Figure 4 depicts that fluid velocity increases with heat source while decreases with heat sink. Figure 5 illustrates that fluid velocity increases due to increase in Eckert number. Figures 6 and 7, respectively show that fluid velocity decreases with increase in Prandtl number or Schmidt number. It is seen from Figure 8 that fluid temperature increases with the increase of heat source parameter while it decreases with the increase of sink. Figure 9 illustrates that fluid temperature increases due to increase in Eckert number. Figures 10 and 11, respectively represent that fluid temperature decreases due to increase in Prandtl number or suction parameter. Figures 12 and 13, respectively represent that the mass concentration decreases with the increase in Schmidt number or suction parameter.

It is seen from the Table 1 that skin-friction coefficient at the plate increases due to increase in Grashof number, modified Grashof number, heat source or Eckert number, while it decreases due to increase in Hartmann number, Prandtl number, Schmidt number or heat sink. Table 2 shows that the Nusselt number at the plate increases due to increase in Prandtl number, heat sink or suction parameter, while it decreases due to increase in Eckert number or heat source. Table 3 depicts that Sherwood number at the plate increases with the increase in Schmidt number or suction parameter.

Table 1. Numerical values of $f'(0)$ **for various values of** Gr, Gm, M, S, $\Pr$, Ec **and** Sc

Gr	Gm	M	S	$\Pr$	Ec	Sc	$f'(0)$
2	1	1	0.5	0.71	0.5	0.22	-0.3796
3	1	1	0.5	0.71	0.5	0.22	0.05
4	1	1	0.5	0.71	0.5	0.22	0.505
2	2	1	0.5	0.71	0.5	0.22	0.129
2	3	1	0.5	0.71	0.5	0.22	0.662
2	1	2	0.5	0.71	0.5	0.22	-0.7993
2	1	3	0.5	0.71	0.5	0.22	-1.136
2	1	1	1	0.71	0.5	0.22	-0.21996
2	1	1	-0.5	0.71	0.5	0.22	-0.5796
2	1	1	-1	0.71	0.5	0.22	-0.7698
2	1	1	0.5	1	0.5	0.22	-0.51018
2	1	1	0.5	7	0.5	0.22	-0.8958
2	1	1	0.5	0.71	0.01	0.22	-0.5104
2	1	1	0.5	0.71	0.2	0.22	-0.441
2	1	1	0.5	0.71	0.5	0.6	-0.4796
2	1	1	0.5	0.71	0.5	1.002	-0.5396

Table 2. Numerical values of $\{-\theta'(0)\}$ **for various values of** S, $\Pr$, Ec **and** V_0

S	$\Pr$	Ec	V_0	$-\theta'(0)$
0.5	0.71	0.5	0.5	0.8151
1	0.71	0.5	0.5	0.5512
-0.5	0.71	0.5	0.5	1.12287
-0.7	0.71	0.5	0.5	1.16
0.5	1	0.5	0.5	0.8491
0.5	7	0.5	0.5	0.8997
0.5	0.71	0.001	0.5	0.8825
0.5	0.71	0.9	0.5	0.761
0.5	0.71	0.5	1	0.9851
0.5	0.71	0.5	1.5	1.149

Table 3. Numerical values of $\{-\phi'(0)\}$ **for various values of** Sc **and** V_0

Sc	V_0	$-\phi'(0)$
0.22	0.5	0.6014
0.3	0.5	0.7163
0.6	0.5	1.071
0.22	1	0.6769
0.22	1.5	0.755
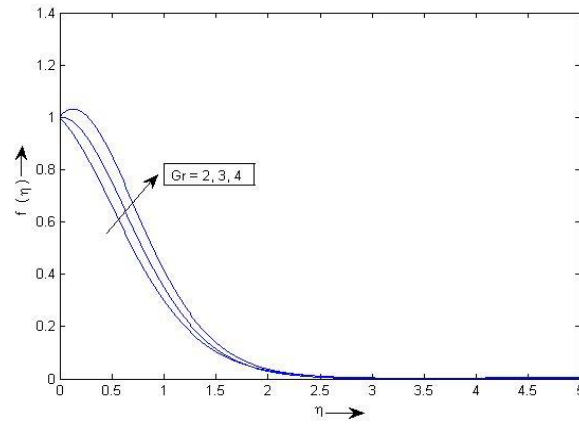
Figure 1. Velocity profiles versus η for different values of Gr when $Gm = 1, S = 0.5, M = 1,$ $V_0 = 0.5, \Pr = 0.71, Ec = 0.5 \, and \, Sc = 0.22.$
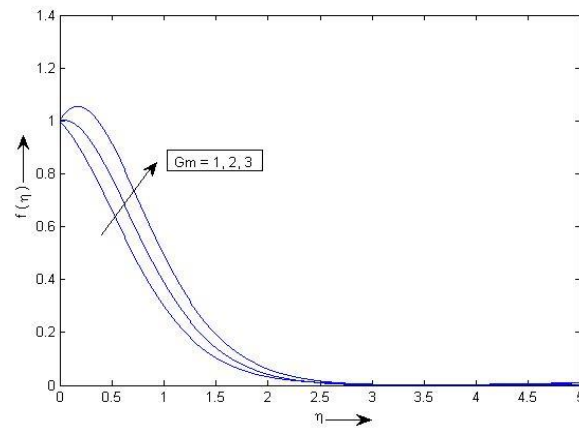
Figure 2. Velocity profiles versus η for different values of Gm when $Gr = 2, S = 0.5, M = 1,$ $V_0 = 0.5, \Pr = 0.71, Ec = 0.5 \, and \, Sc = 0.22.$
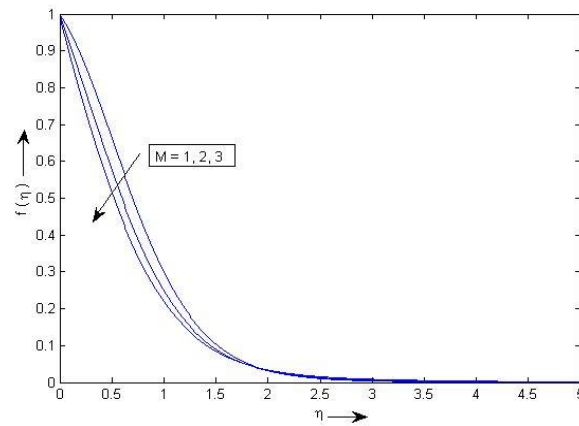
Figure 3. Velocity profiles versus η for different values of M when $Gr = 2, Gm = 1, S = 0.5, \; V_0 = 0.5, \Pr = 0.71, Ec = 0.5 \, and \, Sc = 0.22.$
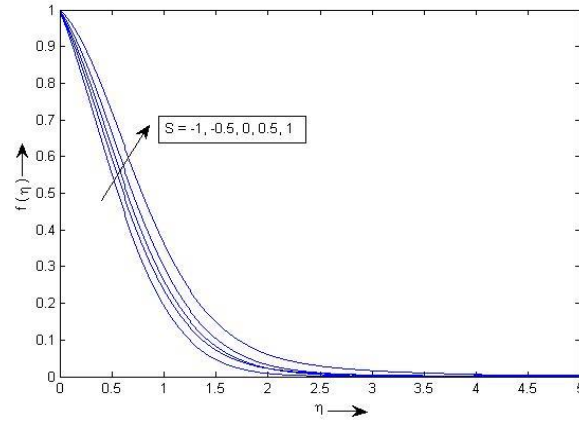
Figure 4. **Velocity profiles versus** η **for different values of** S **when** $Gr = 2, Gm = 1, M = 1,$
$V_0 = 0.5, \Pr = 0.71, Ec = 0.5 \, and \, Sc = 0.22.$
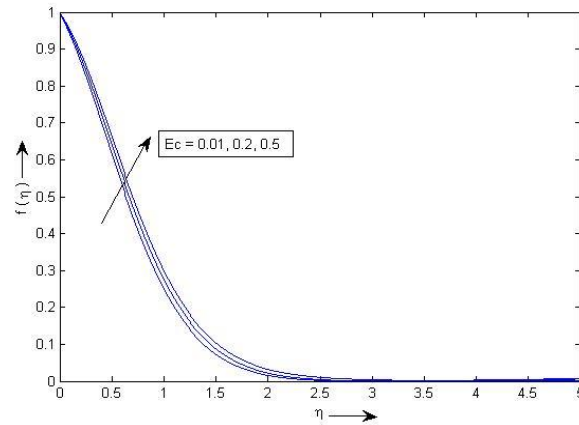
Figure 5. Velocity profiles versus η **for different values of** Ec **when** $Gr = 2, Gm = 1, M = 1,$
$V_0 = 0.5, \Pr = 0.71, S = 0.5 \, and \, Sc = 0.22.$

Figure 6. **Velocity profiles versus** η **for different values of** $\Pr$ **when** $Gr = 2, Gm = 1, M = 1,$
$V_0 = 0.5, Ec = 0.5, S = 0.5 \, and \, Sc = 0.22.$
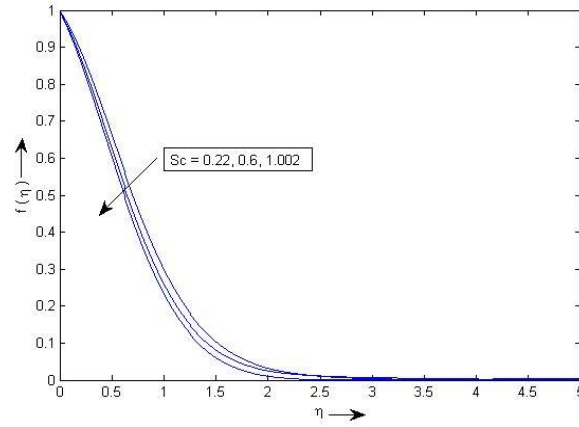
Figure 7. **Velocity profiles versus** η **for different values of** Sc **when** $Gr = 2, Gm = 1, M = 1,$
$V_0 = 0.5, \Pr = 0.71, S = 0.5 \, and \, Ec = 0.5.$
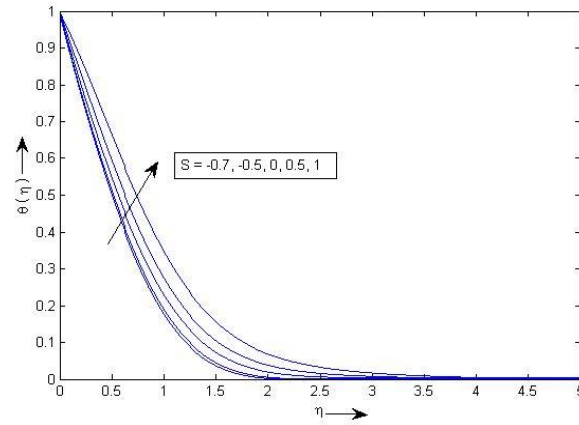
Figure 8. **Temperature profiles versus** η **for different values of** $\Pr$ **when** $Gr = 2, Gm = 1, M = 1,$
$V_0 = 0.5, \Pr = 0.71, S = 0.5 \, and \, Ec = 0.5.$
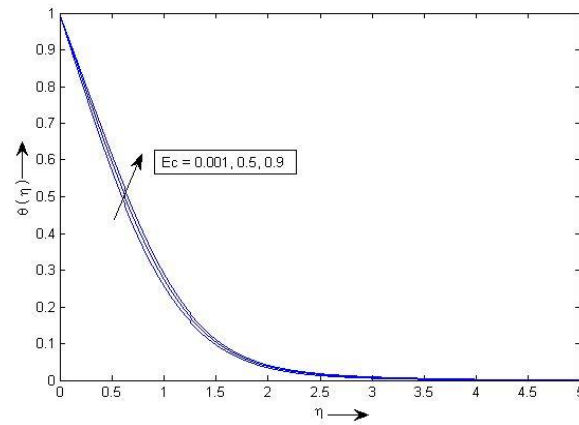
Figure 9. **Temperature profiles versus** η **for different values of** Ec **when** $Gr = 2, Gm = 1, M = 1,$
$V_0 = 0.5, \Pr = 0.71, S = 0.5 \, and \, Sc = 0.22.$

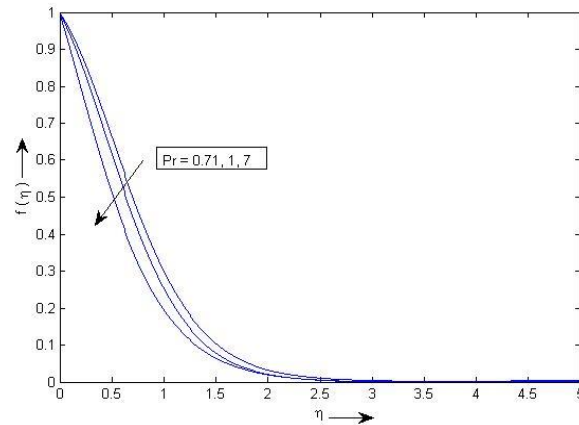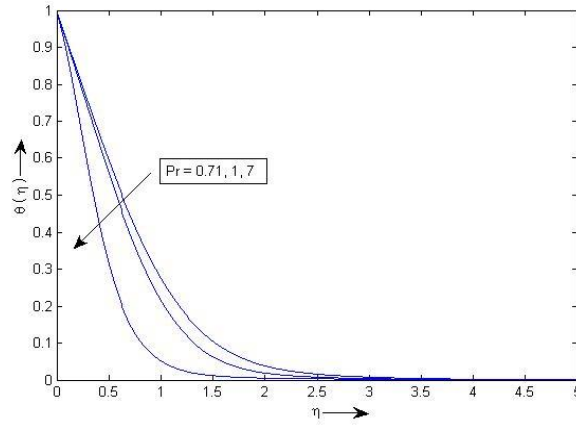**Figure 10.** Temperature profiles versus η for different values of $\Pr$ when $Gr = 2, Gm = 1, M = 1,$ $V_0 = 0.5, Ec = 0.5, S = 0.5\, and\, Sc = 0.22.$

Figure 11. Temperature profiles versus η for different values of V_0 when $Gr = 2, Gm = 1, M = 1,$ $\Pr = 0.71, Ec = 0.5, S = 0.5\, and\, Sc = 0.22.$
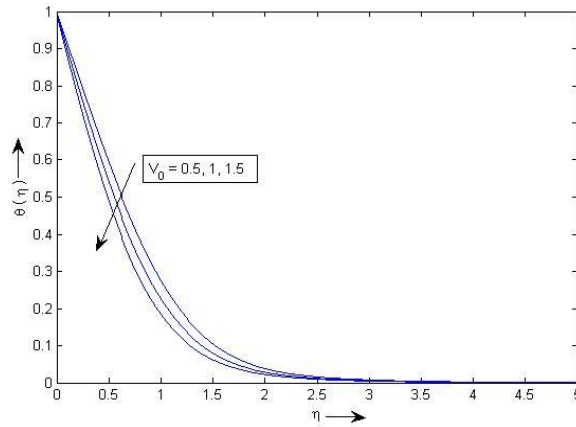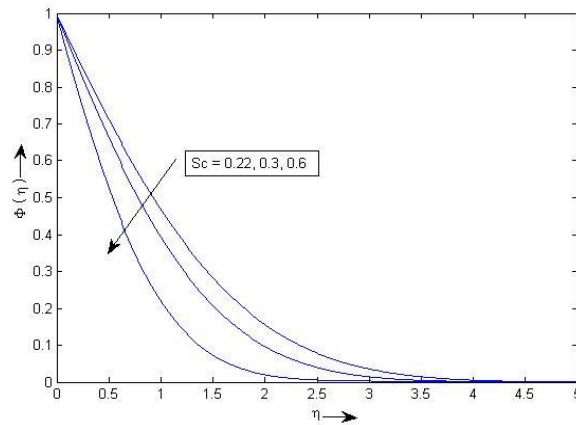

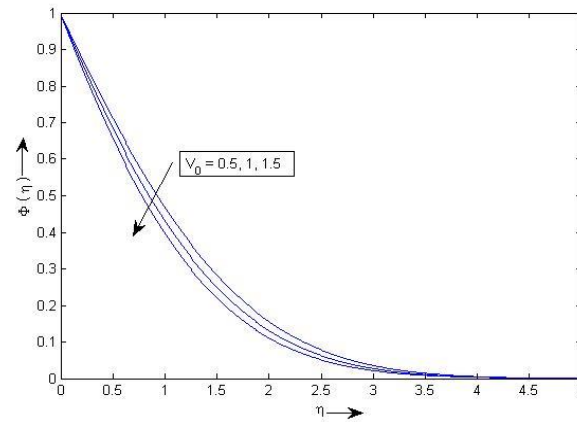**Figure 12.** Concentration profiles versus η for different values of Sc when $V_0 = 0.5.$

Figure 13. **Concentration profiles versus** η **for different values of** V_0 **when** $Sc = 0.22.$

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Study on performance measurement systems – Measures and Metrics

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Abstract- Significant research has been carried out so far in the field of performance measurement and management. Various authors have presented their findings based on their respective perspective of the topic. A wide variety of literature available makes the study of performance measures and metrics more difficult. The present study has made an attempt to dig into the literature to identify the importance of performance management, terminologies and various models in performance measurement system. Knowledge about types of measures, their purpose and tests on measures provides sufficient inputs while designing a performance measurement system.

Index Terms- Performance management, Performance measurement, Performance measures and metrics, Performance models

I. INTRODUCTION

Increasing competition, changing external demand as well as roles of business are forcing the enterprises to examine and improve their strategies and management systems (Michaela et al., 2012). Companies have understood that for competing in continuously changing environment, it is necessary to monitor and understand firm performances. Measurement has been recognized as a crucial element to improve business performance (Taticchi et al., 2010). In recent years, organizational performance measurement framework and factors have received much attention from researchers and practitioners (Gunasekaran et al., 2004).

According to Amlan et al.,(2004) performance measurement provides the means by which a company can assess whether its supply chain has improved or degraded. It is only by means of performance measurement that one can see how much one is behind or ahead of its competitors. In the last three decades, a variety of literature has been published in the area of performance measurement and management. Researchers and practioners initially concentrated on the business performance, definitions for measurement, measures and measurement system (Neely et al.,1995). Later studies were about developing comprehensive frameworks and models for measurement (Kaplan and Norton, 1992). Subsequently importance was given to developing and designing customised performance measurement systems with integrated models gaining prominence.

One of the problems with the performance measurement literature is that it is diverse. This means that individual authors have tended to focus on different aspects of performance measurement system design (Neely et al., 1995). A comparative analysis of some most widely cited performance measurement systems have been undertaken by G. P. Kurien and M.N. Qureshi and it indicates that validity of many of the measurement frameworks needs to be established through further study. Unfortunately these different approaches have led to numerous definitions of a performance measurement system, and there is little consensus regarding its main components and characteristics. The gap between what are wanted to be measured and what can be measured is the main reason for performance measurement being still so challenging (Michaela et al., 2012).

So the study aims to identify the major theories, models and frameworks in order to analyse best practices in performance management systems. A detailed study regarding the performance measures are also carried to facilitate knowledge regarding performance system design.

II. IMPORTANCE OF PERFORMANCE MANAGEMENT SYSTEMS

The famous sayings such as "You get what you measure", "People perform the way they are measured", highlight the importance of a proper performance management system. Thus performance management is an important aspect of a successful supply chain management. Even well-conceived competitive strategies cannot increase organizational success unless they are effectively implemented. Performance-measurement systems can play a key role in strategy implementation by helping to translate organizational strategy into desired behaviours and results, communicate expectations, monitor progress, provide feedback, and motivate employees through performance-based rewards (Fleming et al., 2009). According to Amr Abu-Suleiman, importance of performance management systems can be summarised into the following categories:
- To drive organizational actions

Performance measures drive actions in two ways. First, monitored measures get high visibility within an organization, and people strive to achieve high performance with respect to these measures. Second, Measured metrics drive organizational actions by identifying areas of improvement. Once poor area is identified, managers can take corrective action to address such issues.

- As a framework for decision making

Measures provide a basis to evaluate alternatives and identify decision criteria. The structure of measurement systems drives decisions and action at the different levels in the firm.

- Provides closed loop control

An effective enterprise performance management system allows proper monitoring of business process. The feedback is used to compare actual progress to planned; facilitate benchmarking against industry best practices and to identify improvement opportunities. Meyer (2002) defines 7 purposes of performance measurement that takes place within the different levels of the companies. Performance measurement enables companies to look back and evaluate the past activities and look ahead and prepare for the forthcoming performance. Motivate and compensate, on the other hand are the purposes for the lower levels of the company. In larger and more complicated firms, measures are also expected
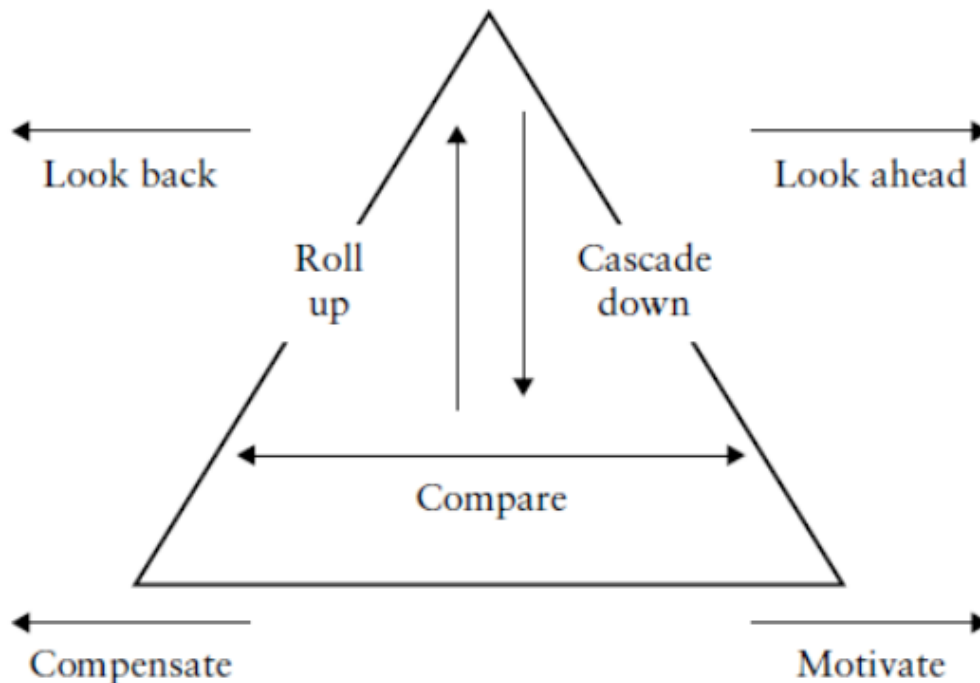
Figure 1: Seven purposes of performance measurement (Meyer 2002)

to roll up from the bottom to the top of the organization, to cascade down from top to bottom, and to facilitate performance comparisons across business and functional units.

III.   TERMINOLOGY

According to Neely(1995) performance measurement is a topic which is often discussed but rarely defined. He defines performance measurement as the process of quantifying the efficiency and effectiveness of action. Effectiveness is the amount of meeting customers' needs and efficiency is rate of economically using corporation's resources in time of measuring a predetermined level of customers' satisfaction.

- A performance measure can be defined as a metric used to quantify the efficiency and/or effectiveness of an action (Neely, 1995).
- A performance measurement system can be defined as the set of metrics used to quantify both the efficiency and effectiveness of actions (Neely, 1994).

Performance Measurement and Evaluation: Definitions and Relationships (GAO/GGD-98-26), the U.S. General Accounting Office (GAO) cited in 'Performance based management handbook', 2001 provides the following definition:

Performance measurement is the ongoing monitoring and reporting of program accomplishments, particularly progress towards pre established goals. Performance measures may address the type or level of program activities conducted (process), the direct products and services delivered by a program (outputs), and/or the results of those products and services (outcomes).

IV.   CLASSIFICATION OF PERFORMANCE MANAGEMENT LITERATURE

Different authors have classified the performance management literature based on their perspectives. According to Başar Öztayşi(2009), the studies about performance can be grouped into two. In the first group, the researches focus on models and frameworks about what to measure in other words, performance indicators. On the other hand, the second group focuses on analytical techniques and quantification of performance.

Table 1: Performance measurement models and evaluations (Öztayşi, 2009)

Models / Frameworks	Focus of the model	Individual Evaluations	Look Back	Look Ahead	Balanced Performance	Alignment with	Flexibility / Dynamism
Traditional Performance Measurement	Financial ratios	-	+	-	-	-	-
Time based performance measurement system. (Stalk, 1988)	Time based measurement of the processes	-	-	+	-	-	-
Time based Costing (Boons, 2002)	Time based costing of products	-	+	-	-	-	-
Theory of Constraints (TOC) and throughput accounting (Goldratt and Cox, 1992)	Efficiency, activities, inputs, inventory and money-time	-	+	+	+	-	-
Tableau de Bord (Eccles, 1991)	Corporate performance	+	+	+	+	+	o
Performance Pyramid (Wedman and Graham, 1998)	Identification of the performance improvement areas	-	-	-	+	-	-
Performance Prism (Kennerley and Neely, 2002)	Considers the perspectives: Shareholder satisfaction, strategies, processes, capabilities	+	+	o	o	+	o
Activity-Based Costing (Turney, 1991)	Costing of activities and resources	-	+	+	o	-	-
SMART System (Cross and Lynch, 1989)	Performance indicators for different levels of the company.	-	+	-	o	o	+
Performance Measurement Survey (Dixon et al, 1990)	Preparation for the prior performance improvement areas.	-	-	-	+	-	-
Performance Measurement Matrix (Keegan et al, 1989)	Groups the corporate performance indicators as financial, non-financial, exterior and interior.	-	+	-	-	-	o
Performance Measurement Framework for Service (Fitzgerald et al, 1991)	Analyzes the performance indicators with a cause and effect relation	-	+	+	o	o	o

Balanced Scorecard (Kaplan and Norton, 1992)	Defines a corporate performance system with, financial, customer, process and learning and growth perspectives.	+	+	+	+	+	+
Macro Process Model (Brown, 1996)	Models the processes as inputs, production system, outputs, outcomes and goals.	-	+	-	¤	-	-
Consistent performance management system (Flapper et. al. 1996)	Defines the steps for implementing performance measurement.	-	+	¤	¤	¤	+
Cambridge Performance Measurement Process (Neely et al. 1997)	Design and tracing of the performance indicators	¤	+	-	¤	¤	+
Quality Frameworks (Macey, 2001; Neely and Adams, 2001)	Standard and corporate performance	-	+	¤	¤	-	-

The present supply chain performance measurement frameworks can be classified into following three main models that are mentioned frequently by other scholars:

- result based (balanced scorecard) (Kaplan and Norton, 1992);
- hierarchical (decision making levels) (Gunasekaran et al., 2004) and
- process based (supply chain operations reference, SCOR model) frameworks (Supply Chain Council, 1996).

Kurien et.al,(2011) classified the literature related to SCPMS to two major orientations. They are: (i) Conceptual articles and (ii) Empirical articles. The conceptual works tend to focus on measurement constructs and prescriptive methodologies. Topics normally covered in conceptual articles are related to performance definition, theoretical evaluation criteria, models and issues with measures. The empirical works tend to focus more on performance content than on measurement process. Empirical articles include descriptive studies, methods, taxonomies, benchmarking and prescriptive performance improvement activities. Table 1. shows the evaluations of various models and frameworks. The symbols are used to define the properties of the models, "+" means that the model satisfies the property while "–" means that the property is not provided. The "¤" sign symbolizes that the property is satisfied to some degree or the user is free to modify.

Many authors have classified PMS in different ways. A basic classification provided by Cagnazzo cited in Kurien et.al,(2011) consists of grouping PMS models into:
1. Balanced models;
2. Quality models;
3. Questionnaire-based models;
4. Hierarchical models; and
5. Support models.

V.   COMMON FRAMEWORKS AND MODELS FOR PERFORMANCE MEASUREMENT

A number of frameworks and models for performance measurement have been developed, since 1980s (Bititci et al., 2000). All these frameworks and models have their own respective benefits and limitations. Kurien et.al,(2011) claims that empirical and theoretical validity of some of the frame works are established whereas information about others is not available. The following section familiarises a few widely cited measurement systems.
  A. Balanced Score Card (BSC):

Since the introduction of Balanced scorecard by Kaplan and Norton in 1992, it has been widely recognised as the leading tool for performance management. Balanced scorecard shown in the figure below provides a quick and comprehensive view of the entire business process by using a set of balanced measures from four different perspectives. They are
- Customer perspective (How do customers see us?)
- Internal perspective (What must we excel at?)
- Innovation and learning perspective (Can we continue to improve and create value?)
- Financial perspective (How do we look to shareholders?)

Figure 2. Balanced Score Card (Source: Adapted from Kaplan et.al, 1992)
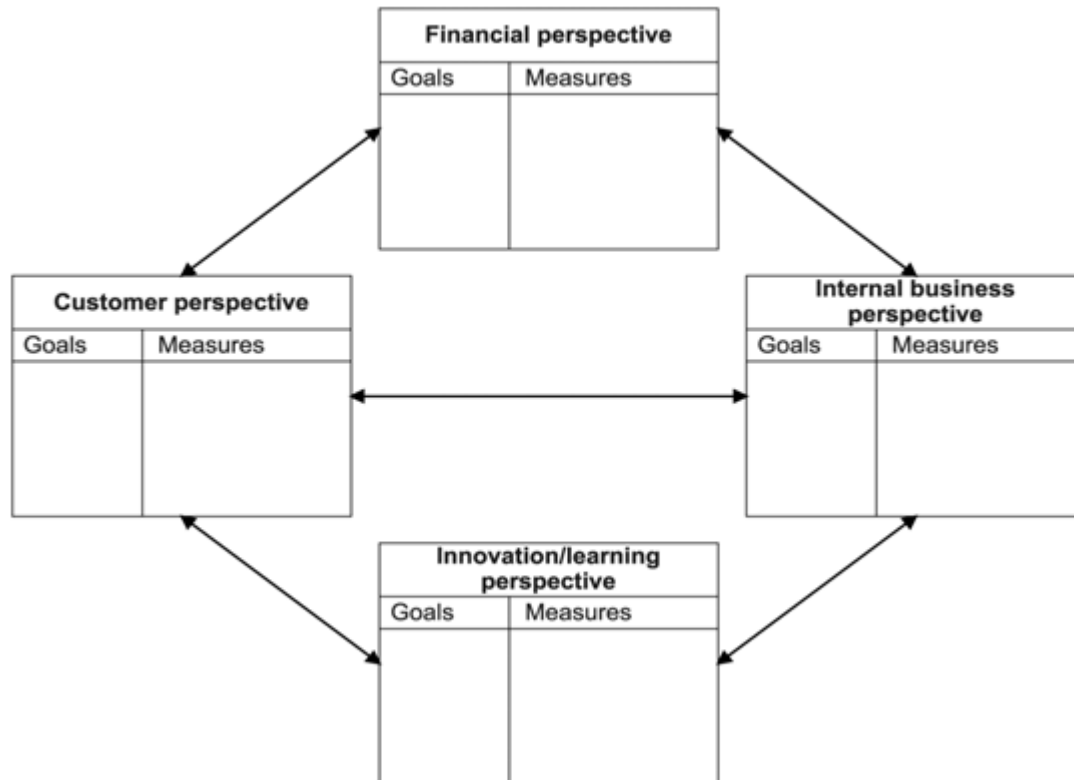
With these perspectives in mind a manager can derive specific measures that are directly linked to the business strategy. Thus BSC provides a set of financial and non financial operational measures and helps the managers to identify a critical few measures that are most important to the business. The balanced score card guards against local optimisation thus providing insight whether an improvement is based on actual process improvement or by reducing the performance of other processes (Kaplan et.al, 1992).

   B. Performance Prism:

The Performance Prism (PP) is one of the younger conceptual systems and is considered as a second-generation PM system (Michaela et al., 2012). The performance prism framework suggests that a PMS should be organised around five distinct but linked perspectives

Figure 3: Performance Prism (Adapted from Tangen, 2004)

of performance as shown in figure 3 (Neely et al., 2001).
   • Stakeholder satisfaction (Who are the stakeholders and what do they want and need?)
   • Strategies (What are the strategies we require to ensure the wants and needs of our stakeholders?)
   • Processes (What are the processes we have to put in place in order to allow our strategies to be delivered?)

- Capabilities (The combination of people, practices, technology and infrastructure that together enable execution of the organisation's business processes, both now and in the future, and what are the capabilities we require to operate our processes?)
- Stakeholder contributions (What do we want and need from stakeholders to maintain and develop those capabilities?)

   According to performance prism the performance measurement need not be strictly derived from the strategy: instead, "strategies should be put in place to ensure the wants and needs of the stakeholders are satisfied" (Neely et.al.,2001). It is tool that helps management teams to think about vital questions and strategies to address them. (Michaela et.al. 2012). Although the performance prism extends beyond "traditional" performance measurement, it offers little about how the performance measures are going to be realised. Another weakness is that little or no consideration is given to the existing PMSs that companies may have in place (Medori et al., 2000), cited in Kurien et.al,(2011).

C. The Performance Pyramid:

   Another important framework is performance pyramid proposed by Cross and Lynch (1992). The purpose of the performance pyramid (refer Figure 4) is to link an organisation's strategy with its operations by translating objectives from the top down (based on customer priorities) and measures from the bottom up. This PMS includes four levels of objectives that address the organisation's external effectiveness (left side of the pyramid) and its internal efficiency (right side of the pyramid). The development of a
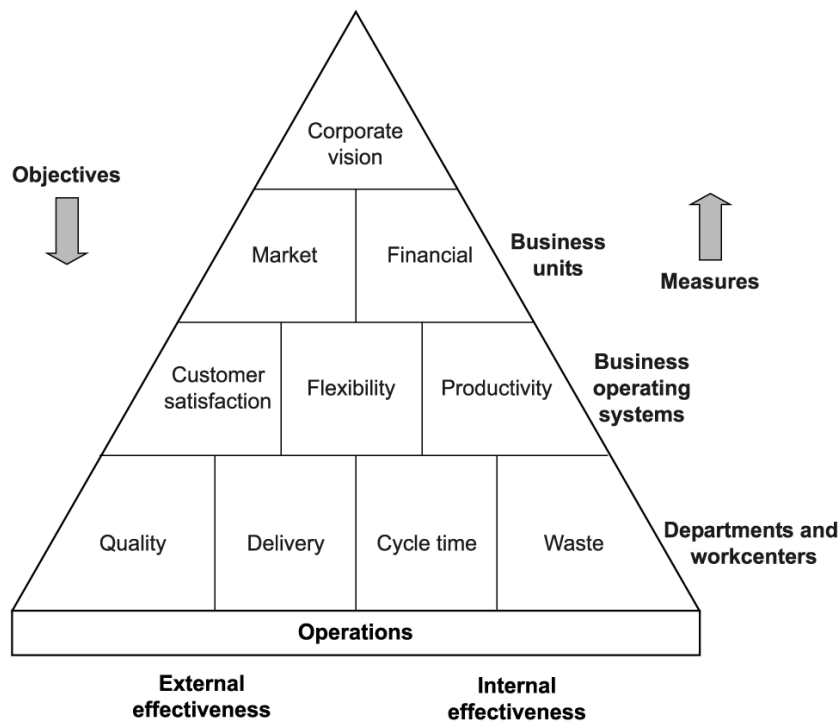
Figure 4. Performance Pyramid (Adapted fromTangen, 2004)

company's performance pyramid starts with defining an overall corporate vision at the first level, which is then translated into individual business unit objectives. The second-level business units are short-term targets of cash flow and profitability and long-term goals of growth and market position (e.g. market, financial). The business operating system bridges the gap between top-level and day-to-day operational measures (e.g. customer satisfaction, flexibility, productivity). Finally, four key performance measures (quality, delivery, and cycle time, waste) are used at departments and work centres on a daily basis (Kurien et.al,2011).

   The strengths of this framework are that it ties together the hierarchical view of business performance measurement with the business process view. It also makes explicit the difference between measures that are of interest to external parties-customer satisfaction, quality and delivery, and measures that are primarily of interest within the business productivity, cycle time and waste (Neely et.al, 2000).

D. The Supply-Chain Operations Reference (SCOR) Model:

   The SCOR model was developed by the Supply-Chain Council (SCC) to assist firms in increasing the effectiveness of their SCs, and to provide a process-based approach to SCM (Kurien et.al, 2011). The Supply Chain Operations Reference (SCOR) model provides a unique framework that links performance metrics, processes, best practices, and people into a unified structure. The

framework supports communication between supply chain partners and enhances the effectiveness of supply chain management, technology, and related supply chain improvement activities (SSC Council, 2010). The SCOR model was originally developed on five supply chain management processes - plan, source, make, deliver and return. Further the measures are grouped into five performance attributes: reliability, responsiveness, flexibility, cost and assets.

VI.   MEASURES AND METRICS

Performance measures help us understand, analyse, control and improve what our organizations do. Commentators believe performance measures and metrics will facilitate a more open and transparent communication between people, leading to a co-operative supported work environment and hence improved organizational performance (Gunasekaran and Kobu, 2007). According to The Performance-Based Management Handbook, 2001 effective performance measures can let us know:
• How well we are doing,
• If we are meeting our goals,
• If our customers are satisfied,
• If our processes are in statistical control, and
• If and where improvements are necessary.
Gopal et.al, (2012) in review of supply chain measures and metrics claim that researchers have associated the supply chain performance with measures in the following diverse ways:

- •   qualitative or quantitative
- •   cost and non-cost;
- •   quality, cost, delivery and flexibility
- •   cost, quality, resource utilization, flexibility, visibility, trust and innovativeness
- •   resources, outputs and flexibility
- •   supply chain collaboration efficiency; coordination efficiency and configuration
- •   input, output and composite measures
- •   strategic, operational or tactical focus
- •   supply chain operations reference (SCOR) model (plan, source, make, deliver and return or customer satisfaction); whether they measure cost, time, quality, flexibility and innovativeness; and, whether they were quantitative or qualitative
- •   modelling the metrics of lean, agile and leagile supply chains
- •   key performance measures and metrics in supply chain
- •   scorecard approach
- •   tangible/intangible
- •   sustainability/green
- •   financial/non-financial

A .Types of Performance Measures:

The Performance-Based Management Handbook, 2001 has divided the performance measures into five general types. They are:
• Input Measures - Used to understand the human and capital resources used to produce the outputs and outcomes.
• Process Measures - Used to understand the intermediate steps in producing a product or service. In the area of training for example, a process measure could be the number of training courses completed as scheduled.
• Output Measures - Used to measure the product or service provided by the system or organization and delivered to customers. An example of a training output would the number of people trained.
• Outcome Measures - Evaluate the expected, desired, or actual result(s) to which the outputs of the activities of a service or organization have an intended effect. For example, the outcome of safety training might be improved safety performance as reflected in a reduced number of injuries and illnesses in the workforce.
• Impact Measures - Measure the direct or indirect effects or consequences resulting from achieving program goals. An example of an impact is the comparison of actual program outcomes with estimates of the outcomes that would have occurred in the absence of the program.
Performance measures can also be categorized as leading, lagging, and/or behavioural. These types of measures are defined below:
• Lagging Measures - Measure performance after the fact. Injury and illness measures such the Lost Workday Case Rate and the Total Recordable Case Rate are examples of lagging measures commonly used to measure environment, safety and health performance.
• Leading Measures - Are more predictive of future performance and include measures such as near misses, procedural violations, or estimated cost based on highly correlated factors.
• Behavioural Measures - Measure the underlying culture or attitude of the personnel or organization being measured. Examples would include management walk-through, safety program implementation, or employee satisfaction questionnaires.

VII.   TESTS FOR PERFORMANCE MEASURES

Once the performance measure types are identified and selected, it is to be tested to analyse the effectiveness of the measure. Even though a wide literature is available on the various requirements of performance measures a set of generic tests will help us to know what to look for in a performance measure and how to develop sound performance measure. Two important tests cited from The Performance-Based Management Handbook, 2001is given below.

A. The SMART test:

SMART test provide a quick reference for determining the quality of a particular performance measure:

- S = Specific - Is the measure clear and focused to avoid misinterpretation? It should include measurement assumptions and definitions, and should be easily interpreted.
- M = Measurable - Can the measure be quantified and compared to other data? It should allow for meaningful statistical analysis. Avoid ?yes/no" measures except in limited cases, such as start-up or systems-in-place situations.
- A = Attainable - Is the measure achievable, reasonable, and credible under conditions expected?
- R = Realistic - Does the measure fit into the organization's constraints? Is it cost-effective?
- T= Timely - Is measurement doable within the time frame given?

B. The Quality Check:

The following questions serve as a checklist to determine the quality of the performance measures that have been defined:

- Is the measurement objectively measurable?
- Does the measurement include a clear statement of the end results expected?
- Does the measure support customer requirements, including compliance issues where appropriate?
- Does the measure focus on the effectiveness and/or efficiency of the system being measured?
- Does the measure allow for meaningful trend or statistical analysis?
- Have appropriate industries or other external standards been applied?

VIII.   CRITICISMS ON PERFORMANCE MEASUREMENT SYSTEMS

We have seen that a variety of models and frameworks were proposed and practiced in various organisational contexts. Even though each model has its own merits and features, they had to face criticisms from reviewers on various fronts. Some of the most observed shortcomings of performance measurement systems are listed below.

- Lack of systematic method for selecting measures
- Lack of a balanced approach
- Too many number of metrics and measures
- Lack of provision for benchmarking
- Lack of connection with organisation's mission and strategy.
- Failure in addressing the practicalities of measurement
- Lack of system thinking of measuring supply chain as a whole
- Lack of systematic method for prioritising measures

IX.   SUGGESTIONS

- Creative efforts are needed to design new measures and new programs for assessing the performance of the supply chain as a whole as well as the performance of each organization that is a part of the supply chain (Gunasekaran et.al, 2004).
- Researchers should include and analyze safety-related measures in supply chains (Gopal et.al, 2012).
- Comparative analysis is needed of short vs long supply chains based on product life cycles (Gopal et.al, 2012).
- Composite models can be generated and be experienced in some case studies (Öztayşi et.al, 2009)
- Measures spanning entire SC do not exist; there is requirement to go beyond internal matrix and take an SC perspective (Kurien et.al, 2011).
- It is expected that future SCPMS will be incorporating technology, Operations Research techniques and heuristics in measurement frameworks (Kurien et.al, 2011).
- Future studies must address the business and environmental results of a green supply chain management performance measurement system and their impact within the organization, industry, and society at large (Hervani et. al, 2005).
- Research to explore how the conceptual frameworks can be translated and tailored to fulfil the unique measurement needs of a specific company, especially at the operational level, is needed (Michaela Striteska et.al, 2012).
- There is a need for longitudinal empirical studies that explores the relationship between the dynamic operating environment; Evolution of performance measures; Evolution of performance management and Evolution of organisational culture to create a better understanding of how one effects the other (Bititci et.al, 2000).

X.   CONCLUSION

The relevance of effective performance measures in achieving sustained business progress in a dynamic environment cannot be understated. With this in mind significant amount of work has been carried out in the field of performance measurement and

management in the last two decades. Literature indicates the existence of wide variety of measures and frameworks. Many of the works are theoretical models with less information on how to implement these models. The validity and practicality of most of these measures and metrics is yet to be determined. With the change of time business practices are also evolving to meet the changes in market demand and customer expectations. Accordingly the measures and measurement systems also need to evolve. The existing performance measurement models and systems are to be strengthened by including new dimensions and measures of the new age. The scope for incorporating suitable optimisation techniques to create integrated performance measurement and management systems is to be tested. While carrying on such advanced researches the ability of a performance measurement system to provide a quick snapshot of the business with relative easiness is to be maintained.

ACKNOWLEDGMENT

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A WEB PORTAL ARCHITECTURAL DESIGN AND IMPLEMENTATION FOR PRIVATE UNIVERSITIES IN NIGERIA

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Abstract - A web portal architecture for implementation in private universities in Nigeria was proposed and described in this paper. The waterfall model was adopted as the methodology of choice where it prescribes a systematic approach to software development which helps to clearly define both the user and system requirements, The portal proposed was developed using several development tools such as WAMP packages where the Windows platform is the operating system on which the portal runs, Apache is the server, while MySQL was used for the database and PHP as the scripting language. A model of the portal was designed using modeling tools such as Data Flow Diagram (which included student level data flow diagram, lecturer level data flow diagram, administrator level data flow diagram) and the Use Case Diagram. This was preceded by the implementation of the portal to achieve specific objectives such as controlling educational processes, providing access to educational resources, storing user details and information, ensuring security and data integrity, providing a user friendly environment for users and confidentiality.

KEYWORDS: Portal, Web, Modeling, University

I.   INTRODUCTION

According to Maedche A et.al (2002), a web portal, also known as a links page, presents information from diverse sources in a unified way. They go beyond static web pages and require a sign-on which links to some knowledge the organization has collected about the visitor. That knowledge allows portals to be tailored to meet individuals need. The business dictionary, enumerated that portals go beyond the delivery of static information and often provide access to services offered by the organization. A portal makes network resources (application, databases, etc.) available to end users. The user can access the portal via a web browser, WAP phone, pager and other devices. Portals include network enabling services such as e-mail, chat rooms and calendars that interact seamlessly with other applications. Most web portals allows for adding personal links as portal providers realize that user may have other interest beyond the organizational boundaries. Personalization will make the portal more appealing to the user, thus a portal allows a user to enter their data space, which can be defined as a space where a user can view and do what he/she wants to do and not what someone else thinks should be done. Examples of web portals are Thrashbarg, AOL, iGoogle, MSNBC, Netvibes, and Yahoo!.

Conventional interaction systems and information dissemination for students and staff (Academic and Non-Academic staff) of a University faces many challenges. Private universities in Nigeria are thus solutions aimed at solving the ills that plague the public universities where inefficient communication/ information dissemination can be regarded as one of those ills. To overcome these challenges there exist the need to develop a portal where students can access vital, relevant university information anytime via the Internet. The web portal as a gateway in the World Wide Web is a starting point for people who are connecting to the Internet. The web portal as the type of knowledge management system provides a rich space to share and search information as well as communication services like content provision for the users. This paper aims at proposing a necessary tool for students in the private universities to help them in getting the required relevant information.

II.   RELATED WORKS

A.   The University of Greenwich web Portal

The University of Greenwich web Portal has been created to make it easier for their students to complete their studies, whilst also enhancing the Greenwich Experience. Students can use the web Portal to access their subject materials online, check their student email, access library services, complete administration requirements and find out about other services offered which are not directly related to their studies and much, much more.
Some useful features include:

- Easy access to administrative and study-related information, allowing students to view and update their personal details online to ensure they don't miss any important University correspondence.

- The 'Information' Directory helps students to locate administrative and study-related resources, policies and information, as well as services to enhance the Greenwich Experience.

- Access to student email account, allowing sending and receiving email messages.

- Access to student notices, allowing students to see the notices relevant to them as well as sending their own notices.

- Access to 'Personal Links'. Save their favorite websites in the 'Quick Links' portlet of the Home page in the Student Portal so they can access them from any computer.

- Links to subject learning tool pages are conveniently located in one place.

- Access to today's weather: a useful tool to help plan your day.

- Front page summaries of students' email, notices and library accounts for quick access.

- Access to library services online. Conduct catalogue searches, view past exam papers and find other key services from one location.

- The student Portal can be accessed from any computer within the University or off-campus at any time provided you have an Internet connection and a University of Greenwich email account.

To use the Student Portal you need:
- PC users: Windows 2000, XP or Vista

- Mac users: MacOS X 10.3.9

- Hardware: 64 MB of RAM, 50-100 MB of free memory space

- Javascript enabled

- Cookies enabled

- If accessing the Student Portal from outside the University, you will need a minimum 56 K modem

You can use the Student Portal on the following web browsers:
- Internet Explorer 6+

- Mozilla Firefox 1.5+

B. Oduduwa University web Portal (Oduduwauniversity.edu.ng)

The Oduduwa university web Portal is not one of the most visited academic portals in Nigeria. It was not created to make it easier for students' to check their grades and register for the semester. The Oduduwa university web portal is STATIC and NOT INTERACTIVE unlike the University of Greenwich web Portal which is DYNAMIC; it was not developed to accommodate lecturers, Alumnae, Guardians and Employers. The Oduduwa university web portal is not a complete university portal and hence the paper attempts to use this as a case study in proposing the architecture.

III   METHODS

A. Analysis of Existing System

In the current approach employed by most universities, students have no communication medium between them and other officials within the institution; also there is no provision for an information dissemination medium from the management of the institution to the students. This causes a great problem in keeping records of daily attendance, performance of each student on the side of the lecturer, and there are lots of difficulties for the students regarding interaction with their departments and getting up-to-date information concerning their respective departmental activities.

B. The Proposed System Analysis

The system has been divided into modules where each module is described below.

*a. Login Module***:** The purpose of this module is to provide entry to the system or website. Based on the type of login, the user is provided with various facilities and functionalities. The main function of this module is to allow the user to use the portal. This module provides two types of login —Admin login and Student login.

b. Administration Module: In this module the administrator enters his/her user name and password, which enables access to the administrator page. This page consists of two following sub modules.
- ***Student Addition/Updating/Deletion:*** Each Student is added, updated or deleted according to his/her department.
- ***Notice/Updates/Result Generation:*** On the portal, information about notice, attendance and Internal result is generated.

c. Study Material Module: This module provides the feature of access to read/download study materials available on the website. The module could be edited only by the administrator of the web portal. Any student can download the material available at any time.

d. Departments Module: This module gives profile information of various departments associated to the faculties. It gives profile information of all the departments. Anyone can contact these departments through the available complaint form.

e. Students Module: This is a separate webpage for students. They can view, edit, and update their profile from anywhere. It also provides them with platforms to view results.

f. Syllabus Module: The syllabus of various branches associated with different departments within the institution is available here. Syllabus can be viewed and downloaded by the students.

g. Registration Module: This module enables students to register for the semester.

h. Courses Module: This module creates a platform for students to view and select courses to be taken for the current semester.

i. Administration Module: This is a backend for the management, registry, student affairs and other departmental officials to manage student records, requests, and complaints as well as disseminate information to the students and other bodies.

j. Requirement Specification: Requirement specification is a description of what the users of a system will be able to do with it, the functionalities the system should have and how it should react in certain situations.

The expected functionalities of the 'to be system' is indicated below:

- The system should maintain a central base of information.
- The system should deliver all the information about student profile and results to be accessible by various departments within the institution.
- The system shall display syllabus of various courses from each department.
- The system should provide a medium for students to lodge complains.
- Students should be able to view their previous results, read and download books, as well as communicate with administrative officials through available contact forms and get feedback through their profile's email address.
- The system shall provide the school with administrative officials an interface to read and access student request as well as respond to such request in a user friendly manner.

C. Assumptions and Dependencies

Although basic password authentication and role based security mechanisms will be used to protect the web portal from unauthorized access; functionality such as inserting, deleting and updating are assumed to be sufficiently protected under the existing security policies provided by the database system proposed for implementation.

System Development Software Tools
- MySQL database to store and secure information.
- PHP, JavaScript, CSS, HTML to develop the system.
- Apache Server testing the application during development.

System Hardware Development Tools
- Microprocessor: AMD Athlon™ X2 Dual Core QL-66 2.2GHz
- RAM: 2 GB of RAM
- Hard Disk: 160 gigabytes (GB) on installation drive

Operating Systems:
- Windows 7 Home Premium 32 bits Operating System for developing this system.

End-user Characteristics
Every user must have basic knowledge of English.
- He/she should be able to work with computer.
- All users must have his/her unique login name and password to access the web portal.

- The user should know in details of the operation and working of the system.

D. System Design

The system is a web based system that allows multiple access concurrently.
System design is divided into stages:
- Logical design: This is concerned with object oriented modeling of the system analysis.
- Physical design: This is concerned with the construction of the real system.
In the object oriented analysis and design, Unified Modeling Language will be used to model the system where a model is the act of drawing one or more graphical representations of a system with modeling being the process of abstracting and organizing significant features of part of the real world.

E. Design Models

Different models were constructed with unified modeling language using CASE (Computer Aided Software Engineering) tools for proper understanding of the system and also to provide a coherent strategy of the way forward. Such models include Use Case Diagram and Data Flow Diagram.

a. Use Case Diagram: A use case is a story or a case of using a system by some users to carry out a process. A use case describes the sequence of events of some types of users called actors, using some part of the system functionality to complete a process. Each use case then captures a piece of functional requirements for some users. All the use cases together describe the overall functional requirements of the system. The first step in requirements capture is to capture requirements as use cases.

b. Data Flow Diagram: This is a process model used to depict the flow of data through a system and the work or processing performed by the system. In this model, there are four symbols, the rounded rectangle represents processes or work to be done, the square represents external agents, which are the boundary of the system, the open ended box represents data stores, which are sometimes called files or databases, the arrows represent data flows, or inputs and outputs, to and from the processes.

Fig 1: Use Case Diagram for the Proposed System
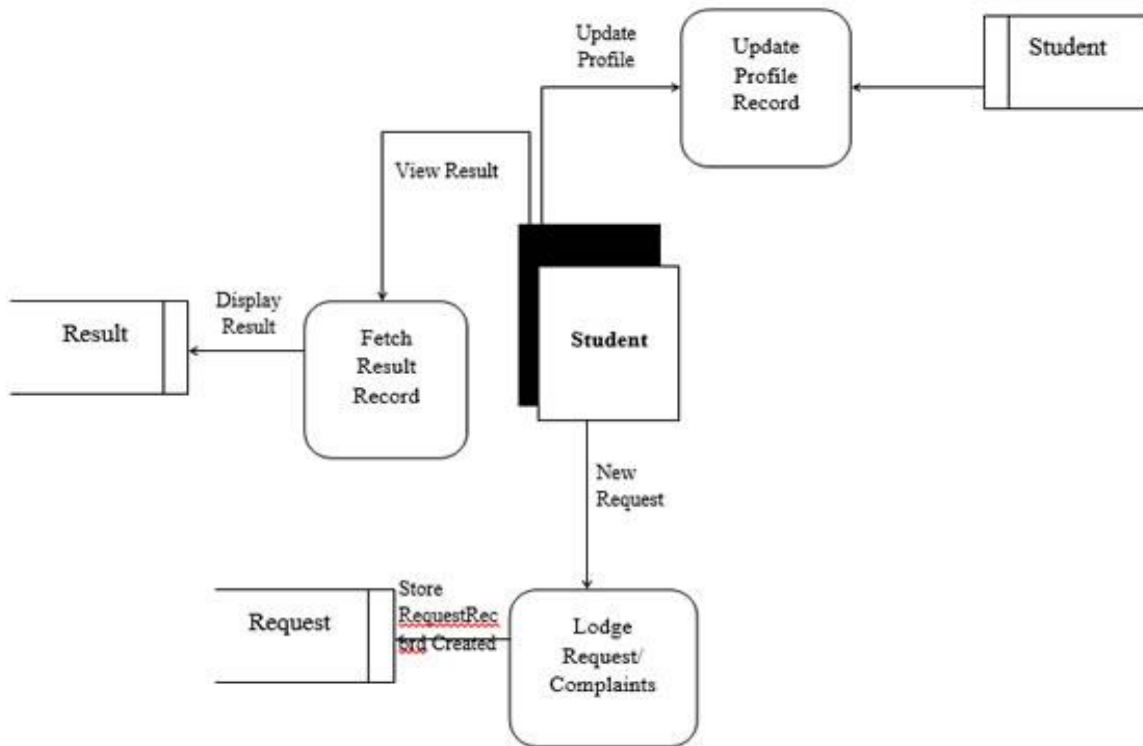
Fig 2: Data Flow Diagram for Student's Level
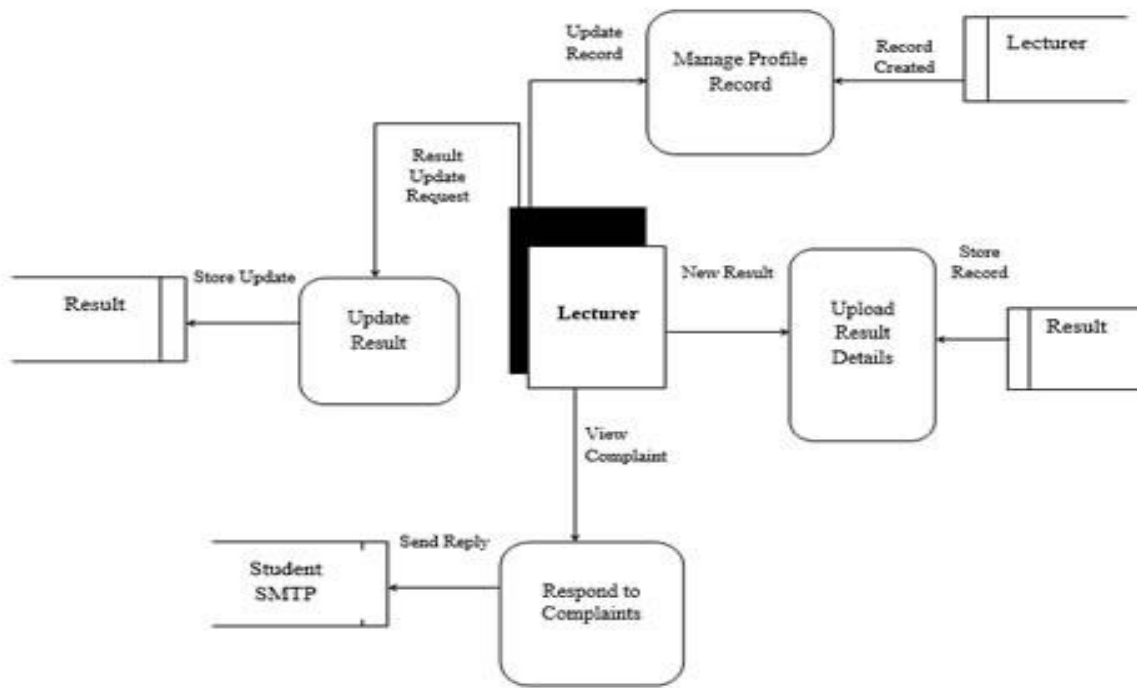
Fig 3: Data Flow Diagram Lecturer's Level
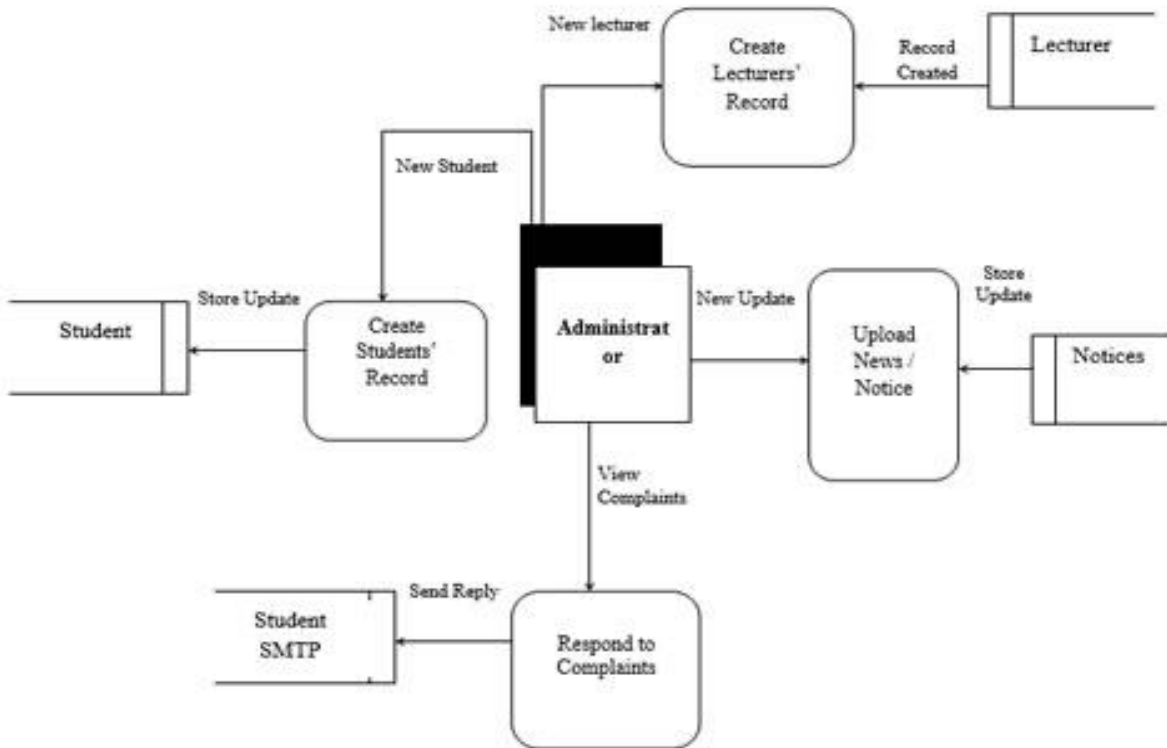
Fig 4: Data Flow Diagram for Administrator's Level

IV RESULTS AND DISCUSSIONS

A. Student Login/Administration Module

Step 1: After launching the system, the student login module is located on the right side of the content.
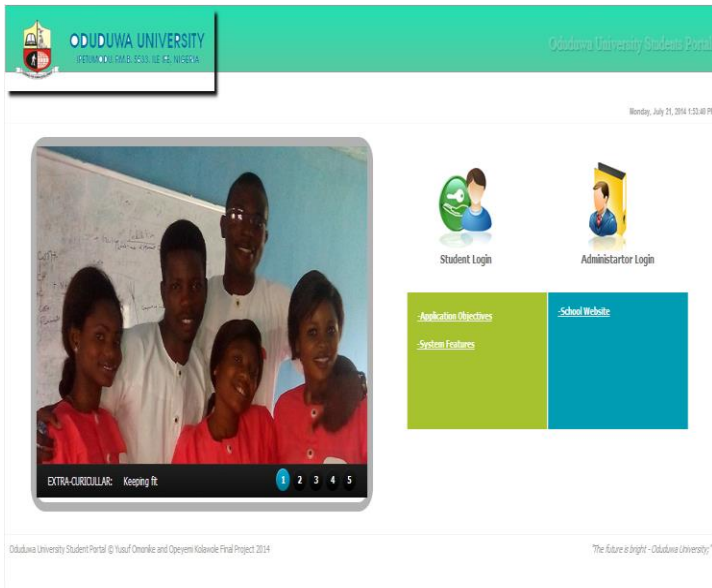
Fig 5: Homepage

Step 2: The login page appears for the student to enter his or her matriculation number and password. Click the "Login" button.
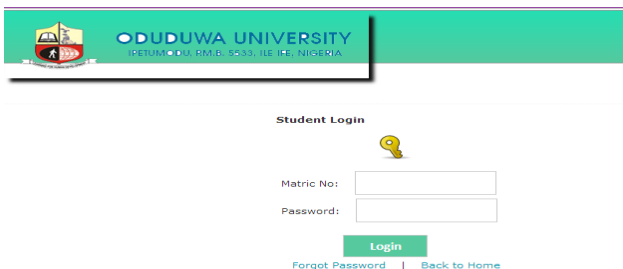
Fig 6: Student Login Page

Step 3: The system test the validity of the login credentials, if invalid, the system remains on the login page with error notification. Otherwise, the system proceeds to the announcement page. Announcements from different departments are displayed.
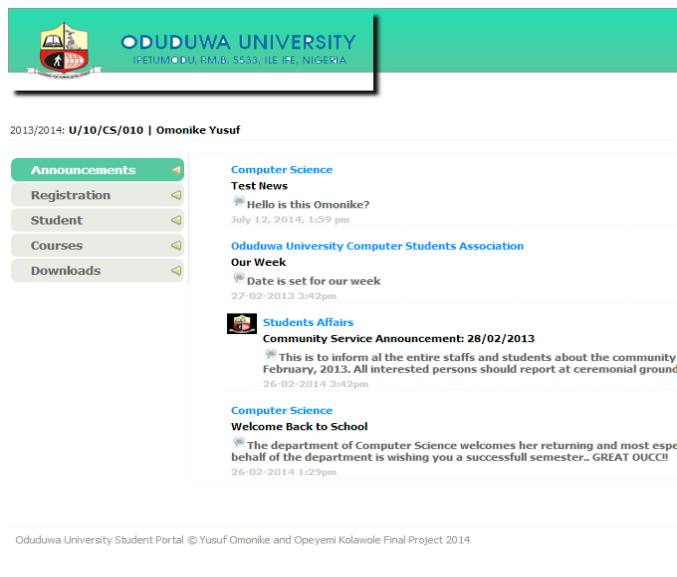
Fig 7: Announcement Page

Step 4: The system allows each student to register for the semester on the register semester page.
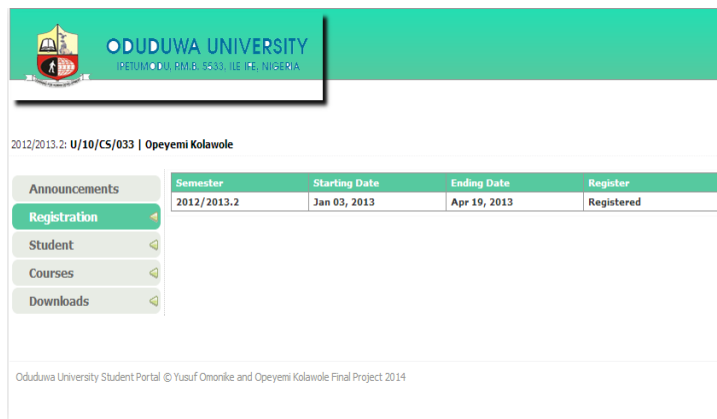
Fig 8: Register Semester

Step 5: The account details page displays the student account information, and notifies the student if he or she is on probation.

Fig 9: Account Information

Fig 11: Semester Result

Step 6: The semester result page wraps up all the semesters result completed by the students by semesters and displays it as well as computes the overall CPGA up to date.

Step 8: Students have the opportunity using the post mail interface to forward complain or request to any department of their interest, these mails gets delivered to the these departmental request box.

Fig 10: Student Result

Fig 12: Post Mail

Step 9: The download page presents students with electronic materials to read and download for further reading, these materials are stored based on their categories.

Step 7: The semester result page presents a detailed semester result showing the score earned for all the courses taken for the semester and their corresponding grade and grade point.

Fig 13: Download Page

V CONCLUSION

This paper provides a solution to the inefficient dissemination of information/communication in private institutions of higher learning in Nigeria. The inclusion of information technology approaches to optimize already existent practices is to be encouraged as any hope towards achieving the developmental visions of turning the country from an under developed nation to a developed nation can be actualized by the infusion of information technology approaches and technologies. This innovatory architecture can perform the most desired activities of the student in an attractive and user-friendly environment.

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Development and Validation of Worktext in Drawing 2

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Abstract- This Study aimed to develop and validate Worktext in Drawing 2 for Technology students of College of Industrial Technology. It was conducted at University of Rizal System during the school year 2010-2011 with 50 first year BT students and 8 drafting professors as respondents. The study used the descriptive-experimental method to describe and evaluate the developed Worktext in Drawing 2 using the questionnaire-checklist and test results in gathering data. A pretest and posttest was administered to the student users to determine the performance in Drawing 2 of the two groups of respondents. They were asked to evaluate the worktext through the following: subject matter, organization and presentation, language and style and style and usefulness. Responses were tallied, tabulated and interpreted with the use of appropriate statistical treatment. The derived conclusions are as follows. Students exposed to the developed worktext in Drawing 2 performed better than the students taught without the use of the worktext. The developed worktext in Drawing 2 as instructional material is highly acceptable in teaching the subject. From the findings and conclusions presented, the study recommended the following: the developed worktext in Drawing 2 may be adopted for use by all Technology and Engineering students in different specializations, continuous revisions and modifications of the worktext may be done to suit the learning styles, needs and abilities of the students and development of worktext, workbook and the same materials in other drawing/drafting areas may be developed.

Index Terms- Drawing 2, Worktext, Instructional Materials, Drafting Technology

I. INTRODUCTION

Drawing subject supplements area of specialization in technology courses. A good drawing is not an accident. It is the product of long period of trainings and experiences. Competencies must be achieved gradually. The subject carries a single unit, three hours a week and considered a laboratory. Lectures and demonstrations are constantly provided so with assignments and researches aside from the usual making of plates. Writing notes, copying drawn procedures and redrawing the given objects which are also vital in learning are usually left undone due to numerous routinary activities. The worktext in Drawing 2 could be beneficial to the students because it provides sufficient lectures and illustrations. This will not replace the drawing lessons to be prepared by the instructors/professors but designed to supplement and suggest uniformity of instructions.

The University guidelines on textbook/instructional materials development, pursuant to Republic Act 8293, encourage full-time faculty members to develop textbook/instructional materials that will develop competencies as required by the subject[1]. Moreover, the Presidential Decree No. 6-A, known as the Educational Development Act of 1972, explicitly stated one of the objectives of tertiary education in the following statement: "Develop the high level professions that will provide leadership for the nation, enhance knowledge through research, and apply new knowledge for improving the quality of instruction." This objective shall be attained through the design, utilization and improvement of instructional technology and development/production of textbooks and other instructional materials (http://www.lawphil.net/statutes/presdecs/pd1972/pd_6_a_1972. html)[2].

Instructional Design Theory of M. David Merill is a set of procedures for systematically designing and developing instructional materials. The emphasis is primarily on what to do, rather than on how to do it, or why it works. It involves five basic phases: analysis, design, development, implementation, and evaluation.[3]

Why do we need the instructional theories and models when we design an instructional material? According to Thompson, instructional theories and models will guide us as follows:

- Speed up the process - focusing the team and serve as foundation of project development.
- Assist in communication: Team members need to share expertise, intent, calendars, and so forth. By using ID Models, each of team members will know when and what to give or share with the other team member.
- Cover all phases of good instructional design: make sure that all elements of instruction are include, relate to and support each other.[4]

The stated theories and models distinctly emphasize the significance of developing materials for instructional purposes. They are related and relevant to the present study since the aim of the study is to develop and validate a tailored-fit instructional materials to supplement the teaching-learning conditions of the Drafting Technology Subjects offered as major and related subjects and assess appropriateness, accuracy and completeness of the training material considering contents, organization and presentation, language and style and usefulness.

Heinich regarded learning materials meaningful to master specific skills and acquire knowledge. According to him, instructional materials are not designed to become a substitute to effective teacher or to supplement the textbook but to supplement the instructional process. The present study has the same intention of providing integral exercises to the instructional process that may lead to consistent and synchronize lessons and not to suppress one's academic freedom.[5]

According to Kelly, the most prevalent factors that facilitate heighten classroom interaction is the material availability and an adequacy of educational materials, which would be effective, suitable and adaptable to the nature or the kind of students the teacher handles without prejudice. Mixed ability classes hamper when these materials are inadequate and scarce, impediments in classroom interaction among students result and learning process.[6]

The literature is related to the present study for it uses customized worktext suited for different levels of Technology students in Drawing. Providing the students adequate educational material is also the ultimate goal of this study.

Castaniares in her study "Development, Validation and Acceptability of Worktext in Advanced Algebra" aimed to evaluate the effectiveness of modular instruction given to the experimental and controlled group. The experimental method of research was utilized using randomized pretest and posttest design.[7]

According to Bautista, pretest is a criterion reference test for knowledge and is given before the lesson. She used the group pretest – posttest experimental design. The first two groups were given before the utilization of the module, and afterwards, the posttest, while the control group was taught in a traditional method of teaching without a module.[8]

The researcher uses the pretest intervention and posttest approach of experimentation and somewhat similar the above mentioned studies.

II. OBJECTIVES OF THE STUDY

The study aimed to develop a worktext that will expedite teaching-learning process, provide independent learning and a remedial tool to slow learners and enhancement for fast learners; furnish the students with customized and affordable worktext leading to immense comprehension of Drawing 2.; and, validate the developed worktext in Drawing 2 as specified in the course syllabus during the school year 2010 – 2011 in the University of Rizal System, Morong, Rizal.

Specifically, the research sought answer to the following problems:

1. How do the student respondents perform in pretest and posttest in Drawing 2 in terms of the following learning areas:
    1.1 Review on Orthographic and Pictorial Drawings;
    1.2 Dimensioning;
    1.3 Scaling;
    1.4 Sectioning;
    1.5 Auxiliary Views; and
    1.6 Pattern and Surface Development?
2. Is there a significant difference on the performance in Drawing 2 of the student-respondents as revealed by pretest and posttest on the six learning areas?
3. What is the level of acceptability of the developed worktext as evaluated by the student-respondents and professor respondents with respect to:
    3.1 subject matter;
    3.2 organization and presentation;
    3.3 language and style; and
    3.4 usefulness of the worktext?
4. Is there a significant difference between the evaluations of the two groups of respondents on the acceptability of the worktext with respect to the above-mentioned criteria?

III. METHODOLOGY

This study used the descriptive method of research in analyzing the data gathered which will lead to realize the objectives which is to develop and validate worktext in Drawing 2 based on the requisites of the students and the curriculum. As stated by Best and Khan "Descriptive research simply seeks to describe particular phenomena which also include hypothesis formulation and testing. Also relevant variables for an independent analysis of their relationship and differences were selected"[9]. Experimental method utilizing two groups, experimental and control groups was also adapted to compare the conventional way of teaching with the application of the developed worktext in Drawing 2. According to Sevilla, the experimental method of research is the only method cause and effect relationship. It was further added that it represents the most valid approach to the solution of the problem.[10]

Pretest and Posttest were used as instruments in the study. The study made use of a 60 item multiple choice of test in Drawing 2 to find out the accomplishment of the two groups of student respondents. The original draft of the test was composed of 100 items. This was pre-tested to second year BT students with different area of specialization of URS Morong. The test was

subjected to the process of item analysis procedure and revisions were appropriately made resulting to the final form of the test which is composed of 10 items each for Review of Orthographic and Isometric Drawings, Dimensioning, Scaling, Sectioning, Auxiliary Views and Pattern and Surface Development.

A questionnaire – checklist was also used as instrument in gathering the needed data. This was used to determine the acceptability of the worktext in Drawing 2. The questionnaire – checklist was adapted from the questionnaire of Melinda S. Jimenez in her study Development and Validation of Laboratory Manual in General Chemistry.[11] The criteria included in the questionnaire – checklist is subject – matter, organizations and presentation, language and style and usefulness.

The professor respondents and the student users were asked to evaluate the developed worktext in Drawing 2 following the given scale:

Scale	Subject Matter	Organization and Presentation	Language and Style	Usefulness
5	Very Highly Sufficient	Very Much Effective	Very Highly Effective	Very Useful
4	Highly Sufficient	Much Effective	Highly Effective	Useful
3	Sufficient	Moderately Effective	Effective	Moderately Useful
2	Slightly Sufficient	Less Effective	Slightly Effective	Slightly Useful
1	Not Sufficient	Least Effective	Not Effective	Not Useful

Topics stated in the course syllabus for Drawing 2 were basis for the various learning components integrated in the development of the worktext. Diverse learning materials were utilized in the different facts, ideas and rudiments of Drawing 2. Directions and information were made simple for better understanding and appreciation of the students. Sufficient illustrations were provided so that students can easily comprehend the concepts. Test items in Drawing 2 were constructed after the development of the worktext. Item analysis was done and after determining its reliability, the test was administered to two groups of respondents prior to lesson presentations. Conventional method was applied to the control group while the experimental group was taught using the developed worktext in Drawing 2 as instructional material.

The following statistical tools were utilized in the interpretation of the gathered data. Mean and standard deviation were used to determine the performance of the two groups of respondents in Drawing 2 as revealed by the pretest and posttest. To determine the significant difference on the performance of the students in the pretest and posttest, independent and dependent t-test were applied. To determine the level of acceptability of the developed Worktext in Drawing 2 as perceived by the professor and student respondents in terms of subject matter, organization and presentation, language and style and the usefulness, the weighted mean was used. Independent t-test was applied to determine the significant difference on the evaluation of the two groups of respondents on the acceptability of the developed worktext.

IV.   RESULTS AND DISCUSSIONS

The Level of Performance in Drawing 2 of the Experimental Group and Control Group as revealed by the Pretest and Posttest in the Different Learning Areas

Table 1 presents the computed mean and standard deviation on the level of performance in Drawing 2 of the experimental and control groups as revealed by the pretest and posttest.

Table 1: Computed Mean and Standard Deviation on the Level of Performance In Drawing 2 of the Experimental and Control Groups as Revealed by Pretest and Posttest

Learning Areas	Experimental Group						Control Group					
	Pretest			Posttest			Pretest			Posttest		
	Mean	VI	SD	Mean	VI	SD	Mean	VI	SD	Mean	VI	SD

Review of Orthographic Isometric Drawings	4.36	P	1.80	8.80	H	1.41	4.64	P	1.55	7.28	H	2.07
Dimensioning	3.64	P	1.55	6.88	A	1.09	2.96	NI	1.40	4.96	P	1.54
Scaling	3.84	P	1.97	7.88	H	1.24	4.20	P	1.55	6.76	A	1.94
Sectioning	3.04	P	1.64	8.32	H	1.18	2.84	NI	1.47	6.56	A	2.09
Auxiliary Views	4.00	P	1.60	8.16	H	1.72	4.08	P	1.67	6.56	A	2.03
Pattern and Surface Development	3.56	P	1.72	7.48	H	1.81	3.60	P	1.35	5.04	A	1.88

H – High, A – Average, P – Poor, NI – Needs Improvement

As shown in the table, the experimental group obtained "Poor" performance in all learning areas in the pretest with mean scores of 4.36, 3.64, 3.84, 3.04, 4.0 and 3.56, respectively with standard deviations of 1.80, 1.55, 1.97, 1.64, 1.60 and 1.72. "High" performance was obtained by all learning areas except in "Dimensioning" with "Average" performance in the posttest of the experimental group after their exposure to worktext in Drawing 2 with mean scores of 8.80, 6.88, 7.88, 8.32, 8.16 and 7.48, respectively.

For the control group, four learning areas obtained "Poor" performances and two "Needs Improvement" performances. "Dimensioning" and "Sectioning" obtained the lowest mean scores of 2.96 and 2.84, respectively and standard deviation of 1.40 and 1.47. With regards to posttest in "Review of Orthographic and Pictorial Drawings" obtained "High" performance with a mean of 7.28 and a standard deviation of 2.07, while "Dimensioning" got "Poor" performance with mean score of 4.96 and a standard deviation of 1.54. However, all other items obtained 6.76, 6.56 and 5.04 mean scores and interpreted "Average". The findings connote that performance in Drawing 2 of the experimental group improved immensely after exposure to worktext. Much the same, the control group's performance also gained with modest mean increases in favor of the posttest.

The Significant Difference on the Level of Performance in Drawing 2 of the Two Groups of Respondents in the Pretest and Posttest in the Different Learning Areas

Table 2 presents the computed t-values on the level of performance in Drawing 2 of the experimental group in the pretest and posttest in the different learning areas.

Table 2: Computed t-values on the Level of Performance in Drawing 2 of the Experimental Group
in the Pretest and Posttest in the Different Learning Areas

Learning Areas	Mean		df	t_{comp}	t_{tab}	Ho	VI
	Pre test	Post test					
Review of Orthographic and Isometric Drawings	4.36	8.80	24	6.857	2.064	Rejected	S
Dimensioning	3.64	6.88	24	8.538	2.064	Rejected	S
Scaling	3.84	7.80	24	7.439	2.064	Rejected	S
Sectioning	3.04	8.40	24	13.313	2.064	Rejected	S
Auxiliary Views	4.00	8.16	24	8.823	2.064	Rejected	S
Pattern and Surface Development	3.56	7.48	24	7.935	2.064	Rejected	S

As reflected from the table, the performance of the experimental group differs significantly in the pretest and posttest since the computed t-value of 6.857, 8.538, 7.439, 13.313, 8.823 and 7.935 exceeded the tabular t-value of 2.064 at .05 level of significance with 24 degrees of freedom. The findings imply that the use of worktext in the teaching of Drawing 2 contributed to the significant improvement in students' performance.

Table 3 presents the computed t-values on the level of performance in Drawing 2 of the control group in the pretest and posttest in the different learning areas.

Table 3: Computed t-values on the Level of Performance in Drawing 2 of the Control Group
in the Pretest and Posttest in the Different Learning Areas

Learning Areas	Mean		df	t_{comp}	t_{tab}	Ho	VI
	Pre test	Post test					
Review of Orthographic and Isometric Drawings	4.64	7.28	24	4.878	2.064	Rejected	S
Dimensioning	2.96	4.96	24	13.680	2.064	Rejected	S
Scaling	4.20	6.76	24	5.179	2.064	Rejected	S
Sectioning	2.84	6.56	24	7.307	2.064	Rejected	S
Auxiliary Views	4.08	6.56	24	4.731	2.064	Rejected	S
Pattern and Surface Development	3.60	5.04	24	3.106	2.064	Rejected	S

It could be gleaned from the table that in all learning areas, the computed t-values all exceeded the tabular t-value of 2.064 at .05 level of significance with 24 degrees of freedom, thus, rejected the null hypothesis. The findings disclose that the meaningful function of drawing professors in the teaching learning process cannot be refuted.

This may connote that a fusion of diverse strategies and the professors' capacity to inspire and stimulate well are significant factors for an enriched level of achievement. The findings are supported by the study of Bautista that the role of teachers in the educational process is still the key factor in classroom learning situation. According to her, when suitable learning strategies are used coupled with teachers' competencies, success in the teaching learning process is ensured.[8]

Table 4 presents the computed t – value on the level of performance in Drawing 2 of the experimental and control groups in the pretest in the different learning areas.

Table 4: Computed t-values on the Level of Performance in Drawing 2 of the Experimental and Control Groups in the Pretest in the Different Learning Areas

Learning Areas	Experimental		Control		Mean dff	df	t_{comp}	t_{tab}	Ho	VI
	Mean	SD	Mean	SD						
Review on Orthographic and Isometric Drawings	4.36	1.80	4.64	1.55	.28	48	0.5553	2.021	A	NS
Dimensioning	3.64	1.55	2.96	1.40	.68	48	3.8900	2.021	R	S
Scaling	3.84	1.97	4.20	1.55	.36	48	0.6293	2.021	A	NS
Sectioning	3.04	1.64	2.84	1.47	.20	48	1.0684	2.021	A	NS
Auxiliary Views	4.00	1.60	4.08	1.67	.08	48	0.3756	2.021	A	NS
Pattern and Surface Development	3.56	1.72	3.60	1.35	.04	48	0.2139	2.021	A	NS

A – Accepted, R – Rejected, S – Significant, NS – Not Significant

It could be gleaned from the table that with respect to "Dimensioning", the performance of the two groups of respondents in the pretest differs significantly with a mean difference of .68 and a computed t-value of 3.89 which exceeds the tabular t-value of 2.021 at .05 level of significance, thus the null hypothesis is rejected. The difference may be due to the different knowledge already gained by the students from encounters on "Dimensioning".

Contradictory, with respect to other learning areas, the null hypothesis is accepted having all computed t-values not exceeding the tabular t-value of 2.021 at .05 level of significance. The findings imply that the two groups of respondents have different entry knowledge on Dimensioning before the experiment but in all other learning areas in Drawing 2 they have similar knowledge before they were subjected to experimentations.

Table 5 presents the computed t-values on the level of performance in Drawing 2 of the experimental and control groups in the posttest in the different areas.

Table 5 : Computed t-values on the Level of Performance in Drawing 2 of the Experimental and Control Groups in the Posttest in the Different Learning Areas

Learning Areas	Experimental		Control		Mean dff	df	t_{comp}	t_{tab}	Ho	VI
	Mean	SD	Mean	SD						
Review on Orthographic and Isometric Drawings	8.80	1.41	7.28	2.07	1.52	48	3.0498	2.021	R	S
Dimensioning	6.88	1.09	4.96	1.54	1.92	48	5.0821	2.021	R	S
Scaling	7.88	1.24	6.76	1.94	1.12	48	5.2830	2.021	R	S
Sectioning	8.32	1.18	6.56	2.09	1.76	48	3.6751	2.021	R	S
Auxiliary Views	8.16	1.72	6.56	2.03	1.60	48	3.0024	2.021	R	S

| Pattern and Surface Development | 7.48 | 1.81 | 5.04 | 1.88 | 2.44 | 48 | 4.6788 | 2.021 | R | S |

The table depicts that with respect to all learning areas, the performance in the posttest of the respondents significantly differs since the computed t-values 0f 3.00498, 5.0821, 5.2830, 3.6751, 3.0024 and 4.6788 exceeded the tabular value of 2.021 at .05 level of significance, thus the null hypothesis is rejected. The findings reveal that the group exposed to worktext and those were taught using the conventional method of teaching have different performance with the mean gains in favor of experimental group. This implies that the developed worktext n Drawing 2 is good instructional material for the enhancement of learning competencies ion the Drawing subject. This is parallel to the findings of Jimenez that the developed laboratory manual contributed to the improvement of students' performance.[11]

The Level of Acceptability of the Developed Worktext as Evaluated by Student Users and Professors

Table 6 presents the computed weighted mean on the level of acceptability of the developed worktext as evaluated by the two groups of respondents with respect to subject matter.

The table reflects that as perceived by students, they evaluated the subject matter of the worktext in Drawing 2 as "Very Highly Sufficient" with an average weighted mean of 4.32 and all item except Auxiliary Views and Pattern and Surface Development were interpreted "Very Highly Sufficient". On the other hand, the professor respondents, all items are interpreted "Very Highly Sufficient" with an average weighted mean of 4.67. The findings reveal that the professors' evaluation of the worktext is higher than

Table 6: Computed Weighted Mean on the Level of Acceptability of the Developed Worktext as Evaluated by the Two Groups of Respondents With Respect to Subject Matter

Subject Matter	Students			Professors		
	$\overline{WX}$	VI	R	$\overline{WX}$	VI	R
Review on Orthographic and Isometric Drawings	4.28	VHS	4	4.78	VHS	3
Dimensioning	4.44	VHS	2.5	4.78	VHS	3
Scaling	4.56	VHS	1	4.63	VHS	4.5
Sectioning	4.44	VHS	2.5	4.44	VHS	6
Auxiliary Views	4.12	HS	5	4.78	VHS	3
Pattern and Surface Development	4.08	HS	6	4.63	VHS	4.5
Average Weighted Mean	4.32	VHS		4.67	VHS	

the evaluation of the students. This connotes that both groups viewed the developed instructional material as a useful instrument in acquiring desired competencies in Drawing.

Table 7 presents the computed weighted mean on the level of acceptability of the developed worktext as evaluated by the two groups of respondents with respect to organization and presentation.

Table 7: Computed Weighted Mean on the Level of Acceptability of the Developed Worktext as Evaluated by the Two Groups of Respondents With Respect to Organization and Presentation

	Organization and Presentation	Students			Professors		
		$\overline{WX}$	VI	R	$\overline{WX}$	VI	R
1.	The objectives of every chapter are stated in behavioral terms.	4.40	VME	5	4.95	VME	1
2.	The topic headings are clear and well presented.	4.88	VME	1	4.45	VME	5.5
3.	The topics are presented in a logical and orderly sequence that is from basic to advance.	4.84	VME	2.5	4.45	VME	5.5
4.	The varied exercises are sufficient enough to realize the objectives.	4.68	VME	4	4.77	VME	2
5.	The varied presentation of exercises effectively reinforces the students to solve drawing problems.	4.08	ME	6	4.62	VME	3.5
6.	The illustrations, examples, figures and exercises serve as instruments to attain the learning process.	4.84	VME	2.5	4.62	VME	3.5
	Average Weighted Mean	4.62	VME		4.64	VME	

As reflected in the table, with respect to organization and presentation, as perceived by student respondents "The Topic Heading are Clear and well Presented" ranked first with 4.88 weighted mean while professor respondents ranked it last with 4.45 weighted mean, both interpreted "Very Much Effective". "Objectives of Every Chapter are stated in Behavioral Terms" ranked by professor respondents as first with 4.95 weighted mean. Ranked last by student respondents is item number 5 with 4.08 weighted mean and interpreted as "Much Effective". The average weighted mean of 4.62 and 4.64 were obtained by the students and professor, respectively with "Very Much Effective" verbal Interpretation. It could be deduced from the results that both respondents are satisfied with the organization and presentation of lessons in the worktext.

Table 8 presents the computed weighted mean on the level of acceptability of the developed worktext as evaluated by the two groups of respondents with respect to language and style.

The table depicts that in general, as evaluated by student respondents and professor respondents, the developed worktext in Drawing 2 is "Very Highly Effective" with an average weighted mean of 4.47 and 4.63, respectively. As a whole, both groups agreed that the developed worktext is an effective instructional material in the teaching of Drawing 2.

It indicates that drawings accompanied by technical terms explained extensively using plain and uncomplicated words would make Drawing 2 interesting and easily understood subject. Furthermore, the findings imply that the worktext possessed the characteristics that would significantly aid in enhancing the performance of students in Drawing 2. This confirmed the findings of Jimenez that the simpler the language, the more it is acceptable and effective to use.[11]

Table 8: Computed Weighted Mean on the Level of Acceptability of the Developed Worktext as
Evaluated by the Two Groups of Respondents With Respect to Language and Style

	Language and Style	Students			Professors		
		$\overline{WX}$	VI	R	$\overline{WX}$	VI	R
1.	The directions give clear information about the topic.	4.52	VHE	2.5	4.79	VHE	2
2.	Language used is simple and easy to understand in terms of vocabulary and technical terminologies.	4.64	VHE	1	4.47	VHE	4
3.	Language structure used avoids misinterpretations.	4.28	VHE	5	4.79	VHE	2
4.	There are provisions for learning new meanings.	4.40	VHE	4	4.30	VHE	5
5.	Language used is suitable to the ability of the students.	4.52	VHE	2.5	4.79	VHE	2
	Average Weighted Mean	**4.47**	**VHE**		**4.63**	**VHE**	

Table 9 presents the computed weighted mean on the level of acceptability of the developed worktext as evaluated by the two groups of respondents with respect to usefulness.

Table 9: Computed Weighted Mean on the Level of Acceptability of the Developed Worktext as
Evaluated by the Two Groups of Respondents With Respect to Usefulness

	Usefulness	Students			Professors		
		$\overline{WX}$	VI	R	$\overline{WX}$	VI	R
1.	The worktext makes the students interested in applications based on theories gained.	4.56	VU	4.5	4.82	VU	1
2.	The worktext is useful in developing skills and analysis, which are tools to effective learning.	4.60	VU	3	4.67	VU	3
3.	The students can learn, understand and answer the exercises thoroughly by reviewing the examples and illustrations which are provided after each topic.	4.56	VU	4.5	4.67	VU	3
4.	The worktext is useful to supplement and reinforce the transfer of learning.	4.72	VU	2	4.67	VU	3
5.	The worktext encourages one to work efficiently at his pace.	4.36	VU	6	4.33	VU	5.5
6.	The worktext answer the students' need to understand drawing.	4.76	VU	1	4.33	VU	5.5
	Average Weighted Mean	**4.59**	**VU**		**4.58**	**VU**	

As manifested in the table, both groups of respondents evaluated the worktext in Drawing 2 as "Very Useful" with a nearly identical average weighted mean of 4.59 and 4.58, respectively, and all are interpreted as "Very Useful". The findings imply that students and professors discern the worktext in Drawing as valuable instructional material in the teaching-learning process in Drawing

2. It also implies that the developed worktext is very useful in the unraveling of practical problems like inconsistency of the given objects, late or unsubmitted plates and low scores in written tests.

The findings of Maranan supports the present study that of the criteria such as content, clarity of presentation and usability was preferred by the respondents as the most important among factors considered as acceptable learning material.[12]

Table 10 presents the composite table of the average weighted mean on the level of acceptability of the developed worktext as evaluated by the two groups of respondents.

Table 10: Composite Table of the Average Weighted Mean on the Level of Acceptability of the
Developed Worktext as Evaluated by the Two Groups of Respondents

Aspects	Students			Professors		
	Ave. $\overline{WX}$	VI	R	Ave. $\overline{WX}$	VI	R
Subject Matter	4.32	VHS	4	4.67	VHS	1
Organization and Presentation	4.62	VME	1	4.64	VME	2
Language and Style	4.47	VHE	3	4.63	VHE	3
Usefulness	4.59	VU	2	4.58	VU	4
Ave. Weighted Mean	**4.50**	**VMA**		**4.63**	**VMA**	

It could be gleaned from the table, as evaluated by both group of respondents, the developed worktext in Drawing 2 is "Very Much Acceptable" with a general weighted mean of 4.50 for the students and 4.63 for the professors. The findings imply that the students and professors agreed that the developed worktext is adequate and suitable instructional material in teaching and learning of Drawing 2. The findings confirm the idea of Jimenez that the instructional material like laboratory manual could catch the interest and understanding of the students and will help the instructors teach better.[11]

The Significant Difference on the Evaluation of the Two Groups of Respondents of the Level of Acceptability of the Developed Worktext

Table 11 presents the computed t – values on the evaluation of the two groups of respondents on the level of acceptability of the developed worktext.

Table 11: Computed t-values on the Evaluation of the Two Groups of Respondents
on the Level of Acceptability of the Developed Worktext

Aspects	Mean		Mean diff.	df	t_{comp}	t_{tab}	Ho	VI
	Students	Professors						
Subject Matter	4.32	4.67	.35	31	1.088	2.042	A	NS
Organization & Presentation	4.62	4.64	.02	31	0.3381	2.042	A	NS
Language and Style	4.47	4.63	.16	31	1.0712	2.042	A	NS
Usefulness	4.59	4.58	.01	31	0.0487	2.042	A	NS

The table reveals that no significant difference prevails on the evaluation of the two groups of respondents on the acceptability of the developed worktext in Drawing 2 since all the computed t-values did not exceed the tabular t-values at .05 level of significance. This accepts the null hypothesis stating that ther4e is no significant difference on the evaluation of the two groups of respondents on the level of acceptability of the developed worktext. The findings imply that for the student and professor respondents the developed worktext is acceptable to be utilized as instructional material in the teaching of Drawing 2. It can also be concluded that there is congruency on the appraisals made by the professors and students.

The findings further imply that both group of respondents considered the developed worktext in Drawing 2 as a supplementary material in learning as validated in terms of different criteria. The findings is confirmed by the idea of Tamonan when he stated that educational materials like workbooks when used properly in classroom may be the most effective venue to hold students' interests and understanding and may lead better teachings.[13]

V. CONCLUSIONS

Based on the summary of findings, the following conclusions are drawn. Students exposed to the developed worktext in Drawing 2 attained better performance than students taught without the use of worktext. The developed worktext in Drawing 2 contributed to the improvement of students accomplishments in Drawing. The developed worktext is effective and acceptable for use as instructional material in the teaching of Drawing 2.

VI. CONCLUSION

The following recommendations are hereby offered: Utilization of the developed worktext in Drawing 2 is strongly recommended in BT and Engineering Courses. Development of worktext in other Drawing or Drafting subjects maybe conducted to make teaching and learning more effective and productive. Revision and modification of the developed worktext should be done regularly to fit the learning needs and abilities of the students. Evaluation on the level of acceptability of the developed worktext may be conducted using other respondents in other schools. Further study is strongly recommended using other factors and other variables.

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Economic Impact of MNCs on Development of Developing Nations

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Abstract- Multinational corporations do not come into being from thin air; there must be a form, an organization, and a goal for them to be brought into existence. Many studies that have been carried out in Europe and the rest of developing nations have concentrated on the benefits of Multinational corporations but literature still remains very little when Africa and the rest of the developing nations are touched. This study sought to bridge the gap of MNC by adding more literature on factual findings from a developing country context such as Kenya. It was centered on principles of employment creation, poverty and dependency reduction and foreign direct investment. The study was geared towards the historical background of global investments while tracing their evolution from small businesses to their giant investments that today their massive capital is a real threat to the nation when issues of capital flight fall due. The study is important to policy makers in deciding whether to continue depending upon multinational corporations which result in eventual capital flight or to nurture the local companies for sustainable development. The research adopted descriptive research design. On the basis of facts presented in this study, the MNC has outlived the usefulness as a development agent. The role of MNCs should be redefined in the context of the LDCs in which they operate finally; LDCs should ensure stable political systems to ensure sound economic policies. The study also concludes that the government should take a prerogative role in supporting the operations of the MNCs since they have boosted the economic development of the developing countries with a drive towards full employment. However, the over-dependence on these MNCs should be avoided at all costs.

Index Terms- Multinational Corporations, Transfer Pricing, Poverty and dependency, Less Developed Countries

I. INTRODUCTION

Multinational corporations as we know do not come into being from thin air. There has to be some substance, some meaning and some objective for them to come into being. Historically, the evolution of multinational corporations date back to the 15th century. At that time, the organization of the production unit was wholly private ownership of the means of production. Using technology and simple division of labour, merchants could manufacture basic commodities, "In situ- without need to travel," (Louis, 1994).

Abdullah (1998) early multinational corporations took the form of alliances with the parent country's military or political powers in extending their activities to foreign areas. Contrary to the simplicity of production of the 15th century, modern complex structure of the world economy is the result of centuries of technological evolution and advancement. According to Clicker (1990) the dominant player in the modern world investment set up is the multinational corporations. According to Root (1994), an MNC is a parent company that engages in foreign production through its affiliates located in several countries, exercises direct control over the policies of its affiliates, and implements business strategies in production, marketing, finance and staffing that transcend national boundaries.

These are giant businesses which have expanded and crossed national frontiers, operate globally and whose organizational framework is complex. Robbok and Simmonds (1989) asserted that, the rise of the multinational corporations has confronted the nation state with challenges of the operations of the local jurisdiction. The nation state has had to grapple with national interests and how to protect them from being compromised by the multinational corporations whose focus is control and transfer of goods and money as they cross national borders.

Robbok and Simmonds (1989) as well trace the early investment. In 1851 an American (singer) invented the modern sewing machine. This gave way to a number of subsidiaries in different continents in two decades. After this pioneering invention, others followed and wanted to divorce themselves from the control of the parent country. Such group was the Otis brothers (also Americans) who invented the modern lift in 1859. In 1890 Alfred Nobel of Sweden invented dynamite and set up various subsidiaries in Germany and other European countries so as to transfer technology as crucial as handling explosives.

In the developing countries, the MNCs are no longer viewed with colonialism or protection from their countries. A new breed of dynamite and aggressive MNCs has emerged over the last three decades. They have cast the stigma of the past which long characterized their predecessors and have thrived on the ability to make more profits and contribute to economic development on their host countries. Nyong'o (1991) strongly contends that, nation-state building requires politically strong nationalistic local entrepreneurs.

The study took scope of the General motors' corporation company which is an American multinational automaker based in Detroit, Michigan and the world's second largest automaker with its global headquarters in Detroit; GM employs 209,000 people in every major region of the world and does business in some 157 countries. General motors' produce cars and trucks in 31 countries and sells and services these vehicles through the following divisions: Buick, Cadillac, Chevrolet, GMC, Opel, Vauxhall, and Holden. GM's oyster subsidiary provides vehicle safety, security and informational services. Unfortunately, for

example in Kenya, the manufacturers are the MNC subsidiaries with global interests that often conflict with the national desire to build up local technological capacity and also the Asian businesses men without political clout to stop the imports that idle local factories The structural transformation of the world economy through internationalization of big businesses has become a real threat to the economic as well as political interdependence of the nation-state. Scientists and political economists have researched and written on this subject for decades. However, most of the writers have concentrated their prosperity in their investment exploits. Majority are preoccupied with the brighter side of the MNC almost to the total exclusion of the dark side of the giant businesses.

It is a fact that MNCs have devastating effects on their host countries; they are crafty in their dealings. More often not many who notice the negative effects including the host countries. The MNCs do more economic and political harm and perpetuate poverty in the LDCs. This indicates a situation really wanting where no research has been comprehensively carried out. A study conducted by Bicknell (1999) has shown that MNCs located in LDC countries do help LDC countries in creating better living standards for competitiveness across the globe after which he recommended for further research on the economic impact of MNC on the developing countries.   Therefore this study sought to evaluate the economic impact of multinational corporations on the less developed countries.

The general objective of this study was to investigate the effects of multinational corporations on various aspects of development in developing countries with an emphasis on economic dominance, poverty, dependency, pollution and entrepreneurs with a view to providing necessary information for remedial action. The specific objectives of this study were; to evaluate the impact of MNCs on employment, to determine the impact of MNCs on the host state in foreign exchange loss through transfer pricing and to determine the impact of MNCs on perpetuating poverty in developing countries.

II. LITERATURE REVIEW

Simply put, multinational corporations refer to firms whose scope of investment in international or in countries outside their immediate origins or outside their national frontiers. Langdon (1981) posits that multinational corporations repatriate their profits and more large amounts of currencies across borders especially in the event of a relocation of plant for various reasons, this result in reduction in value of the host country's currency occasioning inflation hence making the value of imports rise ruining the economy of a developing country. This chapter explores around the three specific objectives of; (1) impact on employment creation (2), transfer pricing and (3) poverty and dependence

2.1 Impact on employment creation
A multinational corporation is a firm with productive capacity in a number of countries. The profit and income flows that they generate are part of the foreign capital flows moving between countries. As local markets throughout the world are being deregulated and liberalized foreign firms are looking to locate part of the production process in other countries where there are advantages. Although LDCs may present higher levels

of risk they also present higher levels of returns in terms of profit. Many LDCs with growing economies and increasing incomes may provide future growth markets (Kotler, 1994)
Multinational corporations contribute to 65% of the non-governmental employment opportunities available at any given country of host (Reid, 2001). Schermerhorn (2002) argues the fact that for the case where many LDCs are often endowed with potentially large low wage labour forces and high levels of unemployment, this might be considered inappropriate technology and MNCs come in to equip the countries with intrinsic knowledge aimed at acquiring a skilled work force in the industry

Gerrefi (2003) maintains that the cycles of poverty will not be broken from within the domestic economy. The level of investment needed to raise productivity and incomes is not possible. Thus a foreign direct investment through multinational corporations is essential (Mulwa, 2000). By investing in areas and utilizing the factors of production where the LDCs have an absolute and comparative advantage MNCs will lead to a more efficient allocation of the world's resources (Gesso, 1999)

Schermerhorn (2001) defined ways to engage developing countries into development with the aid of the MNCs. They are sanctioned non-engagement, principled non-engagement, constructive engagement or unrestricted engagement. It is the responsibility of a developing nation to offer enough allocation opportunities to its people so that the society can provide skilled labour for the worldly market (Mundane, 2003). Langdon (2000) posits that Education is a contingency for paying employees a wage that is well above the poverty line in multinational company context. Marxism (1998) argues that it is the ethical obligation of MNCs to pay educated employees wages of the activities that are well above the poverty line.

It is the responsibility of MNCs to consider developing countries for their labour supply, because if executed property, it will create stockholder value (Kaburu 2005). Domar (1994) suggests that the level of investment is important in determining the level of economic growth and poverty reduction in LDCs. Multinational corporations provide employment. Although wages seem to be very low for us, people in developing countries often see this job as preferable to working as a subsistence farmer with even lower income (Kitche, 2001)

Langdon (1990) stresses that heavy advertisement on the part of MNCs distorts the structure of local demands and destroys indigenous industries which cannot afford the costs involved. According to Lall (2002) Informal employment is at record levels worldwide with severe consequences for poverty in poor countries

The financial crisis is throwing many people out of work and, in developing countries with no unemployment insurance but dependency on MNCs; they are forced to take informal jobs with low pay, no protection and high risk exposure. The study by Domar (1994) finds that 1.8 billion people, or more than half of the global labour force, are working without a formal labour contract and social security. Even during good times with robust growth rates, in many developing countries informal employment increased in some regions with the existence of MNCs," says Johannes (2008)

Jutting (2003) warns of the potential draw-backs of a further increase in informal employment: lower wages and incomes in

poor countries that do not have the means to provide comprehensive safety nets. Women – who constitute the majority of workers in poor quality jobs – will be particularly affected, as will youth and the elderly.

The majority of the 1.4 billion poor people in the world depend exclusively on their labour for survival. Low pay, with no social benefits, increases the likelihood that the Millennium Development Goal of halving poverty world-wide by 2015 will not be met if the MNCs cannot be in the position of supporting the rapidly growing population, (Buckley P J Et al, 2008). 1.8 billion People work in MNCs compared to 1.2 billion who benefit from formal contracts and social security protection (Coughlin, 2006)

The share of informal employment tends to increase during economic turmoil. For example, during the Kenyan post election violence (2008), the country's economy shrank by almost one-fifth, while the share of informal employment expanded from 48% to 52% (Wangari, 2009)
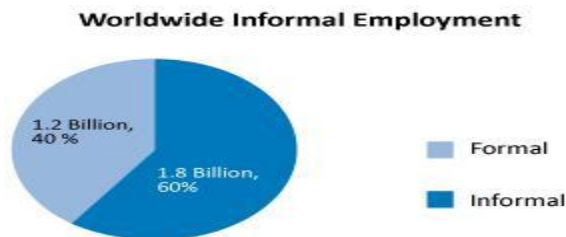

Figure 1

Source: OECD Development Centre "Is Informal Normal? (2009), based on Kenyan development trends, 2009

2.3 Transfer Pricing

MNC is likely to be diverse in terms of products and geographical markets. They have a range of different types of business in the form of subsidiary companies within a holding company structure or divisions within a multinational structure. Despite the MNCs being regarded as the principal agents by whom technological transfer occurs, it remains a fallacy or misplaced notion because MNCs scarcely have the appropriate to transfer.

MNCs engage in transfer pricing where they shift production between countries so as to benefit from lower tax arrangements in developing countries (Schermerhorn, 2000). Ake (2002) points out that, 'what passes as technology transfer occurs is not that the technology transferred is appropriate but that it is available. This is because it is produced in response to the needs of the environment that are quite different from those of host countries. The transferred technology is not integrated into the local center and system of production and so its ability to stimulate further technological development is severely limited.'

As it has been mentioned in the preceding sections, transfer pricing has adverse effects on the LCDs. It is a strategy aimed at lowering total taxes paid by the MNC to the host country. Intra corporate sales rates and purchase of goods and services are artificially invoiced so that the profits accrue to the branches located in low tax countries. The offices in high tax countries show little or no taxable profits in their books. This manipulation

is common with intra firm trade though unrelated companies sometimes collude to transfer funds across boundaries (Lull, 1991)

MNCs pay for higher prices than other Kenyan firms. In 1984, a MNC quoted a price of US $115/KG of methyldopa drug to a licensed manufacturer though others sold it for US $ 68/kg. Another sold Diazepam drug at US $ 600/kg to a local licensee while the product was available for US $ 60/kg. These products are specialists produced in Kenya under licenses from big MNCs (Ake, 2002). The overpricing here could be due to transfer pricing or high production costs. According to Langdon (1981), MNCs repatriate their profits and move large amounts of currencies across borders especially in the event of a relocation of plant for various reasons.

"MNCs have cast the stigma which characterizes their predecessors associated with colonialism," (Abdullah, 1997). Contrary to the expectation of most countries, the MNCs transfer of technology is of no economic significance to the host state. Ake (2002) points out that what passes as technology transfer occurs is not that the technology transferred is appropriate but that it is available. The technology so transferred is often obsolete, archaic, expensive and often unsuited to the application and demands of the host state. The MNC may transfer obsolete technology to developing countries such as expired pharmaceuticals, radioactive goods such as union carbides toxic products or the DDT. Hahlo et all (1997) establishes that an average MNC welds more economic power twice or thrice that of the nation state. Over two decades ago, the annual turnover of General motors' corporations was equal to the GNP of Switzerland, Pakistan and South Africa combined.

Overall incidences of absolute poverty were estimated at 52% based on welfare monitoring survey 3 of 1997. The number of the poor increased from 3.7 million (1972-1973) to 11.5 million in 1994 and now estimated to be 15 million (Gerrefi; 2002). Transfer pricing is common with intra company trade though unrelated companies sometimes collude to transfer funds across boundaries. This is a problem brought by MNCs and the effect on trade and development is disastrous, and (Lall, 1993) confirms this assertion.

Studies of the drug industries in several countries show that MNCs make huge profits at the home base by rising for materials supplied and services rendered to their subsidiary companies. Lall (1991) and Gerrefi (1993) concur on this statement. According to studies by Owino (1991), an examination of company invoices at CBK and suppliers quotation for 1983 and 1984 had evidence of this. Comparison revealed manipulation through over invoicing with MNCs paying higher than other companies. Desmond (2002) elaborates that today GM controls 90% of all exports to East and Central Africa. Transfer pricing is a problem in Kenya. A subsidiary of a large textile firm in Kenya purchased all inputs from the parent company until recently at much higher than competitive prices. Langdon (1991) and Coughlin (1996) also expose over pricing of imported inputs in the textile industry.

Silberztein (2008) posits that transfer pricing is a challenge for developing countries. A lot of debate about tax and developing countries nowadays tends to focus on how to reduce revenue leakage through offshore tax havens. But there is another hot issue called transfer pricing which developing countries have

to be mindful of, particularly if they want to avoid the risk of losing out on tax revenue from cross-border transactions carried out by multinational enterprises. A large proportion of world trade is accounted for by cross-border trade taking place within multinational enterprises, where branches or subsidiaries of the same multinational enterprise exchange goods or services (Hahlo et al, 1997).

Brooks (2005) argues that one key difficulty in applying transfer pricing methods is to find open market transactions between independent enterprises that are comparable to the controlled transactions within a multinational enterprise. This is an issue for developed as well as developing countries, although it is magnified for developing ones due to the smaller size of their economies and smaller number of independent enterprises operating in their markets that can be looked to for comparisons.

2.4 Poverty and Dependency

Nyong'o (1998) strongly contends that nation-state building requires politically strong nationalistic local entrepreneurs. Unfortunately, for example in Kenya, the manufacturers are (1) either the MNC subsidiaries with global interests that often conflict with the national desire to build up local technological capacity, (2) or Asian businessmen without political clout to stop the imports that idle local factories. The structural transformation of the world economy through internalization of big businesses has become a real threat to the economic to the economic as well as political independence of the nation-state. In Kenya for example, despite various forms of interventions and economic policies the country continues to perform poorly. This continues to be despite the long regime of MNCs.

Eglin (1994) further points out that the artificial differentiation of products comes as a result of a single firm monopolizing the domestic market and wants to increase the sale of its products through advertising different brands names for basically the same product. This is true of firms making soap, soft drinks, paints, cosmetics, dry cells, food industries A sound economy facilitates employment by empowering the skilled and the less skilled. (Cowen, 1993) This view is true to a large extent since skills are the input to work and as work, so employment and therefore income and economic development.

A study to determine the MNCs perpetuation of poverty that was held at the cities of Kenya indicated the prevalence of poverty by regions. National percentage stood at 52%. Urban prevalence of absolute poverty is overwhelming despite the fact that MNCs operate in major urban centers. Kisumu has the highest percentage of absolute poverty, food poverty and hardcore poverty respectively. Urban food poverty stood at an average of 35% while overall poverty stood at 45%. (Muller, 2005)

Singh (1999) explains the social-cultural effect of a people's changed consumer taste is the desire to get what is beyond their reach. This breeds corruption, robbery and any measure that is sure to avail money, ethical and moral consideration notwithstanding. Almost half of the urban population lived below the absolute poverty line. The wealth of a nation and living standards are a direct reflection of the performance of the economy. The activities of the MNC directly affect the growth of the economies of the host states. Relocation of business has a sudden economic disorientation which affects economic

performance. MNCs relocate operations without notice. However, Coughlin and Ikiara (1996) disagree by stating that MNCs assisted host countries economically and continue to do so. These authors disregard the exploitative nature of MNCs.

Langdon (1991) narrates that the effects of class formation leads to poverty. The erosion of nationalism among the educated elite leads to their association with MNCs to further narrow interests in the process of class formation. The effects of this are denial of a country of the input of her educated manpower that is expected to plough back to the economy what resources they were trained with.

Donna (2000) adds that the social cultural effects of a changed consumer taste leads to massive corruption and robbery which adversely affect the economy. They are 'indoctrinated to desire what desire they cannot afford.' The technology of MNCs is usually misplaced in LCDs while the small economies are integrated into those of MNCs in most strategic sectors rendering the small economies subsistence and incapability of self generation and growth.

Turner (2001) asserts that corporate managers of MNCs have the ultimate powers to shift and relocate capital (resulting in massive layoffs), develop or suppress technology. They defend brand loyalty and have the power to make daily decisions on what people should eat, live, wear and what sort of knowledge is to be taught in schools and universities. These decisions have some impact on the host government since they result to serious cases of poverty if altered and dependence upon the foreign MNCs which may decide to relocate themselves any time. Langdon (1991) stresses that heavy advertising distorts the structure of local demands and destroys indigenous industries which cannot afford the costs involved.

Majority of Kenya urban poor live in peri-urban and slum settlements that are characterized by low quality basic services such as water, schools and health. They have no regular job and no regular income. 25% of their little income is used on rent. (Corey et al., 2003). MNCs are a key factor in the large improvement in welfare that has occurred in developing countries over the last 40 years. In those countries (the LDC) where the presence of MNCs is negligible, severe poverty rates persist and show little sign of improvement (Lull, 1991).

Brooks (2005) argues that the main role of MNCs is underappreciated — they have provided developing countries with much needed capital, jobs, and environmentally friendly technologies. Ake (2002) posits that through free market initiatives, MNCs create wealth, which provides the income flow necessary for welfare improvements. If the desideratum of developing countries is to escape severe conditions of poverty, they need to privatize, deregulate, protect private property rights, and establish a rule of law — the MNCs will then provide the capital. Never accept statistics about global poverty at face value and always remember that each household behind the figures has its own human story to tell. Whatever the difference of opinion on the extent of global poverty, one thing is certain: a significant proportion of the world's population is excluded from our prevailing economic system of wealth creation. The symptoms of its inherent instability – recession, volatile food and fuel prices, and climate change - impact disproportionately on the poor. (Weitzman, 1999)

Extreme poverty strikes when household resources prove insufficient to secure the essentials of dignified living. The consequences of persistent poverty include insufficient food, children out of school, diminution of household back-up resources and exclusion from valuable social networks (Kaplinsky R, 2001). Expressing poverty as a percentage yields more favorable results due to rising population. For example, extreme poverty in sub-Saharan Africa fell slightly from 58% to 51% between 1990 and 2005. (Todaro, 2000)

III. METHODOLOGY

The researcher adopted both descriptive and analytical survey methods with an objective of finding out the impact of MNCs on development of their host countries. This is because these methods report the way things are in order to look closely to the statement of the problem and thus in line with the research objectives. This study targeted the universal set up of managers working with the General Motors Company with the procurement department, purchases and sales department and the publicity department. The reason behind the target population of managers was because managers are the ones the researcher opted could be having the required information to fill the research questionnaires. The company has 50 managers employed on both full time and part time basis but only a total of 30 successful respondents were found upon which the results of this study is based as shown below;

Table 3.1 target population

Population	Number of managers	Respondents per category
Procurement	15	50%
Sales and purchases	10	33.33%
Publicity	5	16.67%
Total	30	100%

Some information was also obtained from the webpage of ministry of planning and vision 2030, Kenya on how GM has been contributing towards the development of Kenya as a developing nation. A total of 11 managers from procurement, 5 from purchases and sales and 4 from publicity were picked at random. The researcher used the simple random sampling method to group the sample population into a manageable sample of 20 respondents that represented 66.67% of the population which is above the average as shown below;

Table3.2 sampling procedure

Population category	Estimated number of managers	Units per sample	% per category
Procurement	15	11	36.67%
Purchases and sales	10	5	16.67%
Publicity	5	4	13.67%
Total	30	20	66.67%

The research was conducted through administration of closed ended questionnaires to respondents who shall fill and return them for analysis. Both primary and secondary data was viable for this study. The primary data was collected through use of structured questionnaires from the respondents which will form the main data instrument. The questionnaires were administered through telephone and face to face interviews with the respondents. After data had been assembled, descriptive statistics such as measures of central tendency and dispersion and seasonal patterns (use of trends) were employed in the final analysis.

IV. FINDINGS AND CONCLUSION

This chapter reviewed the general context of MNCs and their pros and cons in the developing countries where many of them are hosted. It looked keenly unto the three objectives of the researcher i.e. employment creation, transfer pricing and poverty and dependence reduction. The researcher found that the MNCs do create rigorous employment opportunities in the country, have fostered towards the reduction of poverty and dependency although much of the gains are again lost through transfer pricing to the main branches of this MNCs in the developed countries.

The research also found out that many of these MNCs do have a multiplier effect towards poverty reduction through their contribution to relevant schemes like the Red Cross scheme and other social corporate responsibilities. Many managers in the General Motors Corporation are satisfied with their employment benefits in the procurement, sales and publicity departments. The employment criteria is based primarily on both academic qualification in which case many managers are employed with the post university qualifications and also experience as a benchmarking qualification to employment. The corporation has substantially reduced the poverty levels mainly by the creation of employment opportunities to the locals and also substantially by their schemes of contribution to the poor that they reveal is ideal and active.

On the basis of facts presented in this study, the MNC has outlived the usefulness as a development agent. The role of MNCs should be redefined in the context of the LDCs in which they operate finally; LDCs should ensure stable political systems to ensure sound economic policies. The study also concludes that the government should take a prerogative role in supporting the operations of the MNCs since they have boosted the economic development of the developing countries with a drive towards full employment. However, the over-dependence on these MNCs should be avoided at all costs.

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THEORETICAL FRAMEWORK

This is the foundation upon which the whole research study is based. The nature depends on the type of the study. It can be called elaborate network of association among the identified variables

CONCEPTUAL FRAMEWORK OF MNC COHESIVE CONTROL
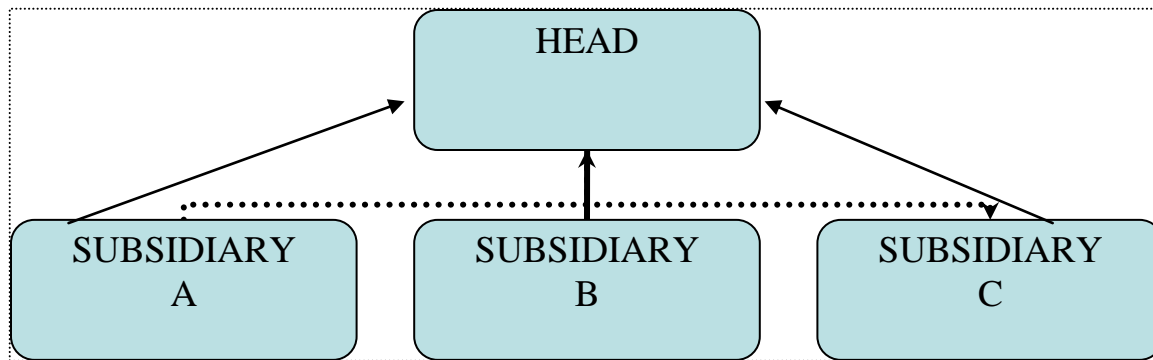
…………………….transmission of policies to Subsidiaries or Affiliates
----------------------feedback to HQ (head company) in parent company

Design and Performance Analysis of Compact Microstrip-fed Multiple Edge Slotted Monopole Antenna for Wideband Applications

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Abstract- In this paper a microstrip-fed planar monopole antenna has been proposed for wideband applications. Three monopole antenna have been designed and analyzed for improving antenna performance parameters. Antenna performance parameter such as return loss, bandwidth, voltage standing wave ratio (VSWR), gain, directivity and radiation efficiency of proposed antenna have been analyzed and compared with each other. As a simulation tool CST Microwave Studio 2012 has been used. Proposed antenna showed the resonance at 6.46 GHz and 10.49 GHz. At these points return loss founded as -19.77 dB and -13.45 dB respectively. Obtained bandwidth of these points at -10dB are 20.14% and 5.79%. Later comparison of performance parameters have been done.

Index Terms- Monopole antenna, wideband, truncated ground, CST MWS 2012.

I. INTRODUCTION

In last few decades information technology has witnessed some of the most astonishing inventions never seen before. Among them wireless communication is one of the most prominent and fastest growing industries in modern era. Today it is difficult to comprehend life without wireless communication as it has changed our way of living. It has been widely engaged in the civilian and military applications such as satellite communications, television, mobile systems, broadcast radio, global positioning system, radio frequency identification, radar systems, remote sensing, missile guidance, surveillance system etc. In recent time desire for high data in wireless communication is continuously increasing in Wireless broadband, Internet browsing, mobile communication, video streaming etc. All these devices must have antenna to radiate or receive wave signal into open free space from one place to other. As the technology advances every year, the demand for low cost, low volume, low profile planar configuration, conformal, and wideband multi-frequency planar antenna has been growing exaggeratedly. Microstrip Patch Antenna satisfies all the requirements due to its printable circuit technology. It consists of a radiating patch on one side of a dielectric substrate which has a ground plane on the other side. MPAs are widely used due to their simplicity and compatibility in different microwave frequency spectrum to service commercial and scientific purpose [1-3]. Besides all benefit, this types of antenna has major drawbacks such as narrow bandwidth, low efficiency, and low gain [1-4]. As a result, it has captured the attention of investors and scientists to prompt more research into improvements in related fields. Researchers have made many efforts to overcome these problems. Modified configurations of different patch shapes of various dimensions of MPA leads to achieve desirable resonant frequency [5-7]. Another way to improve bandwidth by modifying the shape of common radiator patch by cutting slots in the metallic patches like U-slot patch antenna, V-slot patch antenna, half U-shape patch antenna or L shape or E shape [8-14].

Main objectives of this paper were to achieve wideband (>500 MHz) characteristics under -10dB return loss with multiple resonant frequencies and improve other performance parameters such as voltage standing wave ratio (VSWR), directivity, gain, efficiency etc. of proposed antenna. At first a reference antenna [15] has been designed in section II and performance parameters such as return loss, VSWR, bandwidth, gain, directivity and radiation efficiency have been analyzed in the section III. After that multiple slots at antenna edge have been imposed and performance analyzed to get multiband characteristics which also discussed in the section III. Finally all performance parameters have been tabulated and compared with one another in the same section.

II. ANTENNA DESIGN

In this paper three monopole antennas have been designed. All of them designed on FR-4 (lossy) dielectric component which has relative permittivity of 4.3. Antenna patch and ground have been designed by using Perfect Electrical Conductor (PEC) material from CST MWS 2012 material library. Figure 1 shows the reference antenna, first proposed antenna which has four edge slots, second proposed antenna and backside view of all antennas.
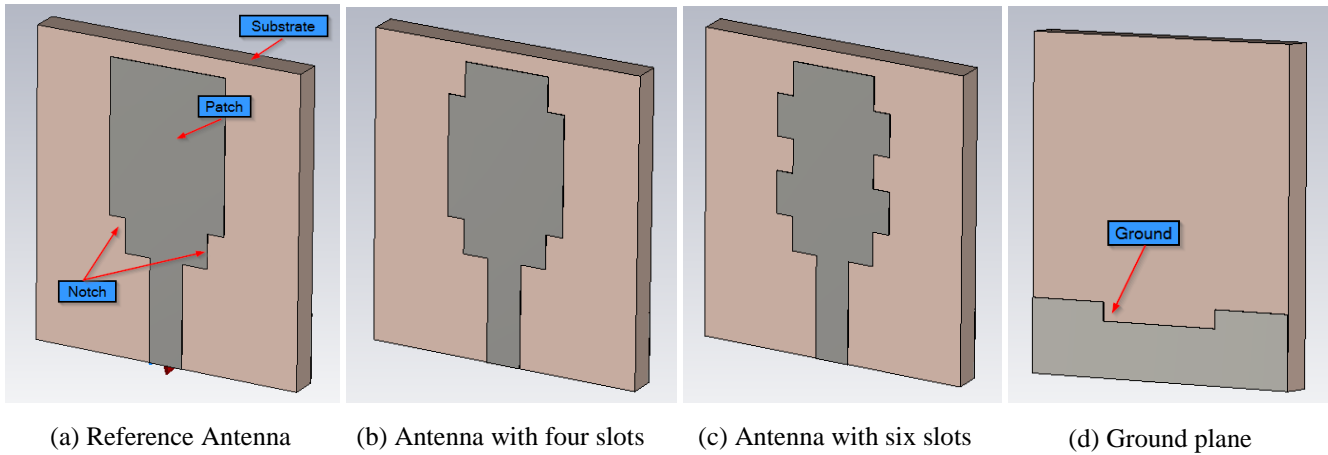
(a) Reference Antenna   (b) Antenna with four slots   (c) Antenna with six slots   (d) Ground plane

Figure 1: Top view of the (a) reference antenna (Antenna A) (b) 1st proposed antenna (Antenna B) (c) 2nd proposed antenna (Antenna C) and (d) Back view of all antenna

Figure 1(a) shows the reference antenna (Antenna A), 1(b) shows the second proposed antenna (Antenna B), 1(c) shows the second proposed antenna (Antenna C) and 1(d) illustrates the common backside view of all three antennas. All six slots have identical dimensions which indicates slot has same width and length. Patch slot width and length have been taken as 1 mm and 2 mm respectively. Ground plane has been truncated which is also designed by PEC. Distance between the top of the patch and top of the substrate is taken as 1mm. Table 1 represents the antenna names for introducing flexibility in design.

Table 1: Antenna Identifications

Antenna	New Name
Reference Antenna	Antenna A
1st Proposed Antenna	Antenna B
2nd Proposed Antenna	Antenna C

Antenna design parameters for all of three antenna have been given in the Table 2.

Table 2: Antenna Design Specifications

Antenna Dimensions	Value (mm)	Material
Substrate Width	16	FR-4
Substrate Length	18	
Substrate Height	1.6	
Patch Width	7	PEC
Patch Length	11	
Patch Slot Width	1	
Patch Slot Length	2	
Patch Height	0.035	
Feed Width	2	
Feed Length	6	
Ground Slot Width	7	PEC
Ground Slot Length	1	
Ground Height	0.035	
Ground Width	16	
Ground Length	4	

III. SIMULATIONS AND RESULTS

After designing the antenna by CST MWS 2012 simulation work has been done. Simulated return loss plot of reference antenna which renamed as Antenna A has been given in the Figure 2. Magnitude of reflection coefficient has been found as -18.805dB at 6.49 GHz. At -10dB the bandwidth has been found as 1.36 GHz which covers 20.98% bandwidth at this resonant frequency.
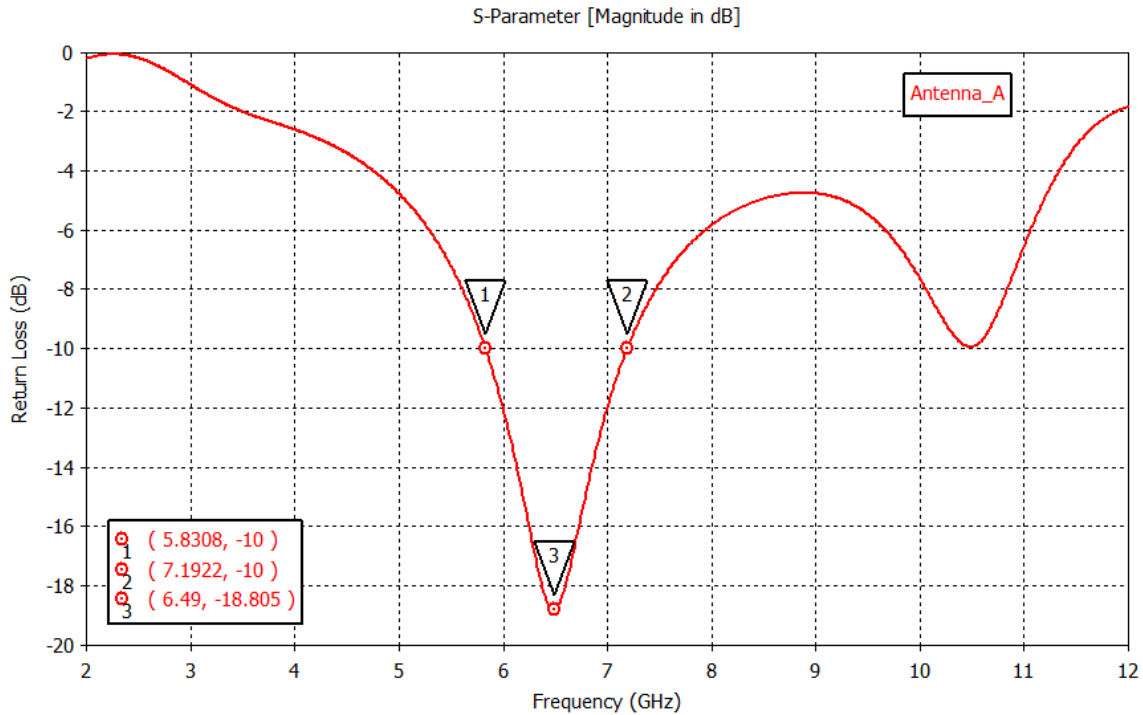
Figure 2: Return Loss Plot of Reference Antenna (Antenna A)

Figure 3 shows the return loss plot of Antenna B. In this case return loss found as -18.307 dB at 6.6 GHz resonant frequency. At -10dB total bandwidth found as 1.37 GHz which is greater than Antenna A.
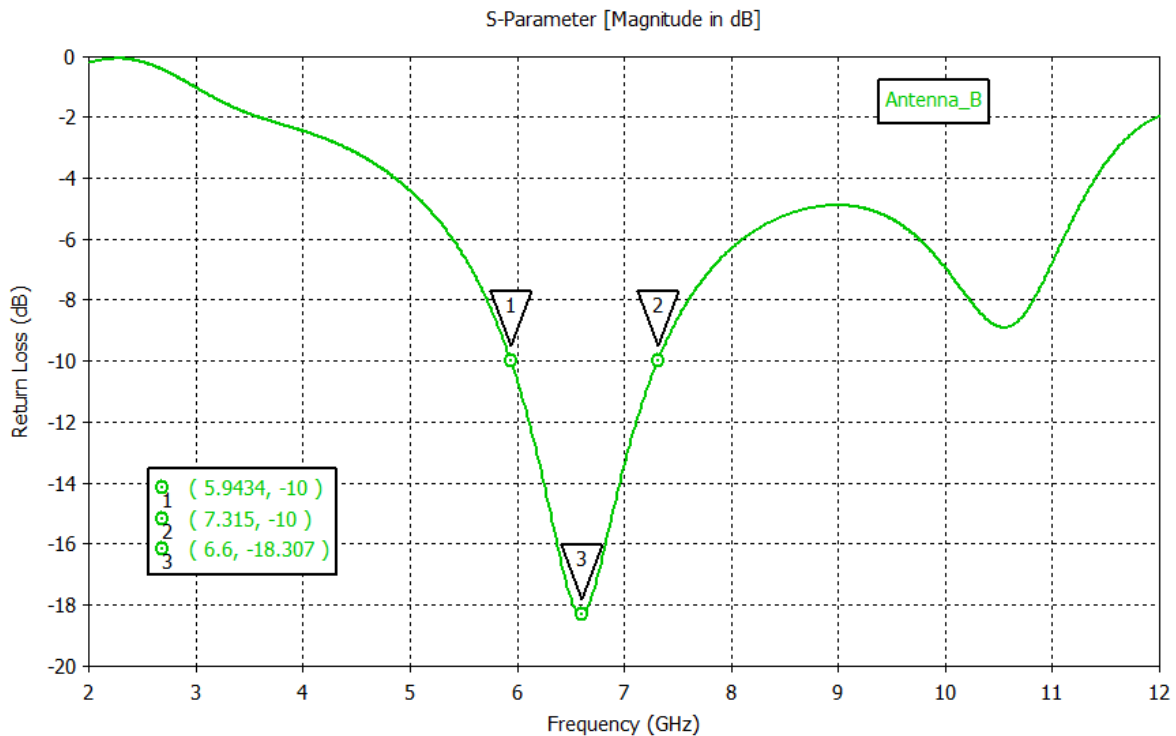
Figure 3: Return Loss Plot of First Proposed Antenna (Antenna B)

Figure 4 shows the return loss plot of second proposed antenna or Antenna C which shows that this antenna has two resonant frequency under -10dB, one is at 6.46 GHz and another one is at 10.49 GHz. Bandwidth found as 1.3 GHz at 6.46 GHz and 0.607 GHz found at 10.49 GHz. This result little bit lower than previous two antenna bandwidths.
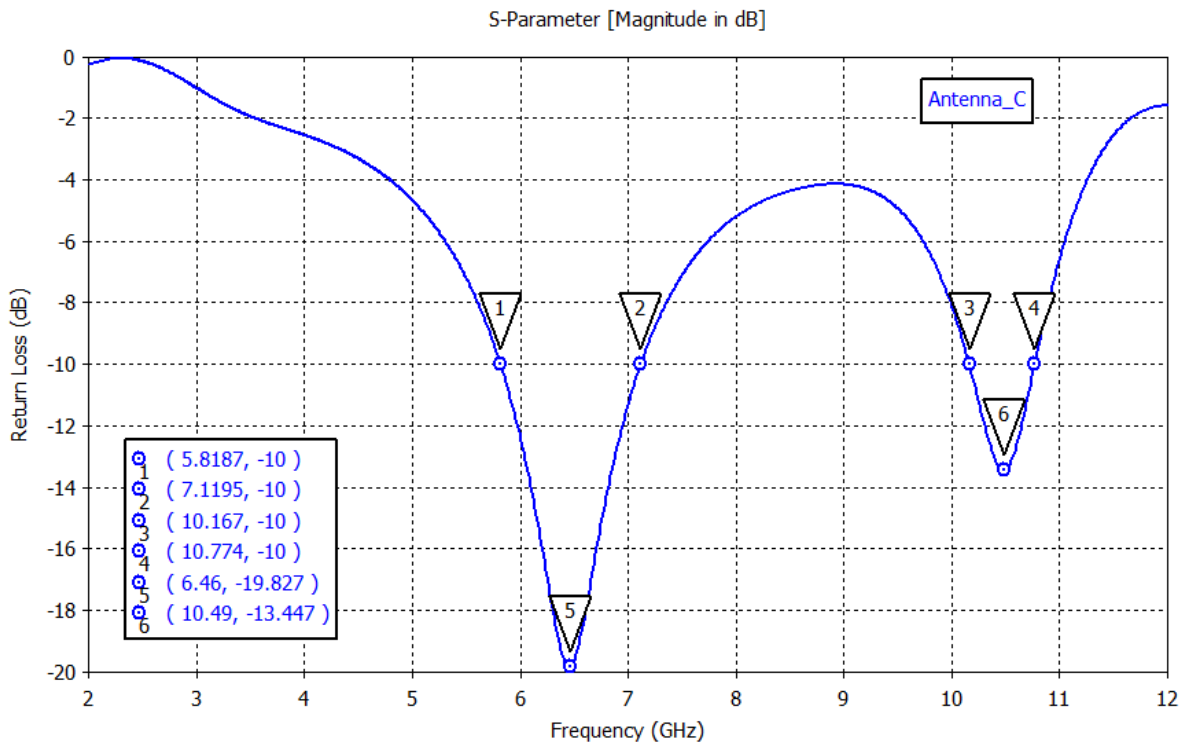
Figure 4: Return Loss Plot of Second Proposed Antenna (Antenna C)

Figure 5 illustrates the combined return loss plots of Antenna A, Antenna B and Antenna C. This figure shows that Antenna C has better resonance characteristics under -10dB.
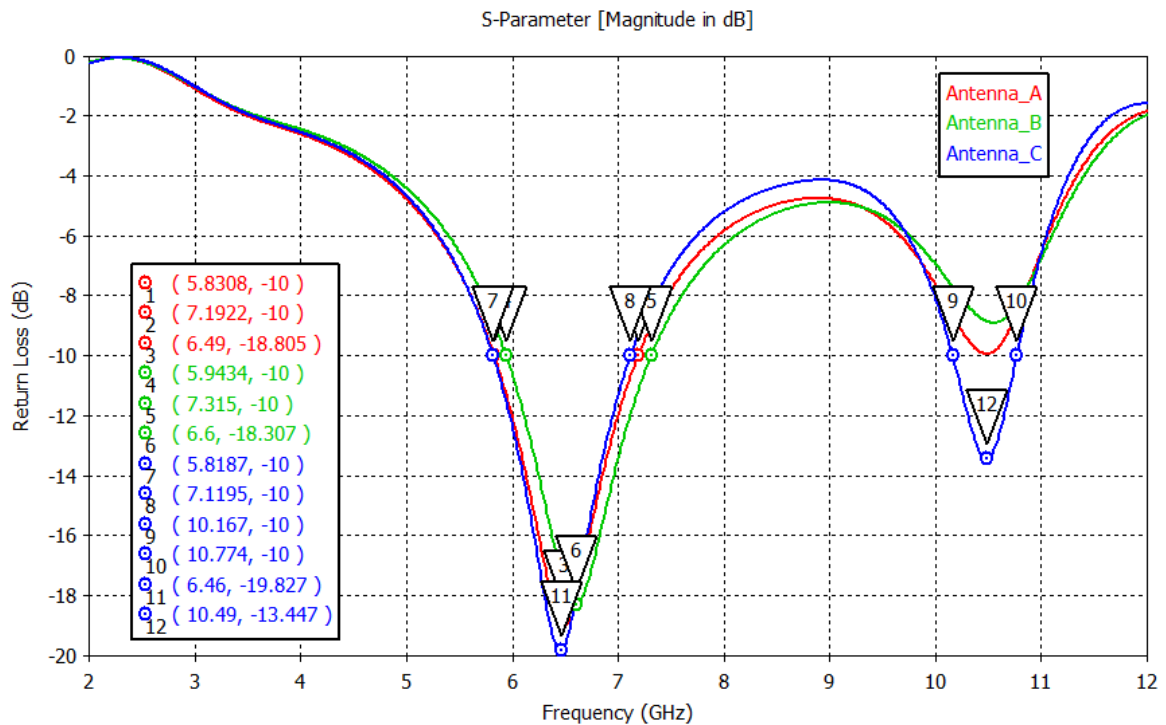
Figure 5: Combine Return Loss Plots of Antenna A, Antenna B and Antenna C
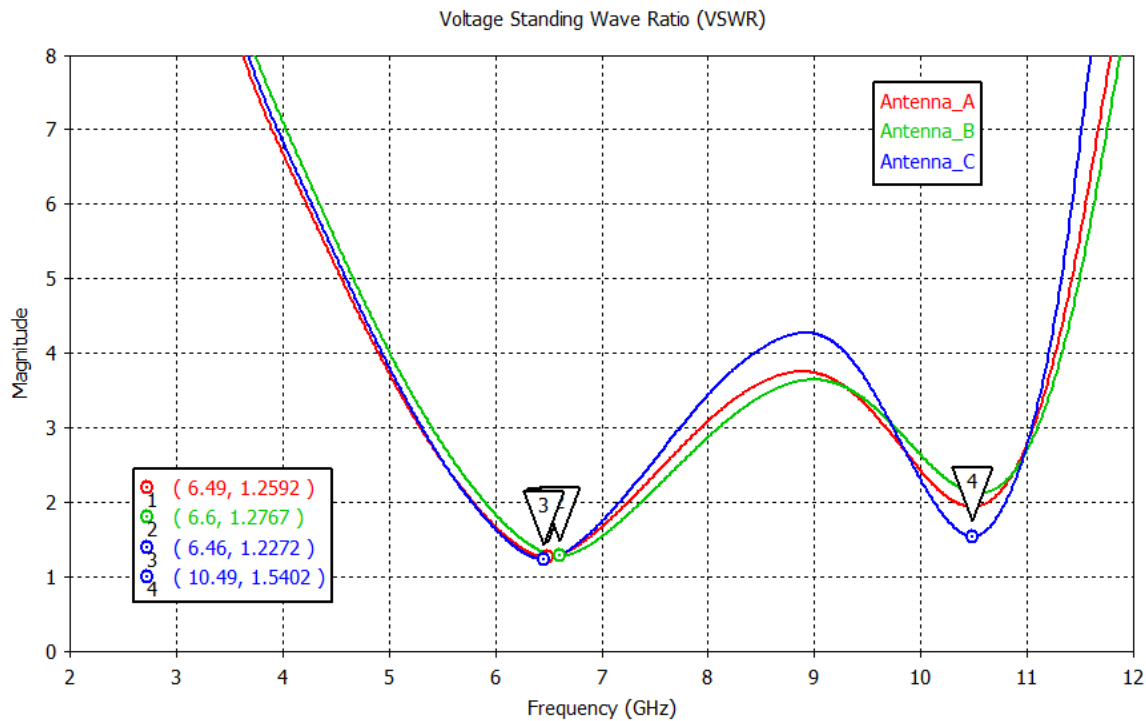
Figure 6: Combine VSWR Plots of Antenna A, Antenna B and Antenna C

Figure 6 shows the VSWR plot of three antennas, for the reference antenna VSWR found as 1.26 at resonant frequency. Whereas for slotted antennas it has been obtained at resonant frequency 6.6 GHz, 6.46 GHz and 10.49 GHz as 1.28, 1.23 and 1.54 respectively.
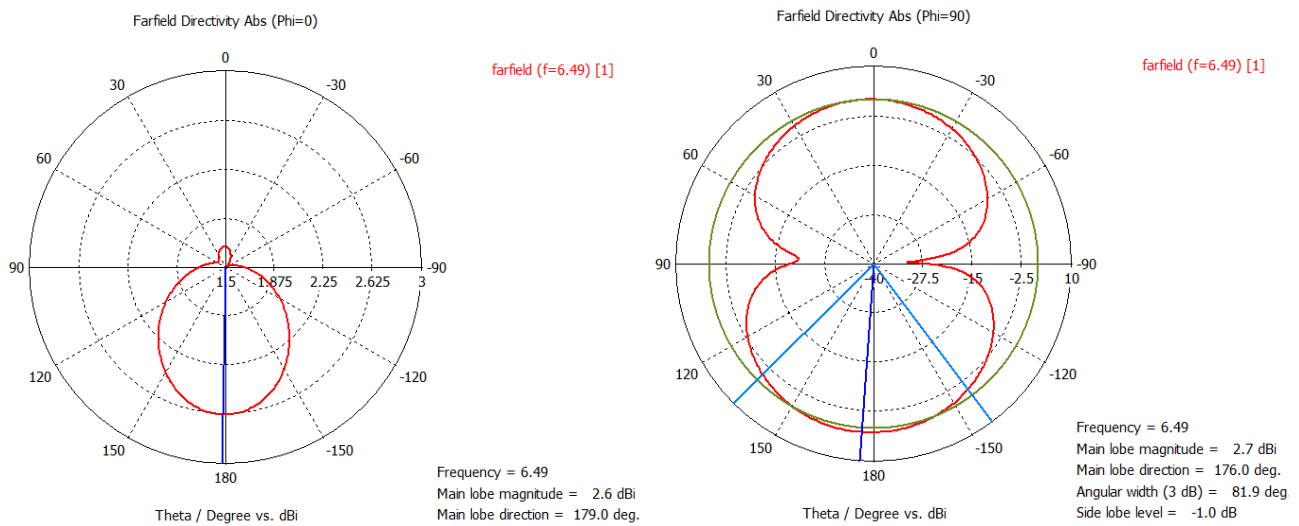
(a) E-field (Phi = 0 degree)   (b) H-field (Phi = 90 degree)

Figure 7: Polar plot of (a) E-field and (b) H-field of Reference Antenna at 6.49 GHz

In the figure 7 polar plot of electric field and magnetic field of reference antenna have been given. Figure 7(a) shows the electric field which indicates main lobe directivity as 2.6 dBi and main lobe direction as 179 degree. Figure 7(b) shows magnetic field from which the main love directivity found as 2.7 dBi and angular width (3 dB) found as 81.9 degree.

(a) E-field (Phi = 0 degree)   (b) H-field (Phi = 90 degree)
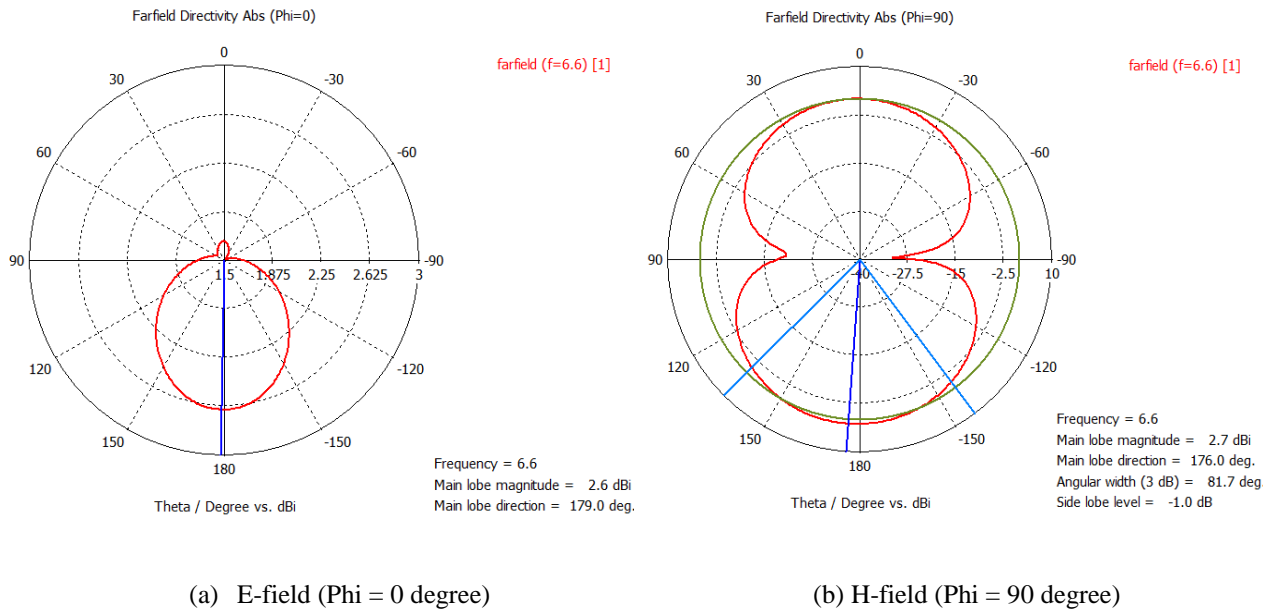
Figure 8: Polar plot of (a) E-field and (b) H-field of 1st Proposed Antenna at 6.6 GHz

Figure 8 illustrates the polar plot of first proposed antenna at 6.6 GHz. Electric and magnetic field at resonant frequency have been shown in figure 8(a) and 8(b) respectively.

(a) E-field (Phi = 0 degree)   (b) H-field (Phi = 90 degree)
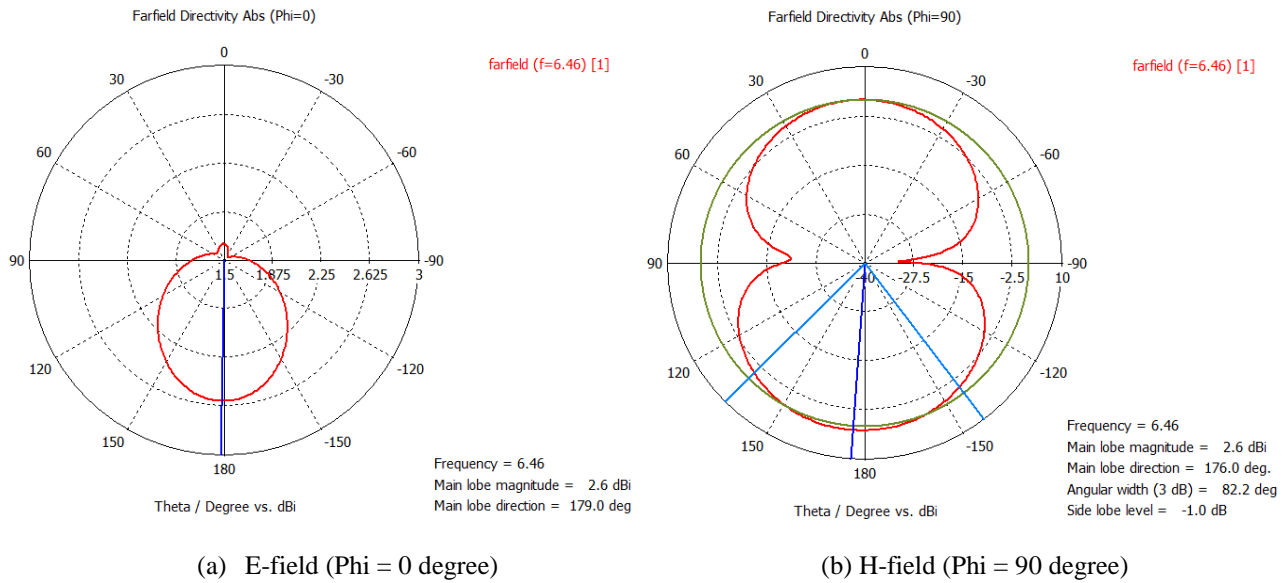
Figure 9: Polar plot of (a) E-field and (b) H-field of 2nd Proposed Antenna at 6.46 GHz

Figure 9(a) and 9(b) shows the polar plot of electric and magnetic field respectively for second proposed antenna at resonant frequency 6.46 GHz. Main lobe magnitude found as around 2.6 dBi and angular width obtained as 82.2 degree.

(a) E-field (Phi = 0 degree)   (b) H-field (Phi = 90 degree)

Figure 10: Polar plot of (a) E-field and (b) H-field of 2nd Proposed Antenna at 10.49 GHz

At the Figure 10(a) and 10(b) polar plot of second proposed antenna have been given at second resonant frequency 10.49 GHz. Main lobe directivity found as around 4.2 dBi and angular width seen as 57.4 degree. Finally from the CST MWS 2012 othe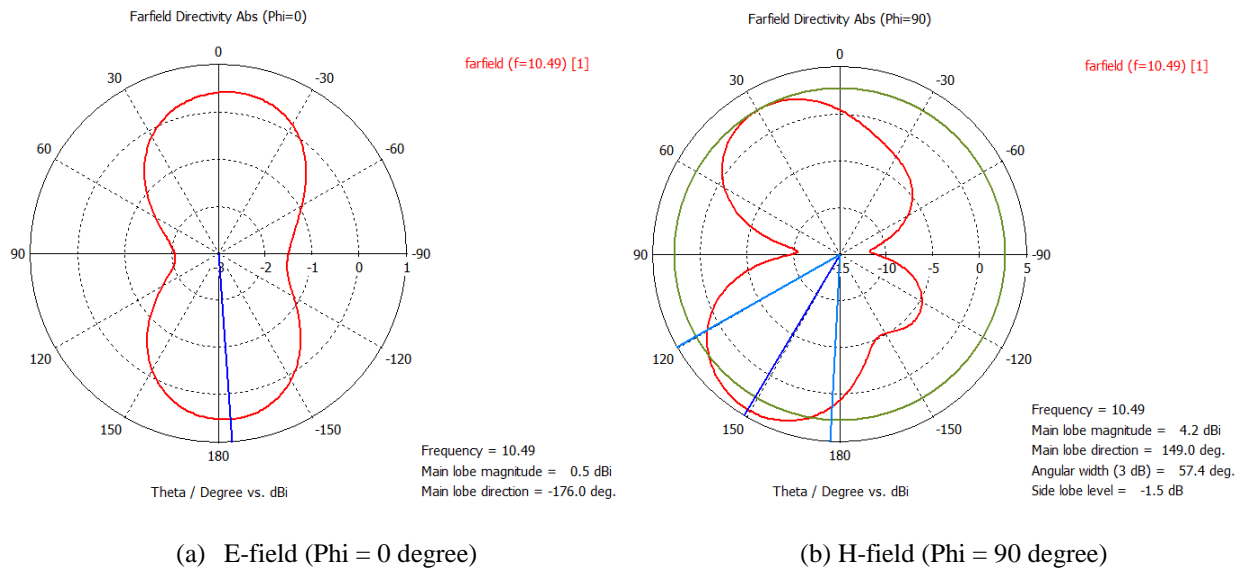r parameters such as radiation efficiency, total efficiency, gain, directivity have been obtained and tabulated in the Table 3.

Table 3: Summery of Simulated Results

Performance Parameter	Antenna A	Antenna B	Antenna C
Resonant Frequency	6.49 GHz	6.6 GHz	6.46 GHz & 10.49 GHz
Return Loss	-18.805 dB	-18.31 dB	-19.77 dB -13.45 dB
Bandwidth at -10dB	1.36 GHz	1.37 GHz	1.3 GHz 0.607 GHz
Bandwidth%	20.98%	20.78%	20.14% 5.79%
VSWR	1.26	1.28	1.23 1.54
Gain	2.39 dB	2.41 dB	2.33 dB 3.28 dB
Directivity	2.66 dBi	2.68 dBi	2.61 dBi 4.25 dBi
Radiation Efficiency	94.1%	93.97%	93.82% 80.10%
Total Efficiency	92.87%	92.59%	92.85% 76.47%

From the comparison of performance parameters shown in the table 3 it is clear that 2nd proposed antenna or Antenna C has two resonant frequencies under -10 dB return loss. Bandwidth at this return loss obtained were 1300 MHz and 607 MHz which fits in ultra wideband [16]. Other parameters such as bandwidth, gain, directivity and radiation efficiency decreases than other two antennas. Lower directivity is necessary for using antenna in various devices such as mobile phone, car radio etc. In this sense 2nd proposed antenna is better. Moreover total efficiency is also better than 1st proposed antenna. But the requirement were to achieve multiband characteristics for wideband communications at -10dB, so the 2nd proposed antenna or Antenna C shows acceptable results in that case. It also shows better VSWR results at resonant frequencies other than previous two antennas. Because for impedance matching VSWR need to be close enough with unity. Radiation efficiency of the second proposed antenna comes better than first proposed antenna. Considering all of the above performance parameters it is obvious that second proposed antenna is better than other two.

IV. FUTURE SCOPES

There are few scopes to improve the performance like as return loss, bandwidth, VSWR, gain, directivity and radiation efficiency of the proposed antenna by optimizing design parameters. Authors would like to improve the performance in future by adding more slots on the patch and ground plane. Because slot on the ground plane against the patch increases the bandwidth [17]. Moreover multiple slot on the patch might be handful to get multiband characteristics of microstrip-fed monopole antenna [18].

V. CONCLUSION

In this paper a microstrip-fed monopole antenna has been compared with a reference microstrip-fed monopole antenna. There have been several performance differences between the reference antenna and newly designed antennas. Reference antenna shows some good result where the second proposed antenna or Antenna C shows better resonance after -10dB return loss. There always be a chance to improve this presented antenna with optimizations. This antenna shows good result at ultra wideband frequency spectrum. This antenna could be useful for multiband applications in ultra wideband spectrum. One of the main advantage of this antenna is compact dimension which could be useful to fit it within small wireless device cases.

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A Quad Band Planar Inverted-F Antenna (PIFA) with Slotted Ground Plane

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Abstract- Planar inverted-F antennas are miniature designs that offer considerable versatility for both mobile and other wireless applications. The design is particularly suited for mobile devices. In this paper the design and of a compact quad band planar inverted-F antenna (PIFA) is proposed for mobile handset applications. The proposed antenna is a PIFA with slots inserted in top radiating patch as well as ground plane to get multi-band operation. The antenna covers GSM900, GPS, GSM1900 and UMTS bands. The antenna consists of a rectangular planar element suspended above the FR4 dielectric substrate. The ground plane is on the bottom side of the substrate. The antenna is having a simple structure, small size, wide bandwidth and good gain. The antenna geometry, simulations of return loss, hardware implementation and measured results are also discussed.

Index Terms- PIFA, internal antenna, FR4 dielectric, planar element, return loss, VSWR

I. INTRODUCTION

Rapid growth in wireless communications all over the world has lead to the development of multiple wireless standards and portable communication devices .The key to the operation of these devices is the antenna and hence there is a great demand of developing miniaturized antennas that can be easily integrated within the space available inside the portable devices. Such antennas should be less prone to damage, compact in total size and aesthetic from the appearance point of view. Conventional microstrip antenna designs are based on half-wavelength of operation, while the Planar Inverted-F Antenna designs invoke the quarter-wavelength operation. The quarter wavelength of PIFA operation is due to the connection of the radiating element to the ground plane through a shorting strip or pin. Thus planar inverted-F antenna (PIFA) is a promising structure to meet these requirements of portable devices [1].

PIFA is extended form of Inverted F antenna (IFA) which have a plate in place of wire radiator element to expand the bandwidth. By integrating this type of mobile phone antenna into a handset, several advantages are possible compared to conventional antennas, such as monopole or spiral antennas. They are easy to fabricate, have a simple structure, small volume, low manufacturing cost. PIFA structure is easy to hide in the casing of the mobile handset as compared to monopole, rod & helix antennas. Also, PIFA has reduced backward radiation towards user's head and body which further minimizes SAR and improves performance [2]. They can resonate at much smaller antenna size and by cutting slots in radiating patch, resonance can be modified. Proper changes results in multiband operation.

In this paper, the design of a quad band planar inverted F-antenna (PIFA) working in GSM900, GPS, GSM1800 and UMTS bands is presented. The radiating element presents an omni-directional radiation pattern, a relatively high gain and at the same time, is having a simple structure. Suitable dimensions are selected for the antenna to achieve the required bandwidth [3].

Next section explains the basic structure of simple PIFA and discusses the relationship between various parameters. Section III discusses the design of the proposed antenna and its properties using HFSS simulation software. Section IV provides conclusion and section VI is acknowledgement.

II. PIFA THEORY

PIFA Structure

PIFA structure consists of a ground plane, a resonating metallic plate i.e. a patch, a feed wire & one or more shorting pins or plates to connect the top patch and the ground plane. Fig. 1 shows a basic PIFA structure which is fed at the base by a feed wire. In a PIFA structure there are several design variables which can be varied and the performance of the desired antenna is achieved [4]-[5]. Some of the design variables are width, length and height of the top radiating patch, width and position of shorting pin or plate, location of the feed point, dimensions of the ground plane.

The performance of the antenna can be enhanced by varying ground plane length. Optimum length of the ground plane is 0.4λ at the operating frequency [6]. In several designs, position of the antenna on the dielectric substrate is important as enhancement in the operating bandwidth can be achieved to few more percentage. The antenna is fed through feeding pin which connects to the ground plane. This type of feeding technique allows designer to place it at any desired location in the patch. The shorting pin and shorting plate allows good impedance matching achieved with the patch above ground plane of size less

than λ/4. Resulting PIFA structure is of compact size than conventional λ/2 patch antennas.
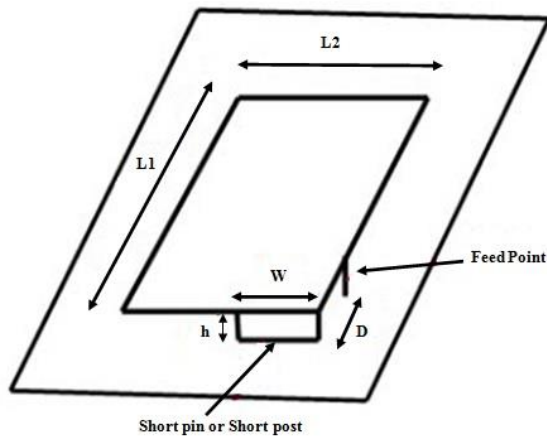

Fig.1: Basic PIFA Structure

B. Basic Design Equation

The frequency at which PIFA resonates can be calculated by using a basic formula as given below

$$L_1 + L_2 - W = \lambda_g/4 \tag{1}$$

Where L_1 is Top patch length
                L_2 is Top patch Width

λ is wavelength corresponding to resonant- frequency

The wavelength here is the guided wavelength which is given as

$$\lambda_g = \lambda_{0/}\varepsilon_r \tag{2}$$

This equation stems from the theory that if we arbitrarily take a point far away from the short circuit edge on the top radiating patch , and calculate the current path , on an average it will be equal to $L_1 + L_2 - W$

But $\lambda_0 = c/f$ (3)

Also PIFA sits on top of a dielectric substrate with permittivity ε_r

Therefore the above equation can be written as

$$L_1 + L_2 - W = c\ /4f\sqrt{\varepsilon_r} \tag{4}$$

Where   c is the speed of light,
                f is the resonant frequency

Above equation represents that the resonant frequency is dependent on width and length of the top plate, the width of the shorting plate and the substrate used. Further more if the height of PIFA is taken as a parameter and if permittivity is taken as the effective permittivity respective to each substrate then the equation can be modified as

$$L_1 + L_2 - W + h = c\ /4f\sqrt{\varepsilon_{reff}} \tag{4}$$

Where the effective permittivity respective to each substrate is approximated using Equation:

$$\varepsilon_{eff} \approx \frac{\varepsilon_r + 1}{2}\ .$$

The equation shows that the sum of the width and length of the top plate should be λ/4. This approximation is very rough and does not cover all the parameters that significantly affects the resonant frequency of the antenna [7]. As width of the shorting plate also affects resonant frequency of the antenna. So, reduction in the width of shorting plate results in lowering the resonant frequency and vice versa.

By analyzing the resonant frequency and bandwidth characteristics we can determine the optimum location of the feed point, at which minimum return loss is to be obtained. By optimizing the spacing between feed point and shorting point impedance matching of the PIFA can be obtained .To broaden the bandwidth of PIFA structure various techniques have been employed and the most widely used method is to increase the height of the shorting plate which finally results in increase of volume[8]. Several other techniques can also be used to enhance the bandwidth of a PIFA namely using dielectric material of high permittivity [9], using capacitive loading, using additional shorting plate etc.

III. PROPOSED ANTENNA
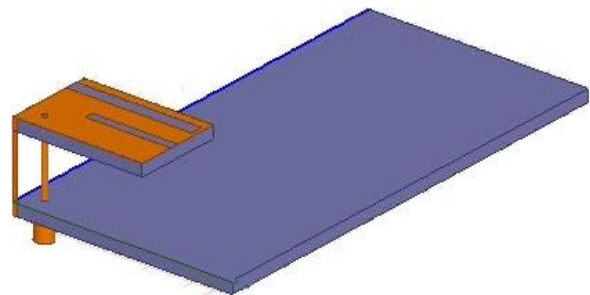
Fig.2: 3-D view of proposed antenna structure

The structure of the proposed PIFA antenna is shown in Fig.2 The proposed PIFA antenna consists of main radiating patch, a rectangular ground plane, a shorting plate, coaxial feed and a ground plane. Slots are inserted in the top radiating patch as well as ground plane so as to obtain multi-band operation. The antenna is designed using a dielectric material as FR-4 which has loss tangent, δ=0.02, dielectric constant, εr = 4.4 and substrate height, h = 1.6 mm.

shorting plate and top plate are made perfect electrical conductor (pec) [12].

Fig. 3: The Simulated S11 (dB) of proposed PIFA

The bandwidth here can be specified as impedance bandwidth for which return loss S11 is -6 dB as this value is good enough for mobile handset applications. Also frequency bandwidth can be specified for voltage standing wave ratio (VSWR) less than 2:1 which is equivalent to 10 dB level.
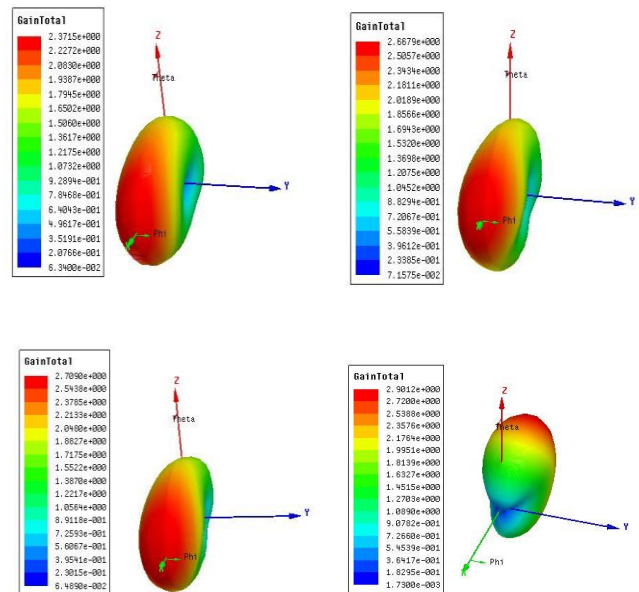
Fig. 4: The Simulated 3-D radiation pattern of proposed PIFA at a)960 MHz b)1.28GHz c)1.85GHz d)2.06 GHz

At this level 10% of the incident power is reflected back at the source. Therefore, the impedance bandwidth of the proposed PIFA design is the difference between upper and lower frequency which is 0.096 GHz, 0.075GHz, 0.105GHz, and 0.113GHz.

The simulated radiation patterns at resonant frequencies are given Fig. 4. The radiation pattern is the relative distribution of power radiated as a function of direction. Usually radiation pattern is determined in the far-field region. It can be seen that the antenna has a an Omni-directional radiation pattern in the

Fig.2: Dimensions of a)Top Radiating Patch b)Ground plane

Feeding point source is used to excite the structure. Total dimensions of the radiating parts of the antenna are 20 x 28.5 mm^2. And that of ground plane are 120 x 50 mm^2. Height of the antenna is 8mm. It can be observed that radiating parts covers small portion of the total size of the antenna leaving more space available for other electronic components [10].
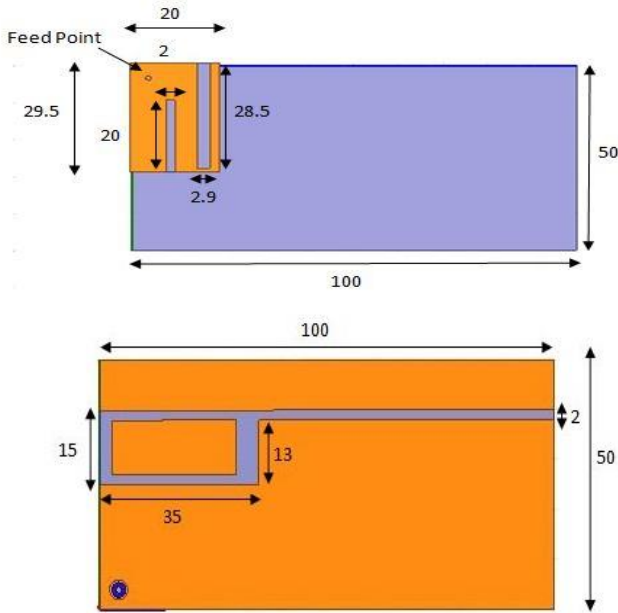
Table 1 shows the detailed dimensions of the proposed antenna having a rectangular radiating patch and ground plane

TABLE 1: Detailed Dimensions of Proposed Antenna

Parameter	Value (mm)
$L_{(ground)}$	100
$W_{(ground)}$	50
$L_{(patch)}$	50
$W_{(Patch)}$	21
$W_{(Short)}$	10
$h_{(short)}$	8

The simulation and analysis of the proposed antenna is done using High Frequency Structure Simulator (HFSS). The simulated reflection coefficient (S11) also known as return loss is presented in Fig. 3. It can be observed from S11 plot that the antenna covers the 850 MHz GSM band. The cellular and non-cellular bands covered by the proposed antenna are GSM900, GPS, GSM1900, PCS and UMTS bands.

The space between ground plane and top plate is air filled; here air is used as dielectric material [11]. Using a dielectric material between ground plane and top plate has effect on gain and bandwidth of PIFA antenna. To get good return loss and gain, the height of top plate selected is 10 mm. The ground plane,

three bands and a near omni-directional pattern in the fourth band. It shows that the antenna is a perfect radiator of electro-magnetic energy.
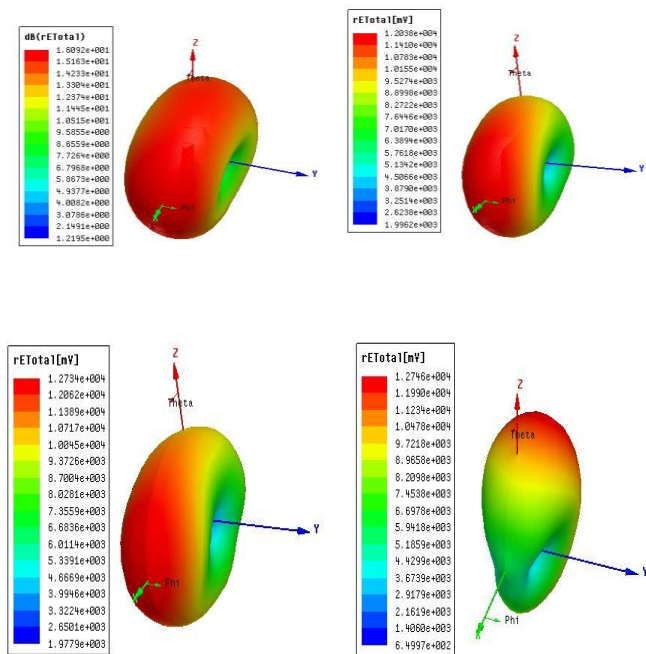

.

Fig. 4: The Simulated gain of proposed PIFA at a)960 MHz b)1.28GHz c)1.85GHz d)2.06 GHz

The gain is one of the important figure of merit of the antenna. The overall gain of the antenna obtained after simulation is shown in Fig. 4.4. A peak gain of 2.322 dB is observed at 867 MHz , 2.476 dB is observed at 1899 MHz and 4.516 dB is observed at 2.42 GHz.

The cellular bands covered by the simulated antenna are are GSM900, GPS, GSM1900 , PCS and UMTS bands.The antenna has a fair bandwidth ,omni –directional radiation pattern and low value of return loss which makes it desirable to be used with hand held devices. The simulation results show that the performance parameters of the antenna are satisfying the requirements of advance wireless communication devices.

IV. CONCLUSION

The design of a quad-band PIFA having simple structure which can work in the GSM900, GPS, GSM1900 , PCS and UMTS bands have been presented and proposed. Simulation results have shown good performance characteristics in terms of return loss gain and radiation pattern. There is a good agreement between measured and simulated results .The design details of the antenna can be used as base for increasing the number of bands covering several communication standards.

ACKNOWLEDGEMENT

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CBT in DHAT Syndrome and Co-Morbid Conditions

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Abstract- Dhat syndrome is a condition in which the male patients suffer from premature ejaculation or impotence, and believe that they are passing semen in their urine. The prevalence rate is varying between 40-66% among Indian population. The patients with Dhat syndrome are experiencing the overlapping symptoms of other disorders such as depression, anxiety, and mood, and it can be hypothesized that they would respond to CBT and symptoms would be diminished. The effectiveness of CBT in the intervention of psychosexual dysfunction has been proved. **Methodology:** Aim of the study was to investigate the efficacy of cognitive behaviour therapy (CBT) in Dhat syndrome and co-morbid conditions. Pre-post research design was used to study the efficacy of Cognitive Behaviour Therapy. Three outward male patients who diagnosed with Dhat syndrome were selected for the sample from GEMS Health Care, Hyderabad. The intervention was included with psycho-education, supportive psychotherapy and cognitive behaviour therapy with a duration of 4 months in 18 sessions and inform consents were taken from the patients. The cognitive behaviour therapy was compiled with activity scheduling, cognitive restructuring (thought challenging, role playing, positive statements, and behavioural rehearsal and relaxation therapy (JPMR). BDI-II, HAM-A and IIEF were used for pre-post assessment.
Result: In CASE-1 on BDI-II he improved 71%, on HAM-A 47%, and on IIEF 61.2%. In CASE-2 on BDI-II he improved 53.8%, on HAM-A 57%, and on IIEF 69%. In CASE-3 on BDI-II he improved 73%, on HAM-A 42%, and on IIEF 61%. This study concluded that CBT techniques are very effective Dhat syndrome and co-morbid conditions.

Index Terms- Dhat syndrome, Case studies, Cognitive Behaviour Bherapy and Supportive Psychotherapy.

I. INTRODUCTION

Dhat is believed to be a precious body fluid in many cultures and its loss can have harmful consequences to the body. This belief is carried forward over generations by different members of the society, which may be a key, authoritative elder member of the family or society or a traditional healer. The individuals do not understand the complex anatomy and physiology of penis and believe that the blood that is collected in the cavernous spaces during erection gets converted into semen and thus, they are losing blood and energy with each sexual activity (Prakash & Meena 2008; Salam, et al., 2012). In India, sexuality is considered as taboo and sexual matters are generally not discussed in the families. The tabooed nature of sex and discussions related to it in social & cultural context make it difficult for them to have discussions with peer groups, which prevents normalization of the experience of semen loss (Ranjith

& Mohan, 2006). Dhat syndrome is a culture-bound neurotic disorder seen in the Indian subcontinent (Chadda & Ahuja, 1990). There are various co-morbid conditions of Dhat Syndrome in which depression is the most common disorder. Dhat Syndrome is a way of expressing depression or anxiety among Indian population. In India, prevalence rate of Dhat Syndrome is varying between 40-66% (Sinha, & Singh, 2013). Dhat syndrome is also found in many South East Asian countries with different names and is characterized by semen loss resulting in a range of mood and anxiety related disorders. Loss of semen can be explained through masturbation, nocturnal emission, through urine and accompanying psychiatric symptoms are usually fatigability, weakness, anxiety, feelings of guilt, insomnia, inferiority, loss of appetite, weight loss, anxiety and sexual dysfunction. The effectiveness of CBT in the intervention of psychosexual dysfunction has been proved (Mohar, & Beutler, 1990, Munjack et al. 1984) because the patients with Dhat syndrome are experiencing the overlapping symptoms of other disorders such as depression (Dobson, 1989; Shapiro, et al. 1994), anxiety (Chambless & Gills, 1993; Borkovec & Ruscio, 2001), and mood, and it can be hypothesized that they would respond to CBT and symptoms would be diminished (Salman, et al., 2012). CBT also appears to be most relevant intervention in view of faulty beliefs and misconceptions about the origin of their symptoms and sexual functioning (Salam, et al., 2012). CBT deals with distinct illness behaviour shown by the patients in Dhat syndrome. A recent study reveals that psychosexual issues, supportive psychotherapy, reassurance, and family intervention is helpful in reducing the distress level of the patient with dhat syndrome and also found that rapid improvement in the depressive symptoms over a period of two weeks which also suggests that the depression was reactionary or secondary (Sinha, & Singh, 2013). A study revealed that 64 % of Dhat patients had no improvement with anti-depressants and dropped out from therapy (Singh 1985). Salam, Sharma & Prakash (2012) developed CBT module consisted of sex education, cognitive restructuring, relaxation training, imaginal desensitization, masturbatory training, Kegel's exercises, 'start-stop technique' and 'squeeze technique' for and found that feasibility of CBT module in clinical setting is suitable for application within busy clinical settings. Though combined modality of treatment (pharmacotherapy and psychotherapy) considered to be the best modality of treatment in resolving the Dhat syndrome as well as the associated co-morbidities (Bhatia, Bohra, & Malik 1989). Considering these factors, present study is an attempt to find the effectiveness of CBT in the patients with Dhat syndrome and co-morbid conditions.

II. METHODOLOGY

Aim of the study was to investigate the efficacy of cognitive behaviour therapy (CBT) in Dhat syndrome and co-morbid conditions. A case study method was used to for the present study. The sample consisted of three male patients from GEMS, Hyderabad, Telangana, who were diagnosed as Dhat syndrome (WHO, 1993) with co-morbid conditions. All of the three consented patients were single and were in the age range of 20 to 25years. Two of the patients had consulted faith healers before consulting GEMS Health Care. Pre-post research design was used to study the efficacy of Cognitive Behaviour Therapy. Three patients were assessed using Beck Depression Inventory (BDI-II) developed by Beck in 1990; Hamilton Rating Scale for Anxiety (HAM-A) developed by Hamilton 1959 and International index of erectile function (IIEF) developed by Rosen et al in 1997 and also by clinical interview and observation. BDI-II, HAM-A and IIEF were used for pre-post assessment of intervention. Informed consents were taken from the patients'. The patients were undergone for therapies such as psycho-education, supportive psychotherapy and cognitive behaviour therapy for 4 months in 18 sessions at GEMS Health Care, Hyderabad. The cognitive behaviour therapy was compiled with activity scheduling, cognitive restructuring (thought challenging, role playing, positive statements, and behavioural rehearsal and relaxation therapy (JPMR).

CASE NO-1

Mr. "V" a 21 yr old male brought by his mother with the complaints of decreased sleep and appetite, weakness/lack of energy, loss of interest in pleasurable activities, decreased self confidence, disturbed activity of daily living, hopelessness, worthlessness, crying spell/death wishes since 4 years. Onset was insidious, course was continuous and progress was deteriorating. Mr. "V" was a Muslim, Male, educated up to 5th standard, working as a knitting worker, belonged to the low SES, and resided at urban Hyderabad.

In brief history, Mr. "V" started masturbating from the age of 13 years, due to curiosity and initially he was practiced once in a week. At the age of 14 years he watched a porn movie with his colleague and he enjoyed the movie. Gradually his interest towards watching such kind of movies was increased and the act of masturbation was also increased up to 6 to 10 times in a weak. During the age of 15yeras he heard that masturbation is injuries to health and is prohibited in Islam. He scared and started trying to control the masturbatory activity, but he used to fail to control himself; due to this failure he started feeling guilty about his interest in watching porn movies and masturbatory activities but still he was fine till the age of 17yrs. Subsequently he started believing that his physical strength and appearance was deteriorating due to these activities which also increased his guiltiness. Finally he used to believe that all his conditions were due to his masturbatory activity and he had no control over that and even he did not want to marry as he started to believe that he had no capacity to make a sexual relationship. In medical history, he visited many traditional faith-healers (hakim) and hospitals and also took medicine for the same, but no improvement was found and he had no record of medicines and any prescriptions. In family history, Mr. "V" belonged to a nuclear family and he was fourth child among seven siblings. His father's attitude toward him was critical and he was more attached with his mother. Interpersonal relationship between family members are cordial, and attitude towards his illness was supportive except his father.

Mr. "V" was born with a full-term normal delivery at home and no prenatal, natal and postnatal complications were reported by mother. His developmental milestones were reported to be normal. Mr. "V" started his schooling at Etha district (U.P) from the age of 6 years and used to perform average in studies till 5th class. At the age of 13year he started learning "zarikam" with one of his friend and after three years he was working independently. He used to maintain healthy relationship with his co-workers and supervisor. Mr. "V" was premorbidly responsible and an active person; but sensitive towards criticism and used to be anxious in a stressful situations. He was religious and has good moral standards and he never been interested towards any type of substance abuse and also never had been any conflict with siblings or peers. On MSE he was looking older than his age, appears short, lean and thin, sitting in a reclined manner, maintained eye to eye contact partially, whenever enquired about his personal matters, he used to keep his hands on mouth, speech tone and intensity was low and productivity was decreased. He had below average cognitive and intellectual functioning, preoccupation with sex, ideas of hopelessness, guilt and suicidal ideation were found in content of thought, mood was irritable and affect was anxious, judgement was poor and had grade-II level of insight.

Mr. "V" was assessed using Beck Depression Inventory (BDI-II) developed by Beck, 1990; Hamilton Rating Scale for Anxiety (HAM-A) developed by Hamilton, 1959; International index of erectile function (IIEF) developed by Rosen et al in 1997; Thematic Apprehension Test (TAT) developed by Bellak 1993; Millon Clinical Multiaxial Inventory (MCMI-III) developed by Millon et al., 1994. In test findings, he scored 31 on BDI which indicated presence of severe level of depression; score on HAM-A 15 indicated present level of anxiety was not at clinical level; scored 31 on IIEF indicated moderate level of erectile dysfunction. TAT results showed that he had predominant need for sex, aggression, dominance and affection, major presses as sexual desire, lust and love. He had main conflict with need for sex and inferiority and to overcome from this conflict he used to utilize wishful thinking. On MCMI-III the results showed that it was a valid profile and his approach toward testing was frank and self revealing. He comes under Depressive, schizoid and avoidant Clinical personality trend means he had worthless self image, and characteristically warm, tender and non competitive, timidly avoids social tension and interpersonal conflicts. On severe personality pattern he comes under schizotypal and borderline group which indicated, he have estranged self-image and tendency toward himself as forlorn with repetitive thoughts of life's emptiness and meaninglessness. On clinical syndrome scale, elevated score was found on anxiety scale which indicated, patient might be having estranged self-image and tendency toward himself as forlorn with repetitive thoughts of life's emptiness and meaninglessness. On clinical syndrome scale, elevated score was found on anxiety scale and severe clinical syndrome scale, elevated score were found on Major depression and Thought Disorder, which indicated that he

have major depression. *Mr. "V" diagnosed as* "Severe Depression with Dhat syndrome"

CASE NO -2

Mr. "R" a 25 yr old male came with the complaints of repetitive thoughts related to sex, palpitation, nocturnal emission, masturbation, disturbed sleep, frequent headaches, increased irritability and difficulty in concentrating at work which are increased since last 6 months. Eventually the repetitive thoughts started interfering in his social and occupational functioning. Total duration of illness was 5 yrs, onset was insidious, course continuous and progress was deteriorating. Mr. "R" was a single, Hindu, male, educated up to post graduation, working as a private tutor, belonged to middle socioeconomic background came to GEMS Health Care at Hyderabad. In brief history, at the age of 20years, Mr. "R" was noticed nocturnal emission with the frequency of once in a weak and gradually it increased. He used to feel shame as the family members were also noticed it and he was suggested for masturbation for the same by his close friend. He was aware of that these practices are not good for health but could not be controlled by himself and he used to masturbate 2-3 times in a day and he maintained well till the age of 23 years. After that he noticed that semen was discharging during urination and he had pain whenever he masturbated and due to this he stopped these practices but he had a feeling of loss of energy and strength in his body. Meanwhile, he had two failed attempts of sexual intercourse with his girlfriend and he became socially isolated and preoccupied with worry for his condition. Thereafter his erection was decreased even for his imaginative thinking of sexual content and due this he started getting palpitation and other bodily sensations which lead him to thought of dying. He has a family history of bipolar mood disorder. Mr. "R" belonged to a joint family which consisted of grandmother, mother- father, elder brother's family, and his twin brothers. His father was retired as a teacher and after that he started running his own tuition classes. His mother was educated up to 7th standard and was a house wife and his elder sister got married and living with her family. Elder brother educated up to 10th standard and was married. He had a monozygotic twin younger brother who is doing Hotel Management with part time job. Mr. "R" reported that his parents are very supportive and he was attached to his mother. He was an obedient and disciplined child to his family and he did not have any conflict with his family members. F/H/S/O mental illness was present in his elder sister.

Birth and developmental history was not elicited due to unavailable of the informants. He was being interested in academics since his childhood and an average student in the class. After his post graduation he started to work as a part time for his further studies. He completed his B.Ed. (Bachelor of Education) and was trying for Teacher Eligibility Test.

Premorbily he was quiet, ambitious, obedient and disciplined since his childhood. He was enthusiastic and optimistic and he wanted to become a good teacher. He used to respect others and had a healthy family and social relationships. His attitude to self and others was positive and had good moral values. He did not have any specific interests or hobbies and had few friends. On MSE, he was appeared older than his age, has lean and thin body built, eye to eye contact was partially maintained, rapport was easily established easily, speech was spontaneous with increased

speed and productivity. Non-adaptive movements like blinking and twitching of the shoulders were observed in psycho motor activities. He has average cognitive and intellectual functioning, mood was "anxious" and affect was congruent, circumstantialities in stream of thought, feelings of guilt, inferiority and ruminations related to past experiences in content of thought. His judgement was intact and insight was in at intellectual level.

Mr. "R" was assessed using Brief Psychiatric Rating Scale (BPRS) developed by Overall & Gorham 1962, Ventura, et al., 1993; Human Figure Drawing Test (HFDT) developed by Mitchel, Richard, & Roland; 1993; Neo- Five factor inventory (NEO-FFI) developed by Costa, & McCrae, 1991; Sentence Completion Test (SCT) developed by Sack & Levy 1950, and Thematic Apperception Test (TAT). In test findings, on BPRS he scored high on anxiety, depression, guilt and hostility and distractibility. HFDT findings indicated the absence of cognitive impairment and organicity but qualitative finding suggested presence of anxiety, uncertainity, insecurity and timidity. Profile figure of the drawing suggested aggressive tendencies, evasiveness, paranoia, oppositional tendencies and intelligence in the patient. On NEO—FFI suggested he was very warm and affectionate towards others, enjoys large and noisy crowds or parties also seen as being forceful and dominant, preferring to be a group leader rather than a follower and has high level of energy. However, low scores on openness, tends to be conventional in behaviour, conservative in outlook and his emotional responses are somewhat muted. Low scores on agreeableness scale suggested he might be having narcissistic, antisocial, and paranoid personality traits. Low scores on conscientiousness scale indicated that he was not applying his moral values on self and tends to be hedonistic, as more interested in sex related matters. On SCT he obtained high scores in the area of self- concept, which suggested feeling of guilt and inferiority. The TAT stories revealed the predominant needs of love, affection, sex and acceptance. The feelings and emotions reflected in the story are love, guilt, hostility and sadness and as a result of ongoing stress, the patient was showing significant conflict with opposite sex individuals and to cope with these conflicts, he was using intellectualization, rationalization and fantasy. The Rorschach Inkblot Test revealed that the patient had significant coping deficits which might resulted in poor interpersonal relationship, thinking by inducing distortions to reality and decision making capacity but there may be an underlying need for social attachment. His personality type was ambient and his self image was negative. His emotional display was inconsistent, sometimes well controlled on the other hand impulsive. He had a chronic vulnerability to become disorganized under stress and the failures might induce depressive feelings and no findings related to impair reality testing were found. Mr. "R" was diagnosed "Anxiety with Dhat syndrome".

CASE NO – 3

Mr. "S" a 20 year old male came with the complaints of loss of energy, fatigability, poor self confidence and self esteem, suicidal ideation, disturb sleep since 2 years. Onset was insidious, course was continuous and progress was deteriorating. Mr. "S" was single, Muslim, was pursuing graduation, belonged

to middle SES of urban area came to GEMS Health Care at Hyderabad. In brief history, he was fine till the age of 17 years and he never used to masturbate as he strongly believed that masturbation spoils the person sexual life and also reduce the physical appearance. At the age of 18yrs once he saw a porn movie on a mobile and had nocturnal emission and it was gradually increased to three to four times in a week which made him to feel shame about it guilty about his behaviour. Since the age of 19yrs he started noticing that semen was discharging during urination and due to this started to believe that his physical strength was reducing. He consulted a faith healer and started taking Ayurvedic medicine for the same. As a result of this semen discharge was reduced but his feeling of helpless, hopelessness and worthlessness was increased significantly.

In family history, he is the younger child to his family and he has one elder brother and two elder sisters and all are married and settled. His father and brother both run their own business and mother was a house wife. He was more attached with brother and depended on brother for his all needs and demands. His father's attitude toward him was critical and other family members were supportive towards him and had sympathy for his physical condition. Birth and developmental history was not elicited due to unavailability of informants. He gained admission in school at the age of 5 years and he was average student in his class since his childhood. He used to participate in extracurricular activities. In premorbidly, Mr. "S" was well adjusted in premorbidly as he had good friend circle and he maintained healthy relationship with friends and peer group. He was a responsible and sensible person for his family and had good moral values. On MSE he was well kempt & tidy, dishevelled, wearing dull colour T- shirt and jeans, has lean and thin body built, looking older than his age, eye to eye contact was maintained partially, rapport was easily established easily, and psychomotor activity was decreased. In speech tone and intensity was low, productivity was decreased, coherent and answered when asked question. Orientation and memory was intact, abstract thinking was at functional level and has average level of intellectual functioning. No abnormalities were elicited in stream, form and possession of thought. Feeling of inferiority, guilt, helplessness and hopelessness was found in content of thought and mood was depressed and congruent. No perceptual disturbances were elicited. Judgement was intact and insight was at grade-V.

Mr. "S" was assessed using Eysenck's Digit Span Series Test (EDSST) developed by Wechsler, 1955; Thematic Apperception Test (TAT); and MCMI-III. In test findings, on EDSST his obtained score was 5 in digit forward and 4 in digit backward which indicated that his attention was easily aroused and sustained. The TAT stories revealed that there was conflict with maternal authority and unwilling submission to it. Patient had a strong superego and most acts are seen clearly as 'crime' and 'punishment'. The society was seen as a means to apprehend 'perpetrators' and nobody could escape from societal punishment. Passivity appeared on 12M that was ego syntonic and indicated that he wanted to receive aid and comfort. There was a clear suicidal ideation as appears on cards 3BM and 14, it could be corroborated with his history. On 3BM there was a combination of intra-aggression and a very strong superego indicated suicidal ideation. On 14 there was a conflict between

an active denial of depressive feelings and suicidal tendencies. However, his story on 14 also pointed towards aesthetic interests, which might be helpful for therapeutic purposes. On MCMI-III, the Profile was valid and his clinical personality pattern was Depressive, Schizoid, and Avoidant which means he might be having worthless self image, and characteristically warm, tender and non-competitive, timidly avoids social tension and interpersonal conflicts. On severe personality pattern, he was Schizotypal and Borderline which indicates he might be having estranged self-image and tendency toward himself as forlorn with repetitive thoughts of life's emptiness and meaninglessness. Among the severe clinical syndromes, he obtained the highest scores on **Scale CC (Major Depression)** which indicated that he was usually incapable of functioning in a normal environment because he was severely depressed, and expressing a dread of the future, suicidal ideation, and a sense of hopeless resignation and had problems of concentration and feelings of worthlessness or guilt. Mr. "S" was diagnosed as "Severe Depression with Dhat Syndrome".

III. THERAPUTIC PROCESS

Session 1 to 3 (Common for all)

Initial intervention sessions were same for all three cases and in mid sessions some cognitive and behavioural strategies were changed according to their symptoms. The therapeutic process was done with psycho-education, supportive psychotherapy and cognitive behaviour therapy with in one session per a week, with the duration of 45 minutes and the overall intervention has been completed within 18 sessions in a period of four months at Gems Health Care, Hyderabad. The cognitive behaviour therapy was compiled with activity scheduling, cognitive restructuring (thought challenging, covert conditioning, role playing, positive statements, and behavioural rehearsal and relaxation therapy (JPMR).

Psycho-education: The patients were provided the information regarding nature, cause, course and prognosis of the disease. In initial session, informal conversation including what they likes, dislikes, interests and hobbies were discussed to make rapport with the patients. After successfully establishing rapport the patients were psycho-educated about the nature, course, prognosis and management, non-pharmacological approach based on their requirements. They were also informed the need and course of the current psychotherapeutic treatment and their active participation for the same.

In second session, sex education was given to them in a very lemon language and common examples were used to convince them regarding the production of semen and its utility. During session they were persistently motivated about asking the questions regarding the sex and the proper information was provided to them and it was found that they had lot of misconceptions and myths regarding the sexuality. In the next session was also dominated with sex education in which they were taught about human reproductive system by using drawing, pictures and posters related to the subject.

Supportive Psychotherapy: Supportive psychotherapy was used as adjuncts to re-educative or reconstructive psychotherapy. Aim of this therapy was to bring the patient to an emotional equilibrium as rapidly as possible, with amelioration (to make

better or easier) of symptoms, so that they can function at a level to approximating their norms. It was an effort to make strengthen existing defenses as well as enhancing better mechanisms of control. Supportive psychotherapy techniques were widely practiced not only for hospitalized or chronically ill psychiatric patients, but also, on a relatively short-term basis, for patients in acute crisis situations (Conte, 1994). It has also been found effective for patients with medical illnesses to help them develop more effective coping mechanisms, thereby providing a more favourable long-term course of illness (Conte, 1994).

Cognitive Behaviour Therapy:
CASE-1: *Sessions 4 to 16*

Mr. "V" has moderate to severe level of depression therefore initially supportive psychotherapy, cognitive strategies and other behavioural techniques were introduced. Initially he was motivated and assured that he will fine and would gain his strength, if he participates in collaborative way. He was advised for morning walk in early in the morning. Meanwhile his mother was involved in a session and provided the therapeutic process and asked her to help the patient to overcome from his problem. She was provided his activity scheduling regarding his food habits and timings and explained to monitor for his betterment.

His negative automatic thoughts and cognitive errors were identified:

1) "I lost all my energy, strength and appearance" because no one is looking to me or interacting with me- black & white thinking
2) "I made a big mistake and god must punish me"- must statement.

During the sessions also targeted his underlying core beliefs and application of pure cognitive techniques to reconstruct his wrong cognition about self, others as well as world. After convincing the patient that his underlying beliefs were maladaptive by proving some examples, he was suggested to write sentences consisting positive and motivating words, such as "I am a young and attractive man", "my family and friends are carrying to me" and some positive statements were also taught to him.

In these sessions his dysfunctional automatic thoughts were identified and challenged by some questions such as "What is the evidence that your thought is true"?, "What will be the effect continuing to think this way"?, "What are the best outcome, worst outcome, and most realistic outcome"?, "What is the likelihood that this will happen"?.

During thought challenging he was motivated and supported with simple conversation which might not hurt him at any point. Initially he used so many defences but gradually his defences were decreased and he started accepting them and even at a point he admitted that he was wrong. In between the sessions, the behavioural techniques were introduced and he was motivated to go for working again, for watching movies or interact with his friends. His mother was reported that initially he was not motivated in maintaining the thought diary and activity scheduling but gradually he started maintaining all instruction which were given by the therapist and she was also happy that he started conversing with his family members. She reported that he used to discuss regarding therapy sessions and weekly activities.

Behavioural rehearsals and role-playing techniques for used to improve his communication skills and advised to start the conversation with female co-workers and he was very comfortable to communication with female co-worker as well as other females. He was realized that his prejudiced behaviour was wrong regarding a neighbourhood lady as he found that she was good in nature after started to talk with her.

CASE NO-2: *Sessions 4 to 6*

Mr. "R" has moderate level of anxiety and ruminative thoughts related to sex for that, initially relaxation therapy and supportive psychotherapy were introduced. Once he learned to relax by himself after that cognitive therapy was introduced to change his misconceptions. The cognitive distortions were elicited from his are as follows:

1) "I will be die soon, because my heart is choking"
2) "My sexual life spoiled" I never satisfied a girl"

Relaxation technique was introduced in which he was taught to relax all 15 muscles (feet, calf, knees, Thais, lower abdominal, stomach, chest, wrist, hand, y-shapes, shoulders, neck, jaws, eyes, forehead) one by one. In first session all the procedure regarding relaxation was taught by demonstration. He was instructed to sit on the chair comfortably, close eyes and try to concentrate on breathing and asked to concentrate instructions to follow them. Immediate after each session his subjective feeling was recorded on 10 point scale. Initially he was not able to concentrate and used to open his eyes in between but late he was doing well and good. First three sessions were assisted him with instructions and later he was advised to follow the procedure by himself and also asked to practice it two to three time at home and he became mastery in sixth session.

Middle Sessions: 7 to 16

CBT techniques were used to change his misconceptions and believe. In covert conditioning he was asked to imagine about his girl friend and her sexual appearance which made him to get the erection in first session. He was advised to do the same at home and also asked to practice the masturbation and also asked to relax himself which helps him to get control over ejaculation and also suggested him to maintain in a particular conditions such as, once in day and the practices should be done in peaceful environment.

In the next session he reported that he had a control over his ejaculation. Then the thought stopping technique (Self control Triad) was introduced by therapist. Therapist was introduced an intrusive thought by covert conditioning which was elicited in thought dairy. He asked to raise his Index finger when he gets the intrusive thought, and this thought was distracted by therapist by using "Stop" as a word and he also reported that his thought was stopped immediately. He was asked to practice it by himself when he gets an intrusive thought.

He was also explained the amusement technique (Laughing at his own thought) and asked to practice it. He was asked to fix a particular time to practice these techniques with a order of first deliberately he has to get the thoughts which was disturbing him and then go for thought challenging and then laugh at his own thoughts. He was reported that he was succeeded with his continuous practices.

CASE NO-3:

Mr. "S" has moderate to severe level of depression for that he was provided supportive psychotherapy behavioural strategies and followed by cognitive techniques.

In initial individual sessions, he was expressed that still he need to clarify few questions regarding sexuality and he was provided the information based on his question.

The cognitive distortion was identified such as "Religiously what was happened with me was wrong and god should be punishing me". He was asked proofs for his believe in which he was failed. There after he was explained that his believes are maladaptive by providing suitable examples and also asked him to write some positive self statements as a home work such as "I have done nothing wrong, it is common for every individual in early adult hood". "It happens with all ".

Once again he was explained the process of reproduction semen and body functions. He taught that our body has ability to produce it again and again and the semen discharge has no harmful effects to human beings. Some examples were used to convince him such as "married men do sex every day but they don't become weak".

In the next session he reported that at times he was disturbing by his above mentioned maladaptive thoughts for that he was also explained the amusement technique (Laughing at his own thought) and asked to practice it. He was asked to fix a particular time to practice these techniques with a order of first deliberately he has to get the thoughts which was disturbing him and then go for thought challenging and then laugh at his own thoughts.

Terminal session: 17 to 18

The terminal sessions were taken in a group as they were familiar with each other. They have provided to discuss about their therapeutic experiences individually and their present conditions and during discussions others were asked to raise their questions. Therapist was maintained a passive role during these sessions and he used to interrupt only when it was necessary or for any clarification.

IV.   RESULTS

Graph-1: Graphical representation of Pre and Post assessment scores of Case-1, Case-2 and Case-3.
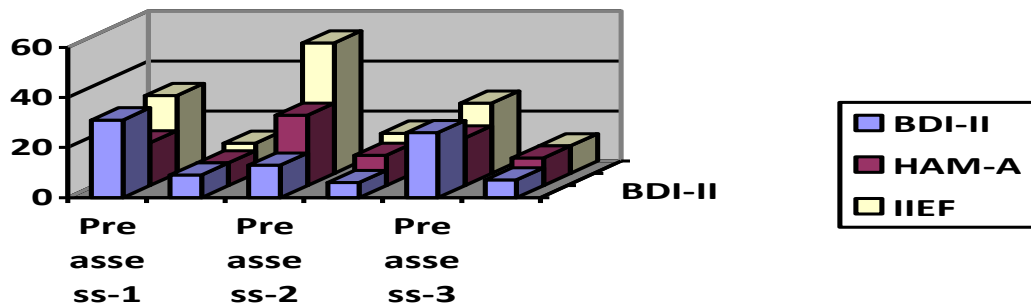
In CASE-1 pre assessment score of BDI-II was 31 and post assessment score was 9; on HAM-A pre assessment score was 17 and post assessment score was 9 and on IIEF pre assessment score was 31 and post assessment score was 12. In CASE-2 pre assessment score of BDI-II was 13 and post assessment score was 6; on HAM-A pre assessment score was 28 and post assessment score was 12 and on IIEF pre assessment score was 52 and post assessment score was 16. In CASE-3 pre assessment score of BDI-II was 26 and post assessment score was 7; on HAM-A pre assessment score was 19 and post assessment score was 11 and on IIEF pre assessment score was 28 and post assessment score was 11.

Graph-2: Graphical representation of reduction in scores of BDI-II, HAM-A and IIEF of Case-1, Case-2 and Case-3.
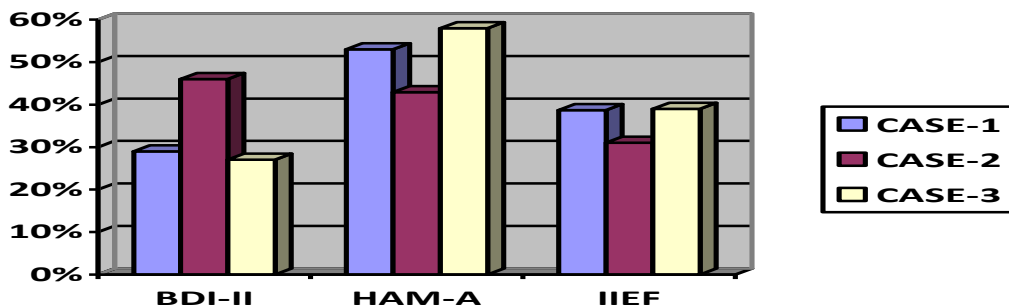
In CASE-1, his score on BDI-II was reduced to 29%, on HAM-A was reduced to 53%, on IIEF it was reduced to 38.7%. In CASE-2, his score on BDI-II was reduced to 46%, on HAM-A was reduced to 42.9%, on IIEF it was reduced to 31%. In CASE-3, his score on BDI-II was reduced to 27%, on HAM-A was reduced to 58%, on IIEF it was reduced to 39%.

Graph-3: Graphical representation of the improvement in Case-1, Case-2, and Case-3 in relation t BDI-II, HAM-A and IIEF.

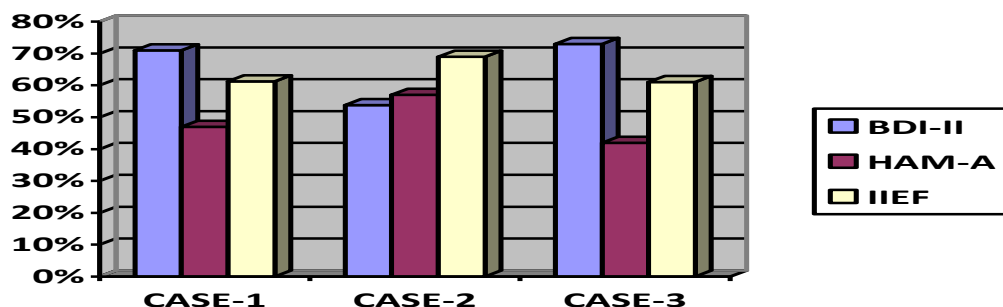In CASE-1 the post assessment score on BDI-II was 9 which shows that his condition was improved to 71%, for CASE-2 it was improved to 53.8% and for CASE-3 it was 73%. The overall decreased scores on BDI-II in all three cases reflect that CBT techniques were useful for the better improvement depression. In CASE-1 the post assessment score on HAM-A was 12 which shows that his condition was improved to 47%, for CASE-2 it was improved to 57% and for CASE-3 it was 42%. On HAM-A in all three cases there was significant reduction on the scores which showed the better improvement in the patient's anxiety level. In CASE-1 the post assessment score on IIEF was 12 which shows that his condition was improved to 61.2%, for CASE-2 it was improved to 69% and for CASE-3 it was 61%. On IIEF in all three cases there was significant reduction on the scores which showed that CBT techniques were very much useful to improve their condition in clients with erectile dysfunction. The overall findings in all three cases suggested that CBT techniques were very effective in clients with Dhat Syndrome related co-morbid conditions.

V. DISCUSSION & CONCLUSION

Present study was an attempt to find out the efficacy of CBT in Dhat syndrome and co-morbid conditions. Finding reveals that it was an effective intervention technique in Dhat related neurotic disorders such as depression and anxiety and findings also supported that psychological intervention alone was effective in these types of cases.

Masturbation and nocturnal emission perceived as detrimental to mental and physical health in our society. Most of the individuals are depending on suggestions of friends or visits self claimed sex specialists and traditional faith healers. This type of health providers are spreading the misconception and these types of false beliefs and also compel the patients expensive for investigations and drugs which are not only non effective but also hazardous. During assessment process we also noticed that the misconceptions associated with biological or anatomical aspects of sex and sexuality are very difficult to be corrected with the help of pharmacotherapy or psychological counselling. Although, our patients are from different social, economical, cultural and educational background but they found almost same level of depression, anxiety and the erectile dysfunction and it was also revealed that CBT techniques were effective for clients with Dhat Syndrome. This study was concluded that CBT techniques are effective in clients with Dhat Syndrome with co-morbid conditions.

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Study of some important medicinal plants found in Imphal-East District, Manipur, India

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Abstract- The present study revealed that a total of 50 medicinal plants, belongs to 26 families are recorded for the treatment of different diseases viz. asthma, arthritis, cough, fever, diabetes, dysentery, gastric and indigestion, jaundice, toothache, skin diseases, etc. Some important medicinal plants widely used are *Acorus calamus* Linn., *Cassia alata* Linn., *Andrographis paniculata* Nees., *kaempferia galanga* Linn., *Zanthoxylum acanthopodium* DC., *Eryngium foetidum* Linn., *Eupatorium birmanicum* DC., *Adhatoda vasica* Nees., etc. Some of the species reported in the present paper are in critical conditions due to deforestation, over exploitation, various activities of human population for their survival and other developmental activities such as agriculture, urbanization etc. as a result of which the rich habitats are gradually depleting day by day. Therefore, it is suggested that the high diversity of bio-resources needs to be conserved for livelihood sustenance of the future generation.

Index Terms- Traditional knowledge, Conservation, Marketable, Medicinal plants, Manipur

I. INTRODUCTION

India is extremely rich in medicinal plant diversity distributed in different geographical and environmental conditions and associated tribal and folk knowledge systems. India has the second largest tribal population in world after Africa (Kshirsagar& Singh, 2000). Manipur, a state of north-eastern India is known for its ecologically distinctive and rich biodiversity, having many endemic flora and fauna and rich cultural diversity. Medicinal plants have been used virtually all cultures as a source of medicine. It is estimated that 70-80% people worldwide relay chiefly on traditional, largely herbal, medicines to meet their primaryhealth care needs (Srivastava*et al*., 1995). Approximately 85% of traditional medicine preparations involve the use of plants or plants extracts (Vieira and Skorupa, 1993). The use of medicinal plants and traditional medicinal knowledge system is still continuing from time immemorial through ages, by the communities of Manipur. The state is endowed with a variety of medicinal plants. It has virgin forests and rich comparatively unexplored ecosystems. A number of workers have investigated on the utility of certain plants of Manipur for the treatment of diseases. Study of some Dicotyledonous plants of Manipur and recorded the names of useful plants of the state (Deb, 1961). Important medicinal plants of Manipur were recorded by (Shukla and Baishya, 1979). Similarly, investigation of medicinal plants and its uses were discussed in Manipur by (Sinha, 1996 and Singh *et al*, 2003) and the sacred plants species having medicinal and religious importance was reported by (Khubongmayum, 2004). The rich wealth of bio-resources and potential need proper management, conservation and development to utilize these in some suitable form for health care of the people and to develop herbal based industries. In present study, we chose some plants currently used in the folk medicine in Imphal-east district, Manipur. So far few works has been reported on ethnobotanical uses of plant species found in Imphal-east district. Thus, keeping this in view, the present investigation was carried out.

II. MATERIALS AND METHODS

Information on the use of medicinal plant was collected during Jan. 2013 to Dec. 2013 through field surveys in different remote villages of the Imphal-east District. The questionnaires were devised to identify the indigenous knowledge of plant based remedies from local people. Plant based remedies have presented with botanical name of species followed by family, local name, parts used and ethno-medical uses. The collected plant specimens were identified based on Sinha, 1987, Hooker, 1872-1898, Kanjilal *et al*., 1934-1940, Bor, 1940 and correct nomenclature were given to the specimens. The socio-economic importance of the medicinal plants are also studied. The botanical name, family, local name along with its medicinal uses were presented under its plant species (Table 1).

Table 1: Medicinal plant species used by local people of Imphal-East District, Manipur

Sl. no.	Scientific Name	Family	Local Name& Common name	Parts use	Medicinal values	M/NM
1.	*Acorus calamus* Linn.	Araceae	Ok-hidak Sweet flag	Rhizome	Cough,fever,itching	NM
2.	*Adenostem malavenia* (L.) Kuntze	Asteraceae	Lalu-kok Sticky daisy	Leaves	Fresh injuries & skin disease	NM
3.	*Adhatoda vasica* Linn.	Acanthaceae	Nongmangkha-angouba Malabar nut	Leaves & flower	Cough, fever, dysentery	NM
4.	*Alocasia cucullata* (Lour.) Schott	Araceae	Palukabi/Singju-pan Chinese taro	Rhizome	Purify blood	M
5.	*Alpinia galanga* (Linn.) Willd.	Zingiberaceae	Kanghu Blue ginger/Thai ginger	Rhizome	Regulate blood circulation	M
6.	*Andrographis paniculata* (Burm.f.) Wall.	Acanthaceae	Bhubati King of bitters/ Andrographio	Leaves	Chronic fever	NM
7.	*Artemisia nilagirica* (Linn.)	Asteraceae	Laibak-ngou Mugwort	Shoot & leaves	Mouth ulcer & dizziness	NM
8.	*Asparagus filicinus* Buch. Ham.	Liliaceae	Nungarei Fern Asparagus	Root	Dysentery & epilepsy	NM
9.	*Butea monosperma* (Lam.)	Papilionaceae	Panggonglei Butca Gum Tree	Leaves, bark, gum, seed	Diarrhea, dysentery, snake bite	NM
10.	*Cardamine hirsute* (Linn.)	Brassicaceae	Chantruk-maan Hairy bittercress	Whole plant except root	Diuretic, better urination	NM
11.	*Cassia alata* (Linn.) Roxb.	Caesalpiniaceae	Daopata-achouba Candle bush	Leaves	Diabetes, skin diseases	NM
12.	*Calotropis gigantea* (Linn.) W.T.Aiton	Asclepiadaceae	Ang-got Crown flower	Shoot	Ring worm & leprosy	NM
13.	*Cinnamomum tamala* (Buch. Ham.)	Lauraceae	Tejpata Indian bay leaf	Leaves	Dizziness, headache	M
14.	*Clerodendrum serratum* (Linn.)Moon	Verbenaceae	MoirangKhanambi Bayflower/bleeding heart	Leaves, stem	Fever, dysentery, asthma,bronchitis	NM
15.	*Clerodendrum colebrookianum* (Walp.)	Verbenaceae	Kuthap Glorybower	Leaves	Skin diseases, dysentery	NM
16.	*Curcuma caesia* (Roxb.)	Zingiberaceae	Yaimu Black turmeric	Rhizome	Cough, dysentery	NM
17.	*Costus speciosus* (J. Konig) C. Specht	Zingiberaceae	Okchak-KhombiKhongban-Takhelei Crepe ginger	Rhizome	Urinary stone case	NM
18.	*Cedrela toona* (Roxb.)exRottler&Willd.	Meliaceae	Tairen Red – cedar	Leaves	Skin diseases & poxes	NM
19.	*Cymbopogon citrates*(D.C.) Stapf.	Gramineae	Lemon grass	Leaves	Digestion	M
20.	*Cymbopogon flexuosus* (Nees ex Sleud.) Will. Watson	Gramineae	Haona Malabar grass	Leaves	Cut & injuries for early healing	NM
21.	*Eryngium foetidum* (Linn.)	Apiaceae	Awa-phadigom Coriander	Whole plant	Arthritis	M
22.	*Eupatorium birmanicum* (DC.)	Asteraceae	Langthrei Burma Agrimony	Young shoot & Leaves	Epilepsy	NM
23.	*Euphorbia hirta*	Euphorbiaceae	Pakhangleiton	Young stem &	Diarrhoea, dysentery &	NM

				Asthma plant/ Hairy spurge/garden spurge	flower	colic pain	
	(Linn.)						
24.	*Gynura nepalensis* (D C.)	Asteraceae	Terapaibi Ashitaba	Young stem & flower	Against stomach ulcer	NM
25.	*Hedychium coronarium* (J. Koenig)	Zingiberaceae	Takhellei-angouba White ginger lily	Rhizome	Cough,vomiting	NM
26.	*Hedychium marginatum*(C. B. Clarke)	Zingiberaceae	Takhellei-angangba Red ginger lily	Rhizome	Bronchitis & stomach ulcer	NM
27.	*Iris bakeri* (Chapin.)	Iridaceae	Kombirei Fire- maned bowerbird	Rhizome	Brain coolant & hysteria	M
28.	*Jatropha gossypifolia* (Linn.)	Euphorbiaceae	Kege-manbi Bellyache bush/ Black physic nut	Leaves & root	Eczema, leprosy & snake bites	NM
29.	*Kaempferia galangal* (Linn.)	Zingiberaceae	Yaithamna-manbi Aromatic ginger	Rhizome	Baldness	M
30.	*Melothria perpusilla* (Blume.) Cogn.	Cucurbitaceae	Lamthabi Creeping cucumber	Leaves & Fruit	Jaundice & kidney affection	M
31.	*Meriandra benghalensis* (Roxb.) Benth.	Lamiaceae	Kanghuman Salvia abyssinica	Leaves	Cough, dizziness	M
32.	*Mimosa pudica* (Linn.)	*Mimosa pudica*	Kangphal-ikaithabi Sleepy plant	Young shoot	Piles & jaundice	NM
33.	*Ocimum basilicum* (Linn.)	Lamiaceae	Naosek-lei Thai basil/ Sweet basil	Leaves & young shoots	Fever	M
34.	*Oroxylum indicum* (Linn.) Benth. ex Kurz	Bignoniaceae	Shamba Broken Banes Tree	Leaves & seed	Gastric ulcer, tonsil	NM
35.	*Phlogacanthus thyrsiformis* (Roxb.) Nees.	Acanthaceae	Nongmangkha Poison Berry	Leaves & flower	Fever ,cough	M
36.	*Piper longum* (Linn.)	Piperaceae	Tabopi Long pepper	Root & fruit	Jaundice,laxative	NM
37.	*Plumbago zeylanica* (Linn.)	Plumbaginaceae	Telhidak Ceylon Leadwort/ Doctor bush	Root	Piles,bronchitis	NM
38.	*Pogostemon parviflorus* (Benth.)	Lamiaceae	Sangbrei Phangla	Leaves & root	Bleeding piles	M
39.	*Polygonum orientale*(Linn.)	Polygonaceae	Yellang Smartweeds	Tender leaves & shoots	Tonic & against headache	M
40.	*Polygonum posumbu* (Buch.-Ham.) ex D.Don	Polygonaceae	Phak-pai Smartweed	Tender shoots & leaves	Heart beat increases	M
41.	*Psophocarpus tetragonolobus* (Linn.) D.C.	Papilionaceae	Tengnou-manbi Four-angled bean/ Winged bean	Young fruit	Cough	M
42.	*Rhussemi alata* (Murr.)	Anacardiaceae	Heimang Chinese Sumac	Fruit, leaves	Intestinal worms, hair care	M
43.	*Sesbania grandiflora* (Linn.) Poiret.	Papiplionaceae	Chuchu-rangmei Agati or humming bird	Young fruit	Diabetes	M
44.	*Sida rhombifolia* (Linn.)	Malvaceae	U-han Queensland hemp/ Indian hemp.	Leaves	Urinary disorder, rheumatism	NM
45.	*Stevia rebaudiana* (Bertoni.)	Asteraceae	Stevia Sweet leaf/ Sugar leaf	Leaves	Diabetes control	NM
46.	*Scutellaria discolor* (Wallich. ex Benth.)	Lamiaceae	Yenakhat Skull cap	Leaves	Menstrual pain	M

| 47.	*Smilax ovalifolia* (Roxb.)	Liliaceae	Kwa-mana-manbi Kumarika	Aerial part	Skin diseases	NM
48.	*Swertia chirata* (Wall.) C.B. Clarke	Gentianaceae	Chiraita Chirayita	Stem	Tonic, stomachic & laxative	NM
49.	*Tinospora cordifolia* (Thunb.) Miers.	Menispernaceae	Ninthou-khong-lee Guduchi	Leaves	Diarrhoea& muscular sprain	NM
50.	*Zanthoxylum acanthopodium* (D.C.)	Rutaceae	Mukthrubi Andaliman/ Toothache Tree	Young leaf & fruit	Fever , cough, bronchitis	M
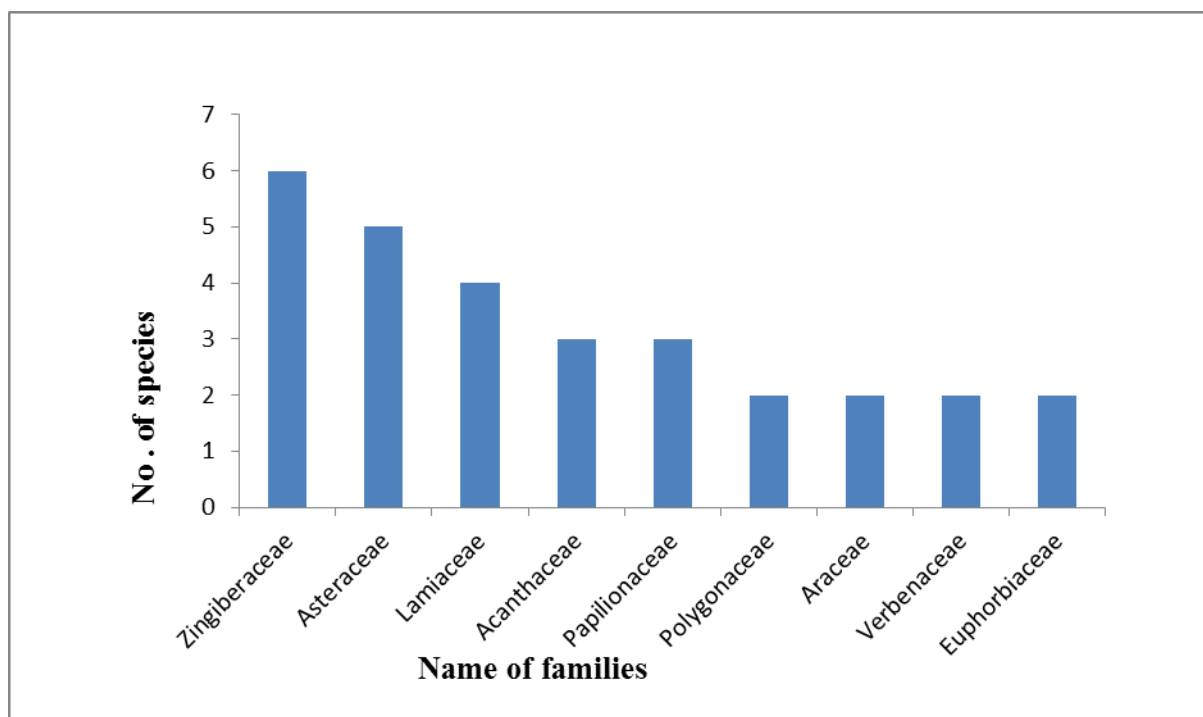
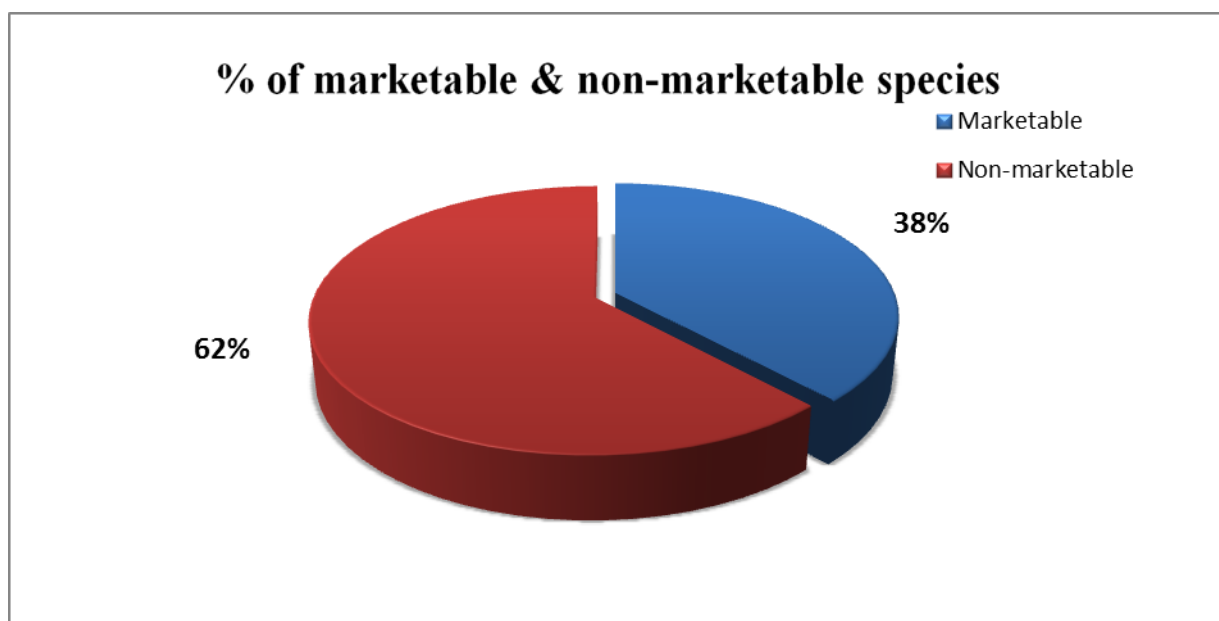**Fig.1: Family distribution of medicinal plant species**

Fig.2: Graphical presentation of marketable and non-marketable of medicinal plant species.

III. RESULTS AND DISCUSSION

The investigations revealed that total of 50 species of medicinal plants belonging to 30 families were collected from Imphal-East district of Manipur. Data obtained from the present investigation were compiled in table 1. And the plant species are arranged in alphabetical order. The maximum number of species falls in the zingeberaceae family followed by Asteraceae, Laminaceae, Araceae, Verbenaceae, Euphorbiaceae etc. The used of these plants to treat various illness is still needed by the communities because of poor socio-economic conditions, the highest and difficult to access the allopathic medicines. The destructive harvest is of grave consequences from both ecological as well as survival point of view of the species Dawit & Ahadu, 1993. The present study suggests for an urgent need to explore ethnobotanical potential of the area, extensively, covering additional villages, to identify the more plants of pharmaceutical value and the plants for their uses. The efforts are also required to strengthen community based conservation initiatives. These ethnobotanical data may provide a base to start the search for new compounds for the phytochemist, pharmacologist and pharmacognosysts. Moreover, it may be mentioned that over exploitation of these species in the name of medicine may lead some species ultimately to the disappearance in future. Thus, proper documentation of this indigenous traditional medicinal knowledge is needed for future generations.

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Parametric Optimization of Shielded Metal Arc Welding Processes by Using Factorial Design Approach

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Abstract- The Shielded Metal Arc Welding (SMAW) process is an arc welding process which produces coalescence of metal by heating them with an arc between a covered metal electrode and the work. Shielding is obtained from decomposition of the electrode covering. Pressure is not used. Filler metal is obtained from the electrode. The prediction of the optimal weld deposit area is an important aspect in shielded metal arc welding (SMAW) process as it is related to the strength of the weld. The goal of this research work is to optimize various parameters for Shielded Metal Arc Welding process, including welding voltage, welding current and welding speed by developing a mathematical model for sound weld deposit area of a mild steel specimen. Factorial design approach has been applied for finding the relationship between the various process parameters and weld deposit area. The study revealed that the weld deposit area varies directly with welding voltage and welding current and inverse relationship is found between welding speeds with weld deposit area.

Index Terms- Arc Welding; shielding gases; Shielded Metal Arc Welding; Factorial Design Approach; Weld Deposit Area.

I. INTRODUCTION

Welding is a process of joining different materials. It is more economical and is a much faster process compared to both casting and riveting [1]. The weld deposition area is the maximum area of the weld metal deposited. It influences the flux consumption rate and chemistry of the weld metal and hence determines the mechanical properties of the weld [2]. SMAW input process parameters like welding current, welding speed; open circuit voltage and external magnetic field are highly influencing the quality of weld joints. [3]. A precise means of selection of the process variables and control of weld bead shape has become essential because mechanical strength of weld is influenced not only by the composition of the metal, but also by the weld bead shape. The weld bead width is an important factor of the shape of the weld. The weld quality can be achieved by meeting quality requirements such as bead geometry which is highly influenced by various process parameters involved in the process. Inadequate weld bead dimensions will contribute to failure of the welded structure [4]. Among all the welding processes, SMAW is very important. The advantages of this method are that it is the simplest of the all arc welding processes. The equipment is often small in size and can be easily shifted from one place to the other. Cost of the equipment is very less. This process finds a number of applications because of the availability of a wide variety of electrodes which makes it

possible to weld a number of metals and their alloys. The welding of the joints may be carried out in any position with highest weld quality and therefore the joints which are difficult to be welded because of their position by automatic welding machines can be easily welded by shielded metal arc welding. Both alternating and direct current power sources could be used effectively. Power sources for this type of welding could be plugged into domestic single phase electric supply, which makes it popular with fabrications of smaller sizes [5]. However, non equilibrium heating and cooling of the weld pool can produce micro-structural changes which may greatly affect mechanical properties of weld metal. To get the desired weld quality in SMAW process, it is essential to know interrelationships between process parameters and bead geometry as a welding quality. Many efforts have been done to develop the analytical and numerical models to study these relationships, but it was not an easy task because there were some unknown, nonlinear process parameters. For this reason, it is good for solving this problem by the experimental models. These results showed that arc current has the greatest influence on bead geometry, and that mathematical models derived from experimental results can be used to predict bead width accurately. Nearly 90% of welding in world is carried out by one or the other arc welding process; therefore it is imperative to discuss the effects of welding parameters on the weldability of the materials during the arc welding. Mild steel was selected for work-pieces to be welded because it is the most common form of steel as its price is relatively low while it provides material properties which are acceptable for many applications.

II. FACTORIAL DESIGN APPROACH AND TERMINOLOGY

Factorial design approach permits to evaluate the combined effect of two or more experimental variables when evaluated simultaneously. Result obtained from factorial design approach is more accurate than those obtained from a series of single factor design approach, in the sense that factorial design method permits the evaluation of interaction effects. An interaction effect is an effect attributable to the combination of all considered variables which can be predicted from the variables considered separately.

For the need of factorial design, the information gathered experimentally could be used to make decisions, which have a broad range of applicability. In addition to information about how the experimental variables operate in relative isolation, it can be predicted, what will happen when two or more variables are used in combination.

In this approach factors may be classified as treatment and classification factors.
• Classification factors group the experimental units into classes which are homogeneous with respect to what is being classified.
• Treatment factors define experimental conditions applied to an experimental unit.

The administration of the treatment factors is under the direct control of the examiner, where as classification factors are not, in sense.

The effects of the treatment factors are of primary interest to the examiner, where as classification methods are included in an experiment to reduce experimental error and clarify interpretation of the effects of the treatment factors.

The design of factorial experiments is concerned with answering the following questions:
• What factors should be included?
• How many levels of each factor should be included?
• How should the levels of the factors be spaced?
• How many experimental units should be selected for each treatment conditions?
• Can the effects of primary interests be estimated adequately from the experimental data that will be obtained?

A factor is a series of related treatments or related classifications. The related treatments making a factor constitute the levels of that factor. The number of levels within a factor is determined largely by the thoroughness with which an experimental desires to investigate the factor.

The dimensions of a factorial experiment are indicated by the number of levels of each factor. For the case of p*q factorial experiment, PQ different treatment combinations are possible. As number of factors increase, or as the number of levels within a factor increases, the number of treatment combinations in a factorial experiment increases quite rapidly. In an experiment, the elements observed under each of the treatment combinations will generally be a random sample from some specified population. This population may contain potentially infinite number of elements. If n elements are to be observed under each of treatment combination in p*q factorial experiment, a random sample of npq elements from population is required. The npq elements are then subdivide at random to the treatment combinations. The P potential levels may be grouped in to P levels (p<q) by either combining adjoining levels or deliberately selecting what are considered to be representative levels. When p = P then the factor is called the fixed factor. When the selection of the p levels from the potential P levels is determined by some systematic, non-random procedure, then also the factor is considered a fixed factor. In this later case, the selection procedure, reduce the potential P levels to p effective levels .Under this type of selection procedure, the effective, potential number of levels of factor in the population may be designated as P effective and P effective = p. In contrast to this systematic selection procedure, if the p levels of factor A included in the experiment represents a random sample from the potential p levels, then the factor is considered to be random factor. In most practical situations in which random factors are encountered, p is quite small to relative to P, and the ratio p/P is quite close to zero. The ratio of the number of levels of a factor in an experiment to the potential number of levels in the population is called the sampling fraction for a factor. In term of this sampling fraction, the definition of fixed and random factors may be summarized as mentioned in Table 1.

Table1. Relationship between Sampling Fraction and Fixed Random Factors

Sampling fraction	Factor
p/P or p/P effective =1	A is a fixed factor
p/P = 0	A is a random factor

Cases in which the sampling fraction assumes a value between 0 and 1 do occur in practice. However, cases in which sampling fraction is either 1 or very close to 0 encountered more frequently. Main effects are defined in terms of parameters. Direct estimates of these parameters will be obtainable for corresponding statistics. The main effect for the level is the difference between the mean of all potential observations on the dependent variable at the level and grand mean of all potential observations. The interaction between different levels is a measure of the extent to which the criterion mean for treatment combination cannot be predicted from the sum of the corresponding main effects. From many points of views, the interaction is a measure of the non-addivity of the main effects. To some extent the existence or non-existence of interaction depends upon the scale of measurement. For example, the interaction may not be present in terms of a logarithmic scale of measurement, whereas in terms of some other scale of measurement an interaction may be present. If alternative choices are present, then that scales which leads to the simplest additive model will generally provide the most complete and adequate summary of the experimental data.

III. METHODOLOGY

For this research work, after conducting the related literature survey we found that the among the most important parameters were welding voltage, welding current ,and welding speed. So these three variables were used as treatment variables for the model.

3.1 Treatment Variables:

• Welding Voltage (V)
• Welding Current (I)
• welding Speed (S)

For conducting trial runs values or levels of these variables were chosen randomly from an infinite potential level i.e. the sampling fraction for these trials runs was equal to zero, however, we got a rough range of these factors from the literature we surveyed. With the help of these trials runs effective, representative's levels were developed for each factor (variables). The numbers of levels to be included in the

experiment were chosen for each factor as per the design. These numbers of levels were two for each so as per the definition it is a 2^n (=2*2*2) factorial experiment. Where n is number of factors. If full factorial approach had been practiced, the number treatment combination would have been 8. The levels for each factor were the highest value and the lowest value of the factors in between and at which the outcome was acceptable. These values were outcomes of trials runs. Highest value has been represented by '+' and the lowest value has been represented by '-' as mentioned in Table 2. As per the design matrix the final runs were conducted and the response i.e. the weld deposit area was measured and noted down against each combination. Then the values of different coefficients were calculated as per the modeling. These values of coefficients represent the significance of corresponding factors (variable) on the response.

3.2 Design Matrix:

Table2. Model showing the treatment variables

S. No.	Voltage (V) X_1	Current (I) X_2	Speed (S) X_3
1.	+	+	+
2.	-	+	+
3.	+	-	+
4.	-	-	+
5.	+	+	-
6.	-	+	-
7.	+	-	-
8.	-	-	-

IV. . MATHEMATICAL MODEL DEVELOPED

Assuming the values of responses as y_1, y_2, y_3, y_4, y_5, y_6, y_7, y_8 against the treatment combinations 1, 2, 3, 4, 5, 6, 7, 8 respectively (as per the S. No. in the matrix design) Y as the optimized value of response (i.e. left hand side in the equation used for the showing the relation among the factors and the response). Relation between main effects interactions effects and the response has been shown in the following equation:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_{12}(X_1X_2) + b_{13}(X_1X_3) + b_{23}(X_2X_3)$$

Here Y is the optimized weld deposit area, y_i (i = 1 to 8) is the response of the ith treatment combination, b_0 is the mean of all the responses, b_j (j =1 to 3) is the coefficient of jth main factor (j = 1 for voltage, 2 for current, 3 for speed), and b_{jk} (j, k=1 to 3) is the coefficient for interaction factor. Values of all these coefficients were calculated as followings:

$$b_0 = \Sigma y_i / 8 = [(y_1+y_2+y_3+y_4+y_5+y_6+y_7+y_8)]/8$$

$b_1 = [(y_1-y_2+y_3-y_4+y_5-y_6+y_7-y_8)]/8 = [(y_1+y_3+y_5+y_7)-(y_2+y_4+y_6+y_8)]/8$

$b_2 = [(y_1+y_2-y_3-y_4+y_5+y_6-y_7-y_8)]/8 = [(y_1+y_2+y_5+y_6) - (y_3+y_4+y_7+y_8)]/8$

$b_3 = [(y_1+y_2+y_3+y_4-y_5-y_6-y_7-y_8)]/8 = [(y_1+y_2+y_3+y_4) - (y_5+y_6+y_7+y_8)]/8$

$b_{12} = [(y_1-y_2+y_3+y_4+y_5+y_6+y_7+y_8)]/8 = [(y_1+y_4+y_5+y_8) - (y_2+y_3+y_6+y_7)]/8$

$b_{13} = [(y_1-y_2+y_3-y_4-y_5+y_6-y_7+y_8)]/8 = [(y_1+y_3+y_6+y_8) - (y_2+y_4+y_5+y_7)]/8$

$b_{23} = [(y_1+y_2-y_3-y_4-y_5 - y_6+y_7+y8)]/8 = [(y_1+y_2+y_7+y_8) - (y_3+y_4+y_5+y_6)]/8$

V. RESULTS

Using the half factorial approach following are the optimized values of treatment variables obtained as mentioned in Table 3.

Table3. Optimized Shielded Metal Arc Welding Parameters

S. NO.	Voltage (V) in volts X_1	Current (I) in amperes X_2	Speed (S) mm/sec. X_3	Response (WDA) in mm^2 Y_i
1.	24	100	60	23.80
2.	20	100	60	21.74
3.	24	90	60	23.38
4.	20	90	60	21.34
5.	24	100	40	24.36
6.	20	100	40	22.28
7.	24	90	40	23.94
8.	20	90	40	21.86

Now as per the equations mentioned earlier the values of different effects can be calculated as below:

$b_0 = 19.793$
$b_1 = 1.0325$
$b_2 = 0.2075$
$b_3 = - 0.2725$
$b_{12} = 0.0025$
$b_{13} = - 0.0075$
$b_{23} = - 0.0025$

So the actual model could be represented by following equation:

$$Y = 19.793+ 1.0325X_1 + 0.2075X2 + (-0.2725)X_3 + (0.0025)(X1X2) + (- 0.0075) (X1X3) + (- 0.0025)(X2X3)$$

The results of present investigation show the influence of treatment variables (Welding Voltage, Welding Current and Welding Speed) on welding deposition area (WDA) as shown in Fig. 1.
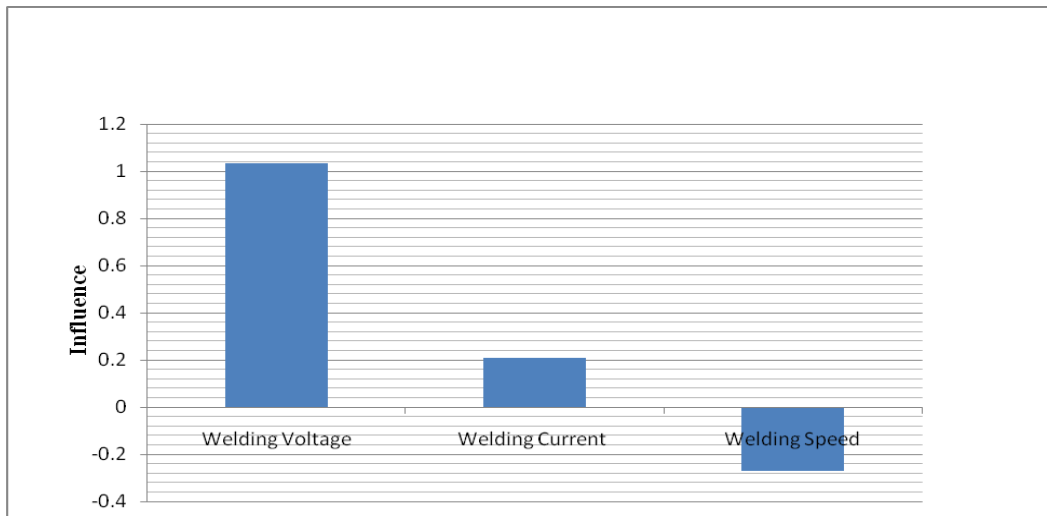
Fig. 1 Influence of Process Parameters on welding deposition area

VI. CONCLUSIONS

Based on the experimental work and the Factorial design approach the following conclusions are drawn:

(1) A strong joint of mild steel is found to be produced in this work by using the SMAW technique.

(2) Results indicate that processes variables influence the weld deposition area to a significant extent.

(3) If amperage is increased, welding deposition area generally increases.

(4) If voltage of the arc is increased, welding deposition area generally increases.

(5) Welding voltage was found to be most influencing variable to WDA.

(6) If travel speed is increased welding deposition area generally decreases.

(7) The two level fractional half area fractional designs is found to be very effective tool for quantifying to main and interaction effects of variable on weld bead area.

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Global Hypoxia, Global Warming, Global Recession consequent to rising Environmental Estrogen equating with aborted blood, contraceptive menstrual blood pollution depleting Ozone.

Proof of Concept Study-Observational analysis

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Abstract- New age practice of contraception, [20th, 21st centuries] abortion, witnessed new age global environmental threats namely Global hypoxia, global warming, global recession, disappearance of birds, fish, islands, tsunamis, tornadoes, cyclones, earth quakes. 'Estrogen like particles are in the rise in the air, waters, identified as pollutant`, was published in 1998, 1994 respectively; global abortion summary informed of 863,000,000 surgical reported abortions, from 1923 to 2010; environmental pollution with estrogen has to come from spilt blood. Estrogen level was measured in seven river water, sea water samples. Estimation of fetal hemoglobin in sea water was attempted using routine hemoglobin electrophoresis. Estimation of alpha feto protein, β human chorionic gonadotropins in river, sea water was planned. Estrogen was detected in river water- 3-5pg/ml and sea water - 0.3-1pg/ml. Fetal hemoglobin could not be detected as visible bands, by routine hemoglobin electrophoresis, capable of detecting values in grams. Alpha feto protein was detected in sea, river water as <0.6ng/ml, β human chorionic gonado tropin was detected in sea and river water as <0.1miu/ml. The concept is, contraceptive menstrual blood, aborted blood environmental pollution, equates with rising environmental estrogen pollution. Aborted blood, contraceptive menstrual blood with its high affinity for oxygen, depletes oxygen,[unlike emissions of alive people which can be replaced by plants,] to result in global hypoxia, ozone layer depletion, global warming, cyclones, floods, tsunamis, tornadoes, hurricanes, earthquakes resultant disappearance of birds, grapes, sea food, islands. Abortions, contraception, resultant reduced customers, consumers, people, passengers, students, than providers, has resulted in terrible global recession, since investment is for, on, by and from, the people to see returns. God ordained self sustaining ecology and economy are disrupted by global contraception, abortion.

Index Terms- Rising environmental estrogen; reduced endogenous estrogen; global contraception; aborted blood pollution; contraceptive menstrual blood pollution; global hypoxia; global warming; global recession.

I. INTRODUCTION

By 1960s, contraception was being steadily, stealthily, implemented including small family norms, one child policy, family welfare program [presumed to have no side effects without evidence base; implemented without therapeutic indication, based on guillotine protocol] in the globe. **:** In 1994-2002, to elucidate the cause for disappearance of fish, analysis of pollutant of waters [assuming probably industrial waste to be identified]was undertaken, in four major rivers of Australia, United Kingdom, United States of America by Dr. Susan[1] Job ling of Brunel University, United Kingdom, the results showed estrogen like compounds are on the rise in waters; London Times had portrayed this as,` are we drowning in our own estrogen`?!; contraceptive pills containing artificial exogenous estradiol, get excreted in the urine, could the estrogenic compounds rise in waters be explained by this, was speculated.

1998 Professor Paul Devroey had [2] discovered `estrogen like particles are on the rise in the air` as pollutant, when he attempted to analyze the pollutant of the air, to answer the increase in infertility [presuming industrial waste to be identified, rectified]; rising estrogen like particles can produce male infertility, by suppression, was the possibility considered; but the reason for environmental estrogen rise was sought for, with no obvious answers.

2003 Tamil Nadu-India`s text books started to mention estrogen as pollutant; 2004 tsunami occurred in Indian belt.

~2011, Information from the West mentioned, four Heifer`s breast started engorging, the veterinarian found out, by analyzing the waters, of the streams wherein the animals were fed, contained high levels of estrogen; the probable reason being, 1km.ahead sewage was draining, containing menstrual blood, aborted blood; without knowing all these details, the owner of the Heifers, drew water from his wells and fed the animals, and the breasts returned to normalcy in a few months.

2012 in India, some wild elephants which had come down from the virgin forest, to drink water from the streams, close by dams, people`s lodgings, to eat sugarcane, were noticed to have engorged breasts-newspaper reported –probably estrogen increase in water, secondary to tubectomy-puerperal sterilization resultant contraceptive menstrual blood pollution, with its estrogen, in water of the streams; a correlation was sought after, for the mystery of rising environmental estrogen as pollutant and global threats.

II. METHODS

Estrogen levels were assessed in 3 samples of water from one river of Cape Comorian, and four samples of water obtained from 4 different seas namely Indian ocean, Bay of Bengal at cape, Arabian Sea, Bay of Bengal near union territory of Pondicherry.

Hemoglobin electrophoresis was attempted in one sample of sea water to identify presence of fetal hemoglobin.

Alpha feto protein estimation was done in one sample each of river and sea water; β Human chorionic gonadotropins secreted by the placenta was estimated in one sample each of river and sea water.

In 2004 data of 93 hospital patients was collected over a period of 6 months, including diseases prevalent, contraception status, life style, nutrition, type of oil ingested, level of hemoglobin and were assigned to the 3 age groups namely 20-35 years, >35-50 years, >50 years by stratified random sampling with a minimum of 30 patients in each age group; serum estrogen estimation was done for all 93 patients; the data was tabulated matching diseases against status of contraception and other variables; one patient was a foreign national.[1a] Retrospective bioinformatics analysis was done in 2012 for serum endogenous estrogen levels and contraception status.

III. RESULTS

3-5pg/ml of estrogen was detected in river water, and estrogen in sea water measured 1, 0.8pg 0.3pg, 0.4 pg/ml suggesting estrogen pollution was brought by the river (3-5 fold higher), gets diluted in the sea.

Attempts to detect fetal, adult hemoglobin in sea waters, by routine hemoglobin electrophoresis, failed to identify visible bands, since hemoglobin is measured in grams; if nano science can devise an instrument to measure hemoglobin by electrophoresis, in nanograms or pictograms (as we measure estrogen) in sea waters, rivers, probably we can confirm further by detecting the presence of fetal, adult hemoglobin.

Alfa feto protein was detected in river and sea water as <0.6ng/ml; β Human chorionic gonado tropin secreted by the placenta was identified as <0.1miu/ml in river and sea water.

Endogenous serum estrogen was reduced in {supplementary figure} 61 % of contraceptive users [p <0.0005], was in the low normal range in 25% of contraceptive users; retrospective bioinformatics analysis detected 275% increase in degenerative, neoplastic, autoimmune diseases in contraception users; contraception reversal reverts diseases by 79.9% by autologous

germ cells replantation i.e. germ cells fragmentation stops and endogenous estrogen and androgen return.

IV. DISCUSSION

Estrogen is a steroid, female reproductive hormone, cells` lifecycle, genomic repertoire,[3] supporting hormone, synthesized from cholesterol[4,5] by the ovary, placenta, and is secreted into the blood directly, circulates in the blood, enables every cells differentiation[6] controlled proliferation, embryo like healing in tissue injury,–genomic repertoire, prevents, protects from neoplasia, tumors, cancers, enables normal growth, development of tissues, including breast, reproductive tract, pregnancy, fetus; after metabolism, it disappears from blood; hence blood shed only, can bring estrogen to the environment.

Normal estrogen values in the blood are as follows 17 years-100-300pg; 37 years it dips to 15 pg; at 80 years it further decreases to 5 pg, androgen is a precursor of estrogen by 2-3 steps with similar values in males; puberty, menarche can be attained, if this endogenous estrogen   is produced ~100-300pg, from consumed oil, nuts, seeds contained cholesterol, fatty acids; 2 days mid cycle peak only, the value will be 300 pg of estrogen, resulting in ovulation, which is suppressed by exogenous (contraceptive pills) estradiol, achieving contraception.

all forms of contraception[condoms, copper-t, intrauterine devices, puerperal sterilization, abortions, vasectomy..] with resultant smashed destruction of germ cells [7] to acentric fragments, ring chromosomes, chromatid breaks, associated reduced endogenous estrogen to 5-8pg, result in 275% increase in degenerative, neoplastic, autoimmune diseases in both partners, resulting in global, early demise of young parents, people using contraception, as against the healthy geriatrics, who did not know or practice contraception.[2 subsets of population, one with, the other without contraception]

During pregnancy the placenta has to secrete, estrogen of 4200 pg/ml, from the 3rd month, if pregnancy has to continue [from the essential fatty acids containing diet, which the mother has to consume]otherwise fetus will undergo spontaneous abortion –[placental switch over insufficiency]by 3rd -4th month of gestation; hence this 4200 pg /ml of estrogen, secreted by the placenta, circulating in the mother`s blood, increases the life of parents, by minimum 10 years i.e. estrogen prevents osteoporosis, coronary syndrome; kidneys enlarge during pregnancy, estrogen dependent is thyroid function, normal growth is supported, neoplasia is prevented by estrogen surveillance…etc; more number of children- parents are blessed with longer life without diseases or in the absence of contraception their life easily reaches 80 years ,without significant degenerative diseases e.g. Our grand parents .

In 2005 population research institute quoted 498 surgical, reported abortions per minute; world meters [8] quote 125000 abortions /day; another Bible organization from United States of America quote 6278 abortions/ hour;   Global abortion clock summary quoted, from 1922-2010, 863,000,000 surgical reported abortions; [9] world health organization quoted 37,500,000 surgical reported abortions per year; contraception are also abortions at cell levels –uni /semi cellular abortion [condoms, vasectomy, tubectomy], bi cellular abortion[copper-t, intrauterine

devices,] multi cellular abortion [medical termination of pregnancy]

The concept is Estrogen hormone is secreted into the blood directly, circulates in the blood, bathes, nurtures every cell, influences cell metabolism, cell cycle; unless blood is spilt, estrogen cannot enter the environment.

If an individual`s [whose age is >37 years`], blood is spilt by accident, 150 ml. of blood×15pg of estrogen=2250pg will be the estrogen pollutant to the atmosphere; if a teen ager `s blood is spilt by accident then 150ml.of blood ×300pg of estrogen=45000pg will be the estrogen pollutant to the atmosphere.

498 reported surgical abortions/minute×60 minutes×24hours×365days×60-90years×4200pg of estrogen×350ml of minimal blood loss /abortion=rising environmental estrogen in air, water[9a].
Or

1922-2010: 863000000 reported surgical abortions ×4200pg of estrogen/ml. of blood×350ml.of minimum blood loss per abortion=rising environmental estrogen of air, water.

When a woman is blessed with for eg.10 children, she will not menstruate for 200 months or 20 years minimum; with acquired contraception every woman of reproductive age group is achieved to menstruate for 200 months or 20 years more; so 1,989,375,754 women of 15-45 years of age×200 months of menstruation×300pg of estrogen×350 ml blood loss during menstruation=environmental increase in estrogen of air and water.

The concept is rising environmental estrogen as pollutant=innocent aborted blood, contraceptive menstrual blood polluted environment=global innocent aborted blood, contraceptive menstrual blood polluted air inhalation and menstrual, aborted blood polluted water ingestion.

Presence of detected alpha feto protein, β Human Chorionic gonadotropins in sea, river water further confirms aborted blood environmental pollution.

Attempt to identify fetal hemoglobin in sea waters by hemoglobin electrophoresis, could not detect visible bands, because the instrument can measure hemoglobin in grams, whereas estrogen can be detected in pictograms in sea, river waters; if nano science can detect fetal, adult hemoglobin in nanograms in waters, air, this concept can still be confirmed.

innocent aborted blood, contraceptive menstrual blood pollution of the air has resulted in a)obnoxious stimuli to the respiratory tree resulting in alarming increase in chronic obstructive pulmonary disease, emphysematous destruction, exponentially increasing lung cancer;

b)innocent aborted blood, contraceptive menstrual blood polluted air has formed a good media for robust growth of microbes 1)emergence of new viruses including human immunodeficiency viruses, hepatitis A,B,C,D,E viruses, H1N1,Subacute respiratory distress syndrome viruses,2)increased prevalence, spread of existing chikungunya, dengue viruses,3)drug resistance, microbial virulence, emergence of new strains making vaccines ineffective whereas before the era of contraception, vaccines imparted life time immunity, 4)slow growing mycobacterium tuberculosis, has developed multidrug resistance, before it was curable[modern times have achieved, flourishing microbial growth, rather than bringing up our darling babes]

c) mosquitoes' food[10a] being human blood, now freely available in the environment as innocent aborted blood, contraceptive menstrual blood, has resulted in growth of mosquitoes in spite of luxurious, posh hygiene; increase in vector borne diseases namely Filariasis, tropical pulmonary eosinophilia with asthma, dengue, chikungunya, malaria .

d)innocent aborted blood, contraceptive menstrual blood with its hemoglobin, high affinity for oxygen binds, depletes oxygen of the environment [global hypoxia] which cannot be replaced by plants, unlike emissions of all forms, of the live humans; for whom, self sustaining ecobalanced cycle exists to maintain life, replenish oxygen, as ordained by the Creator, in nature, physiology, ecology. 2012 December, Whales had come up to the surface of waters, through the breaks in the ice, to breathe better oxygen content.

Live people using fossil fuels, result in emissions, releasing carbon dioxide [co+o2=co2]-taken by plants for photosynthesis, leaves releasing oxygen, replenishes oxygen of the air, water; [never would there have been global hypoxia, but for contraception]

The concept is innocent aborted blood, contraceptive menstrual blood-[hemoglobin binds oxygen]-depleting oxygen becomes progressive, cumulative resulting in global hypoxia [no amount of forestation can help replenish this depleted oxygen, because no molecule of carbon dioxide is available to enable replacement, plants themselves will die, disappear by this hypoxic, obnoxious environment of aborted, menstrual blood; existing ecobalanced cycle is meant to support life, when life is destroyed, annihilated , gets disrupted]; ozone layer[10] (condensed oxygen) gets depleted, radiation increases, global warming results, hot air currents are set up leading to inevitable cyclones, floods, earthquakes, tsunamis, tornadoes, hurricanes **figure-1**;
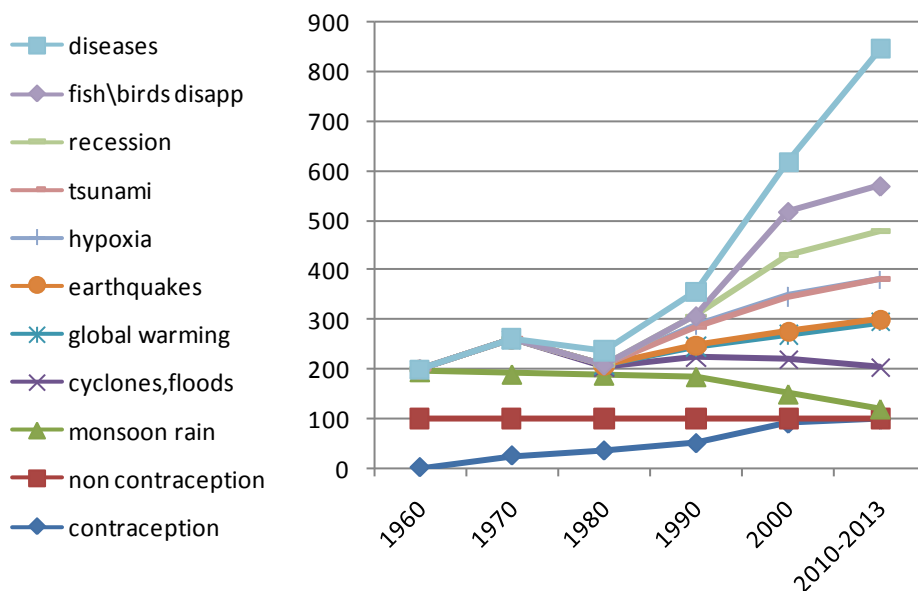
no more monsoon rains –[ecobalanced cycle`s disruption]arctic stretch of ice melting, Himalayan peaks are visible with ice melting, sea level has gone up 5-7 fold, resulting in tsunamis, associated with earth quakes, occurring more frequently, due to earth plates getting heated up, secondary to global warming, increasing unchecked, rather promoted by contraception, abortions; when earthquake occurs, with ~5-7 fold risen sea level[due to stretch of ice melting with global warming]tsunami results, [waves set by earth quake, hit against land mass, due to heightened sea level, waves of increased height-e.g.~7fold higher is tsunami]; earth splits during the quake sea enters with heightened force; earth plates are getting heated by global warming ; >5 fold warming, quakes richter scale also is higher, powerful to split the coastal land mass.

Photochemical mechanisms that give rise to ozone were discovered by the British physicist-Sydney Chapman in 1930;ozone is formed [11] when ultraviolet rays hit oxygen molecules containing 2 oxygen atoms, splitting them into 2 individual oxygen atoms(atomic oxygen),the atomic oxygen combines with unbroken oxygen to form O3-ozone; ozone molecule is unstable[although in the stratosphere long lived]; when ultraviolet rays hit ozone, it splits into oxygen molecule and atomic oxygen, a continuing process called the ozone-oxygen cycle; so basically its condensed oxygen, God ordained oxygen envelope, that exists to protect life on earth; short or vacuum ultraviolet rays (10nm-100nm) are screened out by nitrogen; ultraviolet radiation capable of penetrating nitrogen is divided into 3 categories, based on its wavelength; they are referred to as ultraviolet A(400-315nm), ultraviolet B(315-280nm), ultraviolet C(280-100nm); ultraviolet C rays-very harmful to living is screened by ozone and oxygen around 35km altitude; Ozone layer is higher in altitude in the tropics and lower in altitude outside the tropics specially in the polar regions [probably gases rise with heat in tropics];[11a] during winter ozone increases in depth[the snow reflects ultraviolet ray, so ozone-oxygen cycle is probably seen at lower altitude increased depth]; thickness of ozone is thinner near tropics, thicker near the

poles [oxygen is split more and more, over tropics, gases expand with heat, rise up towards north pole, and condense]; thinner during autumn,[leaves would have dropped with decreased oxygen production]thicker during spring[leaves spring back restoring oxygen production].

2004 December 26th tsunami did cost many lives in India; similar time Rita, Katrina-recurrent cyclones, occurred in United States of America.

Ozone may be depleted by Nitric oxide, nitrous oxide, chlorine, bromine atoms,- all postulated [12] by complex chemistry laboratory models, and their validation against observational data; oxygen envelope is existing to support life with its emissions[02-0-03-02], self sustaining ecology for, by, of life; we are trying to comprehend the facts that could lead to the ozone hole formation , which did not exist prior; the concept is most of these so called ozone depleting substances are present in the nature with a God ordained purpose for e.g. nitrogen shuts off 0-100nm ultraviolet rays, nitrogen dioxide helps in ozone formation, chlorine, bromine, fluoro carbons, nitrous all are reacted, oxidized , with thunder storms, showers of rain, to become manure for plants, plants supply oxygen in exchange for the emissions, exhaled air of live humans, living; ozone is not formed over tropics , rather oxygen envelope, undergoes splitting by higher intensity ultraviolet rays of tropics, than polar regions, gases ascend up towards north pole, [top of the atmosphere the intensity is 350 times more than the earth`s surface for ultraviolet rays]have less splitting over poles, gases condense with less heat so ozone,[11a] oxygen is thicker over polar regions and thinner over tropics.

2011 March, portions of Japan disappeared, under the oceans, secondary to the earthquake coupled with tsunami; a land known for earth tremors for ages, but never disappeared, but with global warming, secondary to global contraceptive blood, innocent aborted blood pollution (destruction of human race, in disguise, permitted, promoted by life sciences), tsunami coupled with earthquake, land masses of the rising sun, disappeared.

2011 March latter half, witnessed, millions of fish, dead, coming ashore along the coasts of LosAngeles-California belt and the newspapers read, it was not due to oil leak or nuclear leak but unknown hypoxia; the concept is globally implemented, practiced abortions, contraception, with its blood pollution of the waters, depleting oxygen of the waters –hypoxia, fish were washed ashore dead.

e) Due to global hypoxia, global warming birds have disappeared, grapes are disappearing, air crew members develop 24% cancer. Many varieties of birds have disappeared, secondary to global hypoxia, warming, with resultant irreparable repair in nucleic acids, proteins; grapes –slender plants with fruits which ripen at higher level above ground, due to global warming have disappeared; Aircrew members face a risk of 24%increased cancer due to global warming, since they are close to the sun, by 25000 km height, irreparable repair of the Deoxy ribo nucleic acids-DNA.

f) By the combined global hypoxia, resultant global warming, risen sea levels, earth quakes coupled with tsunamis, its predicted most of the islands will be under the oceans by 2050;

It's predicted 98% of sea food will disappear by 2048, by hypoxia of waters; most of the islands will disappear by 2050, due to hypoxia of the air [same time, same etiology]; all secondary to the innocent aborted blood, contraceptive menstrual blood, evidenced by rising environmental estrogen, depleting oxygen of the environment.

h)People`s needs for daily living, shelter, comfort, transport, education etc are the means for business ; if all the millions of, innumerable, darling babes, unborn children, who had gone down the drain as abortions, contraception, had been born, there`ll be no recession today, it`ll be flourishing business of all sectors, because the need will match or undermine the supply leading to signs of innovations, growth, flourishing economy; November 7th 1997 United Nation`s experts opined that 5 countries namely Thailand, Bahamas, Italy, Mongolia, had negative birth rate, whereas India had replacement rate i.e. 0.5% difference from Italy; experts had warned India, China, not to reduce the population, if reduced there`ll be no personnel for army, there`ll be economic crisis, as example Italy.

Today we are observing, luxurious transports without passengers, big bazaars without customers –closing shops; hospitals with modern technology but few patients; schools, colleges with less students, banks with few customers; growth, production as initiated ,by population with needs, in 20th century(1950s), when achieved gloriously, did not see the customers by mid 20th, 21st century, who were robbed off, guillotined by abortions, contraception, resulting in agonizing recession, including cost per head escalation; population is the potential in which we invest to see returns, hence the global recession, secondary to abortion, contraception;

i)Texas `state space, is enough to accommodate the people on this earth, receding population, global annihilation secondary to contraception;

Emergency efforts directed towards halt of contraception, abortion, which belittle womanhood to use and throw napkin policy (pornography, adultery, fornication, family welfare scheme, one child policy, small family norms)with reversal of existing permanent or temporary methods of contraception,

(educating, legalizing, promoting, implementing, basic family life with uncurbed, blessed child birth after holy matrimony) will achieve prevention of further worsening of global hypoxia, global warming, global recession, prevent islands, fish, birds, grapes from disappearing, reduce cyclones, floods, earthquakes, tsunamis, tornadoes, hurricanes.

V. CONCLUSION

Increasing estrogen like particles-environmental estrogen, were discovered as pollutant in the air, waters by 1998, 1994, respectively;

Reports of 2005, regarding 498 abortions per minute, enabled, the missing link, in the puzzle of rising environmental estrogen to be identified; innumerable abortions, universally practiced contraception, with its innocent aborted blood, contraceptive menstrual blood pollution, resulted in environmental estrogen increase, which is the evidence, for innocent aborted blood, contraceptive menstrual blood polluted hypoxic air-inhalation, hypoxic water ingestion globally. Presence of detected alpha feto protein, β Human Chorionic gonadotropins in sea, river water further confirms aborted blood contraceptive menstrual blood environmental pollution.

Innocent aborted blood, contraceptive menstrual blood polluted air, water as evidenced by rise in environmental estrogen, detected alpha feto protein, β human chorionic gonado tropin in sea, river water has favored 1) the emergence of new microbes,

2) Microbial virulence with drug resistance

3) increased mosquito, vector borne diseases

4) Virulent strains emergence, making vaccines ineffective, failure of antimicrobials,

5) Inhalation of this aborted, contraceptive menstrual blood with its obnoxious stimuli, has resulted in increased incidence of chronic obstructive air ways diseases, exponentially increasing lung cancers

6)innocent aborted blood, contraceptive menstrual blood, depleting environmental oxygen global hypoxia, global warming, with ozone layer depletion, inevitable cyclones, floods, tsunamis, earthquakes, hurricanes; birds, grapes islands disappearing, its predicted most of the islands will be under the sea by 2050; increasing skin lesions, neoplasm, solar keratoses; air crew members `cancer risk has increased by 24%;

Growing human resources, with their emissions, are mandatory for stable, self sustaining, God ordained, existing ecobalanced cycle of oxygen envelope- ozone and economy; existing atmospheric oxygen split by ultraviolet rays to form atomic oxygen, ozone, oxygen molecule[02-0-03-02]; again ozone also splits under radiation to form oxygen molecule; hence its thinner over tropics, whereas intensity of radiation is less towards polar region, gases ascend up towards the north pole; the ozone envelop is thicker and deeper since the white snow reflects the ultraviolet rays from the surface; its thinner during autumn, fall due to absence of leaves to produce oxygen; with spring, plants sprout back, oxygen, ozone envelop grows thicker; as the oxygen is depleted by contraception, abortion in inhabited areas over tropics and temperate climates, condensed gases of the poles,[which are denser in poles due to decreased heat, gases rise towards north pole;] move away from polar regions towards

oxygen depleted areas, producing holes in the ozone in Antarctica; regions towards Antarctica are vigorously practicing contraception, abortion, than the countries of north pole , e.g.- Sweden, Ireland; as oxygen over inhabited tropics ,temperate zones is depleted by contraception, abortions, gases will move from poles, towards the tropics, temperate zones; more depletion in the Antarctica, than north pole because, due to ascension of gases towards north pole[heights] condensation, density is more in the Arctic zone, predicting a slower depletion in the Arctic's than Antarctica;

7) Innocent aborted blood, contraceptive menstrual blood, depleting oxygen of the waters leads to disappearance of fish, its predicted 98% sea food, would be disappearing by 2048; increase in water borne infections.

8) Global innocent aborted blood, contraceptive menstrual blood, as evidenced by rise in environmental estrogen, with receding population, is associated with severe global economic crisis, recession.

Global emergency halt of contraception, abortions including pornography, adultery, fornication, premarital, extramarital sex, family welfare schemes, one child policy, small family norms with urgent contraception reversal, educating, promoting family life with uncurbed blessed child birth, will prevent further progression of global hypoxia, warming, recession, disappearance of islands, fish, birds, reduce inevitable cyclones, floods, tsunamis, earthquakes, reduce lung, skin cancers, chronic obstructive pulmonary diseases, early demise of young parents.

VI.   KEY POINTS

- Rising environmental estrogen, detected alpha feto protein, human chorionic gonado tropin in sea, river water refers to innocent aborted blood, contraceptive menstrual blood pollution of the air, water-environment

- Contraceptive menstrual blood, innocent aborted blood pollution of air, water results in depletion of oxygen, global hypoxia, global warming, cyclones, floods, tornadoes, hurricanes, earthquakes, tsunamis, disappearance of birds, islands, fish, increase in lung, skin cancers, chronic airway diseases, microbial virulence, drug resistance, mosquito, vector borne diseases

- Contraception reversal, halt of contraception, abortion, will arrest the progression of global hypoxia, recession, warming, and annihilation.

- Contraception, abortion has resulted in devastating global recession by annihilating customers, consumers, passengers, students, people, human race.

- Global annihilation is the achievement by contraception, abortion still being implemented , enthusiastically by all, unchecked

- Live humans with emissions are mandatory for self sustaining ecology maintaining stable ozone.

- Live humans are made extinct with environmental aborted blood, contraceptive menstrual blood depleting oxygen envelope resulting in progressive, cumulative ozone depletion.

Conflicts of Interests: None Declared

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On rational Diophantine Triples and Quadruples

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Abstract- This paper concerns with the study of constructing strong rational Diophantine triples and quadruples with suitable property.

Index Terms- Strong rational Diophantine triples and quadruples, Pythagorean equation
2010 MSC Number: 11D09, 11D99

I. INTRODUCTION

Let q be a non-zero rational number. A set $\{a_1, a_2, \ldots a_m\}$ of non-zero rational is called a rational $D(q)$ - mtuple, if $a_i a_j + q$ is a square of a rational number for all $1 \le i \le j \le m$. The mathematician Diophantus of Alexandria considered a variety of problems on indeterminant equations with rational or integers solutions. In particular, one of the problems was to find the sets of distinct positive rational numbers such that the product of any two numbers is one less than a rational square [20] and Diophantus found four positive rationals $\frac{1}{16}, \frac{33}{16}, \frac{17}{4}, \frac{105}{16}$ [4,5]. The first set of four positive integers with the same property, the set $\{1, 3, 8, 120\}$ was found by Fermat. It was proved in 1969 by Baker and Davenport [3] that a fifth positive integer cannot be added to this set and one may refer [6, 7,11] for generalization. However, Euler discovered that a fifth rational number can be added to give the following rational Diophantine quintuple $\left\{1, 3, 8, 120, \frac{777480}{8288641}\right\}$. Rational sextuples with two equal elements have been given in [2]. In this 1999, Gibs [13] found several examples of rational Diophantine sextuples, eg., $\left\{\frac{11}{192}, \frac{35}{192}, \frac{155}{27}, \frac{512}{27}, \frac{1235}{48}, \frac{180873}{16}\right\}$, $\left\{\frac{17}{448}, \frac{265}{448}, \frac{2145}{448}, 252, \frac{23460}{7}, \frac{2352}{7921}\right\}$.

All known Diophantine quadruples are regular and it has been conjectured that there are no irregular Diophantine quadruples [1,13] (this is known to be true for polynomials with integer co-efficients [8]). If so then there are no Diophantine quintuples.

However there are infinitely many irregular rational Diophantine quadruples. The smallest is $\frac{1}{4}, 5, \frac{33}{4}, \frac{105}{4}$. Many of these irregular quadruples are examples of another common type for which two of the subtriples are regular i.e., $\{a, b, c, d\}$ is an irregular rational Diophantine quadruple, while $\{a, b, c\}$ and $\{a, b, d\}$ are regular Diophantine triples. These are known as semi – regular rational Diophantine quadruples. These are only finitely many of these for any given common denominator l and they can readily found.

Moreover in [12], it has been proved that $D(mk^2)$ - triple $\{k^2, k^2 \pm 1, 4k^2 \pm 1\}$ cannot be extended to a $D(mk^2)$ - quintuple. In [10], it has been proved that $D(-k^2)$ - triple $\{1, k^2 + 1, k^2 + 4\}$ cannot be extended to a $D(-k^2)$ - quadruple if $k \ge 5$. Also, one may refer [14 -20].

These result motivated us to search for strong rational Diophantine triples and quadruples with suitable property.

II. METHOD OF ANALYSIS

Section A

In this section we generate a sequence of strong rational Diophantine triples such that (A,B,C), (B,C,D), (C,D,E),…… with the property $D\left((2n+1)^2 k^2\right)$

Case 1:

Consider $A = \dfrac{a}{b}$ and $B = \dfrac{-(4n+1)k^2 b}{a}$

Note that $AB+(2n+1)^2 k^2$ is a perfect square

Let C be any non-zero rational integer such that

$$AC+(2n+1)^2 k^2 = \alpha^2 \tag{1}$$

$$BC+(2n+1)^2 k^2 = \beta^2 \tag{2}$$

From (1), we have

$$C = \frac{\alpha^2 - (2n+1)^2 k^2}{A} \tag{3}$$

Consider the linear transformations

$$\alpha = X + \frac{a}{b}T \tag{4}$$

$$\beta = X + \frac{-(4n+1)k^2 b}{a} \tag{5}$$

On substituting (3) in (2) and by using (4) and (5), we get

$$C = \frac{(2nkb+a)^2 - (2n+1)^2 k^2 b^2}{ab}$$

Case 2:

Let $B = \dfrac{-(4n+1)k^2 b}{a}$ and $C = \dfrac{(2nkb+a)^2 - (2n+1)^2 k^2 b^2}{ab}$

Let D be any nonzero rational integer such that

$$BD+(2n+1)^2 k^2 = \alpha^2 \tag{6}$$

$$CD+(2n+1)^2 k^2 = \beta^2 \tag{7}$$

From (6), we have

$$D = \frac{\alpha^2 - (2n+1)^2 k^2}{B} \tag{8}$$

Using the linear transformations

$$\alpha = X + \frac{(-(4n+1)k^2 b)}{a}T \tag{9}$$

$$\beta = X + \frac{(2nkb+a)^2 - (2n+1)^2 k^2 b^2}{ab}T \tag{10}$$

On substituting (8) in (7) and by using (9) and (10), we get

$$D = \frac{a}{b}$$

Case 3:

$$C = \frac{(2nkb + a)^2 - (2n+1)^2 k^2 b^2}{ab} \quad \text{and} \quad D = \frac{a}{b}$$

Consider

Let E be any non-zero rational integer such that

$$CE + (2n+1)^2 k^2 = \alpha^2 \tag{11}$$

$$DE + (2n+1)^2 k^2 = \beta^2 \tag{12}$$

From (11)

$$E = \frac{\alpha^2 - (2n+1)^2 k^2}{C} \tag{13}$$

Let us assume the linear transformations

$$\alpha = X + \frac{(2nkb + a)^2 - (2n+1)^2 k^2 b^2}{ab} T \tag{14}$$

$$\beta = X + \frac{a}{b} T \tag{15}$$

On substituting (13) in (12) and by using (14) and (15), we get

$$E = \frac{(2nkb + 2a)^2 - (2n+1)^2 k^2 b^2}{ab}$$

Case 4:

Consider $D = \frac{a}{b}$ and $E = \frac{(2nkb + 2a)^2 - (2n+1)^2 k^2 b^2}{ab}$

Let F be any non-zero rational integer such that

$$DF + (2n+1)^2 k^2 = \alpha^2 \tag{16}$$

$$EF + (2n+1)^2 k^2 = \beta^2 \tag{17}$$

From (16)

$$F = \frac{\alpha^2 - (2n+1)^2 k^2}{D} \tag{18}$$

Consider the linear transformation

$$\alpha = X + \frac{a}{b} T \tag{19}$$

$$\beta = X + \frac{(2nkb + 2a)^2 - (2n+1)^2 k^2 b^2}{ab} T \tag{20}$$

On substituting the value of (18) in (17) and by using (19) and (20), we get

$$F = \frac{(2nkb + 3a)^2 - (2n+1)^2 k^2 b^2}{ab}$$

From all the above cases, (A,B,C), (B,C,D), (D,E,F),…. will form a sequence of strong rational diophantine triples

Section B

In this section, we search for distinct rational quadruple (A,B,C,D) such that product of any two of them added with 4 is a perfect square.

Assume $A = \frac{a}{b}$ $\tag{21}$

$$B = \frac{b}{a}(n^2 \pm 2n - 3)$$

and   (22)

where $a = 12r^2 + s^2 - 4rs(n \pm 1)$

and $b = 2rs$ $(r, s \neq 0)$

Let C be any non – zero rational integer such that

$$AC + 4 = \alpha^2$$ (23)

$$BC + 4 = \beta^2$$ (24)

From (23) we get,

$$C = \frac{\alpha^2 - 4}{A}$$ (25)

Assume

$$\alpha = X + \frac{a}{b}T$$ (26)

$$\beta = X + \frac{b}{a}(n^2 + 2n - 3)T$$ (27)

On substituting (25) in (24) and by using (26) and (27), we get

$$C = \frac{\left(12r^2 + s^2 - 4rs(n \pm 1)\right)^2 + 4r^2 s^2 (n^2 + 2n - 3) + 4\left(12r^2 + s^2 - 4rs(n \pm 1)\right)(rs)(n \pm 1)}{\left(12r^2 + s^2 - 4rs(n \pm 1)\right)(2rs)}$$

Let D be any non – zero rational integer such that

$$AD + 4 = \alpha^2$$ (28)

$$BD + 4 = \beta^2$$ (29)

$$CD + 4 = \gamma^2$$ (30)

From (29) we get

$$D = \frac{\beta^2 - 4}{B}$$ (31)

Assume

$$\alpha = X + \frac{b}{a}(n^2 + 2n - 3)T$$ (32)

$$\beta = X + \frac{(bn + b + a)^2 - 4b^2}{ab}$$ (33)   On   substituting

(30) in (28) and by using (32) and (33), we get

$$D = \frac{\left(12r^2 + s^2 - 4rs(n \pm 1)\right)^2 + 16r^2 s^2 (n^2 \pm 2n - 3) + 8\left(12r^2 + s^2 - 4rs(n \pm 1)\right)(rs)(n \pm 1)}{\left(12r^2 + s^2 - 4rs(n \pm 1)\right)(2rs)}$$

Hence (A, B, C, D) is a strong rational diophantine quadruple in which the product of any two when added with 4 is a perfect square.

Remark:
If we take B different from (22) we can generate different quadruples. Some of them are given below

1) If $B = \dfrac{b}{a}(n^2 + 4n)$ with the property $D(4)$, then the quadruple is

$$\left(\frac{12r^2 + s^2 - 4rs(n+2)}{2rs}, \frac{2rs}{12r^2 + s^2 - 4rs(n+2)}(n^2 + 4n), \right.$$

$$\frac{\left(12r^2 + s^2 - 4rs(n+2)\right)^2 + 4r^2s^2\,n(n+4) + 4rs\left(12r^2 + s^2 - 4rs(n+2)\right)(n+2)}{\left(12r^2 + s^2 - 4rs(n+2)\right)(2rs)},$$

$$\left. \frac{\left(12r^2 + s^2 - 4rs(n+2)\right)^2 + 16r^2s^2\,n(n+4) + 8rs\left(12r^2 + s^2 - 4rs(n+2)\right)(n+2)}{\left(12r^2 + s^2 - 4rs(n+2)\right)(2rs)} \right)$$

2) If $B = \dfrac{b}{a}(2n+1)k^2$ with the property $D(n^2 k^2)$, then the quadruple is

$$\left(\frac{a}{b}, \frac{b}{a}(2n+1)k^2, \frac{a^2 + k^2 b^2(1+2n) + 2kab(n+1)}{ab}, \frac{\left(\text{ka}(n+1) + 2k^2 b(2n+1)\right)^2 - n^2 k^2 a^2}{ab(2n+1)k^2} \right)$$

where $a = \dfrac{n\left(3r^2 + s^2\right) - 2rs(n+2)}{n}$ and $b = \dfrac{2rs}{nk}$

3) If $B = \dfrac{b}{a}\left(p^2 - 2npq\right)$ with the property $D(n^2 q^2)$, then the quadruple is

$$\left(\frac{a}{b}, \frac{b}{a}\left(p^2 - 2npq\right), \frac{\left(q(p-nb) + a\right)^2 - n^2 b^2 q^2}{ab}, \frac{\left(a(p-nq) + 2b\left(p^2 - 2npq\right)\right)^2 - n^2 q^2 a^2}{ab\left(p^2 - 2npq\right)} \right)$$

where $a = 3r^2 + s^2 + 4rs\left(1 - \dfrac{p}{qn}\right)$ and $b = \dfrac{2rs}{nq}$

4) If $B = \dfrac{b}{a}\left(n^2 q^2\right)$ with the property $D(p^2 - 2npq)$, then the quadruple is

$$\left(\frac{a}{b}, \frac{b}{a}\left(n^2 q^2\right), \frac{a^2 + q^2 n^2 b^2 + 2ab(p - qn)}{ab}, \frac{a^2 + 4q^2 n^2 b^2 + 4ab(p - qn)}{ab} \right) \text{ provided } n = -\frac{a}{qb}$$

5) If $B = \dfrac{b}{a}\left(-2npq\right)$ with the property $D(p^2 + n^2 q^2)$, then the quadruple is

$$\left(\frac{a}{b}, \frac{b}{a}\left(-2npq\right), \frac{a^2 - 2b^2 pqn + 2b(p - qn)}{a}, \frac{a^2 - 8npqb^2 + 4ab(p - qn)}{ab} \right) \text{ provided } n = \frac{a^2 + 4abp}{6b^2 pq + 4abq} \text{ or}$$

$$n = \frac{a^2 + 4abp}{10b^2 pq + 4abq}$$

III. CONCLUSION

To conclude, one may search for other families of strong rational diophantine triples and quadruples .

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Gas Leakage System

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Abstract- The heart of this paper here is a LPG gas leakage sensor circuit that detects the outflow of LPG gas and the circuit is a gas sensor module SEN 1327. QM 6 gas sensor is used in the SEN 1327 module. The output signal from SEN 1327 gas sensor module is used to drive a 555 timer based astable multivibrator circuit. Here 555 timer works as a tone generator, the frequency of tone can be altered by varying the preset VR1. The system alerts the user via audio and visual indications.

Index Terms- Leakage sensor,555 timer,sensor modules

I. OPEREATION OF THE CIRCUIT

The gas leakage alarm circuit operates on a 9V PP3 battery. Zener diode ZD1 is used to convert 9V into 5V DC to drive the gas sensor module. A preset in the module is used to set the threshold. Interfacing with the sensor module is done through a 4-pin SIP header.

Whenever there is LPG concentration of 1000 ppm in the area, the OUT pin of the sensor module goes high. This signal drives timer IC 555, which is wired as an astable multivibrator. The multivibrator basically works as a tone generator.

Output pin 3 of IC 555 is connected to LED1 and speaker-driver transistor SL100 through current-limiting resistors R5 and R4, respectively. LED1 glows and the alarm sound to alert the user of gas leakage. The pitch of the tone can be changed by varying preset VR1. It Uses a suitable heat-sink for transistor SL100.
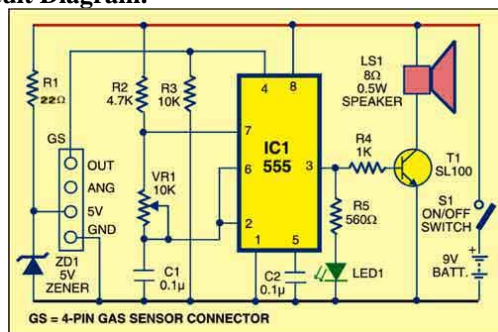
3.1 Circuit Diagram:

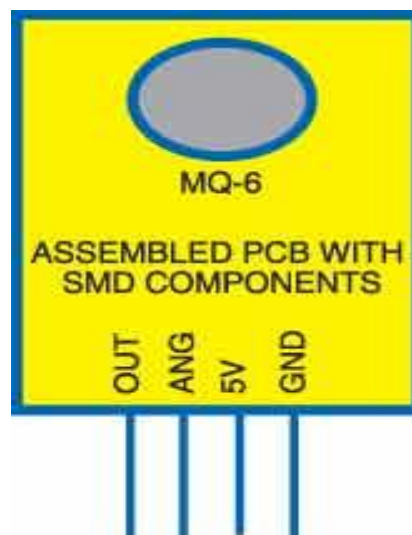**Fig.:3.1 Gas Leakage Alarm**

Fig.:3.2 MQ-6 Sensor

3.2 Working:

The gas leakage alarm circuit operates off a 9V PP3 battery. Zener diode ZD1 is used to convert 9V into 5V DC to drive the gas sensor module. A preset in the module is used to set the threshold. Interfacing with the sensor module is done through a 4-pin SIP header.

Whenever there is LPG concentration of 1000 ppm in the area, the OUT pin of the sensor module goes high. This signal drives timer IC 555, which is wired as an astable multivibrator. The multivibrator basically works as a tone generator.

Output pin 3 of IC 555 is connected to LED1 and speaker-driver transistor SL100 through current-limiting resistors R5 and R4, respectively. LED1 glows and the alarm sound to alert the user of gas leakage. The pitch of the tone can be changed by varying preset VR1. Use a suitable heat-sink for transistor SL100.

Here is a LPG gas leakage sensor circuit that detects the outflow of LPG gas and alerts the user via audio and visual indications. The heart of this the simple engineering circuit is a gas sensor module SEN 1327. QM 6 gas sensor is used in the SEN 1327 module. The output signal from SEN 1327 gas sensor module is used to drive a 555 timer based astable multivibrator circuit. Here 555 timer works as a tone generator, the frequency of tone can be altered by varying the preset VR1.
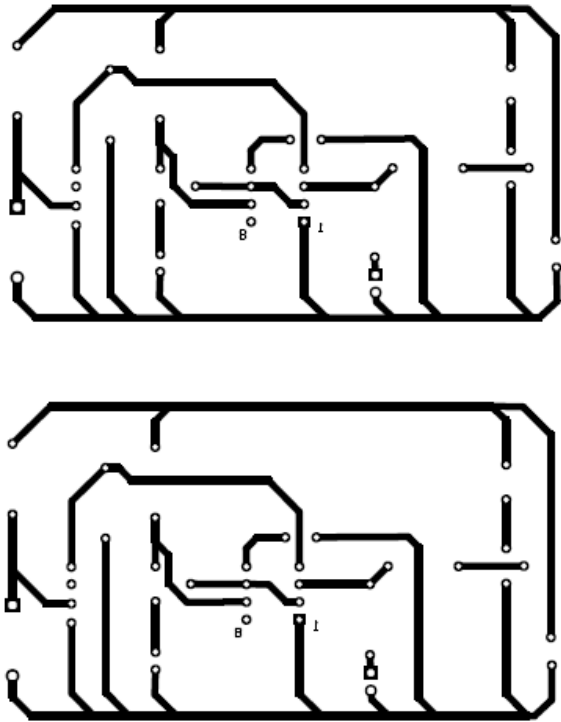
3.3 PCB Layout:

Fig.: 3.3 Layout

5.2 MQ-3 Gas Sensor

This is an alcohol sensor from [futurlec,](futurlec) named MQ-3, which detects ethanol in the air. It is one of the straightforward gas sensors so it works almost the same way with other gas sensors. It costs $6.90.Typically, it is used as part of the breathalyzers or breath testers for the detection of ethanol in the human breath.
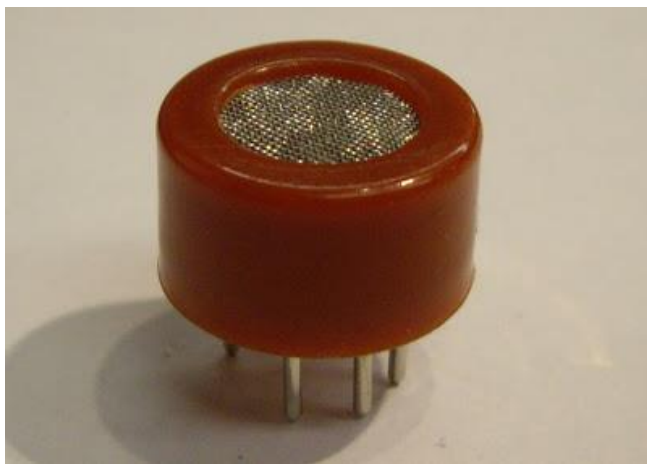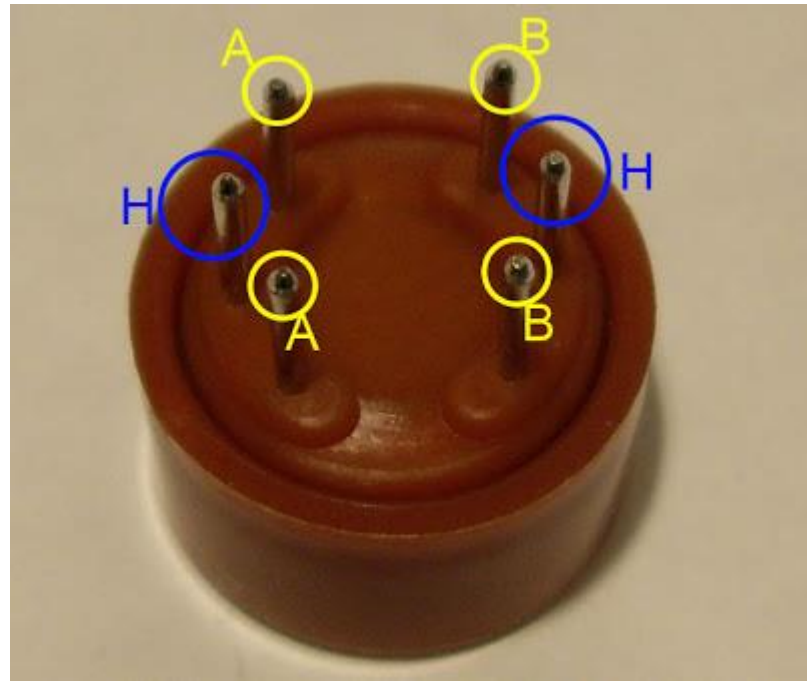

Fig.:5.7 MQ-3 Gas Sensor

If you look at the inside of the sensor, you will find the little tube. Basically, this tube is a heating system that is made of aluminum oxide and tin dioxide and inside of it there are heater coils, which practically produce the heat. And you can also find 6 pins. 2 pins that I called Pin H are connected to the heater coils and the other ones are connected to the tube.
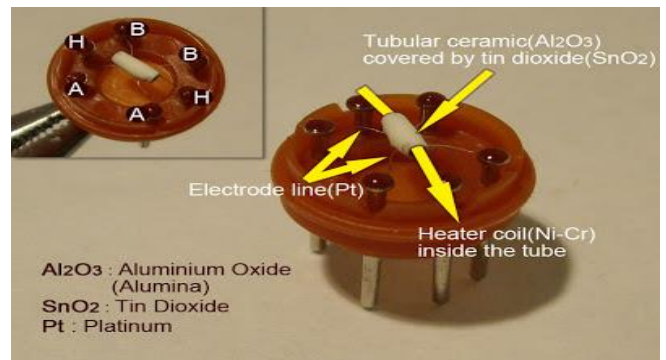
The core system is the cube. As you can see in this cross-sectional view, basically, it is an Alumina tube cover by SnO2, which is tin dioxide. And between them there is an Aurum electrode, the black one. And also you can see how the wires are connected. Basically, the alumina tube and the coils are the heating system, the yellow, brown parts and the coils in the picture.SnO2 ceramics will become the semi - conductor, so there are more movable electrons, which means that it is ready to make more current flow.

Then, when the alcohol molecules in the air meet the electrode that is between alumina and tin dioxide, ethanol burns into acetic acid then more current is produced. So the more alcohol molecules there are, the more current we will get. Because of this current

5.8 Switches:

In electronics, a switch is an electrical component that can break an electrical circuit, interrupting the current or diverting it from one conductor to another.
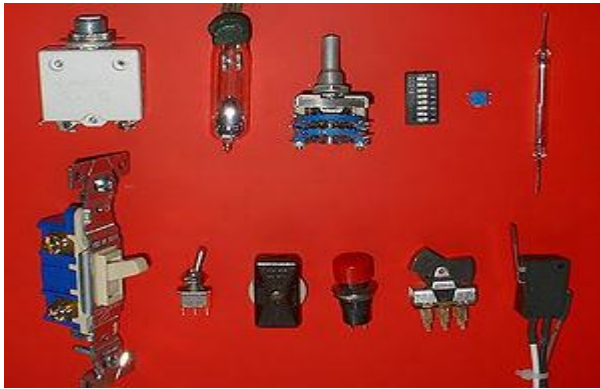

Fig.:5.14 Switches

The most familiar form of switch is a manually operated electromechanical device with one or more sets of electrical contacts, which are connected to external circuits. Each set of contacts can be in one of two states: either "closed" meaning the contacts are touching and electricity can flow between them, or "open", meaning the contacts are separated and the switch is non conducting. The mechanism actuating the transition between these two states (open or closed) can be either a "toggle" (flip switch for continuous "on" or "off") or "momentary" (push-for "on" or push-for "off") type.

A switch may be directly manipulated by a human as a control signal to a system, such as a computer keyboard button, or to control power flow in a circuit, such as a light switch.

II. Conclusion

LPG gas is supplied in pressurised steel cylinders. As this gas is heavier than air, when it leaks from a cylinder it flows along floor and tends to settle in low spots such as a basement. This can cause fire or suffocation if not dealt with.

Zener diode ZD1 is used to convert 9V into 5V DC to drive the gas sensor module.

The SEN-1327 gas sensor module from RhydoLABZ is used in this circuit. Its output goes high when the gas level reaches or exceeds certain point. A preset in the module is used to set the threshold. Interfacing with the sensor module is done through a 4-pin SIP header.

Whenever there is LPG concentration of 1000 ppm (parts per million) in the area, the OUT pin of the sensor module goes high. This signal drives timer IC 555, which is wired as an astable multivibrator. The multivibrator basically works as a tone generator.

It was experience in making this project as this project consist of so many components hence it give a chance to know about various electronics components. We have successfully completed this project "Gas Leakage Alarm". We sincerely thanks Mr. Naresh Soni and Mr. Nitin Jain for their invaluable

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A review of Wetland Conservation and Management Policy in Ethiopian

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   Abstract: In Ethiopia, wetlands cover nearly 2% of the total land area of the country. They are one of the most productive ecosystems and perform many functions that maintain ecological integrity. They provide lots of goods and services that encompass agricultural production, tourism, and biodiversity conservation, social, economic as well as cultural activities. More specifically, wetlands are crucial resources of income generation and livelihood for local communities. Despite the diverse benefits that wetlands provide, lack of effective management has led to their continued degradation that includes unsustainable activities such as converting wetlands into agricultural and grazing lands, using them as waste disposal sites, and overexploitation of resources. Misconception about wetlands and considering them as wastelands and breeding grounds of mosquitoes and also absence of clearly defined tenure right on wetlands are further challenges that exacerbate wetlands' degradation. In response to the aforementioned challenges and threats, there have been commendable efforts exerted by scholars in the last decades to publicize the value of wetlands to the national and local economy in a number of national and regional awareness-creation workshops. In many of these workshops, apart from emphasizing the significance of wetlands and expressing the looming threats imposed on them, the need for formulating a national policy or a wetland development strategy that could enhance sustenance of their ecological and socioeconomic functions for the present and future generations of the country was boldly stated. Ethiopia stands for environmentally safe world and has given due consideration to natural resource protection and management in which wetlands are a component. Although the country hasn't adopted clearly defined national policy on wetland conservation and management, the issue of wetlands has been indirectly mentioned in various policies and legal frameworks including the National Water Resources Management Policy, the Federal Environmental Policy, the Biodiversity Policy, Agricultural and Natural Resources Development Policy and the Land Administration and Use Policy, National Conservation Strategy of Ethiopia. Though these policy frameworks are potentially helpful to introduce better management of wetlands in the country, the reality on the ground shows that wetlands are being mismanaged and some of them are in a state of extinction. To assure a sustainable wetland ecosystem development and addresses the multiple interests of stakeholders, it seems rational either to strengthen and act in accordance with the existing policy frameworks or to initiate a National Wetland Conservation and Development Policy. Adopting international conventions, such as the Ramsar Convention, that facilitate wetland conservation and sustainable utilization is also very important. To influence policy makers appreciate the value of enacting a strong policy framework for wetland conservation and management professionals would be required to further strengthen their efforts to produce more tangible data on current status of wetlands and also clearly demonstrate how wetlands support the livelihood of the local people and the ecosystem in general. Considering the cross-sectoral nature of wetland management, it is of crucial importance to designate a responsible agency to guide and coordinate the development interventions in wetland resources.

   Index Terms: Community-based wetland management, Ramsar Convention, Wetland conservation, Wetland policy, Wetland tenure

I. INTRODUCTION

Wetlands are defined as: "areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water, the depth of which at low tide does not exceed six metres"[1]   Wetlands are found in different parts of the world including in Ethiopia. Even though an exhaustive inventory of wetlands is not done yet, wetlands are estimated to cover about 2% of the country's land coverage [2]. Despite their small area coverage, wetlands in Ethiopia are among the most productive ecosystems, and have immense economic, social, and environmental benefits. The importance of our wetlands goes beyond their status as habitat of many endangered plant and animal species but they are a vital element of national and global ecosystems and economies.

Wetlands provide with various benefits to local communities. They are vital sources of water and fodder, particularly during dry season and in times of drought, to both domestic and wild animals. Wetlands also serve as important sources of food, construction and fuel wood, raw materials for making household furniture, fodder, and medicine to rural communities. Poor rural households, particularly women, rely on wetlands for additional income to their families. Hence, wetlands contribute significantly

to efforts aimed at poverty reduction and food self-sufficiency. Growing number of people in Ethiopia, in both rural and urban areas, depend on wetland resources for their survival. Many peasant farmers in the western parts of the country make their living from wetlands. Communities who live around the wetlands in the Rift Valley lakes, and Lake Tana benefit a lot from fishing and irrigation farming [2]. Wetlands are exceptional habitats for endemic birds and are endowed with many natural attractions offering immense potential for tourism development in Ethiopia.

Wetlands have their own positive impacts on the environment. They serve to slow down storm flood, trap sediments, protect property damage in downstream, and the siltation of dams. Studies also reveal that wetlands have a role in ameliorating adverse climatic variations. As scientific understanding of wetlands has increased, more subtle goods and services have become apparent. Wetlands have been described both as "the kidneys of the landscape", because of the functions they can perform in the hydrological and chemical cycles, and as "biological supermarkets" because of the extensive food webs and rich biodiversity they support [3].

Notwithstanding their diverse services and values, the misconceptions on wetlands have led people to consider them as waste lands that are infested by malaria and other vectors. Because of this and due to shortage of farm land and absence of clearly defined land tenure, there is a tendency to drain them for agricultural and settlement activities thereby weakening other multiple benefits that they provide. To make their situation worse urban wetlands are polluted by all kinds of waste dumped and/or discharged on them and are exposed to excessive pressures from open grazing. The degradation of adjacent watersheds, excessive utilization of water, and the diversion of feeder streams are seriously damaging wetlands.

Although wetlands provide wide ranging social, economic, and environmental benefits, because of mismanagement and inappropriate utilization, several of them have either disappeared or are on the verge of drying out globally. In Ethiopia the recent total drying up of Lake Alemaya and the precarious existence of Lake Abijata are clear evidences of the looming danger on wetland ecosystem. Unless the necessary management and conservation strategy is in place, the disappearance of more wetlands appears to be unavoidable. In countries having wetlands a continuous and un-interrupted supply of wetland benefits can be ensured if only a strategy to sustainably utilize them is in place.

The precarious national and global situation of wetlands has signaled the need for taking swift action to curb the severe situation and move on facilitating the formulation of a wetland development policy and strategy. Accordingly, the Ramsar Convention, a convention which focuses on the conservation and wise use of wetlands and associated resources by national action and international cooperation has been put in place as a means to achieving sustainable development throughout the world [1]. The convention came into force in 1975 and currently there are number Contracting Parties, which are obliged to undertake four main activities, including:-

- Designating wetlands for inclusion in the 'List of Wetlands of International Importance' and to maintain their ecological character.
- Developing national wetland policies, to include wetland conservation considerations within their national land-use planning, to develop integrated catchment management plans and, in particular, to adopt and apply the guidelines for implementation of the Wise Use Concept, which is the sustainable utilization of wetlands for the benefit of mankind in a way compatible with the maintenance of the natural properties of the ecosystem.

- Promoting the conservation of wetlands in their territory through establishment of nature reserves and to promote training in wetland research, management and wardening.
- Consulting with other Contracting Parties about transfrontier wetlands, shared water systems, shared species and development aid for wetland projects.

In this way the Convention plays an important role in helping to prevent detrimental changes to wetland sites in states that are party to the Convention. Recognizing the value of wetlands in the livelihood of local communities as well as in sustaining a productive ecosystem and biodiversity, Ethiopia is in the process of developing a protocol consistent with the Ramsar Convention and also has drafted a National Wetland Policy awaiting approval of the law makers. A number of National and Regional Wetland Awareness creation and consultative workshops have been carried out in Ethiopia to attract the attention and win the will of policy makers on wetlands management. Mention could be made to the 2001, 2003, 2005, 2004 and 2008 wetland related workshops all carrying similar messages to policy makers and practitioners that are conservation and development of wetlands for the benefit of the nation. In addition organizations such as the Ethiopian Wildlife Conservation Organization, the Ethiopian Wildlife and Natural History Society, The National Environmental Protection Authority; various scholars from Universities and research institutions, the Ethiopian Wetland Research Programme (EWRP) and the Ethio-Wetlands and Natural Research Association (EWNRA) have been making tremendous efforts to promote the case of wetlands [3]. All these endeavors signal the need for capitalizing our efforts on what has been achieved so far and design strategies that will enhance wetland development in the country

II. METHODS

In order to gather background and historical information, an extensive literature review were explored. Both published and unpublished papers, reports, wetland related government policies and discussion with stockholders was included in the review. Moreover, to a comprehensive understanding of this review, we sought informants from multiple different international conventions and other countries experiences were assessed. To create an insight about the existing situation of wetlands, focus group discussion with Community members representing cross section of the wetland beneficiary, spot check visit, and local government authorities were contacted. Finally, after having all

the secondary data from different sources, analyses were made qualitatively for the rapid understanding of wetland policies of Ethiopia.

III. RESULTS

Ethiopian Policies, Legislation and Strategic Documents Dealing with Wetlands

Many sectoral and cross-sectoral policies, legal and strategic documents implicitly mention issues pertaining wetlands though wetland conservation and management is not vividly articulated as a standalone policy [4]. Wetland-related policy statements are reflected in the overall policy objectives of different sectors including the Ethiopian Water Management Policy, Environmental Policy of Ethiopia, Agriculture and Natural Resources Development Strategies, the Conservation Strategy of Ethiopia, the policy on Biodiversity, Land administration, etc. Some of them have explicitly stated the issue of wetland management and some others mentioned in implicit forms. This issue is well argued by Mellese [5] in his article dealing with policies, laws and strategic documents in protecting wetlands in Ethiopia.

To give some examples, the Environmental Policy of Ethiopia [7] addressed water resources, land use and biodiversity issues and indicates the need to integrate the rehabilitation and protection of wetlands with the conservation, development and management of water and biodiversity resources. Specifically Article 3.4 of the policy element on water resources states the following:-

- To recognize that natural ecosystems, particularly wetlands and upstream forests, are fundamental in regulating water quality and quantity and to integrate their rehabilitation and protection into the conservation, development and management of water resources''.
- To promote the protection of the interface between water bodies and land (e.g. lake shores, river banks and wetlands);
- To subject all major water conservation, development and management projects to the environmental impact assessment process and to include the costs and benefits of protecting watershed forests, wetlands and other relevant key ecosystems in the economic analysis of such water projects. The policy in its water resource section emphasizes the need to integrate the rehabilitation and protection of wetlands with the conservation, development and management of water resources. Similarly stipulations on environmental impact assessment for development projects and environmental education and awareness are fundamental issues that may not exclude wetlands.

The National Conservation Strategy of Ethiopia which is the basic policy document addresses a variety of sectoral and cross-sectoral issues among which environmental protection is widely indicated as a cross cutting issue. Regional states have also formulated their own Regional Conservation Strategy in their own context and circumstances. In this regard it has been recognized the Gambella region has boldly stated the issue of wetland management in its regional conversation strategy. Likewise the ANRS conservation strategy has also referred to wetland conservation and management owing to the prevalence of bird species in and around Lake Tana [8].

As related to The Water Resources Management Policy [9], one of the five main objectives clearly states the need to conserve, protect and enhance water resources and the overall aquatic environment on a sustainable basis. In the definition of terms, wetland is clearly defined implying that it is part of the policy. In addition, Messele Fesseha [6] has clearly indicated that the River Basin Development Master Plans in Ethiopia have given due emphasis to wetlands and have integrated wetland management issues. For example the Awash Basin Master Plan indicates a preliminary investigation of three major swamps in the basin, including Borkena, Becho and Gedebassa (Gewane) which are annually flooded and serve as major sources of grazing during the dry season. Likewise the Abay River Basin study has identified wetland coverage of the basin in the order of 579,876 ha or 2.9% of the basin area and prepared project profile for the Lake Tana Fogerat plain considering that the wetland in these areas is an important habitat for local and migratory birds. The Policy on Water Supply and sanitation states that water bodies should be protected from pollution by wastewater and other waste indiscriminately discharged by industries and other institutions. Despite all these assertions in the national water resource development policy attention given to wetland management seems implicit [6].

The ANRS Rural Land Proclamation No. 133/2006, provisions under article 13 clearly indicated the need for considering effective land use plan which in deed does not exclude wetlands. All these policy elements, therefore, could serve as an entry point to consider immediate actions pertinent to the protection, conservation and rehabilitation of wetlands in the country''.

In Ethiopia, natural resources conservation and development activities have been given due consideration and great strides forward have been made to mobilize the public to rehabilitate degraded lands. Although there is no a standalone policy for wetlands, it seems that pertinent legal frameworks are in place so that we cannot undermine the value of wetlands. In reality, however, apart from pieces and isolated efforts by few organizations and communities wetland resources management in the country seems overlooked and it is hardly possible to come across concrete management actions on the ground. In a country where huge efforts are being exerted to rehabilitate land resources, in which wetlands are not out of this domain, and where many of the policy frameworks, legislations and development strategies have some elements of wetland management, failure to address wetland issues posses a great challenge. Some scholars argue that this reality may give a ground to critically review the content of policy frameworks, legislations and strategies in place whether they have provisions to address strategies on wetland resources conservation and management.

It is evident that Ethiopia has suffered a lot from natural resources degradation and the severity of the problem has urged the government to make environmental protection a top agenda of the country and assure sustainable development. As stated above wetland resources seem lacking due attention and their ecosystem is degrading. In terms of land tenure arrangement, it seems that there is no clarity that actually has command on such valuable resources. The reality on the ground forces us to pose critical questions such as - are our wetlands degrading because of policy gaps or due to our negligence and ignorance? Or lack of legal frameworks on wetland tenure? Although the issue of a standalone policy for wetlands can be challenged on certain grounds there is a line of argument that for wetlands in Ethiopia to get attention and serve their intended purposes they need to be supported by a standalone National Wetland Policy.

Why are national wetland policies needed?

Many scholars argue that wetlands are seldom explicitly covered at a national level in other existing natural resource management policies such as for water, forest, land, agriculture or other sectors. Development of a unique or standalone wetland policy statement and/or strategy can be an important step in recognition of wetland problems and targeted action to deal with them. A unique wetland policy provides a clear opportunity to recognize wetlands as ecosystems requiring different approaches to their management and conservation, and not being masked under other sectoral management objectives [1].

In many cases, however, wetland policies or strategies are made a component of national sustainable development, water or other sectoral environmental policies. The wetland messages can therefore become diffused and remain dominated by the broader objectives of other Government policy objectives. The implication is that in many countries, institutions having a stake in natural resources management will not be motivated to assign adequate staff and even the available staff will be overloaded and pressurized to deal with the broader issues and tend to overlook wetland conservation and management [10]. This seems an all pervading challenge observed in many areas of Ethiopia where wetlands are located. In view of these challenges, initiating a standalone wetland policy has the potential to draw the attention of legislators and the public to consider better and strong management interventions on wetlands.

Policy in principle must be viewed as a statement of the considerations which will guide both rational decisions and actions. It is within this context of policy that the national wetland policy has to be developed and implemented. Articulation of clear goals and objectives for wetland ecosystems in general helps to identify clear responsibilities of the Government and an expectation that the Government will actually deliver on these commitments. Cognizant of this, many countries having substantial wetland resources such as Uganda and Kenya have already developed a national wetland policy and strategy.

A National Wetland Policy in general will function as a framework that enables clear conclusions to be drawn about what actions are required (but does not in itself set out detailed prescriptions for actions) and what end result is expected. It must be clear how things would be different if the policy did not exist – and thus demonstrate its own net added value.

Experiences of many countries show that national initiatives towards developing a wetland policy, strategy, legislation, or technical guidelines require preparation of detailed background document on the status of wetlands. The background paper should clearly demonstrate the following elements [1] which indeed are of crucial importance in Ethiopia's efforts to do the same.

a. The functions and values of wetlands in the nation;
b. The types of wetlands and resources present in the nation's existing wetlands;
c. Historical review of the uses and impacts of development on wetlands;
d. Review of existing statistics on inventory and wetland loss;
e. Examination of the relationships of wetlands to other sectoral resource management issues;
f. Summary of existing legislative and government responsibilities for wetlands;
g. Examination of opportunities for programme development, partnerships and support; and
h. The value of wetlands to the environment and people, with quantified economic values.
i. The review of patterns of use and impacts of development on wetlands;

Defining stakeholders in national wetland policy development and implementation

While developing a national wetland policy, it is of crucial importance to define stakeholders who play significant role in the design, discussion and implementation of the Policy. Hence, stakeholders include: government departments, non-governmental organizations, agencies, institutions, groups and many others who have an interest in, or are affected by, the National Wetland Policy. Defining pertinent stakeholders having vested interest in wetlands, and involving and consulting them in the whole process of wetland management issues helps to achieve effective results in wetland development.

An effort to develop a national wetland policy requires an agency to lead the development and implementation of the national policy. Initially, developing issues, planning of meetings and workshops and then in due course, actual writing of a policy or strategy, requires coordination and resource support (e.g. staff time, office support, travel costs). A national government agency should coordinate and facilitate the development phase in cooperation with appropriate regional or local authorities. In this regard the Federal Environmental Protection Authority which is

already promoting the issues of wetlands seems the appropriate organization to handle the case.

As clearly stated by the [1], policies should assist in the protection of wetlands in good condition, rehabilitate degraded wetlands where feasible, and support appreciation of wetlands by protecting wetland biodiversity, functions and services through:-

- protecting social and economic benefits of wetlands;
- providing flow regimes that mimic natural conditions, where possible;
- providing wetlands with water of appropriate volume and quality;
- limiting further fragmentation and reconnecting wetland systems;
- preventing or limiting catchment activities that impact upon wetlands;
- protecting the cultural heritage and spiritual significance of wetlands;
- rewarding wetland managers who improve the condition of wetlands; and
- promoting the importance of wetlands to the community.

Additionally, in order to implement the wise use concept in national legislation at a minimum level the following variables should be observed as Ntambirweki (1998) has expressed it in the context of Uganda's wetland policy.

- Controlling development interventions in wetland areas;
- Determining what activities are unsustainable on the basis of a country's social and economic circumstances and prohibiting such activities;
- Providing incentives for conservation of wetlands especially for activities which do not affect the natural properties and functions of wetlands;
- Controlling the introduction of alien species;
- Carrying out Environmental Impact Assessment and environmental audits in wetlands;
- Creating strict nature reserves for representative samples of wetlands;
- Maintaining a national inventory of wetlands;
- Increasing public awareness of wetland values and functions; and
- Providing modalities for restoration of degraded wetlands on the basis of the polluter pays principle and the user pays principle.

IV. CONCLUSION AND RECOMMENDATIONS

Wetland resources in Ethiopia could be considered as an integral component of the environment in the country and provide multifarious social, economic and ecological benefits. It is, however, a common incident that much of these resources are exposed to exploitation and signs of wetland degradation have become rampant across the country. To curb the situation and to rehabilitate wetlands and sustain their benefits, scholars have been exerting tremendous efforts to create awareness on the benefits and status of wetlands in Ethiopia since the beginning of the 1990s. The need for initiating wetland development policies and strategies has been a point of discussion and different views have been expressed by different scholars; some arguing that the

issue of wetlands has been addressed in the general framework of the existing policies and development strategies and others have stressed the need for a standalone wetland development policy.

After reviewing previous policy debates on wetlands and considering the threats imposed on wetlands two points of argument have been forwarded. One, to revisit existing wetland policy elements in the different sectors and magnify the issue of wetland development and encourage the respective institutions to consider the issues of wetland development in their strategic and annual development plans. The other contention attaches prime importance of designing a national wetland development policy and using this framework regional states need to develop their own polices that reflect objective realities on the ground. The later argument indeed demands compilation of facts on wetlands in the context of ecological, social and economic benefit of the country clearly depicting concrete data on area coverage, magnitude local community dependence on the resource, ecological significance from biodiversity and water resource management.

The multi-sectoral interests on wetlands make it imperative to involve a number of sectors to coordinate their efforts to generate reliable data on the value and other attributes of wetlands to influence policy makers take appropriate actions. In this regard, the Ministry of Agriculture, Ministry of Water and Energy, Environmental Protection Authority, Institute of Biodiversity Conservation, Ethiopian Institute of Agricultural Research and the Ethiopian Wildlife Conservation Authority, and the sectors in the Regional State having a stake including land administration institutions have to come together to discuss the issue and produce a document that clearly depicts the national wetland scenario and development interventions required. To enable these sectors produce the needed output one institution amongst them has to serve as a lead agency to coordinate the overall activities. Currently, the Federal Environmental Protection Authority seems to have been working in this line and making significant efforts to realize the signing of the Ramsar Convention and approval of the draft wetland policy.

It is axiomatic that the management and conservation of wetlands, as it is true in other sectors, shall be based on research, planning and monitoring. To this end, the national and regional agricultural research institutions in collaboration with development partners need to carry out research on wetland resources and develop technologies that enhance wetland management.

An Environmental Impact Assessment should be carried out before undertaking any development that affects wetlands irrespective of the presence or absence of wetland development policy or strategy.

To update existing information and also to collect a comprehensive data on wetland resources across the nation, there is a need for preparing a fund soliciting project by interested groups and forward the project to potential donors to secure the fund to carry out the task. In this regard universities can take the initiative to establish a consortium and enhance the overall activity. This consortium can also be made in charge of

reviewing all the national and regional workshops conducted in the country over the years and synthesize the salient features of wetland resource management in the country. This has to be followed by an immediate national workshop to bring the issue to the attention of policy makers and also enlighten them on the importance of being signatory of the Ramsar Convention and also approving the draft national policy on wetlands.

Finally, successful conservation of wetlands is fundamentally determined by the institutions and property rights associated with resource management decisions. Thus, an understanding of property rights regimes, the constraints which they impose on users of wetlands resources, and the distribution of benefits of use among users and non-users are essential if the economic values of wetland ecosystems and functions are to be realized. Efforts focusing on promoting sustainable development of wetlands should therefore give due consideration to the unique property right regimes due to their ecological characteristics, such as multiple resource characteristics, the indivisible nature of these resources and the seasonal and cyclical nature of different wetland resource components.

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The Back Bone of Indian Infrastructure

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Abstract: The main objective of this paper is to evaluate the consumption & investment and the market size of the cement industries in India. They play an important role in the growth of India. In India, there are 69 industries producing cement. In this, the studies of top 5 companies are done, their market size, their investment is studied. The major part of the cement is consumed by the housing sector i.e. 64%, 17% consumed by infrastructure, 13% by commercial and only 6% is consumed by industrial sector.

Index Terms: Cement industries, market size, consumption, investments

I. INTRODUCTION

Cement Company plays a major role in the growth of nation. The demand and supply of cement in India has grown up in a fast developing economy. There is always large possibility of expansion of Cement Industries.

The history of the cement industry in India dates back to the 1889 when a Kolkata based company started manufacturing cement from 'Argillaceous'. But industry started getting the organized shape in the early 1900 so on 1914. India Cement Company Ltd. was established in Porbandar with a capacity of 10000 tonnes and production of 1000 tonnes installed.

Cement is one of the core industries and plays a vital role in the growth and development of a nation. The cement industry of India is the second largest producer in the world. The production of cement has increased at a compound annual growth rate (CAGR) of 9.7% to reach 272 million tonnes. During FY 06-13. The production capacity is expected to grow in 500 MT by FY 20.

India's potential in infrastructure is huge. The country is expected to become the world's third largest construction market by 2025, adding 11.5 million home a year to become a US$ 1 trillion a year market, according to a study by a Global construction Perspectives and oxford Economics.

Notwithstanding its current position as one of the leaders in cement production. India riches in the sector remain somewhat untapped. 'Lafarge's India business has been very successful and the country is among the top 10 markets globally for Lafarge. But going forward, We should rank higher because of the potential of the Indian market says Mr. Martin Kriegner, CEO of the Indian branch of the World's largest cement manufacturer 'Lafarge'.

II. OBJECTIVE

An attempt was made in the present study
- To evaluate the consumption & investment of cement industries in India.

- To analyse the maximum consumption of cement industries in India in different sectors.

III. REVIEW OF LITERATURE

In 2013, Prof. Acharekar studied the various factor affecting the working capital requirement in cement industry. To assess the relative significance of various sources of working capital. To analyse relative asset liquidity and finance liquidity in cement industry.

In 2013, Dr. P. Krishna Kumar, investigate the progress of Indian cement industry since 1991, in terms of its growth in installed capacity, production, exports and value additions. In detail the research methodology used for the study that has focused on the past, present and future performance of cement industry at the Macro Level.

In 2009, Bhayani & Sanjay an attempt has been made to identify which variable are judging the profitability of Indian Cement Industry. The study covers the all listed cement firms working in India for the period of 2001 to 2008.

IV. MARKET SIZE

India is among the best cement markets in Asia, according to Switzerland based cement major Holcim. The company operates in India through group companies ACC & Ambuja Cements.

The Indian cement sector is expected to witness positive growth in coming years, with demand set to increase at a CAGR of more than 8% during 2013-14 to 2015-16. According to the latest RNCOS report titled "Indian Cement Industry Outlook 2013". The report further observed after analysing the regional trend of cement consumption that the southern region is creating maximum demand, which is expected to increase in future

V. INVESTMENT

The cement industry has been expanding on the back of increasing infrastructure activities and demand from the housing sector over the past many years. According to data released by the Department of industrial polity and promotion cement and gypsum products attracted foreign direct investment (FDI) worth Rs. 13,370.32 crores (US $ 2.24 billion) between April 2000 and Feb. 2014.

Some of the major Investments and developments in the Indian Cement Industry are as follow:

- Ambuja Cement part of Holcim Group, plans to invest Rs. 802 crores (US $ 134.39 million) in 2014 in various ongoing projects. The company has proposed to find the entire capex through internal accruals as per Ambuja Cement annual report.

- Prism cement Ltd. has become the first Indian company to get the quality Council of India's (QCI) certification for its ready-mix concrete plant in Kochi, Kerala,   The company received the certification from Institute for Certification & Quality Management(ICQM) a leading Italian Certification body authorised to oversee QCI compliance.

- After commissioning its first waste heat recovery plant at Gegal in Himachal Pradesh. ACC plans to replicate the success at its cement plants in Wadi (Karnataka), Jamul (Chattisgarh) Kymore (M.P.) and Chanda (Maharashtra) with an investment of about 360 crore (US $ 60.32)

- Ultratech cement Ltd. India's biggest maker of cement plans to buy the Local assets of Holcim Ltd. & Lafarge SA.

- ACC plans to invest Rs. 3000 Crore (US $501.16 million) in a capacity upgrade and expansion project at its Jamul plant in Chattisgarh and its grinding unit in Jharkhand.

- Ultratech Cement 2550.05 crores, an Aditya Birla Group company has acquired 4.8 million tonne per annum

- Gujrat unit of JAYPEE cement corp for Rs. 3800 Crores.

VI. RESEARCH METHODOLOGY

Area of study:-

The study shall be conducted in above top 5 cement companies.

Period of Enquired :

last 5 years data of cement companies are considered for study. The proposed research work will be conducted at micro level for which the study period is 2009-2013.

Collection of Data :-

The study is based on secondary data collected through different journals and annual reports of various cement companies.

Tabulation, Analysis & Interpretation :-

Collected data shall be logically arranged in the form of tables which will be analysed on the basis of :
•   Total Income of Companies

•   Total Expenditure of Companies

•   Total Profits of Companies

TABLE 1
Total Profits of Companies for last 5 years

Company	2012-13	2011-12	2010-11	2009-10	2008-09
India Cement LTD	4616.67	4222.69	3509.42	3794.03	3473.40
Ultratech	20608.84	20479.95	18685.00	13468.03	7144.53
Ambuja Cement	9553.97	10079.17	8802.13	7500.11	7258.73
ACC	11386.20	11267.38	9946.59	7874.34	8187.73
JK. Cements	2100.87	2116.40	1781.50	1335.15	1524.96

Interpretation:-

From table 1, it is clear that total income of cement companies are increasing except Ambuja Cement & J.K. Cement . The maximum Income earned by (20608.84) Ultratech cement securing 1st position, ACC 2nd Position, Amhuja 3rd, India Cement 4th position and J.K. Cements enjoying 5th position with the least income.

TABLE 2
Total Expenditure of Cement Companies for the last 5 years.

Company	2012-13	2011-12	2010-11	2009-10	2008-09
India Cement LTD	3773.72	3300.04	3062.49	2929.54	2419.73
Ultratech	16461.90	15499.46	14165.71	10646.48	5065.18
Ambuja Cement	7569.22	7257.93	6577.23	5514.67	5765.64
ACC	10290.44	10206.19	8621.33	6754.33	6581.00
JK. Cements	1754.64	1626.24	1390.73	1134.06	1049.20

Interpretation:-

From table 2, it is clear that total expenditure is also increased with the income of the companies. Maximum expenditure incurred by Ultratech Cement enjoying 1st position in income, 2nd position of ACC, Ambuja cement at 3rd, India Cement at 4th rank and JK Cement enjoying with last position in expenditure.

TABLE 3
Net Profit of Cement Companies for the last 5 years.

Company	2012-13	2011-12	2010-11	2009-10	2008-09
India Cement LTD	842.95	922.65	446.93	864.44	1053.67
Ultratech	2144.47	2655.43	2446.19	1404.23	1072.10
Ambuja Cement	1269.75	1576.19	1253.11	1113.40	1186.98
ACC	1095.76	1061.19	1325.26	1120.01	1606.73
JK. Cements	1754.64	1626.24	1390.73	1134.06	1049.20

Interpretation:-

Table 3, depicts that top cement companies are suffering from losses except ACC and JK Cement. They are continuously increasing losses with comparison to earlier year. Ultratech cement suffers from huge losses. Anbuja bear losses with shortage in income also. India cement Ltd. suffer losses at position 3rd. ACC Cement and JK Lakshmi Cement earning profits with comparison to earlier years.

Domestic Cement Consumption:-

The domestic cement consumption is expected to increase at a CAGR of 10.2% during FY 11-17 and reach 398 tonnes.

Year	Domestic Consumption
FY-10-11	222 MT
FY 11-12	242 MT
FY 12-13	265 MT
FY 13-14	293 MT
FY 14-15 E	324 MT
FY 15-16 E	359 MT
FY 16-17 E	398 MT

VII. FINDINGS

Major Cement Demand Drivers

Total 69 industries are in India producing cement and cement consumption in India was estimated from 2013-14 to about 280-285 MT. It consumed 293 MT. In which consumption of cement is as follows:

Major 64% of the total cement consumption is consumed by housing sector, 17% consumed by infrastructure, 13% consumed by commercial and institutions and only 6% is consumed for industrial sector.

VIII.   CONCLUSION

The housing segment accounts for a major portion of total domestic demand for cement in India. The government of India is strongly focused on infrastructure development to boost economic growth and plans to increase investment in infrastructure to 12th five year plan (2012-17). During the plan, the industry is estimated to add a capacity of 150 MT of Cement production. Housing development plays important role in growth of India by providing much funds through the higher consumption.

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