

March 2015
Online Print Version

International Journal of Scientific and Research Publications

Print Version, Volume 5, Issue 3
March 2015 Edition
ISSN 2250-3153



IJSRP
www.ijsrp.org

International Journal of Scientific and Research Publications

GENERAL INFORMATION:

IJSRP, International Journal of Scientific and Research Publications publish monthly journal under ISSN 2250-3153.

ONLINE VERSION

<http://www.ijsrp.org/e-journal.html>

PRINT VERSION

<http://www.ijsrp.org/print-journal.html>

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Exploring the critical factors for improving customers' perceived food quality of casual-dining restaurants

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Abstract- This study intends to integrate IPGA with the DEMATEL model in order to determine food quality core factors demanding restaurants' most urgent improvement, as well as the highest effect for resource investment. It is hoped that such information can be provided as reference for casual-dining restaurants to develop food quality improvement and resource reallocation strategies under limited resources. 562 valid questionnaires were returned in Taipei City. The results showed that, from the perspective of customers, casual-dining restaurants should give priority to improving the quality dimensions of "hygiene" and "cooking." Among various quality dimensions, experts suggested that "cooking" is the core factor with the highest effect of resource investment affecting food quality, such as visual appeal, taste, and hygiene. Moreover, this study further analyzed and found that a total of 15 quality items are located in the area of "Concentrate here".

Index Terms- Food quality, Casual-dining restaurant, IPGA, DEMATEL

I. INTRODUCTION

Economic growth and increased national income have led to a rapid increase of demands for service industry markets, thus, increasing its competition. Jang, Ha, and Silkes (2009) indicated that the quality of a product is a key factor affecting consumers' decision-making for the service industry. Regarding the hospitality industry, food quality is ranked as one of the most important determinants of a customer's decision to return. This element is significantly more important than cleanliness, value, price, or convenience (Kim, Ng, and Kim, 2009). Casual-dining restaurants are important restaurant types. In the US, in 2010, the volume of business accounted for approximately 22% (USD\$ 83 billion) of the overall restaurant industry (Darden, 2011). The majority of restaurants in Taiwan are casual dining, as most restaurants in this category are small businesses (USDA, 2012). The facts show that casual-dining restaurants are the most representative restaurant type in the restaurant industry in developed countries. Food quality was the most important reason

for respondents to patronize a casual-dining restaurant (Mattila, 2001). As a result, food quality has a significant effect on the operation and sustainable development of casual-dining restaurants, and how to effectively and precisely assess their food quality has become an important research issue.

Lin, Chan, and Tsai (2009) integrated the concept of traditional IPA with that of quality gap, and developed Importance-Performance & Gap Analysis (IPGA) through function conversion. The IPGA model converted the axes of the traditional IPA matrix into relative importance (RI) and relative performance (RP). In addition to reflecting quality gap, IPGA can assist enterprises to develop strategies meeting customers' needs. Some scholars have used the IPGA model to investigate the service quality of different service industries (Tsai and Lin, 2010; Tsai, Chan, and Lin, 2011; Cheng, Chen, Hsu, and Hu, 2012). Cheng, Lin, Liu, Hu, and Lin (2011) used IPGA to investigate the food quality of fine-dining restaurants. The above show that IPGA is an effective research method used in the research field of quality management.

According to the resource-based view (RBV), as proposed by Wernerfelt (1984), a competitive advantage of a firm is the result of optimal resource allocation and combinations. Regarding casual-dining restaurants, the best approach to fulfill the resource investment utility of food quality under limited resources is to determine the dependent (cause-and-effect) relationships between the quality attributes of the highest efficiency and other quality attributes. When quality characteristics are shown to have a cause-effect relationship, the traditional IPA and IPGA model are unable to correctly analyze priority level of importance and performance (Hu, Chiu, Cheng, and Yen, 2011; Cheng et al., 2012). However, the methodology of the decision making trial and evaluation laboratory (DEMATEL) can change a complicated system into a causal relationship with a clear structure, and determine the core issues and improvement directions in a complicated system through interaction levels between quality characteristics (Cheng et al., 2012). Many scholars used DEMATEL to solve problems of different fields (Nanayo and Toshiaki, 2002; Tamura et al., 2006; Tseng, 2009; Hu et al., 2011). Tsai et al. (2011) and Cheng et al.

(2012) combined the perspectives of customers with those of experts and used a two-stage decision-making model integrating IPGA with DEMATEL to investigate the cause-and-effect relationships between improvement priorities and resource investments in service quality as important guidelines for service quality improvement strategies. Obviously, the decision-making model integrating IPGA with DEMATEL is an effective approach to develop quality improvement and resource investment strategies. Food quality improvement strategies of casual-dining restaurants also involve the issues of “quality gap” and “effective allocation of resources,” which have never been discussed in previous studies. Therefore, the use of a quality improvement decision-making model integrating IPGA with DEMATEL in the investigation of quality improvement strategies for casual-dining restaurants is of significant practical contribution and value.

The purposes of this study are to use IPGA model to investigate the food quality of casual-dining restaurants and to understand the core factors for improving food quality, as well as their priority. In addition, this study interviewed restaurant chefs and scholars, and used DEMATEL to analyze the effect of resource investment and dependent relationships (cause-and-effect relationship) of various dimensions of food quality of casual-dining restaurants, as well as to identify critical quality attributes in order to improve overall food quality under resource-limited conditions. Based on the research results of IPGA and DEMATEL, this study intended to determine the critical factors affecting food quality that demand the most urgent improvements, and the highest effect of resource investment, and provide such information as reference for casual-dining restaurants to develop food quality improvements and resource reallocation strategies, in order to significantly improve the food quality of casual-dining restaurants.

II. LITERATURE REVIEW

Food quality

Palmer (1985) suggested that food is a product constrained by culture, as it is the most fundamental and profound consumer culture affecting daily life. Compared with other products, it is harder to change the behavior consumption of food from among various consumer behaviors. From a commercial perspective, food quality is the phenomenon developed for commercial products based on perceptual/evaluative construe assessment on any factors concerning people, place, and time, which can affect expectation factors, as assessed by sensory perception (Cardello, 1995). Food quality refers to quality that is acceptable to both the producers and consumers, namely, it is producers’ production of the quality most desirable to consumers at the most rational price under limited economic conditions (Cheng et al., 2011). With the development of economy, consumers’ demand for quality of food has gradually increased. They not only intend to meet their physical needs, but also take food quality, health, and safety into account (Barbas, 2003; Henson, Majowicz, Masakure, Sockett, Jones, Hart, Carr, and Knowles, 2006). Therefore, food quality attributes have begun to attract the attention of consumers. Moreover, food quality becomes one of the most important factors affecting customer satisfaction (Pettijohn, Pettijohn, and Luke, 1997). Mattila (2001) confirmed that food quality is the

most important reason for respondents to patronize a casual-dining restaurant. Kim et al. (2009) indicated that food quality is the strongest predictor of customer satisfaction, as well as revisit intention. Improvement of visual appeal, food taste, freshness, and nutritional content might help food service operators meet or exceed customer expectations and improve intention to return.

In terms of the evaluation indicators of food quality, Molnaar (1995) indicated that the characteristics of food quality evaluation include sensory attitude, chemical and physical aspects, microbiological hazard, texture damage, and the labeling of package and appearance. For the food quality of the meals provided by the army and public groups, consumers will consider the factors of taste, texture, and nutritional value (Cardello, Bell, and Matthew, 1996). Verbeke and Lopez (2005) used nine food attributes as evaluation indicators for preference and attitude, including price, color, appeal, taste, spiciness, convenience, leanness, safety, and healthiness, in order to analyze the attitude and behavior of Belgians and Belgian Spanish for ethnic food. Tsai et al. (2006) found that, the evaluation factors for food quality of fast food industry mainly include three dimensions, “freshness and hygiene,” “menus and menu content,” and “attractiveness of food,” with a total of 16 items. Jang et al. (2009) developed 20 main attributes of Asian food, and used such attributes to determine 6 Asian foods as the new constructs of food attributes from the perspective of American consumers. Kim et al. (2009) used four items, taste of food, eye appeal of food, freshness of food, and overall quality of food, to assess the food quality of restaurants. Cheng et al. (2011) also summarized relevant previous studies to obtain five major dimensions, including appeal of food, taste, cooking, hygiene, and other factors, for 22 items in order to assess consumers’ satisfaction with food quality of fine-dining restaurants. This study found that, such restaurants should give priority to the improvement of “hygiene” and “taste.” Based on the above, this study suggested that the dimensions and items of the food quality assessment, as proposed by Cheng et al. (2011), are more specific and complete. Moreover, the empirical validity for restaurant food quality assessment is acceptable. Consequently, this study intended to use the food quality scale developed by Cheng et al. (2011) as the basis for the evaluation of food quality of casual-dining restaurants.

Importance-performance and gap analysis (IPGA)

Importance-Performance Analysis (IPA) is regarded by scholars and managers as an effective tool for improving service quality and customer satisfaction. Its analysis results can provide enterprises with relevant information for planning resource allocation. The IPA model, as proposed by Martilla and James (1977), is an analysis technique for determining whether to strengthen or adjust the resource allocation for analyzed strategies. The vertical and horizontal axes of a strategy matrix is constructed to denote respondents’ perceived degrees of “importance” and “satisfaction.” The overall average importance and satisfaction can be regarded as the intersecting point of two axes to facilitate the division of the coordinate matrix into four quadrants. Managers can understand enterprise performance based on IPA analysis, which facilitates the development of revitalization strategies in the future. Although the IPA model has been regarded as a convenient tool for assessing quality, it

has several deficiencies in terms of practical application. For example, the IPA model can neither distinguish properties (Tarrant and Smith, 2002) in the same quadrant, nor integrate the concepts of quality gap (the difference between customers' expectations and perceptions) (Lin et al., 2009). Moreover, the assessment of means may easily lead to subjective conflict (Cheng et al., 2012).

IPGA was extended and developed from IPA as a model integrating the traditional IPA model with a resource reallocation analysis model for gap analysis (Importance-Performance and Gap Analysis; IPGA), as developed by Lin et al. (2009), and based on function conversion. IPGA converts the axes of traditional IPA matrix into relative importance (RI) and relative performance (RP). The vertical axis of the amended matrix is relative importance of the evaluated attributes, while the horizontal axis is the relative performance of the evaluated attributes. The resource allocation strategies, as denoted by the various quadrants of the IPGA model, are as shown in Figure 1 (Lin et al., 2009).

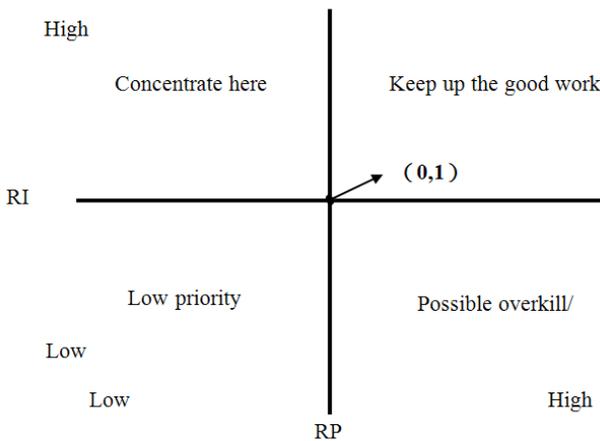


Figure 1 IPGA Model

Quadrant I: is the quadrant consisting of high relative performance and high relative importance, and is located in the upper right area of the two-dimensional matrix. It represents the situation where there is a positive gap between performance and importance in the evaluated attribute, and because the importance of evaluated attributes is higher than the average importance, it is necessary to “keep up the good work.”

Quadrant II: is the quadrant consisting of low relative performance and high relative importance, and is located in the upper left area of the two-dimensional matrix. It presents the situation where there is a negative gap between performance and importance in the evaluated attribute, and because the importance of evaluated attributes is higher than the average level of importance, it is necessary to “concentrate here.” Moreover, the larger the distance between the evaluated attributes and coordinate center (0, 1), the more urgent it is to make improvements.

Quadrant III: is the quadrant consisting of low relative performance and low relative importance, and is located in the lower left area of the two-dimensional matrix. It presents the situation where there is a negative gap between performance and

importance in the evaluated attribute, and because the importance of evaluated attributes is lower than the average importance, the quadrant is the area of “low priority.”

Quadrant IV: is the quadrant consisting of high relative performance and low relative importance, and is located in the lower right area of the two-dimensional matrix. It presents the situation where there is a positive gap between the performance and importance in the evaluated attribute. However, because the importance of evaluated attributes is lower than the average importance, this quadrant is the area of “possible overkill.” Moreover, the larger the distance between the evaluated attribute and the coordinate center (0, 1), the higher the level of received resource transfer.

The analysis process of the IPGA model includes the following 6 steps (Lin et al., 2009; Tsai et al., 2012; Cheng et al., 2012):

Step 1: Collect information on users' perceived degree of importance and performance of quality attributes.

Step 2: Calculate the average importance (\bar{I}_j) and average performance (\bar{P}_j) perceived for each attribute, as well as the average importance (\bar{I}) and average performance (\bar{P}) of all the items.

Step 3: Use paired sample T test to understand whether there is a positive gap (i.e. performance larger than importance) or a negative gap (i.e. performance smaller than importance), or there is no gap (i.e. performance equals to importance) between users' expectation and actual perception of various attributes.

Step 4: Calculate the relative importance (RI) and relative performance (RP) of various quality attributes, respectively. Relative importance (RI) is the value of the importance of an assessment factor divided by the average importance of all the assessment factors. The formula is \bar{I}_j / \bar{I} . In addition, relative performance combines the concept of gap analysis model. The average performance of various attributes, as evaluated by respondents, is converted into perceived performance. In other words, after paired sample t-test is applied to perform gap analysis on the importance and performance of evaluated attributes, the formula was used to convert the values to obtain the RP values (as shown in Table 1) of various food quality attributes (as shown in Table 1).

Table 1 Relative performance (RP) calculation regulation table

Factor j's gap analysis result	Paired samples t-test	Factor j's RP value
$\bar{P}_j > \bar{I}_j$	Significant (p ≤ 0.05)	\bar{P}_j / \bar{P}
$\bar{P}_j < \bar{I}_j$	Significant (p ≤ 0.05)	$-(\bar{P}_j / \bar{P})^{-1}$
$\bar{P}_j > \bar{I}_j$ or $\bar{P}_j < \bar{I}_j$	Not significant (p > 0.05)	0

Note: The average performance of Assessment factor j is \bar{P}_j , the importance is \bar{I}_j , and the average performance of all assessment factor is \bar{P}

Step 5: Draw the IPGA strategy matrix (as shown in Figure 1), where relative importance (RI) and relative performance (RP) are used as vertical axis and horizontal axis, respectively. The intersecting point of the horizontal and vertical axes is (0, 1). The resource allocation strategy and management definitions of various quadrants of IPGA strategy matrix are as follows:

Step 6: Determine the priority of resource allocation for attributes requiring improvement in quadrant II, namely, the larger the distance, the higher the priority for improvement. The formula is:

$$D_q(j) = \sqrt{\left[\frac{RP_j}{\max_{r \in q} \{RP_r\}} \right]^2 + \left[\frac{(RI_j - 1)}{\max_{r \in q} \{RI_r - 1\}} \right]^2} \quad (1)$$

Decision Making Trial and Evaluation Laboratory (DEMATEL)

The decision making trial and evaluation laboratory (DEMATEL) was developed by the Battelle Memorial Association in Geneva (Gabus and Fontela, 1973; Fontela and Gabus, 1976). At the time, the DEMATEL method was used to research complex, and difficult to solve, global problems, including ethnic issues, hunger, energy, environmental protection, etc. (Fontela and Gabus, 1976). The DEMATEL method takes complicated systems and directly compares the relative relationships between different quality characteristics, using a matrix to calculate all direct and indirect cause and effect relationships, as well as the level of influence between quality characteristics, especially through the use of a visual structure cause-effect diagram to determine the core questions of a complex system, thus, simplifying decision making (Cheng et al., 2012). Measurements are separated into four levels (0, 1, 2, 3), which are labeled “no influence”, “low level of influence”, “high level of influence”, and “extremely high level of influence” (Lin and Wu, 2008). Recent studies have comprehensively used DEMATEL to solve the problems of different fields. For example, Nanayo and Toshiaki (2002) used amended DEMATEL to conduct an integrated assessment on a medical care system. Tamura et al. (2006) used DEMATEL to investigate the factors leading to customers’ sense of insecurity regarding food and its improvement. Tseng (2009) combined the Fuzzy set theory with DEMATEL to evaluate the interrelationships of service quality evaluation criteria and to compare group perceptions for a cause-and-effect model regarding uncertainties. Hu et al. (2011) used DEMATEL to improve the order-winner criteria in the network communication equipment manufacturing industry. Tsai et al. (2011) used DEMATEL to determine the critical factors affecting customers’ needs for quality of an online tax-filing system. Cheng et al. (2012) used DEMATEL to investigate the priority of improvements in the service quality of fine-dining restaurants. However, such a research method has never been used in previous studies to resolve issues concerning food quality improvement strategies and resource allocation of casual-dining restaurants.

This study adopted the explanation of the steps of DEMATEL, as described by Tsai et al. (2011) and Cheng et al. (2012), as follows:

Step 1: Build the initial average direct-relation matrix

Suppose n is the number of experts consulted, and p is the number of practices that each expert considers. The integer score x_{ij}^k refers to the degree that practice i affects practice j for the k -th expert. The $p \times p$ average matrix A is realized by averaging all expert scores, and can be represented mathematically by the following equation:

$$A = [a_{ij}]_{p \times p} = \left[\frac{1}{n} \sum_{k=1}^n x_{ij}^k \right]_{p \times p}$$

Step 2: Calculate the normalized direct-relation matrix

The normalized direct-relation matrix Z is obtained by normalizing the direct-relation matrix A , and can be represented mathematically by the following equation:

$$Z = \lambda^{-1} A, \text{ where } \lambda = \max(\max_{1 \leq i \leq p} \sum_{j=1}^p a_{ij}, \max_{1 \leq j \leq p} \sum_{i=1}^p a_{ij}) \quad (2)$$

Since the sum of each row i of matrix A represents the *direct effects* that practice i gives to the other practices, and the sum of each column j of matrix A represents the *direct effects* that practice i receives from the other practices; therefore,

$\max(\max_{1 \leq i \leq p} \sum_{j=1}^p a_{ij}, \max_{1 \leq j \leq p} \sum_{i=1}^p a_{ij})$ represents the direct effects of the practice with the most directly given and received effects on others.

Step 3: Derive the total relation matrix

The *total relation effects* include both the *indirect effects* and *direct effects*. Since there is a continuous decrease of the *indirect effects* of problems along the powers of matrix Z , the total relation matrix, T , is defined as a $p \times p$ matrix, and I is the $p \times p$ identity matrix. The mathematical equation can be represented, as follows:

$$T = \lim_{k \rightarrow \infty} (Z + Z^2 + \dots + Z^k) = Z(I - Z)^{-1} \quad (3)$$

Step 4: Calculate the total effects and net effects.

Define r and c' as $p \times 1$ vectors as the sum of rows and the sum of columns, respectively, of the total relation matrix T . The mathematical equations can be represented, as follows:

$$r = [r_i]_{p \times 1} = \left[\sum_{j=1}^p t_{ij} \right]_{p \times 1} \quad (4)$$

$$c = [c_j]_{1 \times p} = \left[\sum_{i=1}^p t_{ij} \right]_{1 \times p} \quad (5)$$

The sum r_i shows the *total given effects*, both directly and indirectly, that practice i has on the other practices. The sum c_j shows the *total received effects*, both directly and indirectly, that

all the other practices have on practice j . Thus, the sum $(r_i + c_i)$ gives us an index representing the *total effects* (i.e. prominence) both given and received by practice i . In addition, the difference $(r_i - c_i)$ shows the net effects or the net contribution by practice i on the system. In other word, $(r_i - c_i)$ is defined as the cause and represents the level of influence and being influenced of this specific quality characteristic.

III. METHODOLOGY

Research Procedures for the Improvement of Food Quality of Casual-dining Restaurants

This study reformed the two-stage decision-making model integrating IPGA with DEMATEL, as proposed by Tsai et al. (2011), and used a questionnaire survey for customers' opinions and expert interviews to perform analyses. Firstly, this study conducted a questionnaire survey on customers to obtain information regarding the degree of importance and satisfaction with various food attributes, and calculated the RI and RP. IPGA was applied to determine the quality attributes (i.e. critical factors) requiring improvement. Secondly, After identifying the key factors of customer's perception, by applying IPGA, experts further analyze the critical factors of these practices, as based on their practical experiences and professional judgment, to achieve the cost effective target for resource allocation of food quality of casual-dining restaurants. Therefore, this study further used a DEMATEL questionnaire to investigate cause-and-effect relationships and total effects of various food quality attributes of casual-dining restaurants. Lastly, the analysis results of IPGA (perspective of customers) and DEMATEL (perspective of experts) questionnaires were integrated in order to determine critical food quality factors with the most urgent demand for improvement and for the highest effect of resource investment as reference for improving food quality strategies of casual-dining restaurants.

Measurement

The questionnaire used in this study was developed based on food quality, and the characteristics of food quality, of casual-dining restaurants. The content of the preliminary questionnaire included five major dimensions, visual appeal, taste, cooking, hygiene, and other factors, with 25 items totally. This study mainly investigated the importance and performance of various attributes of food quality, and used a 5-point Likert scale for measurement. The respondents completed the questionnaires anonymously. Before the formal questionnaires were distributed, 50 pre-test questionnaires were distributed to analyze reliability (Cronbach's α). The results showed that the reliability of various dimensions of the questionnaire was larger than 0.7, which suggested that there is internal consistency among the various dimensions (importance and performance). Moreover, regarding expert questionnaire, this study developed the DEMATEL expert questionnaire, as based on the five dimensions of restaurant food quality, and the measurement was separated into four levels (0, 1, 2, 3), labeled "no influence," "low level of influence," "high level of influence," and "extremely high level of influence."

Research samples and data collection

The majority of restaurants in Taiwan are casual dining (USDA, 2012), which suggests that casual-dining restaurants play an important role in the hospitality industry in Taiwan. Taipei City is the largest international city in Taiwan, and in 2011, there were 16,764 restaurants, ranking it the highest in Taiwan (Financial Data Center, Ministry of Finance, Taiwan, 2012), thus, market competition in the hospitality industry will inevitably become more intense in Taipei City. In order to attract customers and maintain sustainable operation, operators in the hospitality industry must provide good food quality. Therefore, the priority of food quality evaluation and food quality resource investment has become an important research issue for casual-dining restaurants in Taipei City.

By customer questionnaire survey, this study selected the customers of 10 casual-dining restaurants in Taipei City as the subjects. A systematic sampling method was utilized to collect the questionnaires. Questionnaires were distributed to customers willing to participate in this research after their dining experience. The questionnaires were distributed once for every 10 customers dining in the restaurants. The questionnaires were distributed for 3 months, from January 1 to March 31, 2012, with 600 questionnaires distributed. After invalid questionnaires (e.g. incomplete questionnaires) were removed, 562 valid questionnaires were returned, for a valid return rate of 93.67%. In terms of expert questionnaire, this study interviewed 12 experts (6 executive chefs of restaurants and 6 scholars that had studied restaurant food quality in Taiwan) as the respondents to complete the DEMATEL questionnaires.

Data analysis methods

The data collected from the questionnaires were analyzed using SPSS version 12.0 for descriptive statistical analysis on the effective questionnaires. Second, this study then assessed the properties of measurement scales for convergent validity and discriminant validity, and constructed composite reliability by confirmatory factor analysis (CFA) using maximum likelihood to estimate parameters. Third, the allocated quadrant of restaurant food quality attributes, with the two dimensional matrix constructed by RI and RP through IPGA analysis, was examined to understand the strategy meaning of food quality attributes of casual-dining restaurants. Through expert questionnaire, this study analyzed the total effects and dependent (cause-effect) relationships among 5 dimensions of food quality of casual-dining restaurants by using the DEMATEL method.

IV. RESULTS

Profile of the respondents

This study selected the customers of 10 casual-dining restaurants in Taipei City as the subjects, and successfully retrieved 562 valid samples. The sample structure distribution is as shown in Table 2. Most of the respondents are females (56.57%), aged 31-40 (34.16%), followed by 21-30 (32.74%), have junior college education (46.98%), are married (50.53%), have an average monthly income of NTD 20,001~40,000 (35.23%), followed by NTD 40,001~60,000 (32.38%), work in the service (34.52%) and manufacturing industries (23.49%), and

have dined in restaurants twice or less (40.93%) or for 3~5 times (38.08%) within the past 3 months.

Table 2 Profile of the respondents

Characteristics	Items	Frequency	Percentage
Gender	Male	266	47.33%
	Female	296	52.67%
Age	Below 20	78	13.88%
	21-30	184	32.74%
	31-40	192	34.16%
	41-50	86	15.30%
	More than 51	22	3.91%
Education	Junior high or lower	57	10.14%
	Senior high or vocational school	152	27.05%
	University or college	264	46.98%
	Graduate school or above	89	15.84%
Marital status	Unmarried	278	49.47%
	Married	284	50.53%
Monthly income (NT\$)	Below \$20,000	54	9.61%
	\$20,001-\$40,000	198	35.23%
	\$40,001-\$60,000	182	32.38%
	More than \$60,001	108	22.78%
Occupation	Student	60	10.68%
	Industrial and commercial industry	132	23.49%
	Service industry	194	34.52%
	Public sector	89	15.84%
	Housewives or retirees	67	11.92%
	Others	20	3.56%
Number of meals within three months	Below 2	230	40.93%
	3-5	214	38.08%
	6-8	86	15.30%
	More than 9	32	5.69%

Reliability and Validity Analysis

In accordance with accepted practice, this study assessed the properties of measurement scales for convergent validity, discriminant validity, and construct composite reliability (CR) (i.e. construct reliability). Table 3 lists standardized coefficient loadings of the confirmatory factor analysis (CFA) results, and construct CR and the average variance extracted (AVE) of food quality scales using customer satisfaction scores of casual-dining restaurants. The measurement model of this study provided a good overall fit with the data (GFI=0.94, AGFI=0.87, CFI=0.97, NFI=0.96, NNFI=0.97, IFI=0.97, $\chi^2/d.f = 2.51$, RMR=0.038, and RMSEA=0.057). Composite reliability (CR) for all dimensions of food quality scales was more than 0.8, respectively. In general, the measurement scales used in this

study were found to be reliable. The average variance extracted (AVE) for all dimensions were more than 0.5, respectively, all exceeding the benchmark of 0.50 for convergent validity (Fornell and Larcker, 1981). Discriminant validity is established if the AVE is larger than the squared multiple correlation (SMC) coefficients between constructs (Fornell and Larcker, 1981). Our results demonstrate that the AVE values for all dimensions were more than SMC coefficients in Table 4. This result indicates sufficient discriminant validity of the five dimensions of restaurant food quality scales in this study.

Table 3 Construct reliability and validity analysis of food quality scales

Dimension	Items	Loading	CR	AVE
A. Visual appeal	1. Alternativeness of cuisine types	0.82	0.84	0.63
	2. Dish plating is beautiful and attractive	0.77		
	3. Dishes served are identical to those in the menu	0.82		
	4. Dishes on the menu are always available	0.79		
	5. Visual appearance meets the specific needs of customers, as possible	0.78		
B. Taste	1. Scent of dishes	0.82	0.84	0.64
	2. Dishes are delicate	0.81		
	3. Overall texture of dishes	0.79		
	4. Taste of dishes	0.81		
	5. The taste of dishes is unique	0.76		
C. Cooking	1. Temperature of cold and hot dishes (drinks)	0.75	0.84	0.65
	2. Color of dishes after cooking	0.84		
	3. Doneness of dishes	0.81		
	4. Tenderness of cooked food	0.81		
	5. Crispness and juiciness of fried food	0.81		
D. Hygiene	1. Hygiene of dishes	0.76	0.82	0.58
	2. Hygienic quality of tableware	0.77		
	3. Personal hygiene of staff	0.79		
	4. Cleanness of dining environment	0.78		
	5. Service process meets hygienic requirements	0.71		
E. Other	1. Freshness of food	0.74	0.82	0.60
	2. Nutritional balance of dishes	0.69		
	3. Side dishes are delicious	0.80		
	4. Alternativeness of seasonings	0.83		
	5. Meal size	0.79		

Table 4 Discriminant validity of the five dimensions of food quality scales

Dimensions	Mean	S.D.	A	B	C	D	E
A. Visual appeal	4.03	0.54	0.63^a				
B. Taste	4.08	0.55	0.52	0.64^b			
C. Cooking	4.07	0.55	0.36	0.51	0.65^c		
D. Hygiene	4.50	0.50	0.02	0.01	0.07	0.58^d	
E. Other	4.05	0.52	0.35	0.38	0.42	0.02	0.60^e

^{a,b,c,d,e} represent AVE of each dimension. Other numbers represent SMC coefficients between dimensions

IPGA Analysis

The IPGA analysis quantified the importance and performance of various food quality attributes of restaurants. The coordinate axes of a traditional IPA matrix were converted into relative importance (RI) and relative performance (RP) to develop the IPGA strategy matrix (Lin et al., 2009). IPGA analysis results of food quality dimensions showed that (as shown in Table 5), the attributes located in quadrant II (Concentrate here) included cooking and hygiene. Those located in quadrant III included visual appeal, taste, and other factors. Therefore, priority should be given to the improvement of cooking and hygiene, followed by taste, visual appeal, and other factors.

Table 5 IPGA analysis of the dimensions of food quality scales of casual-dining restaurants

Dimensions	T-test (P-I)	RI	RP	Quadrant	$D_q(j)$
Visual appeal	-4.03*	0.985	-0.984	III	-
Taste	-4.12*	0.996	-0.975	III	--
Cooking	-6.19*	1.014	-0.993	II	1.081
Hygiene	-10.98*	1.026	-1.059	II	1.414
Other	-4.63*	0.980	-0.993	III	-

*p<0.05

After analysis of food quality through IPGA (as shown in Table 6), various items of food quality were located in quadrant II, including “dish plating is beautiful and attractive” and “dishes in the menu are always available” in the dimension of visual appeal, “dishes are delicate,” “overall texture of dishes” and “taste of dishes” in the dimension of taste, “temperature of cold and hot dishes (drinks),” “color of dishes after cooking,” “doneness of dishes,” and “tenderness of dishes” in the dimension of cooking, “hygiene of dishes,” “hygienic quality of tableware,” “personal hygiene of staff,” “cleanness of dining environment,” and “service process meets hygienic requirement” in the dimension of hygiene, and “freshness of food” in the dimension of other factors, with 15 items totally.

The items located in quadrant III were “alternativeness of cuisine types” and “dishes served are identical to those in the menu” in the dimension of visual appeal, “scent of dishes” and “the taste of dishes is unique” in the dimension of taste, “crispness and juiciness of fried food” in the dimension of cooking, and “nutritional balance of dishes,” “side dishes are

delicious,” and “meal size” in the dimension of other factors, with 8 items totally. Only “visual appearance can meet the specific needs of customers as much as possible” in the dimension of visual appeal and “alternativeness of seasonings” in the dimension of other factors were located in quadrants III and IV.

Moreover, in quadrant II, the larger the value of $D_q(j)$, the higher the priority for improvement (Lin et al., 2009). This study further calculated the distance between various items and the coordinate center (0,1), and the order of the value of $D_q(j)$ from the largest to smallest was “freshness of food,” “personal hygiene of staff,” “hygienic quality of tableware,” “cleanness of dining environment,” “service process meets hygienic requirement,” “color of dishes after cooking,” “hygiene of dishes,” “doneness of dishes,” “temperature of cold and hot dishes (drinks),” “tenderness of cooked food,” “dish plating is beautiful and attractive,” “dishes in the menu are always available,” “dishes are delicate,” “taste of dishes,” and “overall texture of dishes.” The aforementioned order could be provided as reference for the priority improvements to be made to food quality of casual-dining restaurants.

Table 6 IPGA analysis of the items of food quality scales of casual-dining restaurants

Dimensions	Items	T-test (P-I)	RI	RP	Quadrant	$D_q(j)$	Rank
A. Visual appeal	A1	-2.02*	0.957	-0.986	III	--	--
	A2	-5.75*	1.011	-0.989	II	0.943	11
	A3	-5.07*	0.987	-0.986	III	--	--
	A4	-5.66*	1.008	-0.984	II	0.925	12
	A5	-1.11	0.959	0.000	Boundary	--	--
B. Taste	B1	-2.34*	0.987	-0.974	III	--	--
	B2	-5.45*	1.008	-0.977	II	0.919	13
	B3	-4.61*	1.001	-0.970	II	0.898	15
	B4	-4.14*	1.008	-0.965	II	0.908	14
	B5	-3.94*	0.973	-0.989	III	--	--
C. Cooking	C1	-6.25*	1.018	-0.989	II	0.989	9
	C2	-7.81*	1.020	-1.012	II	1.025	6
	C3	-6.74*	1.018	-0.996	II	0.995	8
	C4	-6.22*	1.015	-0.986	II	0.964	10
	C5	-5.31*	0.999	-0.984	III	--	--
D. Hygiene	D1	-10.98*	1.006	-1.081	II	1.008	7
	D2	-8.87*	1.032	-1.027	II	1.161	3
	D3	-12.87*	1.039	-1.078	II	1.286	2
	D4	-11.45*	1.029	-1.066	II	1.156	4
	D5	-9.73*	1.025	-1.044	II	1.097	5
E. Other	E1	-10.83*	1.048	-1.027	II	1.379	1
	E2	-3.97*	0.980	-0.982	III	--	--
	E3	-4.26*	0.978	-0.986	III	--	--
	E4	0.78	0.922	0.000	Boundary	--	--
	E5	-3.00*	0.971	-0.979	III	--	--

*p<0.05

DEMATEL analysis

This study used five dimensions of food quality to perform DEMATEL analysis in order to understand the dependent (cause-and-effect) relationships between the different dimensions of food quality of casual-dining restaurants. Using formulas (1)~(3), the direct-relation matrix is formed from the opinions of 12 experts, and after performing regularization and calculating a direct/indirect-relation matrix, used formulas (4) and (5) to calculate the r_i value of each column and the c_i value of each row. To simplify the relationship of various attributes, this study referred to Cheng et al. (2012) to use the maximum value of the diagonal (1.44) of the total relation matrix T as the threshold value, and deleted the values smaller than [1.44] in the total relation matrix T to re-obtain a new total relation matrix. This study also obtained the total effects ($r_i + c_i$) and net effects ($r_i - c_i$) by the new total relation matrix T, as shown in Table 7 and Figure 2. The results of DEMATEL analysis showed that there was a highly dependent relationship among visual appeal, taste, cooking, and hygiene of food quality. As shown in Table 7 and Figure 2, the dimension with both a high level of prominence (total effects) and cause (net effects) were “visual appeal” and “cooking,” suggesting that these were core dimensions that influenced other dimensions of food quality of casual-dining restaurants. Among them, the total effect of resource investment in cooking (6.09) was the highest. The dimension with both a low level of prominence (total effects) and cause (net effects) were “hygiene” and “taste”. Further analysis, as seen in Figure 2, showed that “cooking” and “visual appeal” would affect each other, “taste” would be affected by “visual appeal and cooking,” and “hygiene” would be affected by “cooking.” Since the total effect ($r_A + c_A = 0$) and net effect ($r_A - c_A = 0$) of “other factors” of food quality scales were very weak, “other factors” could be ignored and regarded as an independent factor.

Table 7 Total effects and net effects of the five dimensions of food quality scales of casual-dining restaurants

Dimensions	total given effects (r_i)	total received effects (c_i)	total effects ($r_i + c_i$)	net effects ($r_i - c_i$)
A: Visual appeal	2.95	1.57	4.53	1.38
B: Taste	0.00	3.02	3.02	-3.02
C: Cooking	4.59	1.51	6.09	3.08
D: Hygiene	0.00	1.44	1.44	-1.44
E: Other	0.00	0.00	0.00	0.00
<i>Mean</i>			3.02	0

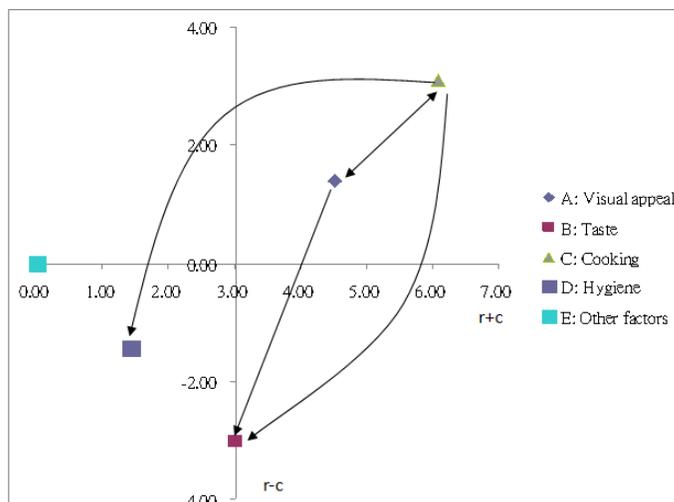


Figure 2 The DEMATEL analysis diagram

V. DISCUSSION AND CONCLUSIONS

The contribution of this study was the integration of the perspective of customers with that of experts to propose a two-stage decision-making procedure for food quality improvement strategies of casual-dining restaurants. Firstly, this study used the IPGA strategy matrix model to investigate the critical factors affecting food quality of restaurants, from the perspective of customers. Secondly, this study further used DEMATEL to determine the effect of resource investment and cause-and-effect relationships of various attributes of food quality in casual-dining restaurants, from the perspective of experts. Lastly, this study integrated the results of IPGA and DEMATEL to determine the critical food quality factors most in demand for urgent improvement and the highest effect for resource investment, and provide such information as reference for operators of casual-dining restaurants to develop food quality improvement strategies, as well as to determine the priority of resource allocation, thus, enabling food quality improvements for casual-dining restaurants to achieve the maximum effect.

In the IPGA model, the dimensions of cooking and hygiene were located in the area of “Concentrate here,” which were factors of high relative importance but low relative performance from the perspective of customers, and were the food quality dimensions most in demand for urgent improvement. This research result is different from the IPGA result of food quality of fine-dining restaurants (Cheng et al., 2011): [hygiene and taste were the dimensions most in demand for urgent improvement], suggesting that the guidelines for food quality improvement strategies of fine-dining restaurants were significantly different from those of casual-dining restaurants. This study presumed that the characteristics and appeals of general casual-dining restaurants focused on low price, convenience, and large meal size. However, they tended to ignore hygiene and taste. Therefore, casual-dining restaurants should give priority to the improvement of cooking and hygiene to improve customers’ satisfaction with food quality of casual-dining restaurants. Moreover, dimensions such as visual appeal, taste, and other factors, were in the area of Low priority, which were factors of low relative importance and low relative performance from the

perspective of customers, and were the food quality dimensions less in demand for improvement. Thus, the operators of casual-dining restaurants do not have to excessively invest resources in improving food quality attributes, such as visual appeal, taste, and other factors, and can adequately allocate investment resources in visual appeal, taste, and other factors to the dimensions of “hygiene” and “cooking,” to meet customers’ needs for food quality of casual-dining restaurants. Furthermore, worthy of note, in the research results of IPGA, none of the food quality dimensions of casual-dining restaurants was located in the area of [Keep up the good work]. The investigation showed that, although the importance of some of the quality dimensions was higher than the average importance, there was no [positive gap (i.e. satisfaction—importance were both>0)] in the dimensions of food quality. Consequently, the food quality of casual-dining restaurants must be continuously improved to increase customers’ satisfaction to a degree higher than importance, in order to develop substantial competitive advantage of food quality.

Among the 25 items of food quality, further IPGA analysis (perspective of customers) showed that a total of 15 items were located in the area of “Concentrate here,” including 2 items in the dimension of visual appeal, 3 items in the dimension of taste, 4 items in the dimension of cooling, 5 items in the dimension of hygiene, and 1 factor in the dimension of other factors. From the perspective of customers, operators of casual-dining restaurants should give priority to the improvement of the 15 items mentioned above. The priority, from the highest to the lowest, was “freshness of food,” “personal hygiene of staff,” “hygienic quality of tableware,” “cleanness of dining environment,” “service process meets hygienic requirement,” “color of dishes after cooking,” “hygiene of dishes,” “doneness of dishes,” “temperature of cold and hot dishes (drinks),” “tenderness of cooked food,” “dish plating is beautiful and attractive,” “dishes in the menu are always available,” “dishes are delicate,” “taste of dishes,” and “overall texture of dishes.” Moreover, a total of 8 items were in the area of Low priority, including 2 items (alternativeness of cuisine types and dishes served are identical to those in the menu) in the dimension of visual appeal, 2 items (scent of dishes and the taste of dishes is unique) in the dimension of taste, 1 item (crispness and juiciness of fried food) in the dimension of cooking, and 3 items (nutritional balance, side dishes are delicious, and meal size) in the dimension of other factors. There was 1 item (visual appearance can meet the specific needs of customers as much as possible) in the dimension of visual appeal, and 1 item (alternativeness of seasonings) in the dimension of other factors, which were located on the boundary between low priority and possible overkill. This study suggested that operators of casual-dining restaurants should not excessively invest resources in the quality items on the boundary between “Low priority” area and “Low priority and Possible overkill” area.

However, the priority for quality improvement, as obtained from IPGA results mentioned above, was from the perspective of customers. In terms of the practical priority of quality improvement, there remains a need to consider the total effect of resource investment and cause-and-effect relationships, in order to obtain actual effect. Therefore, based on the results of the DEMATEL model, this study further found that, among the five

dimensions of food quality of casual-dining restaurants, the dimension of the highest total effect of resource investment was “cooking.” In addition, this critical quality factor had an effect on visual appeal, hygiene, and taste. Moreover, although the total effect of resource investment in “visual appeal” was not the highest, it would also affect “cooking” and “taste.” The results of IPGA and DEMATEL (as shown in Table 8) showed that, casual-dining restaurants should give priority to the improvement of quality attributes of “hygiene” and “cooking,” especially the items in the dimension of hygiene (including “personal hygiene of staff,” “hygienic quality of tableware,” “hygiene of dining environment,” “service process meets hygienic requirement,” and “cleanness of dishes,” with 5 items totally), from the perspective of customers. However, “cooking” was the important factor of the highest effect of resource investment, which can affect food quality dimensions of “visual appeal, taste, and hygiene,” from the perspective of experts. As a result, this study suggested that operators of restaurants should give top priority to “cooking,” in order to achieve better effects in terms of food quality improvement measures. In terms of the improvement of cooking, as the quality of “cooking” (e.g. “temperature of cold and hot dishes (drinks),” “color of dishes after cooking,” “doneness of dishes,” and “tenderness of cooked dishes”) is mainly subject to the professional capacity and skill of chefs, this study suggested that casual-dining restaurants can focus on finding excellent professional chefs to significantly improve the food quality of restaurants. DEMATEL analysis found that, the dependent relationship between “other factors” and the remaining four food quality dimensions were weak, and thus, was regarded as an independent factor, and could not achieve any specific effect.

Table 8 Integrated Strategies for Food Quality Improvement of Casual-dining Restaurants

Methods	IPGA strategy	DEMATEL strategy
Visual appeal	Low priority	Investment with high effect; Cause class
Taste	Low priority	Investment with low effect; Effect class
Cooking	Concentrate here	Investment with high effect; Cause class
Hygiene	Concentrate here	Investment with low effect; Effect class
Other factors	Low priority	Independent factor

VI. RECOMMENDATIONS

The IPGA model not only overcomes the deficiency of the subjective judgment of the traditional IPA, but also combines the concept of quality gap to fully reflect consumers’ expectations, perceptions, and evaluations (Cheng et al., 2012). Moreover, the use of DEMATEL can help understand the effect of resource investment and cause-and-effect relationships among various food quality attributes, and such information can be provided as reference for restaurant operators’ resource investment to achieve the objective of cost minimization. It has been verified that a decision-making model, integrating IPGA with DEMATEL for quality improvement, can be applied to the service quality

improvement of IT and hospitality industries (Tsai et al., 2011; Cheng et al., 2012). However, as food quality improvement strategies of restaurants continue to involve issues concerning [quality gap] and “effective resource allocation,” a decision-making model integrating IPGA with DEMATEL for quality improvement can combine the perspectives of customers and experts to effectively determine the critical factors most in demand for urgent improvement and of the highest effect of resource investment. The research results can be provided as reference for restaurant operators to develop more adequate guidelines for quality improvement strategies and resource allocation. The research results may have a considerable practical contribution and value to the food quality improvement strategies of casual-dining restaurants, which will be beneficial to the enhancement of casual-dining restaurants’ competitiveness in the market, and thus, the development of sustainable operation. Owing to restrictive factors, such as cost and geography, the main research limitations of this study were that only customers in 10 casual-dining restaurants in Taipei City were selected as the subjects, and the opinions from customers in other areas or dining at restaurants of other price levels could not be reflected. Therefore, future researchers are advised to expand the research scope to restaurant customers in different areas and countries, or even use other research methods (e.g. Kano model, ANP), to investigate food quality improvement strategies for restaurants from different perspectives in order to effectively analyze factors affecting the food quality of restaurants.

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Evaluation of different binding materials in forming biomass briquettes with saw dust

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Abstract - Biomass briquettes are often used as an energy source for cooking purpose and in some industries like bricks and bakery. The briquettes are produced by densification of waste biomass using various processes. In this study manual densification of saw dust was tested with three different binding agents; dry cow dung, wheat flour, and paper pulp. The samples with cow dung as binding agent failed with mould detaching and minimum required binder percentage for other two binders for successful forming were found to be 30%. Density of briquettes with 30% binder of wheat flour and paper pulp was found to be 373.7 kg/m³ and 289.8 kg/m³ respectively. Natural drying time was evaluated at 86~89% relative humidity and 25~30°C ambient temperature. The time for achieving 15% moisture content (wet basis) was 55 hours. Compressive strength of the briquettes was tested for binder percentages of 30%, 40% and 50% (dry basis) of wheat flour and paper pulp binders. Results indicated that compressive strength increased with the increase of binder percentage. The briquettes with paper binder exhibited comparatively high compressive strength compared to wheat flour binder. Calorific values of briquettes formed having 30% paper binder and 30% wheat flour binder were found as 18.14MJ/kg and 20.04MJ/kg respectively, whereas the value of pure saw dust was 18.8 MJ/kg. The briquettes formed with paper pulp gave the minimum energy cost, the value being 0.16Rs./MJ.

Index Terms- Biomass briquettes, sawdust, renewable energy, biomass wastes

I. INTRODUCTION

Saw dust is an abundantly available solid waste in Sri Lanka. Large heaps of saw dust are common sight around the saw mills while some are appearing at the environmentally sensible areas such as river basins, estuaries and woodlands. The annual production of saw dust in the country is about 112,000MT which can be used to produce the energy products [1]. One of the suitable energy products is the Densified Biomass Briquette Fuel (DBBF) which can be used for cooking purposes and in industries like brick, tea and bakery. Several DBBF manufacturers are now in Sri Lanka, but they face difficulties with the cost of the briquette due to rising electricity bill. Therefore, manual densification is a suitable process. Therefore, developing a suitable technology for small scale manufacturers who can easily collect saw dust from saw mills produce biomass

briquettes and sell while being in his living area is very important as a self-employment.

The main problem related to the manual densification process is the low pressure, hence low level of agglomeration of biomass particles. In general, pressure exerted on the mould is roughly classified as low pressure (up to 5MPa), intermediate pressure (5-100MPa), and High pressure (above 100MPa). Usually high pressure processes will release sufficient lignin to agglomerate the briquette. Intermediate pressure machines may or may not require external binder materials, depending upon the material whilst low pressure process essentially needs external binder materials. Identification of suitable binder materials in low pressure application was rarely investigated.

Many studies have been reported related to the chemistry behind the bonding of biomass particles. The understanding of binding of saw dust particles requires knowledge of the uniqueness of the wood structure for bond formation. The main components of the wood are the cellulose, hemi-celluloses and lignin. Further, main types of natural binding agents of biomass particles are lignin, protein and starch [2, 3]. The softening temperature of the lignin heavily depends on the moisture content of the raw material. It is around 90~100 °C at 30% moisture (wet basis) and around 130°C at 10% (wet basis) moisture. So, Lignin is not softened at the ambient temperature. Likewise, protein acts as a binder in plasticized state which needs processing at high temperature too. Therefore, in ambient temperature processing, binding agents need to be supplied externally. These binding agents can be made of different materials. The waste materials or readily available materials are the best option for this type of applications for economic feasibility. As far as Sri Lankan situation is considered, cow dung, starch and paper pulp are possible materials.

Drying is the next energy consuming process in biomass briquette making. Moreover, quality of the briquette substantially depends on the method of drying. Drying refers to removal of water from solid by evaporation. This could be achieved through mechanical methods, thermal methods or naturally under atmospheric conditions. Natural drying is the most inexpensive method and it is suitable for the low dense saw dust DBBF.

The objective of this study was to compare different binding materials in the production of DBBF using saw dust under low

pressure, in terms of reliability of the process, the quality attributes of the DBBF and the cost of the product.

I. MATERIALS AND METHOD

A. Collection and pre-treatment of raw materials

1) Base material

Saw dust was selected as the base material, which was taken from the heaps around the saw mills in *Moratuwa* area (Western province of Sri Lanka). Saw dust was sieved with a 2mm mesh and it was then tested for initial moisture content, and recorded as 27.2 ± 2.1 % (dry basis).

2) External Binding Material

Three types of commonly available external binding materials were used.

Dried cow dung: This material is available in the country for commercial purposes. It is easy to transport due to low weight and low stickiness. Firstly, lumps of cow dung were manually disintegrated to small particles. It was then tested for initial moisture content which was 62.8 ± 6.8 % (dry basis). The observed high standard deviation may be due to entrapping of high moisture content in the lumps of cow dung. Cow dung has many foreign particles which were removed before processing.

Newspaper waste: This is again amply available material in commercial level in Sri Lanka. The waste papers were manually torn to small pieces and soaked in water to form a gelatinized paste. Three to five days of soaking in water was required to get a sticky solution.

Wheat flour: Wheat flour was selected as a substitute for the starch. Since wheat flour is a relatively expensive food product, non-edible starch, like wild variety of Capioca could be utilized as energy product in commercial level application. The external binding agents which are derived from biological starch are regulated in EN 14961-2 and, only additives such as corn flour, potato flour or vegetable oil are allowed [4]. Initially, experimental trials were done with gelatinized wheat flour but it was found difficult to process due to stickiness. Therefore, wheat flour was used in powder form.

3) Experimental condition

In order to minimize the energy consumption of the compression process, manually applied pressure and ambient temperature was chosen. Additionally, saw dust was sieved with a 2mm mesh to reduce the energy demand and increase the degree of bonding. Further, natural drying was tested for the DBBF.

B. Equipment

1) Choice of Briquetting Machine:

Peterson press (Figure 1) was used as a densification device. It is relatively simple equipment having hydraulic jack and the frame. Cyclic pressure can be applied on the mould with a lever of the hydraulic jack (Max. 1500kg) until required compaction is obtained.

2) Size and shape of the Briquette and mould

Size of the briquette was selected with compaction geometry, height to Diameter ratio (H/D) being unity, which favours the combustion process [5, 6]. The exact dimensions selected were 35mm length and 35mm diameter. In addition to that, the shape of the briquette was selected as cylindrical for convenience.



Figure1- Peterson press

Size of the mould was 35 mm diameter and 100 mm height which was designed to make a 35mm diameter and 35mm height biomass briquette. A pictorial view of the mould and the hydraulic jack is shown in the Figure 2.



Figure 2 - Mould and briquette

3) Other equipment

Domestic electric grinder/blender was used to crush the coarse particles of saw dust and ground particles were sieved with a 2mm mesh. Calorific value of the raw materials and briquettes were tested by using a bomb calorimeter (Cussons technology). Temperature increment within the calorimeter was measured with thermometer with accuracy of $\pm 0.01^\circ\text{C}$ and within the range of 27°C to 33°C . Furthermore, compressive strength of the briquettes was measured with a compression tester (Siemec 0.55kN Motor, 20kN Load cell).

C. Sample preparation

1) Blending of materials

Uniform distribution of binding materials in saw dust particle is a critical requirement for the proper binding action. Although starch was manually mixed with saw dust, cow dung and paper pulp binders were mixed with the domestic blender. Water was added as a medium to facilitate good mixing. Six samples for each binding agent were prepared with different percentages of binder content, 5%, 10%, 20%, 30%, 40% and 50%, and the rest being the base material.

2) Pressing

The material blends were filled up to the edge of the mould and it was pressed by the Peterson press. The pressure on the mould was recorded by a weighing balance placed under the hydraulic jack. When the lever of the hydraulic jack completed a cycle, the pressure applied on the mould reached the maximum for that cycle and each lever cycle was taken as a pressure cycle.

3) Drying

Resulting DBBF samples were dried in a naturally ventilated room with relative humidity (RH) 86% - 89% and ambient temperature 25°C - 30°C for three days. Weights of the DBBF samples were recorded in each hour which was used to calculate the moisture content of the product.

Finally the samples were kept in an oven at $105\pm 2^\circ\text{C}$ until a constant weight is achieved to determine the moisture content of samples.

4) Density

The density of samples was calculated by measuring the volume and weight. A vernier calliper was used to measure the diameter and the height of a sample and an electronic balance was used to measure the weight.

5) Compression strength

No standard test methods have been established for testing of compressive strength of DBBF. Compressive strength is usually performed to identify the ability of the DBBF to withstand the crushing loads during handling, transporting and storing. It measures the maximum crushing stress of a DBBF before cracking or breaking.

Compressive strength with saw dust DBBF with the paper pulp and wheat flour binders were tested by increasing the

binding agents (30%, 40% and 50%, dry basis) to identify the contribution of the binding agents for the strength of the product.

II. RESULTS AND DISCUSSION

A. Process description

1) Mould detachment

The visual observations made on the stability of the briquette during mould detachment are summarized in Table 1. Saw dust samples with less percentage of binder showed a difficulty in binding the mass together and they were totally disintegrated at 110 kg load (1.12MPa). However, a clear improvement of the binding performance was observed with the increase of binder percentage of wheat flour and paper pulp. The samples made with wheat flour and paper pulp as binder gave stable briquettes when the binder was 30% or above. Further, behaviour of samples of DBBF made with cow dung as the binder was different where the addition of the binder did not give any contribution to the bonding of sawdust DBBF. This observation clearly eliminates the dry cow dung as a binding agent for saw dust. Hence further investigations were done only with the paper pulp and wheat flour binders (30% or more) only.

TABLE 1
VISUAL OBSERVATIONS OF MOULD DETACHING

Binder	Dry binder percentage					
	5%	10%	20%	30%	40%	50%
Cow dung	No	No	No	No	No	No
Wheat flour	No	No	No	Yes	Yes	Yes
Paper pulp	No	No	No	Yes	Yes	Yes

No = Briquettes were disintegrated when detaching from the mould
Yes = Briquettes were easily detached from the mould.

The observation with the binder-less saw dust briquettes proved that the impossibility of activation of natural binding agents such as lignin in the given process conditions. As described by Kaliyan *et al* (2010) lignin is squeezed out from the cell wall only with the elevated pressures (above 150MPa) or at the elevated temperatures [2] (glass transition temperature of lignin is 60°C to 90°C).

Cow dung is thought to be a famous binding material in its fresh form. However, it was revealed that the cow dung has lost this ability in the dry form. It is very hard to interpret this result due to limited information about the variation of composition of cow dung when it becomes old and dry. Starch and paper pulp are possible good binders as both are natural binding agents in biomass structure. The lignin is the major component in the paper pulp where it is broken down from the structure in the pulping process. Gelatinisation of starch during the mixing process also contributed to good binding properties.

2) Cyclic loading

The variation of load applied on the mould during the each compression cycle (sometimes called as compression factor) is presented in Fig 3. In this study a maximum load of 110kg was maintained for all the experiments. The corresponding maximum pressure was 11.43 kg/cm² and it was lower than the previously reported values of manual densification process, 60 kg/cm² [7] and 83 kg/cm² [8].

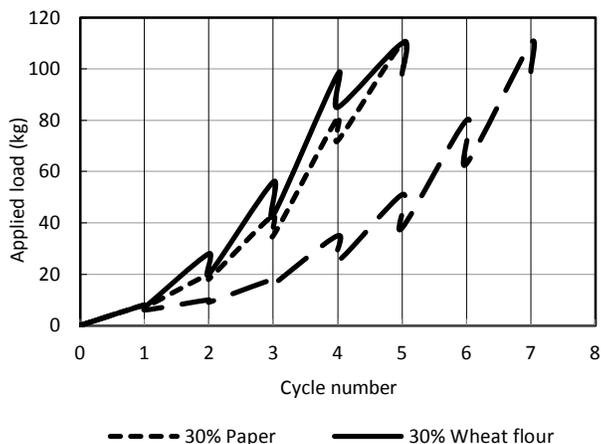


Figure 3 -The variation of applied load on the mould

The load was increased in a cyclic manner corresponding to pressure cycle of the lever. Mould pressure was directly related with the lever position. Pressure was reached to maximum when the lever was at the lowest position and then dropped before starting the next cycle. During the process, water was squeezed out from the holes around the mould. Small time gap was maintained between two pressure cycles to facilitate the squeezing of water out from the briquette. Repetitive pressure cycles were continued until the predetermined maximum load of 110kg was achieved. Number of pressure cycles needed to reach the maximum load was recorded and summarized in table 3.

TABLE 2
FORCE ACTING ON THE MOULD

	Maximum force (kg)	Number of force cycles
Cow dung	110 kg	7
Wheat flour	110 kg	5
Paper	110 kg	5

Table 2 shows that additional two force cycles were needed for the cow dung samples which demonstrates the demand of extra energy for the compression.

Water plays a dominant role in the particle bonding. Some of the added water escapes through the holes around the mould

during the application of pressure and thin layer of water is created around the biomass particles which helped to increase the contact between particles [2]. Therefore, amount of water remains within the briquette is important for inter particle bonding [9]. Final moisture contents of the briquettes were 50.0% (wb) for the samples with wheat 30% and 52.0% (wb) for the samples with paper pulp 30%.

3) Natural drying process:

Figure 3 shows the variation of moisture content of the DBBF with respect to time under natural drying conditions.

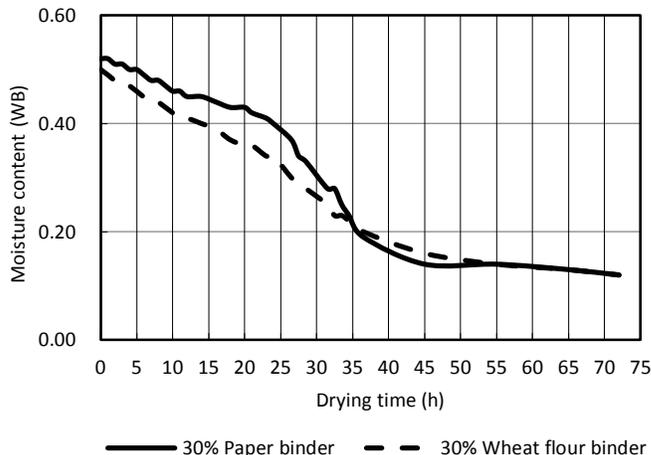


Figure 4 - Natural drying curve of saw dust briquettes

Generally, 20% (Wet basis) moisture content can be achieved over a period of 35 hours and 15% (Wet basis) over a period of 55 hours.

Initially, both paper and starch (30%) DBBF had moisture content (Wet basis) slightly above 50%. This was rapidly decreased in the first 35 hours until moisture content was reached to 20%. After that, slight decrement of moisture content was observed for next 35 hours and at the same time moisture content became stable at the 15% (55 hours from the beginning). More interestingly, both types of DBBF showed the same drying characteristic under same conditions.

The DBBF contained low dense bed of solid which has more water inside the porous structure. This water can exist as either free water in the porous structure, or as bound water. When briquette dries, water first moves from the porous structure until fibre saturation point is reached [10]. Thereafter, bound water may evaporate until the equilibrium moisture content is reached. In this study fibre saturation point of the DBBF was found to be 20% whereas the equilibrium moisture content was 15%. The optimum moisture content of the DBBF should lie within the range of 12% ~ 15% [11]. When the moisture content of the briquette reaches below 12%, low compression strength of the briquette is observed [12]. When it reaches above 15%, low heating value problems and other commercial problems such as pricing and transportation could arise.

Fine surface was observed with the final DBBF products. Surface quality of the briquette is related with the drying behaviour of the biomass solid. As demonstrated by Walker *et al.* (1993), to get the proper surface structure, the movement of moisture from the interior to the surface would equal to the evaporation of moisture from the surface to the environment [9]. If evaporation is too rapid excessively steep moisture gradient will result and this will be accompanied by drying stresses which may cause structural damages. In addition to that, Kaliyan *et al.* (2009) stated that 5% of the durability factors depend on the drying method [12]. Obviously, these favourable conditions were fulfilled by the natural drying process with the absence of forced air and resultant DBBF was free from cracks and fractures.

B. Quality of the DBBF

1) Size and density of the briquette samples:

Density of the briquette was calculated for paper pulp (30%) and wheat flour (30%) DBBF. Average of six samples of each was tested and the results are summarized in Table 4.

TABLE 3
DENSITY OF THE BRIQUETTE

Sample	Average density (kg/m ³) For 6 samples	Average Height (mm) For 6 samples
Wheat flour	373.7±8.3	55±1.8
Paper	289.8±6.5	36±2.1

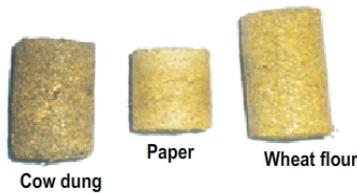


Figure 5 - Pictorial view of hand pressed briquettes

Diameter of the briquette was maintained as 35mm. But heights were varied with respect to the degree of compression at the maximum loading. As per the visual observation, the paper pulp briquettes were more compacted and rigid.

Average density of briquettes was significantly lower than 400 kg/m³ which is generally accepted density level for normal handling and storage without deterioration [9].

2) Compressive strength of DBBF

The contribution of different binding agents for the strength of the DBBF is presented in the Figure 4. As a whole, the compressive strength increased with the increase of the binder percentage. This proved that the binding agents actively contribute to the binding process. Paper binder DBBF showed a higher compressive strength (0.124 N/mm² to 0.238 N/mm²) than wheat flour DBBF (0.032 N/mm² to 0.055 N/mm²). Further, the paper binder DBBF had a remarkable increment (91%) of the compressive strength with the increase of the binder percentage

from 30% to 50% while wheat flour DBBF exhibited 71% increase.

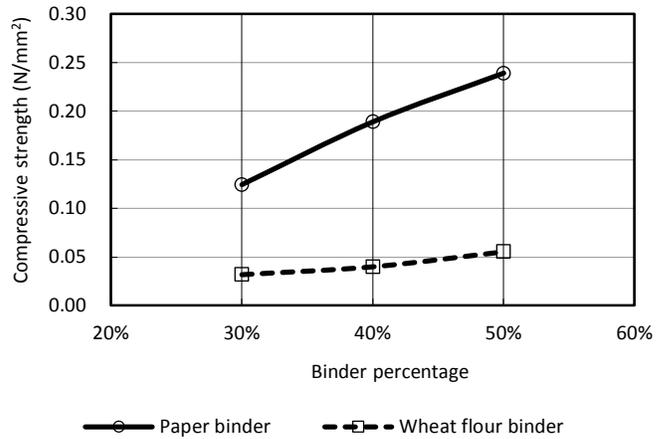


Figure 6 - Influence of binder % on compressive strength of saw dust briquettes

There was no recommended standard on the minimum acceptable level for the strength of the densified biomass [12]. Instead, it depends on the application requirements.

3. Combustion characteristics of DBBF

ASTM D5865 - 11a Standard Test Method for Gross Calorific Value of Coal and Coke was used to evaluate the calorific value of biomass materials with Bomb Calorimeter (Cussons technology). Calorific value (Higher Heating Value) of saw dust (raw material), DBBF with wheat flour (30%) and paper pulp (30%) were tested.

HHV, HHV_d, LHV of saw dust and DBBF were calculated using equation 2, 3, 4 and 5, and values are tabulated in Table 4.

$$W = \frac{m_1 H_1}{\Delta T_1} \dots \dots \dots (1)$$

$$HHV = \frac{\Delta T_2 W}{m_2} \dots \dots \dots (2)$$

$$HHV_d = \frac{HHV}{(1 - M)} \dots \dots \dots (3)$$

$$LHV = HHV(1 - M) - 2.447M \dots \dots \dots (4)$$

- W - Energy equivalent of Calorimeter
- m₁ - Weight of standard benzoic acid
- m₂ - Weight of fuel
- H₁ - Heat of combustion of benzoic acid
- ΔT₁ - Temperature rise in benzoic acid combustion
- ΔT₂ - Temperature rise in fuel combustion
- M - Moisture content of the biomass (wb)
- HHV - Higher heating value determined by the calorimeter

HHV_d - Higher heating value of the biomass in MJ/kg of dry biomass
 LHV - Lower heating value of biomass (MJ/kg dry biomass)

TABLE 4
 CALORIFIC VALUES OF DBBF AND SAW DUST

Material	ΔT	MC	HHV MJkg ⁻¹	HHV _d MJkg ⁻¹	LHV MJkg ⁻¹
Saw dust	2.28	0.28	18.88	26.23	18.20
30 % Paper pulp DBBF	2.19	0.20	18.14	22.67	17.65
30% Wheat flour DBBF	2.42	0.20	20.04	25.05	19.55

ΔT - Temperature increment in bomb calorimeter
 MC – Moisture Content

The calorific value (HHV) of the saw dust was found to be 18.8 MJ/kg at 28% moisture content. This value was found to be decreased in the DBBF with paper pulp and increased with wheat flour. In fact, heating value of briquettes depends on the fixed carbon content, ash content and moisture content [13]. Briquetting is the physical transformation of biomass in to densified product. Therefore, fixed carbon content and ash content remains as the original raw material. Fixed carbon content basically depends on the cellulose content of the selected biomass. Sharma and Mohan (1987) estimated the calorific value of pure cellulose as 17.3MJ/kg [14]. According to the literature, cellulose content of paper is nearly 95% and it could vary with the original wood from which the saw dust is obtained. There is no significant difference between experimental calorific value of 18.8 MJ/kg of saw dust in the present study and the previously reported value of 19.4 MJ/kg [15].

For the moist fuel, heating value decreases because a portion of the combustion heat is used to evaporate the moisture in the biomass and this evaporated moisture has not been condensed to return the heat back to the system. Therefore, an estimation of LHV with the equation 5 was obtained from the measured HHV by subtracting the heat of vaporization of water in the products. According to the study, wheat flour DBBF had the highest LHV which was higher than that of pure saw dust. The paper pulp DBBF showed a LHV slightly less than that of saw dust.

Equation 4 was used to determine the HHV and values were independent from the effect of moisture. Highest value was obtained with the pure saw dust and, calculated values for DBBF were lower than it, which means binding additives has a lower HHV_d than that of saw dust.

4) Comparison of DBBF made out of different binding agents

The binding ability of different binders with saw dust particles depends on the constituents of the saw dust and binder. In general, starch, lignin and water soluble fibre are good binders. Protein acts as a binder at plasticized state which needs processing at high temperature. Even though saw dust contains

40~50% cellulose and 30% lignin [14], activation of lignin cannot be achieved under certain process conditions. Therefore, starch, lignin or water soluble fibres are needed be added externally to increase the bonding of biomass in the briquette.

Firstly, in the pulping process, native cellulose breaks down into small particles. This can be observed with the degree of polymerization where, native cellulose is >3500, cellulose in paper is in the range 600~1000 and hemi cellulose in paper is in the range 500~300[16]. This Cellulose helps to enhance the bonding of saw dust particles in water soluble state. Lignin mainly exists as a binder of cellulose fibres, but in a paper it has separated from Cellulose and freely exists [17]. This lignin plays a dominant role in binding of saw dust particles.

Wheat flour contains 63% starch [18] which acts as a binder. Kaliyan et al. (2009) stated that the native starch has less binding ability than the gelatinized starch [12]. This occurs in the presence of heat and moisture and during the mechanical shearing in the densification process. Although gelatinization is a supportive process for the binding, wheat flour in this form was difficult to mix with the saw dust. Therefore, mixing of wheat flour with saw dust was done before adding water. However, considerable amount of wheat flour was drained out during the briquette densification process.

Cow dung DBBF was broken during the mould detaching proving the less ability of binding of cow dung with saw dust particles. Since, availability of limited knowledge about the change of composition of cow dung during drying process, it is hard to discuss about the binding observation of cow dung.

5) Comparison of sawdust DBBF with international norms

Quality of the DBBF was compared with the recommended values of quality parameters in EN 14961-3 Class B-1.2. (Briquettes made out of residues of wood processing industry). Results are summarized in Table 5. These briquettes industrially made at high temperature and high pressure.

TABLE 5
 COMPARISON OF QUALITY OF DBBF WITH INTERNATIONAL NORMS

Parameter	Measurement	Recommended level	Experimental value
Moisture content	weight % as received	≤ 15	≤ 15
Ash content	weight % dry basis	≤ 3.0	Not tested
Particle density	g/cm ³	≥ 0.9	≤ 0.4
Additives	Additives percentage like starch, corn flour ect...	≤ 2	≥ 30

In order to meet the international norm EN 14961-3, saw dust DBBF is generally made in a high pressure process. Major deviation is particle density (much lower than the standard) and additive percentage (cannot increase 2%). However, moisture content can be achieved to 15% within 55 hours with natural drying process.

C. Comparison of energy cost

Estimation of energy cost was done by considering prices and calorific values of the raw materials. Transport cost, process cost and labour cost were not considered. Table 8 indicates the comparison of energy cost of DBBF (Saw dust briquette with 30% dry binder) with available energy sources in Sri Lanka.

TABLE 6
COMPARISON OF COST OF ENRGY

Raw material	Cost/Price	Energy Content	Energy cost/Price
Saw dust DBBF with 30 % Wheat flour binder (HHV _d)	31.80Rs/kg	25.05 MJ/kg	1.26 Rs/MJ Raw material cost
Saw dust DBBF with 30% Paper binder (HHV _d)	3.75Rs/kg	22.67 MJ/kg	0.16 Rs/MJ Raw material cost
Fuel wood	15 Rs/kg	15 MJ/kg	1.00 Rs/MJ
Electricity	12.5 Rs/kWh	3.6 MJ/kWh	3.57 Rs/MJ
LP Gas	198Rs/kg	45 MJ/kg	2.10 Rs/MJ

This Comparison was done based on the actual pricing in 2012. Electricity prices were taken by Public Consultation Documents on Setting of Tariff for the Period 2011-2015 Sri Lanka.

Saw dust DBBF with 30% dry binder is comparatively cheaper than LP gas and electricity. DBBF with paper pulp binder is the cheapest. However it should be noted that the labour cost was not considered for this comparison.

D. Future recommendations

Briquetting is a sustainable technology for meeting heat energy demand in Sri Lanka. Available biomass residues vary in a big range such as rice straw, hay, tea plantation residues, home garden residues, starch substitutes etc. In order to that, research can be extended to identify different biomass and to examine suitable composition for combination in biomass materials.

Burning characteristics of the briquette in different burners such as boilers, stoves, kiln etc. is different. This research would need to be adapted with the cooking stove developments to enhance the burning characteristics of briquettes.

Milling and mixing is energy consuming processes. Several kinds of manual milling and mixing machines have successfully run in the world, henceforth research can be extended in to that area to enhance the briquette project in Sri Lanka. Apart from that, particle size distribution can be increased above 2mm to find the optimum value.

Quality of the DBBF has standardized in European Union in EC 16940 guidelines for international briquette market. Same way Inland quality standards of DBBF can be developed by

analysing burning characteristics and handling requirements in Sri Lankan context.

Even though availability of raw materials is high, handling and transportations should be improved with the proper technology. Such as, transportation of saw dust can easily achieved by using the packing of saw dust in a Flexible Intermediate Bulk Containers (FIBCs).

E. Economic evaluation

Forest products and agricultural residues are of great importance to Sri Lanka's overall energy supply. Still fuel wood is consumed for 79% of house hold energy requirement in Sri Lanka [19]. The resulting deforestation is a severe problem and would result in a complete depletion of forests within a few decades. Therefore, fuel wood is a limited resource and it is not advisable to depend only on fuel wood. Saw dust DBBF could be an acceptable solution for industrial boilers, furnaces and household applications.

1) Availability

Availability of raw material is an important parameter for economic feasibility. Table 7 shows calculated values with the aid of available data extracted from different sources.

TABLE 7
AVAILABILITY OF RAW MATERIALS IN SRI LANKA

Raw Material	Availability (MT/Year)	Reference
Saw dust	112000	[1]
Cow dung	1159	[16]
Wheat flour (Starch substitutes)	Potential to grow*	[20]
Paper	264000	[20]

Thirty percent of the land in Sri Lanka is under cultivation. The gross extent of land cultivated under major crops in hectares are, paddy 600,000, coconut 395,000, tea 211,000 and rubber 115,000. Other starchy crops such as cassava, cannas, *Immala* could also be cultivated in large scale along with these major crops. However, a proper mechanism for collection of raw materials such as saw dust, waste paper or starch derivatives has to be established.

Availability of saw dust around a major saw mill is about 277.5MT annually. Small scale manufacturers can be located around the saw mill and briquette making could be done throughout the year. Most of the saw mills are located in Moratuwa area and it is near to the capital city Colombo. As an additive, paper waste could be collected from urban areas hence saw dust-paper blend is a feasible option. Since Moratuwa is in the boundary of the *Kaluthara* district which is a high rain fall region non edible yams can be cultivated in this low populated

area, hence saw dust-starch blend is also feasible with availability.

III. CONCLUSIONS

Manual densification of saw dust DBBF is possible with the piston press technology. However, binding agents should be added externally to get the proper binding. Dry cow dung, wheat flour and paper pulp are possible binders and dry cow dung was not suitable for it. Final DBBF was stable and fine surfaced. Since low density of the DBBF, natural drying can be used to dry DBBF. The briquettes with paper binder exhibited comparatively high compressive strength compared to wheat flour binder. Calorific value of briquettes obtained with 30% paper binder was 18.14 MJ/kg and with 30% wheat flour binder it was 20.04MJ/kg.

Energy cost of the saw dust DBBF is low compared to the convectional sources such as LP Gas, fuel wood and electricity. However, external binding agent percentage was quite high (30% or higher). So, initial establishment of raw material supply such as paper waste and starch substitute will need to be addressed for commercial level production.

ACKNOWLEDGMENT

Authors wish to thank The Open University of Sri Lanka for providing the laboratory facilities and NOMA fund program from Telemark University, Norway for the financial assistance.

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A Client-Server Based Architecture for Intruder Detecting and Playing Safety Alarm System

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Abstract- The current world is rapidly growing depending on Information Technology. There is a most concern able issue, which is "Security". Today's world security necessity is extremely higher and sometimes it can be very expensive. Considering the "Security" of our daily life, this paper proposes architecture for physical intruder detecting and playing safety alarm system. In our application design, there is a web cam, which is connected to a client application program. The client application program always informs the server about any kind of bugler attack. Both client and server are connected using a well-established network .i.e. LAN, MAN and WAN. The web cam behaves as sensing device. Basically, it reads the environmental object status. Then image of web cam processes by a motion detection algorithm to detect, if there's any motion or change of that object. This object motion is primary symptom of bugler attack.

Index Terms- Motion detection, bugler attack, intruder detection, safety alarm

I. INTRODUCTION

Ensuring security by costly and important devices are very challenging job. Detecting intruder is also another challenge to stop such criminal activities. The proposed architecture only uses are regularly used devices or easily available devices and added another services to us. So, this architecture is used as a security device. A webcam or CCTV is used to observe the environments of the object to ensure security. It can be set up in a sophisticated place to enhance the security. The system uses the webcam(s) to read the environmental status and if any kind of motion of objects is detected from webcam video image then it makes an alert to inform the environmental changes to the server using LAN, WLAN, MAN, WAN, PAN, intranet, internet etc. The security enhancing policy is simple. Whenever a motion of objects is detected in any client then client will send an appropriate signal to server. Server will save the data to keep the track and at the same time server will send to all clients this message. Then all clients will play alarming sound. The architecture can be used in bank security, home security, office space or sophisticated device security.

II. LITERATURE REVIEW

2.1. Existing Work

Considering our country, we use basically key-lock system, which is defends on mechanical technology and has no proper safety.

2.1.1 Mechanical Lock

A lock is a mechanical fastening device which may be used on a door, vehicle, or container, restricting access to the area or enclosed property. Commonly, it can be released by using a key.

2.1.2 Keycard Lock



Fig. 1. Keycard Lock.

A keycard lock is a lock operated by a keycard with identical dimensions to that of a credit card or driver's license. Keycard systems operate either by physically moving detainees in the locking mechanism with the insertion of the card or by reading digital data encoded on the card's magnetic strip.

2.1.3 RFID signal

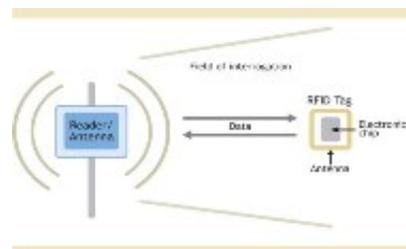


Fig. 2. RFID Signal.

Radio-frequency identification (RFID) is the use of an object (typically referred to as an RFID tag) applied to or incorporated into a product, animal, or person for the purpose of identification and tracking using radio waves. Some tags can be read from several meters away and beyond the line of sight of the reader.

2.1.4 Key Code

A key code is a series of alphanumeric characters to create a key. There are two kinds of key codes: blind codes and biting codes.

2.1.5 Fingerprint



Fig. 3. Fingerprint.

A fingerprint is an impression of the friction ridges of all or any part of the finger. A friction ridge is a raised portion of the epidermis on the palmer (palm) or digits (fingers and toes) or plantar (sole) skin, consisting of one or more connected ridge units of friction ridge skin.

2.1.6 CCTV

Closed-circuit television (CCTV) is the use of video cameras to transmit a signal to a specific place, on a limited set of monitors. It differs from broadcast television in that the signal is not openly transmitted, though it may employ point to point wireless links. CCTV is often used for surveillance in areas that may need monitoring such as banks, casinos, airports, military installations, and convenience stores. CCTV systems may operate continuously or only as required to monitor a particular event. A more advanced form of CCTV, utilizing Digital Video Recorders (DVRs), provides recording for possibly many years, with a variety of quality and performance options. It only stores some events but it cannot play alarm for bugler attack.

Fig. 4. CCTV

III. PROPOSED MODEL

The proposed architecture of intruder detection and safety alarm system modeled on figure 2.

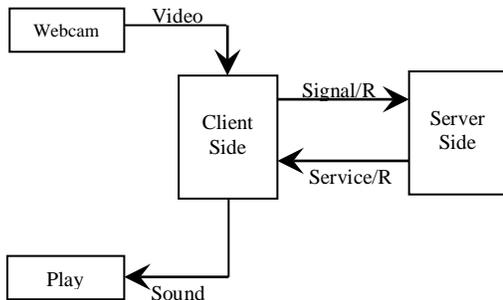


Fig 5. Model of IDPSAS

A webcam read the environmental status as video image, which is processed by client application. Whenever any kind of motion is detected, detected motion is treated as a bugler attack, a signal is sent to server as sign of change of environment. Then server processes the signal and sends a signal to all clients to play the alarm services.

3.1 Client Application

A client is an application or system that accesses a remote service on another computer system. A client does not share any of its resources, but requests a server's content or service function. Clients therefore initiate communication sessions with servers which await (listen to) incoming requests.

3.2 Server Application

In computing, a server [1, 2, 3, 4] is any combination of hardware or software designed to provide services to clients. When used alone, the term typically refers to a computer which may be running a server operating system, but is also used to refer to any software or dedicated hardware capable of providing services.

3.3 Internal Structure of Client-Server architecture

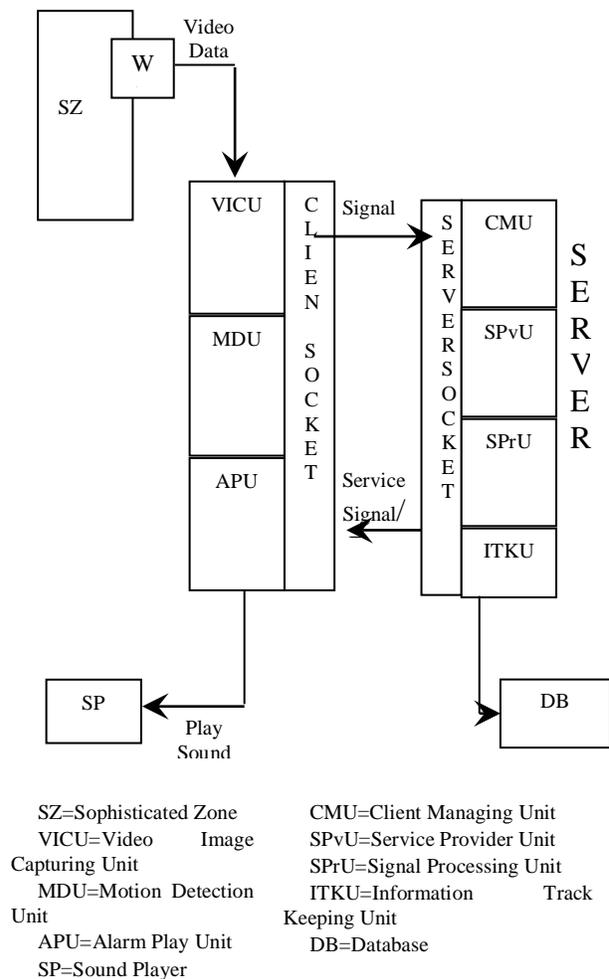


Fig 6. Internal Structure of Client-Server architecture of IDPSAS

This (Fig 6) is extended figure of previous (Simple Model, Fig 5) one. Client section holds Video Image Capturing Unit (VICU), which accepts the webcam captured video image. Motion Detection Unit (MDU), which analyzes the captured video image and find motion detected area. Alarm Play Unit (APU) and there are also some data processing units. Server section holds database and some data processing units. Server also holds clients managing unit. Here, the basic client-server communicating policy is very simple. Whenever any kind of motion is detected at any client side, the buglers attack message is sent to server and server accept this message and take necessary steps. Such as keeping track of buglers attack, informing to each clients about victim clients and request to play the alarming sound for buglers attack.

3.4 Motion Detection

Motion can be detected by measuring change in speed or vector of an object or objects in the field of view. This can be achieved either by mechanical devices that physically interact with the field or by electronic devices that quantifies and measures changes in the given environment.

3.4.1 Motion Detection Algorithmic Steps

Getting the video image data from the webcam [7, 8, 10] and set the reference image for once. Also need to calculate the average intensity. This reference image won't be changed until system termination. Then the newly captured image will be treated and processed as the current image. Here, mentionable thing that reference image will be kept in RBG format.

1. Now, Current image need to convert YUV to RGB for image processing purpose.
2. Calculating average image intensity of current image. This image intensity needs to calculate for each newly captured image by web cam
3. Calculating correction from determined average image intensities (Reference Image and Current Image). This correction value will carry a significant role for normalizing an image. Image normalization needs to eliminate noise effect, light intensity variation and increase the motion detecting performance.
4. Calculating image difference between reference and current image, where calculation contents R, G and B components. This calculation helps to find the significant properties of images. Example: $diff[i][j] = img1[i][j] - img2[i][j]$, this is a simple C syntax to find the image difference.
5. Normalizing R, G and B component by correction.
6. Calculating B/W component of subtracting image. To run any kind of morphological operation on an image, we need to convert it into Black and White image. Example: $eachPixel = \sqrt{((R*R)+(G*G)+(B*B))/3}$, this simple C style syntax.
7. Now finding B\W white image by comparing with threshold value. By using threshold we can separate motion detected region from its background. Example:

```

if diff[i][j] > thresholdValue
    diff[i][j]=255
else
    
```

else

$$diff[i][j]=diff[i][j]$$

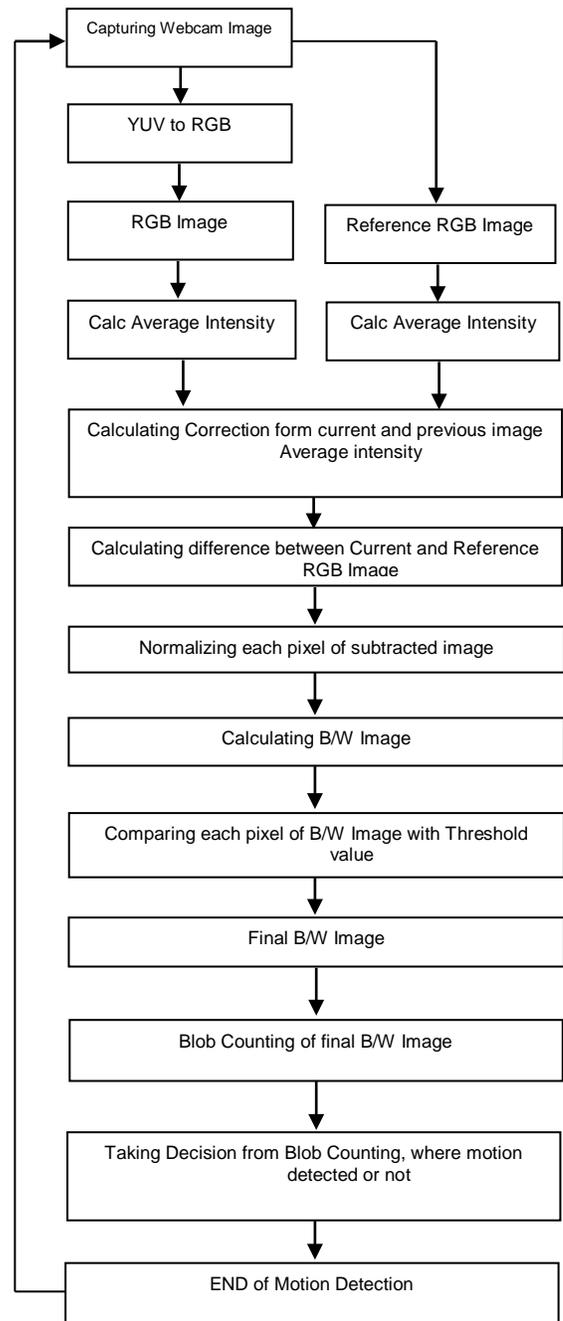


Fig 7: Motion detection Flow

8. BLOB elimination
9. Take decision motion detected or not by comparing BLOB Counting with BLOB threshold

IV. IMPLEMENTATION

Implementation is a phase in the project life cycle in which a product is put into use. It is when a chosen project solution is developed into a completed deliverable. Implementation is also a

term used as a synonym for development.

4.1 Developing Tools

- Language: Java
- JDK 1.6
- JRE 1.6
- JMF 2.1e
- Text Pad
- MYSQL 5.1.36
- Webcam 2MP
- Speaker

4.2 Work Steps

- Server Developing
 - Preparing server socket
 - Client managing unit
 - Messaging processing and other processing unit
- Client Developing
 - Developing webcam accessing unit and video image processing for detecting motion
 - Connecting to server and messaging unit

4.3 System Testing

Testing is an empirical investigation conducted to provide stakeholders with information about the quality of the product or service under test, with respect to the context in which it is intended to operate. System Testing also provides an objective, independent view of the system to allow the business to appreciate and understand the risks at implementation of the application. Test techniques include, but are not limited to, the process of executing a program or application with the intent of finding system bugs.

```
Connection Accepted: localhost
Server Get the Message: Burglaries attempt :localhost
Data Inserted !!
The message send successfully to Tania
Connection Accepted: localhost
Server Get the Message: Burglaries attempt :localhost
Data Inserted !!
The message send successfully to Tania
Connection Accepted: localhost
Server Get the Message: Burglaries attempt :localhost
Data Inserted !!
The message send successfully to Tania
```

Fig. 8. Bugler attack informed to server

This figure states that bugler attract message [12, 14, 16] sends to server from the client application.

```
Client Started: 5555
Connection accepted: localhost
localhost
Alaram Raised
```

Fig. 9. Alam raising by client

This figure shows that client application accept the server request and message for raising bugler attract alarm. Finally,

alarm is raised successfully.

Fig. 10. Running webcam view

This figure represents the webcam images. Black image [Figure: d] represents the subtraction of previous [Figure: b] and current [Figure: c] image. Figure [a] is the initial image.

V. CONCLUSION

We hope that our paper will be a useful and greatly help to its users and it will meet user requirements. It will also be cost effective and maintenance will be less costly. This application supports cross platform. So, Operating system does not matter, where it is running.

ACKNOWLEDGMENT

We would like to thank almighty God who blesses us to finish the work successfully and also thank to anonymous friends for supporting us.

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On the cubic equation with four unknowns $x^3 + y^3 = 14zw^2$

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Abstract- The sequences of integral solutions to the cubic equation with four variables are obtained. A few properties among the solutions are also presented.

Index Terms- Cubic equation having four unknowns with integral solutions.

I. INTRODUCTION

The Diophantine equation offer an unlimited field for research due to their variety [1-2]. In particular, one may refer [3-14] for cubic equation with three unknowns. In [15-18] cubic equations with four unknowns are studied for its non-trivial integral solutions. This communication concerns with the problem of obtaining non-zero integral solutions of cubic equation with four variables is given by $x^3 + y^3 = 14zw^2$. A few properties among the solutions and special numbers are presented.

Notations:

$$t_{m,n} = n\left[1 + \frac{(n-1)(m-2)}{2}\right]$$

$$P_n^m = \frac{n(n+1)}{6}[n(m-2) + (5-m)]$$

$$Pr_n = n(n+1)$$

$$S_n = 6n(n-1) + 1$$

$$So_n = n(2n^2 - 1)$$

$$j_n = 2^n + (-1)^n$$

$$J_n = \frac{1}{3}[2^n + (-1)^n]$$

$$Gno_n = 2n - 1$$

$$CP_n^6 = n^3$$

II. METHOD OF ANALYSIS

The cubic Diophantine equation with four unknowns to be solved for getting non-zero integral solution is

$$x^3 + y^3 = 14zw^2 \tag{1}$$

On substituting the linear transformations

$$x = u + v, y = u - v, z = u \tag{2}$$

in (1) leads to

$$u^2 + 3v^2 = 7w^2 \tag{3}$$

We obtain different choices of integral solutions to (1) through solving (3) which are illustrated as follows:

Choice 1:

$$\text{Assume, } w = a^2 + 3b^2 \tag{4}$$

$$\text{Write '7' as } 7 = (2 + i\sqrt{3})(2 - i\sqrt{3}) \tag{5}$$

Using (4)and(5) in (3) and employing factorization it is written as

$$(u + i\sqrt{3}v)(u - i\sqrt{3}v) = (2 + i\sqrt{3})(2 - i\sqrt{3})(a + i\sqrt{3}b)^2(a - i\sqrt{3}b)^2$$

Which is equivalent to the system of equations

$$(u + i\sqrt{3}v) = (2 + i\sqrt{3})(a + i\sqrt{3}b)^2 \tag{6a}$$

$$(u - i\sqrt{3}v) = (2 - i\sqrt{3})(a - i\sqrt{3}b)^2 \tag{6b}$$

Equating the real and imaginary parts either in (6a) or (6b), we have

$$u = 2a^2 - 6b^2 - 6ab$$

$$v = a^2 - 3b^2 + 4ab$$

In view of (2), the non-zero distinct integral solutions of (1) are

$$x = 3a^2 - 9b^2 - 2ab$$

$$y = a^2 - 3b^2 - 10ab$$

$$z = 2a^2 - 6b^2 - 6ab$$

along with (4)

Properties :

- 1) $3y(6a, a - 1) - x(6a, a - 1) + 32s_a - j_5 - J_2 = 0$
- 2) $2w[a(a + 1), a + 2] - z[a(a + 1), a + 2] - 12[Pr_a + 3Pa^3 + 3a] + 1$ is a perfect square.
- 3) $3y(a^2 + a, a + 3) - x(a^2 + a, a + 3) + 112t_{4,a} + 42(OH)_a \equiv 0 \pmod{70}$
- 4) $z(2b^2 + 1, b) - 2w(2b^2 + 1, b) + 12t_{4,b} + 18(OH)_b = 0$

Note :

In (5), 7 may also be considered as

$$7 = (-2 + i\sqrt{3})(-2 - i\sqrt{3}) \tag{7}$$

For this case, the corresponding integer solutions are given by ,

$$x = -a^2 + 3b^2 - 10ab$$

$$y = -3a^2 + 9b^2 - 2ab$$

$$z = -2a^2 + 6b^2 - 6ab$$

Choice 2:

$$7 = \frac{(5 + i\sqrt{3})(5 - i\sqrt{3})}{4}$$

Write ' 7 ' as (8)

Using (4) and (8) in (3) and proceeding as in choice 1, the corresponding integer solutions are given by

$$x = 3a^2 - 9b^2 + 2ab$$

$$y = 2a^2 - 6b^2 - 8ab$$

$$z = \frac{1}{2}[5a^2 - 15b^2 - 6ab]$$

As our interest is of finding integral solutions, choose a and b suitably so that the solutions are in integers. In particular, the choice a=2A, b=2B leads to the integer solutions to (1) are given by,

$$x = 12A^2 - 36B^2 + 8AB$$

$$y = 8A^2 - 24B^2 - 32AB$$

$$z = 10A^2 - 30B^2 - 12AB$$

$$w = 4A^2 + 12B^2$$

Properties:

$$1) -x[a(a+1), a+2] + y[a(a+1), a+2] - w[a(a+1), a+2] + 8t_{4,a^2} - 8t_{4,a} + 240P_a^3 + 32P_a^5 = 0 \quad 2)$$

$x(a,1) + 3w(a,1) - 8a$ is a nasty number.

$$3) x(a,1) - y(a,1) - w(a,1) \equiv -24 \pmod{40}$$

Choose $a = 2A + 1, b = 2B + 1$ leads to the integer solutions to (1) as

$$x = 12A^2 - 36B^2 + 16A - 32B + 8AB - 4$$

$$y = 8A^2 - 24B^2 - 8A - 40B - 32AB - 12$$

$$z = 10A^2 - 30B^2 + 4A - 36B - 12AB - 8$$

$$w = 14A^2 + 12B^2 + 4A + 12B + 4$$

Properties:

$$1) x(a,1) - 4w(a,1) + t_{10,a} + j_7 + J_7 \equiv -4 \pmod{5}$$

$$2) z(a,3) - t_{22,a} + 23a + 22 + J_6$$
 is a cubical integer.

$$3) x(b+1,b) - y(b+1,b) - w(b+1,b) + 24t_{4,b} - 40Pr_b \equiv 8 \pmod{16}$$

Note:

In (8), '7' can also be written as

$$7 = \frac{(-5 + i\sqrt{3})(-5 - i\sqrt{3})}{4}$$

(9)

For this case, the non-zero distinct are illustrated below,

For the choice $a=2A, b=2B$

$$x = -8A^2 + 24B^2 - 32B$$

$$y = -12A^2 + 36B^2 + 8AB$$

$$z = -10A^2 + 30B^2 - 12AB$$

$$w = 4A^2 + 12B^2$$

For the choice $a=2A+1, b=2B+1$

$$x = -8A^2 + 24B^2 - 24A + 8B - 32AB - 4$$

$$y = -12A^2 + 36B^2 - 8A + 40B + 8AB + 8$$

$$z = -10A^2 + 30B^2 - 16A + 24B - 12AB + 2$$

$$w = 4A^2 + 12B^2 + 4A + 12B + 4$$

Choice 3:

Equation (3) can also be written as $u^2 + 3v^2 = 7w^2 * 1$

(10)

Write '1' as,

$$1 = \frac{(1+i\sqrt{3})(1-i\sqrt{3})}{4} \tag{11}$$

Using (4),(8) & (11) in (10) and employing the method of factorization as in choice 1, the corresponding integral solutions are given by

$$x = 2a^2 - 6b^2 - 8ab$$

$$y = -a^2 + 3b^2 - 10ab$$

$$z = \frac{1}{2}[a^2 - 3b^2 - 18ab]$$

As our aim is to find integral solutions, choose a and b suitably so that the solutions are in integers.

In particular, the choice a=2A, b=2B leads to the integer solutions to (1) are given by,

$$x = 8A^2 - 24B^2 - 32AB$$

$$y = -4A^2 + 12B^2 - 40AB$$

$$z = 2A^2 - 6B^2 - 36AB$$

$$w = 4A^2 + 12B^2$$

Properties:

$$1) x(a-1,1) - 8t_{4,a} - Gao_a - j_4 + 50a = 0$$

$$2) z(a^2, a) + 36CP_a^6 - 2t_{4,a} \equiv 0 \pmod{6}$$

$$3) y(a+1, a) - 8t_{4,a} + 40Pr_a \equiv -4 \pmod{8}$$

The another choice $a = 2A + 1, b = 2B + 1$ leads to the integer solutions to (1) as given below

$$x = 8A^2 - 24B^2 - 8A - 40B - 32AB - 12$$

$$y = -4A^2 + 12B^2 - 24A - 8B - 40AB - 8$$

$$z = 2A^2 - 6B^2 - 16A - 24B - 36AB - 10$$

$$w = 4A^2 + 12B^2 + 4A + 12B + 4$$

Properties:

$$1) x(a, a^2 - 1) + 2y(a, a^2 - 1) + 56[Pr_a + (So)_a] \equiv 28 \pmod{56}$$

$$2) y(b+1, b^2) + w(b+1, b^2) - 24t_{4,b^2} + 80P_b^5 - t_{10,b} \equiv -7 \pmod{17}$$

$$3) x[a(a+1), a+2] + 2y[a(a+1), a+2] + 56(Pr_a + 12P_a^3) \equiv -28 \pmod{56}$$

Note:

In (11), '1' can also be written as

$$1 = \frac{(-1+i\sqrt{3})(-1-i\sqrt{3})}{4} \tag{12}$$

For this case of '1' the corresponding, non-zero distinct integer solutions are illustrated below

For the choice a=2A, b=2B

$$x = -4A^2 + 12B^2 + 40AB$$

$$y = 8A^2 - 24B^2 + 32AB$$

$$z = 2A^2 - 6B^2 + 36AB$$

$$w = 4A^2 + 12B^2$$

For the choice $a=2A+1, b=2B+1$

$$x = -4A^2 + 12B^2 + 16A + 32B + 40AB + 12$$

$$y = 8A^2 - 24B^2 + 24A - 8B + 32AB + 4$$

$$z = 2A^2 - 6B^2 + 20A + 12B + 36AB + 8$$

$$w = 4A^2 + 12B^2 + 4A + 12B + 4$$

Choice 4:

'1' can also be written as,

$$1 = \frac{(1+i4\sqrt{3})(1-i4\sqrt{3})}{49} \tag{13}$$

Using (4),(5) & (13) in (10) and employing the method of factorization as in choice 1, the corresponding integer solutions are given by

$$x = \frac{1}{7}[-a^2 + 3b^2 - 74ab]$$

$$y = \frac{1}{7}[-19a^2 + 57b^2 - 34ab]$$

$$z = \frac{1}{7}[-10a^2 + 30b^2 - 54ab]$$

As our interest is of finding integer solutions, choose a and b suitably so that the solutions are in integers.

By taking $a=7A, b=7B$ leads to the integer solutions to (1) to be,

$$x = -7A^2 + 21B^2 - 518AB$$

$$y = -133A^2 + 399B^2 - 238AB$$

$$z = -70A^2 + 210B^2 - 378AB$$

$$w = 49A^2 + 147B^2$$

Properties:

- 1) $19x(a, a^2 - 1) - y(a, a^2 - 1) + 4802(So)_a \equiv 0 \pmod{4802}$
- 2) $19x(7a - 5, a) - y(7a - 5, a) + 19208t_{9,a} = 0$
- 3) $w(1, b) + 7x(1, b) - t_{590,b} \equiv 0 \pmod{3333}$

Note:

In (13), '1' can also be written as

$$1 = \frac{(-1+i4\sqrt{3})(-1-i4\sqrt{3})}{49} \tag{14}$$

For the choice , the integer solutions are

$$\begin{aligned}x &= -133A^2 + 399B^2 + 238AB \\y &= -7A^2 + 21B^2 + 518AB \\z &= -70A^2 + 210B^2 + 378AB \\w &= 49A^2 + 147B^2\end{aligned}$$

Choice 5:

Equation (3) can be re-written as

$$u^2 - 4w^2 = 3(w^2 - v^2)$$

which is written in the form of ratio as,

$$\frac{u + 2w}{(w - v)} = \frac{3(w + v)}{u - 2w} = \frac{a}{b} \tag{15}$$

which is equivalent to the system of equations,

$$\begin{aligned}bu + av + (2b - a)w &= 0 \\au - 3bv - (2a + 3b)w &= 0\end{aligned}$$

Applying the method of cross multiplication we have,

$$\begin{aligned}u &= -2a^2 + 6b^2 - 6ab \\v &= -a^2 + 3b^2 + 4ab \\w &= a^2 + 3b^2\end{aligned}$$

Substituting the values of ‘u’ and ‘v’ we get the non-zero distinct integral solutions to be

$$\begin{aligned}x &= -3a^2 + 9b^2 - 2ab \\y &= -a^2 + 3b^2 - 10ab \\z &= -2a^2 + 6b^2 - 6ab\end{aligned}$$

Properties:

- 1) $2w(2a, a^2) + z(2a, a^2) - 12(t_{4,a^2} + CP_a^6) = 0$
- 2) $x(2b - 1, b) - 3y(2b - 1, b) - 28bGbo_b = 0$
- 3) $z(a^2, a) - 2y(a^2, a) - 14CP_a^6 = 0$

Choice 6:

(15) can also be written as,

$$\frac{u + 2w}{3(w - v)} = \frac{(w + v)}{u - 2w} = \frac{a}{b}$$

which is equivalent to the system of equations,

$$\begin{aligned}bu + 3av + (2b - 3a)w &= 0 \\au - bv - (2a + b)w &= 0\end{aligned}$$

Applying the method of cross multiplication we have,

$$u = -6a^2 + 2b^2 - 6ab$$

$$v = -3a^2 + b^2 + 4ab$$

$$w = -3a^2 - b^2$$

In view of (2), we get the non-zero distinct integer solutions to be

$$x = -9a^2 + 3b^2 - 2ab$$

$$y = -3a^2 + b^2 - 10ab$$

$$z = -6a^2 + 2b^2 - 6ab$$

Properties:

$$1) y(a, a^2) + z(a, a^2) - 3t_{4,a} + 16CP_a^6 + 9a = 0$$

$$2) x(a+1, a) - 3w(a+1, a) - 6t_{4,a} + 2Pr_a = 0$$

3) $-10y(a, a)$ & $-8x(a, a)$ are perfect squares.

Now instead of (2), writing the linear transformations as

$$x = u + v, y = u - v, z = 4u \tag{16}$$

in (1), it leads to

$$u^2 + 3v^2 = 28w^2 \tag{17}$$

Solving (17) in different ways one obtains other different choices of integer solutions to (1) which are illustrated as below:

Choice 7:

Write '28' as $28 = (5 + i\sqrt{3})(5 - i\sqrt{3})$ (18)

Using (4) and (18) in (17) and proceeding as in choice 1, the corresponding integer solutions are given by

$$x = 6a^2 - 18b^2 + 4ab$$

$$y = 4a^2 - 12b^2 - 16ab$$

$$z = 24a^2 - 72b^2 - 16ab$$

$$w = a^2 + 3b^2$$

Properties:

$$1) x(a, 2a-1) + 6w(a, 2a-1) - 12t_{4,a} - 4t_{6,a} = 0$$

$$2) 6y(6b, b-1) - z(6b, b-1) + 80S_b \equiv 0 \pmod{80}$$

$$3) x[a+1, a(a+2)] + 6w[a+1, a(a+2)] - 12t_{4,a} - 24P_a^3 \equiv 12 \pmod{24}$$

$$4) 6y[1, a(2a^2+1)] - z[1, a(2a^2+1)] + 240(OH)_a = 0$$

5)

Note:

In (18), '28' can also be considered as

$$28 = (-5 + i\sqrt{3})(-5 - i\sqrt{3})$$

For this choice the corresponding non-zero distinct integer solutions are obtained as

$$\begin{aligned}x &= -4a^2 + 12b^2 - 16ab \\y &= -6a^2 + 18b^2 + 4ab \\z &= -20a^2 + 60b^2 - 24ab \\w &= a^2 + 3b^2\end{aligned}$$

Choice 8:

Consider '28' as

$$28 = (4 + i2\sqrt{3})(4 - i2\sqrt{3}) \tag{19}$$

Using (4) and (19) in (17) and proceeding as in choice 1, the integer solutions are as follows

$$\begin{aligned}x &= 6a^2 - 18b^2 - 4ab \\y &= 2a^2 - 6b^2 - 20ab \\z &= 16a^2 - 48b^2 - 48ab \\w &= a^2 + 3b^2\end{aligned}$$

Properties:

- 1) $5x(a,1) - y(a,1) - 28t_{4,a} + 84 = 0$
- 2) $y(2b^2 - 1, b) - 2w(2b^2 - 1, b) + 20(SO)_b + 12Pr_b \equiv 0 \pmod{12}$
- 3) $x[a(a+1), a+2] - 3y[a(a+1), a+2] - 336P_a^3 = 0$
- 4) $z(6a, a-1) + 16w(6a, a-1) + 48(Sa-1) - 1152t_{4,a} = 0$

Note :

In (19), '28' can be written as

$$28 = (-4 + i2\sqrt{3})(-4 - i2\sqrt{3}) \tag{20}$$

By choosing this, the non-zero distinct integer solutions are given by

$$\begin{aligned}x &= -2a^2 + 6b^2 - 20ab \\y &= -6a^2 + 18b^2 - 4ab \\z &= -16a^2 + 48b^2 - 48ab \\w &= a^2 + 3b^2\end{aligned}$$

Choice 9:

(17) can also be written as

$$u^2 + 3v^2 = 28w^2 * 1 \tag{21}$$

Using (14), (19) and (11) in (21) and proceeding as in pattern 1, the corresponding integral solutions are given by

$$\begin{aligned}x &= 2a^2 - 6b^2 - 20ab \\y &= -4a^2 + 12b^2 - 16ab \\z &= -4a^2 + 12b^2 - 72ab \\w &= a^2 + 3b^2\end{aligned}$$

Properties :

- 1) $x[1, a(2a^2 - 1)] + 2w[1, a(2a^2 - 1)] + 20(SO)_a$ is a perfect square.

- 2) $y[6a(a-1),1] + 4w[6a(a-1),1] + 16(S_a - 1)$ is a nasty number.
- 3) $y(b+1, b+2) + 4w(b+1, b+2) - S_b - 2t_{4,b} \equiv 9 \pmod{54}$
- 4) $y[a^2 + a, (a+2)(a+3)] - z[a^2 + a, (a+2)(a+3)] - 1344Pt_a = 0$

Note :

Using (4), (12) and (20) in (21), we have the following set of solutions satisfying (1).

$$x = -4a^2 + 12b^2 + 16ab$$

$$y = 2a^2 - 6b^2 + 20ab$$

$$z = -4a^2 + 12b^2 + 72ab$$

$$w = a^2 + 3b^2$$

Choice 10:

Using (4), (13) and (19) in (21) and employing the method of factorization we have the distinct integer solutions are as follows ;

$$x = \frac{1}{7}[-2a^2 + 6b^2 - 148ab]$$

$$y = \frac{1}{7}[-38a^2 + 114b^2 - 68ab]$$

$$z = \frac{1}{7}[-80a^2 + 240b^2 - 432ab]$$

As our aim is to find integral solutions choose a and b suitably so that the solutions are integers.

Taking $a=7A, b=7B$

$$x = -14A^2 + 42B^2 - 1036AB$$

$$y = -266A^2 + 798B^2 - 476AB$$

$$z = -560A^2 + 1680B^2 - 3024AB$$

$$w = 49A^2 + 147B^2$$

Properties :

- 1) $z(a^2 + a, 2a^2 - 1) - 40x(a^2 + a, 2a^2 - 1) + 38416Pr_a - 76832t_{4,a} Pr_a = 0$
- 2) $7x(b+1, b) + 2w(b+1, b) - 588t_{4,b} + 7252 Pr_b = 0$
- 3) $19x(a, 2a^2 + 1) - y(a, 2a^2 + 1) + 57624(OH)_a = 0$
- 4) $19x(a(a+1), a+2) - y(a(a+1), a+2) + 115248P_a^3 = 0$

Note :

Using (4), (14) and (20) in (21), we have the distinct integral solutions are obtained below

$$x = -266A^2 + 798B^2 + 476AB$$

$$y = -14A^2 + 42B^2 + 1036AB$$

$$z = -560A^2 + 1680B^2 + 3024AB$$

$$w = 49A^2 + 147B^2$$

Choice 11:

(17) can be rewritten as

$$u^2 - 25w^2 = 3(w^2 - v^2) \tag{22}$$

which is written in the form of ratio as

$$\frac{u + 5w}{w + v} = \frac{3(w - v)}{u - 5w} = \frac{a}{b} \tag{23}$$

which is equivalent to the system of equations,

$$\begin{aligned} bu - av + (5b - a)w &= 0 \\ au + 3bv - (3b + 5a)w &= 0 \end{aligned}$$

Applying the method of cross multiplication we have,

$$\begin{aligned} u &= 5a^2 - 15b^2 + 6ab \\ v &= -a^2 + 3b^2 + 10ab \\ w &= a^2 + 3b^2 \end{aligned}$$

Substituting the values of u, v in (16) we get the non-zero distinct integer solutions to (1) to be

$$\begin{aligned} x &= 4a^2 - 12b^2 + 16ab \\ y &= 6a^2 - 18b^2 - 4ab \\ z &= 20a^2 - 60b^2 + 24ab \\ w &= 3a^2 + b^2 \end{aligned}$$

Properties:

1) Each of the following expressions represents the nasty number.

$$\begin{aligned} \text{a) } & 3\{x(a, 2a^2 + 1) + 4w(a, 2a^2 + 1) - 48(OH)_a\} \\ \text{b) } & 6y(b^2 + b, b) + z(b^2 + b, b) + 224P_b^5 - 2b^4 \\ \text{c) } & 3\{x(a, a^2 + a) + 4w(a, a^2 + a) - 32P_a^5\} \end{aligned}$$

2) $6w(2b^2 - 1, b) - y(2b^2 - 1, b) - 4(SO)_b$ is a perfect square.

Choice 12:

(23) can also be written as

$$\frac{u + 5w}{3(w + v)} = \frac{(w - v)}{u - 5w} = \frac{a}{b}$$

which is equivalent to the system of equations,

$$\begin{aligned} bu - 3av + (5b - 3a)w &= 0 \\ au + bv - (5a + b)w &= 0 \end{aligned}$$

Applying the method of cross multiplication we have,

$$\begin{aligned} u &= 15a^2 - 5b^2 + 6ab \\ v &= -3a^2 + b^2 + 10ab \\ w &= 3a^2 + b^2 \end{aligned}$$

In view of (16) we get the non-zero distinct integer solutions to (1) are

$$\begin{aligned} x &= 12^2 - 4b^2 + 16ab \\ y &= 18a^2 - 6b^2 - 4ab \\ z &= 60a^2 - 20b^2 + 24ab \\ w &= 3a^2 + b^2 \end{aligned}$$

Properties:

- 1) Each of the following expressions represents a perfect square:
 - a) $2y(a, a)z(a, a)$
 - b) $x(a + 1, a) + t_{4,a} - 16Pr_a + 4$
- 2) $x(a, a)$ and $4w(a, a)$ represents nasty numbers.

III. CONCLUSION

One may search for other Choices of solutions and their corresponding properties.

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A Secure Intrusion Detection on Clustered Heterogeneous MANET

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Abstract—Mobile Ad hoc NETWORK (MANET) have been now seen as the advancement of network models. It involves mobility and hierarchy of network elements on its positive side. The two different parameters of prime importance in MANET are energy efficiency and security. This paper proposes the idea of combining these two factors. It involves a novel idea of dynamic re-clustering to address energy efficiency. Security have been incorporated in data transmission stage by a secure intrusion detection algorithm. Compared to conventional approaches the combination of these two ideas have improved the performance parameters without affecting network performance.

Keywords—MANET; Security; Energy efficiency; Re-clustering; Clustering Algorithm

INTRODUCTION

In the next generation of wireless communication systems, there will be a need for the rapid deployment of independent mobile users. Significant examples include establishing survivable, efficient, dynamic communication for emergency/rescue operations, disaster relief efforts, and military networks. Such network scenarios cannot rely on centralized and organized connectivity, and can be conceived as applications of Mobile Ad Hoc Networks. A MANET is an autonomous collection of mobile users that communicate over relatively bandwidth constrained wireless links. Since the nodes are mobile, the network topology may change rapidly and unpredictably over time. The network is decentralized, where all network activity including discovering the topology and delivering messages must be executed by the nodes themselves, i.e., routing functionality will be incorporated into mobile nodes.

The set of applications for MANETs is diverse, ranging from small, static networks that are constrained by power sources, to large-scale, mobile, highly dynamic networks. The design of network protocols for these networks is a complex issue. Regardless of the application, MANETs need efficient distributed algorithms to determine network organization, link scheduling, and routing. However, determining viable routing paths and delivering messages in a decentralized environment where network topology fluctuates is not a well-defined problem. While the shortest path (based on a given cost function) from a source to a destination in a static network is usually the optimal route, this idea is not easily extended to MANETs. Factors such as variable wireless link quality, propagation path loss, fading, multiuser interference, power expended, and topological changes, become relevant issues. The network should be able to adaptively alter the routing paths to alleviate any of these effects. Hence, nodes prefer to radiate as little power as necessary and transmit as infrequently

as possible, thus decreasing the probability of detection or interception.

In IEEE 802.11 based MANET, it includes over-the-air modulation techniques that use the same basic protocol. The most popular are those defined by the 802.11b and 802.11g protocols, which are amendments to the original standard. 802.11-1997 was the first wireless networking standard, but 802.11b was the first widely accepted one, followed by 802.11g and 802.11n. Security was originally purposefully weak due to export requirements of some governments, and was later enhanced via the 802.11i amendment after governmental and legislative changes. 802.11n is a new multi-streaming modulation technique. Other standards in the family (c-f, h, j) are service amendments and extensions or corrections to the previous specifications.

RELATED WORK

A. Inter node Communication in MANET.

Wireless communication has improved the span of communication in every sense. This have seen further advancement with the introduction of MANET. But the problem with the MANET comes when there is packet loss, collision and energy loss. So we have introduced the idea of clustering. Clustering basically defines the process of grouping the nodes based on some parameters. It may be energy, geographical deployment, proximities or may be a random selection. We will be selecting some of the nodes as cluster heads. After that we will be defining some dependent nodes for the cluster heads.

Once we have done that the dependent nodes (General nodes) will be communicating with their respective cluster heads and cluster heads will be communicating with the server. This will reduce the packet loss as it have some sort of definition for the network. Despite of its advantages the major problem that occurs will be, performance of a set of General nodes will solely depend on the state of the cluster head. If there is some kind of misbehavior from any of the cluster head, it will affect the entire network.

So to address that issue we have introduced the concept of re-clustering. We can take any of the network parameter as a base for network re-clustering. This process will further improve the network attributing to the malicious behavior. After that by including the further stages of intrusion detection will further make network strong to attack. Dynamic rerouting mechanism are also introduced in to make secure packet transfer

B. Clustering and Routing

Even though the idea of clustering is there long ago. Many of them were theoretical proposals, some of them

involved additional network nodes, many had a pre defined hierarchical structure and some of them where mathematical analysis. All these had some vast differences between proposed performances and the obtained performance metric, it was very hard to achieve improvement. It had a problem that it never addressed any other issues like packet loss and performance of the cluster head.

We found that energy and distance between the server node can be taken as the most two reliable parameters for the purpose of cluster head selection. Basically with these kind of clustering we found that DSR or Dynamic source routing is the best method. In DSR routing is done at source node itself. This will make the process as we are earlier aware about cluster head and server node.

SECURE HETEROGENEOUS MANET

There are two things defined here. First one is the defining the network model on to which we can implement the research, the second will be the algorithm which is proposed algorithm which implements the re-clustering and securing the network.

C. Network Model

Network elements consists of heterogeneous elements ranging from cellular phone to big servers which rely on same mode of packet transfer. In other sense it must follow same MAC protocol. The version of MAC protocol that have been incorporated here is IEEE 802.11 which includes over the air modulation standard. It generally deals with a set of specification in both MAC and PHY layer for over the air modulation in wireless networks. The latest of which is IEEE 802.11 ac which uses OFDM modulation techniques which is being supported in almost all bands

D. Algorithm

The proposed algorithm deals with step by step implementation ranging from study of network topology to re-clustering.

- Step 1 : Initial topology discovery of the network elements and noting down its geographical deployment energy level and distance factor between them.
- Step 2 : Selecting (N) cluster head based on the energy and distance between the server node and general nodes.
- Step 3 : Sending a advertisement message from cluster head to dependent nodes.
- Step 4 : Sending discovery packets to make sure all nodes have been classified under some cluster head.
- Step 5: Packet transmission phase starts. initially the dependant nodes to respective cluster heads after that cluster heads to server nodes.
- Step 6 : Securing network with detecting malicious behavior.

- Step 7: If time reaches a particular value (T1) Cluster head re election occurs based on the distance and energy parameters.
- Step 8 : Steps 2 to Step 7 are repeated for infinite number of times.

ANALYSIS

E. Network analysis

1) *Topology Discovery*: It basically deals with identifying the initial geographical co-ordinates of the network node element. The density, inter node distance etc are the factors that require prime importance while deciding the number of cluster heads.

Basically we will be dividing a region based on the factor density of node in a particular area. We will be defining a square geographical area of L meter length and B meter breadth. We will be also consider a factor of limiting N1 number of nodes in each clusters.

2) *Cluster head re-election*: Once residual energy is considered we will be going for the distance between the cluster heads as the second factor of distance between the cluster heads and the server node ie Base station.

3) *Securing the network*: Securing the networks are basically implemented at data transmission stages. It have the phase of detecting malicious node by detecting some parameter by packet drop counter. Once we have done that there requires a re-routing of packet once in a while to avoid the malicious node from in between. When we implement these two things, we can assure that network will be secure.

F. Data transmission analysis

We can take any of the available performance metric for data transmission analysis. We will consider the below mentioned parameters.

1) *Packet size*: Packets are the fixed-size chunks of data that transfer requests and results between clients and servers. The default packet size set by SQL Server is 4,096 bytes. If an application does bulk copy operations, or sends or receives large amounts of text or image data, a packet size larger than the default may improve efficiency because it results in fewer network read and write operations. If an application sends and receives small amounts of information, the packet size can be set to 512 bytes, which is sufficient for most data transfers. We will doing comparative study of 128 bytes, 256 and 512 bytes of data.

2) *Packet Delivery Ratio*: Packet delivery ratio is the ratio of the number of delivered data packet to the destination. This illustrates the level of delivered data to the destination.

This is the most important one because this defines about the loss of data packets. Secure a reliable data transmission has a factor of PDR as its performance metric. We will be taking no of packets dropped to get the instance at which such a loss has occurred by monitoring in order to address the issue at a particular instant.

3) *Residual Energy*: This can be defined as the remaining energy generally attributed to remaining battery power. This is a factor of work load of each node. This has direct dependency towards work done. Considering the case when a cluster nodes have huge number of packet transfer, the respective cluster head will drain. This can in turn lead to loss of data packets which has been routed through the cluster head. This makes it an important factor to monitor energy at regular intervals.

EVALUATION

G. Simulation Environment.

Simulation environment is as shown in Table I. Basically we will be using NS-2 as simulation software as it has 80 % similarity when it is implemented in real time. NS2 is an open source software which can support the conditions attributed in the given project.

H. Simulation Configuration

We will be doing a simulation for about 45 seconds for the data packet sizes of 128 bytes, 256 bytes and 512 bytes. We will be doing performance metric analysis of all these things. Each of the parameters have been plotted separately as shown in the adjacent figures. The performance parameter are denoted below as the figure names. A study on this figures will be the inference from the simulation

TABLE I SIMULATION ENVIRONMENT

SIMULATION PARAMETER	VALUE
Channel type	Channel/Wireless channel
Radio propagation model	Propagation/Two ray ground
Network interface type	Phy/Wireless phy
MAC Type	MAC 802_11
Interface Queue Type	CMUPriqueue
Link Layer Type	LL
Antenna Model	Antenna/Omni Antenna
Maximum Packet in Queue	300
Routing Protocol	DSR
X-Co-ordinate	450
Y-Co-ordinate	450
Number of Nodes	37
Number of Source nodes	30
No of Destination node	1
Initial Energy	100

Fig. 1. Packet Drop for 128 bytes.

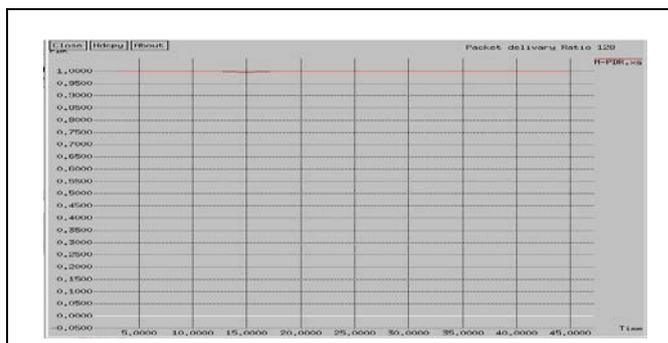


Fig. 2. Packet Delivery Ratio for 128 bytes.

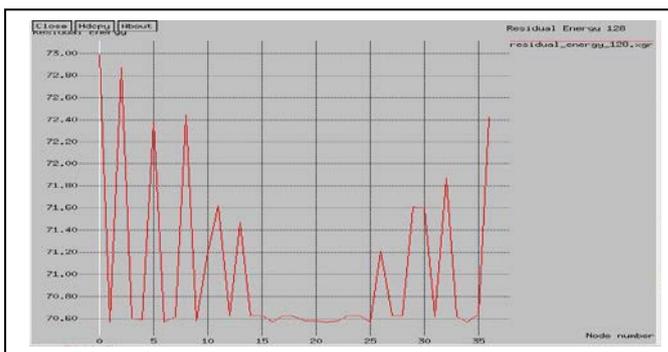


Fig. 3. Residual Energy for 128 bytes.

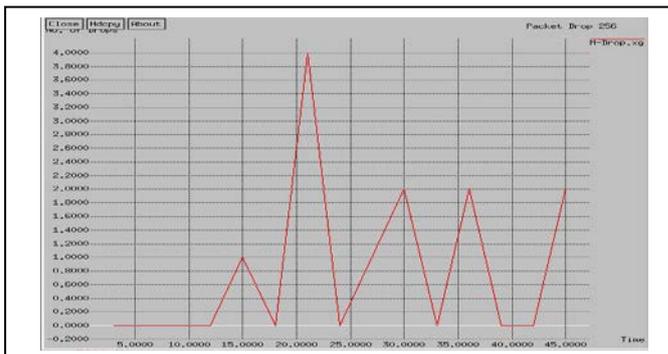
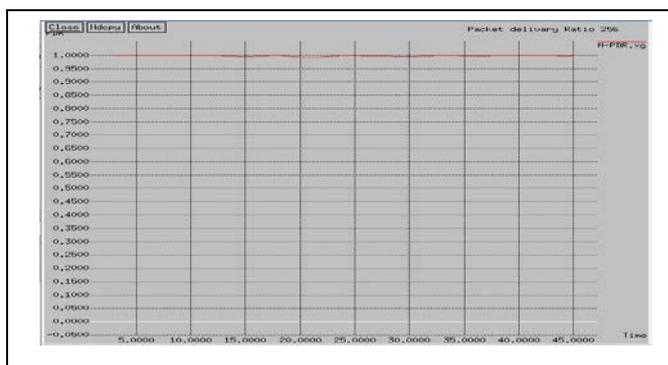
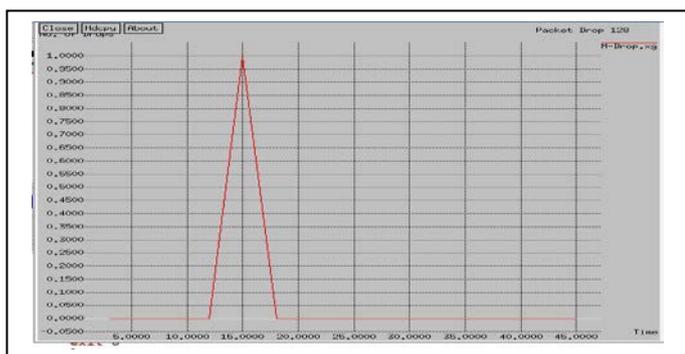


Fig. 4. Packets Drop for 256 bytes.



|||

Fig. 5. Packet Delivery Ratio for 256 bytes.

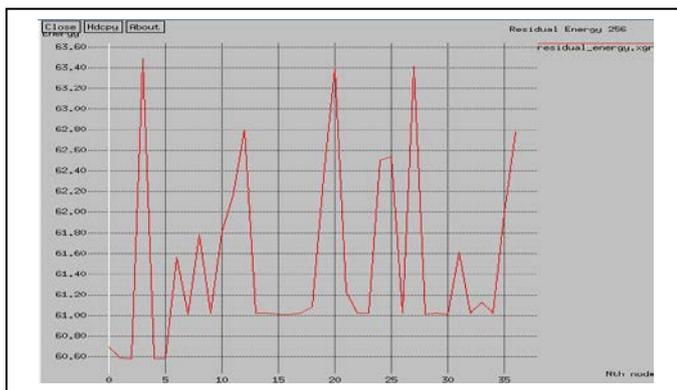


Fig. 6. Residual Energy for 256 bytes.

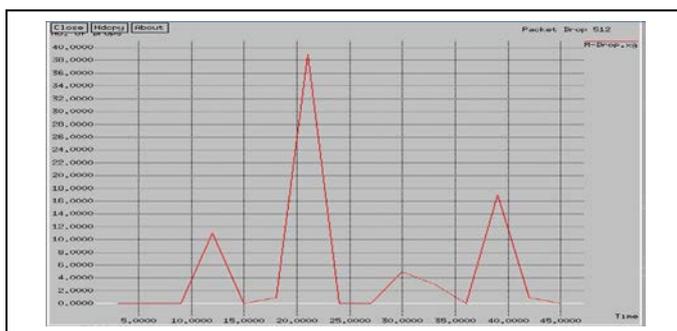


Fig. 7. Packets Drop for 512 bytes.

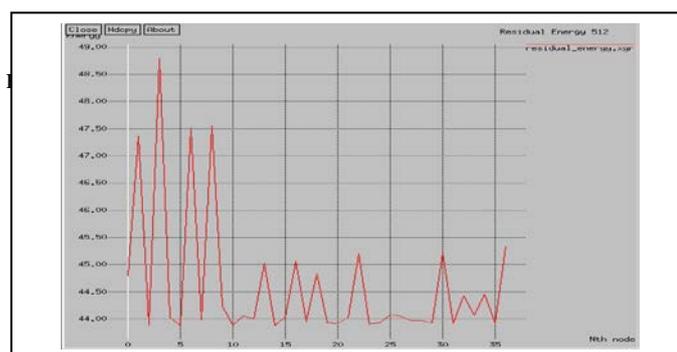
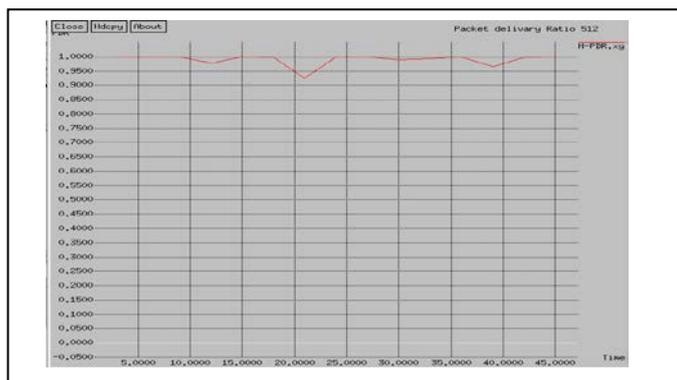


Fig. 9. Residual Energy for 512 bytes.

CONCLUSION AND FUTURE WORKS

As a future work we can aim at securing the network again with some hybrid cryptographic techniques and doing study on some evident attacks.

We have concluded that after the implementation of the algorithm there has been a uniformity in the energy drop which is evident from residual energy plot. PDR and Packets dropped has been decreased as the packet sizes increases from 128 bytes to 512 bytes.

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Use of Internet Resources by Marine Scientists in south India: A Study

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Abstract- Library resources are prevalent on the Internet, like e-formats such as e-books, e-journals, periodical indexes, reference sources and Indian Government documents are available by Telnet, Google, Yahoo, Rediff, World Wide Web and FTP etc., moderately few copyrighted library resources are available freely on the Internet. The main aim of this paper is to create awareness and usage of Internet resources for marine science scientists. Also highlights consistent growth of the frequency of usage various kinds of Internet resources and usefulness of their Internet information sources, search strategy, and ranking of internet search engines for ease of accessibility of the information through Internet.

Index Terms- Internet; Library resources; Marine Science Scientists; South India.

I. INTRODUCTION

The advent of the Internet, as some skeptics predicted, has not meant the end of libraries and traditional library resources. The library catalogues, books, journals, reference works, periodical indexes, and so forth, are all here, just available in somewhat different forms; and they are on the Internet in strikingly large numbers. In fact, the Internet has increased the vitality of and accessibility to library resources. The format-paper vs electronic are not important as the information contained by the sources and how useful and usable that resource is (Nancy L. Buchanan, 1995).

Internet is considered as a great information source to the academic and research groups and also a great information tool to the library and information centers to supplement their information support to the scientists/faculties.

II. NEED FOR THE STUDY

Internet facility has been operation in marine science research and development institute libraries in south India. The researcher conducted a survey "use of Internet information resources and services by marine scientists in south India". But this survey has been necessitated as the situation today has vitally changed. The internet browsing facility, establishment of internet, labs marine science research and development centers and originating vitally different types of information sources and services, types of information search engines.

This survey has particularly in necessitated in marine science research libraries to access benefits of internet.

III. SCOPE AND LIMITATION OF THE STUDY

This research study is confined to the study of Internet resources and services with special reference to Marine scientists. Geographically it is bounded to the departments of Marine Science, Fisheries Colleges and Marine Science Research Institutions affiliated to Central Institute of Fisheries Education (CIFE) and Indian Council of Agricultural Research Institute (ICARI) Mumbai, India with special reference to South India. The study covers four states that include Karnataka, Andhra Pradesh, Tamil Nadu and Kerala.

IV. OBJECTIVES OF THE STUDY

The following are the major objectives of the present study:

1. To study in detail about Internet resources and facilities available in Marine Science Libraries.
2. To find out the most preferred access point for searching of Internet resources.
3. Determine the purpose and utilization of Internet resources by scientists.
4. To find out rank the importance of Internet resources.
5. To identify the user's satisfaction level of Internet resources.
6. To trace out the difficulties of Scientists in obtaining information by the Internet.
7. To suggest suitable measures to develop the collection of Internet resources.

V. METHODOLOGY

As the study is confined to the Marine Science Research Institutions/Universities/Fishery colleges affiliated to the Indian Council of Agriculture Research (ICAR), Central Institute of Fisheries Education (CIFE) and the Oceanographic Research Centers, Council of Scientific and Industrial Research (CSIR) Institutions in India, The questionnaire method has been adopted. Further primary and secondary sources also have been used to collect the necessary information.

The research schedule was designed in two phases; the first schedule meant for users comprising scientists, and the second schedule for librarians of marine science research institutes in south India.

5.1 Method of data collection

A structural questionnaire was developed for the purpose of data collection and distributed. Some are distributed personally, some are by post and some are through e-mail among the

marine scientists in the selected CSIR institutions. 373 questionnaires were distributed, out of which 239 questionnaires were received back with the response rate being 64%. The questionnaire covered five basic areas namely, users characteristics such as age, levels of education, field of specialization, institution affiliation and purpose of current research, strategies of seeking information, use of the libraries/information centers, and suggestions for the improvement of the existing information systems.

Table 6.1. Institution and Gender wise distribution of Respondents: Scientists

Table 6.2. Types of Information Sources Accessed on Internet: Scientists

VI. RESULTS AND DISCUSSION

6.1 Distribution of library users by Gender/Designation

To ascertain the use of e-resources by university faculties of marine sciences departments and marine science research institute scientists, fisheries sciences, data has been collected from different categories of scientists and faculties.

Table 6.1, figure 6.1 clearly show the institution wise and gender wise distribution of scientists. The sample population used in the present study contains more number of male scientists (68.2%) than female scientists (31.8%).

Internet carries a vast array of information resources and services, most notably the interlinked hypertext documents of the www. It has become the best source of information as there is nothing on which you cannot find any information by browsing Internet, whether about science, technology, mathematics, history, sociology, medicine, sports, music, jobs etc. So Internet is not just a source of information, it is the best source of information for any field of study and research. Therefore respondents were asked to mention the extent of use of different Internet resources. The tabulated data is given in Table 6.2, and

Figure 6.2. It is found from Table 6.2 that a huge number of scientists accessed research articles (96.7%) and research reports (94.6%) with WA 1.03 and 1.09 respectively. These sources are followed by research abstracts (77.8%) and information on training/conferences/seminars (45.2%).

It may be summarized after looking at Table 6.2, that information sources on bibliographical information, career planning/ higher education, placement and job opportunities and software based information are less used information sources by scientists.

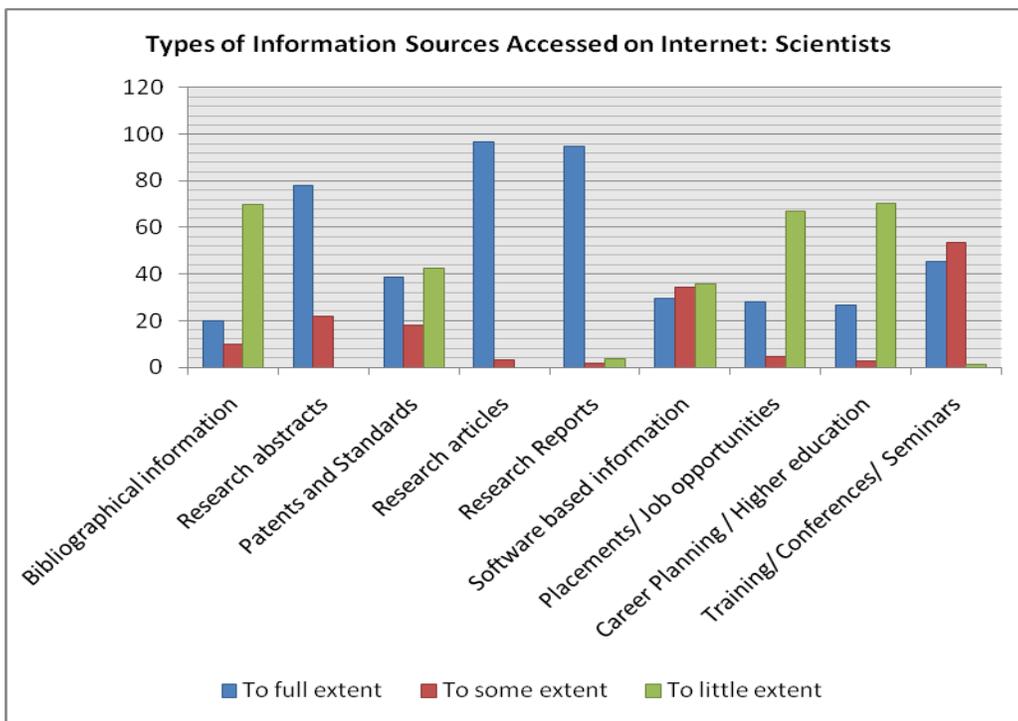


Fig. 6.2. Types of Information Sources Accessed on Internet

Table 6.3. Frequency of Use of Various Internet Services: Scientists

Internet is a wonderful source of information and it offers a verity of services. To elicit information, the respondents were asked to mention the frequency of use of Internet sources and services. Table-6.3, and figure 6.3, Data reveals that a large number of scientists used www (95%) and e-mail (69.9%) most frequently. Quite a good number of scientists also used discussion forum (47.3%) frequently and occasionally news groups (41.8%).

One can also observe from table-6.3 that a large number of respondents i.e. in the range of 60% to 90% never used freeware/shareware, Gopher, Telnet and FTP. The reasons for under utilization of these services would be either a need does not arise or lack of knowledge about these services. So the result of the study demands to bring awareness about these sources and services to exploit for their information need.

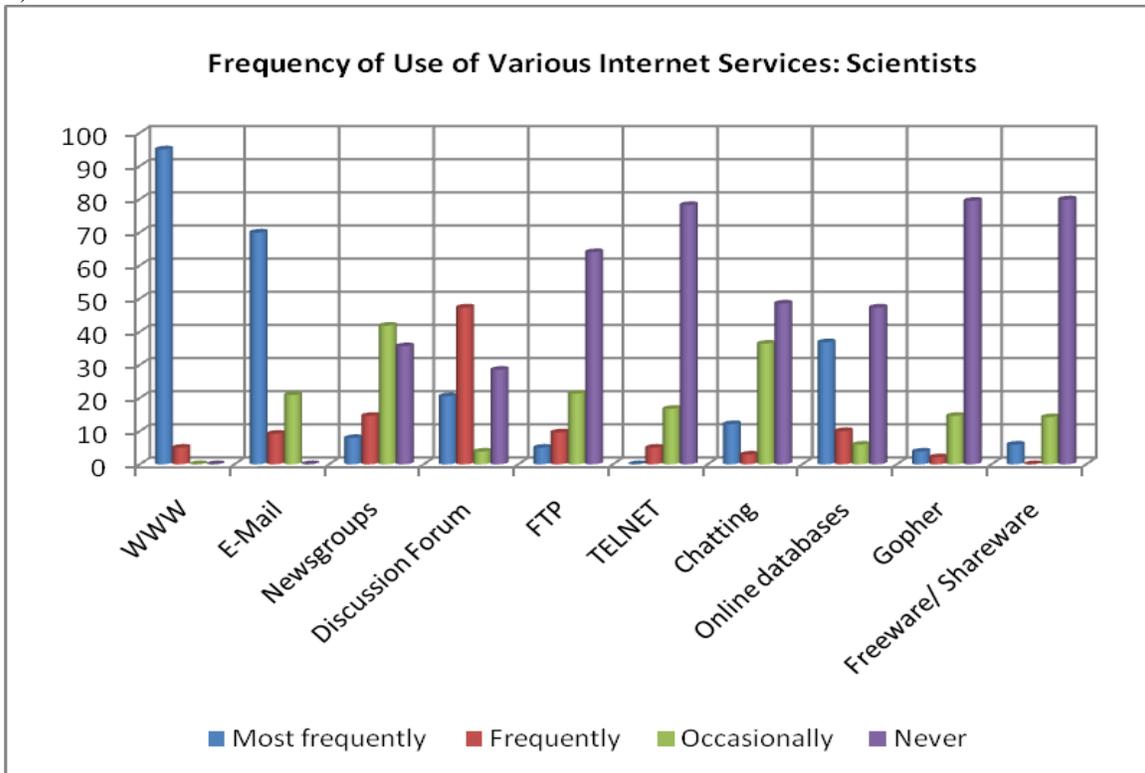


Fig. 6.3. Frequency of Use of Various Internet Services

Whereas Jagboro (2003), Ajuwon (2003), Honauer (2004) and Rajiv Kumar and Kaur. A's (2006) study reveals that e-mail is chosen as the most popular service and being used by nearly total population under study. Studies by Babu, Markwei, Ojedokun Owolabi, Mishra, Sathyanarayana (2001), Kaur (2002) and Biradar .B.S and Sampath Kumar (2005) confirm similar findings. Marginal difference could be found regarding the use of Internet by faculty members in comparison with the present study.²⁻¹⁰

Table 6.4. How would you Describe Internet: Scientists

The perception of Internet technology by the scientists is shown in Table 6.4, and Figure 6.4. For each particulars four point scale is used indicating one as strongly agree, two-agree, three-partially agree and four-never. The strong perception is that Internet is a wealth of huge useful current information. The majority (73.2%) of respondents used Internet and ranked first, followed by the effective communication tool (64.4%). as

described by the users. Further a large number of scientists (61.2%) also described Internet as a source for huge information but difficult to obtain, 55.2% of respondents agreed as it enhances the knowledge, 53% opined that it will be a supplement to library as online library and 52.3% said that it has a great reference value and a mechanism to save time.

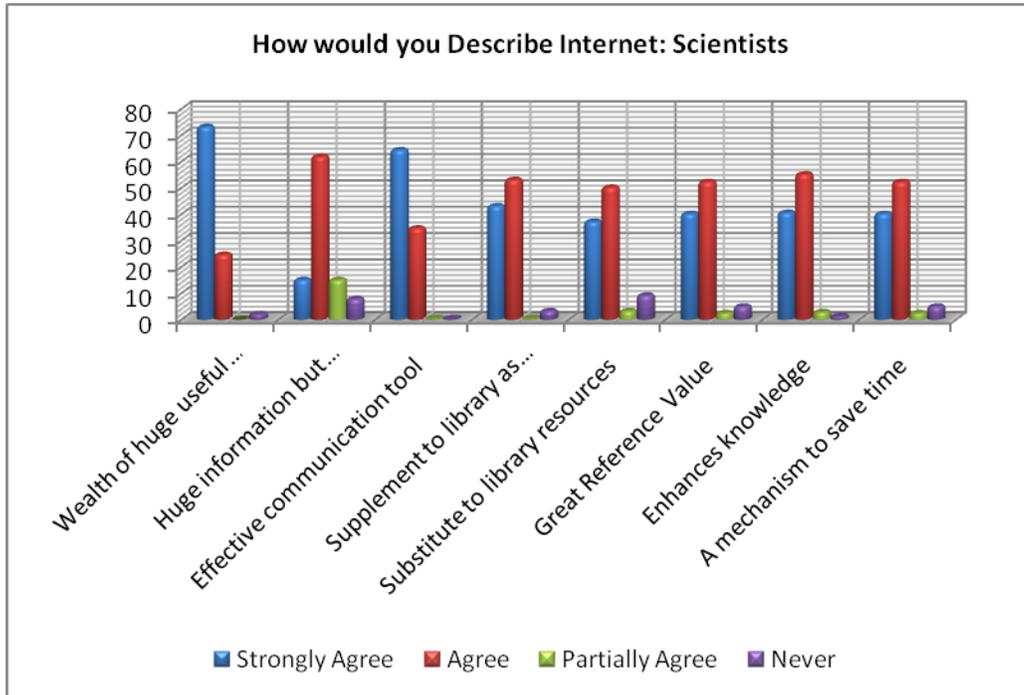


Fig. 6.4. How would you describe Internet

Table 6.5. Sources used for Searching Information on Internet: Scientists

Table 6.5 shows the search strategy adopted by scientists pursuing an activity on a large scale for searching information on the net. The different modes of searching information were also followed by the respondents which indicate browsing websites (58.6%) most often and it is ranked first. A large number of scientists often used interaction with colleagues (77%), follow up

references (67.8%) and publications/magazines (63.6%) as a source for searching information on Internet.

The sources used for searching information on Internet by scientists may also be seen in the form of graph (Figure 6.5).

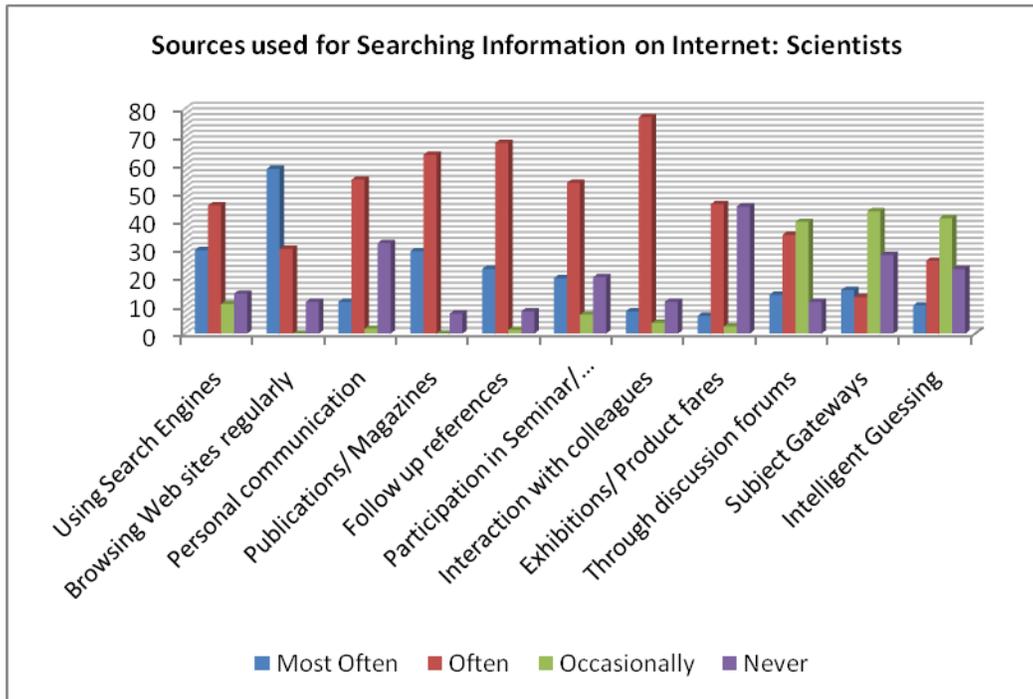


Fig. 6.5. Sources used for Searching information on Internet

Table-6.6. Ranking of Search Engines in the Order of Preference

Sl. No	Ranking	Scientists			Rank
		Yes	No	Total	
1	Yahoo	218 (91.2)	21 (8.8)	239 (100.0)	2
2	AltaVista	197 (82.4)	4 (17.6)	239 (100.0)	6
3	Google	236 (98.7)	03 (1.3)	239 (100.0)	1
4	MSN	188 (78.7)	5 (21.3)	239 (100.0)	8
5	Rediff	212 (88.7)	2 (11.3)	239 (100.0)	3
6	Khoj	168 (28.5)	71 (29.7)	239 (100.0)	11
7	123 India	177 (74.1)	62 (25.9)	239 (100.0)	10
8	Lycos	183 (76.6)	56 (23.4)	239 (100.0)	9
9	WebCrawler	206 (86.2)	33 (13.8)	239 (100.0)	4
10	Hotbot	193 (80.8)	46 (19.2)	239 (100.0)	7
11	NLSEARCH	152 (63.6)	87 (36.4)	239 (100.0)	12
12	Subject Portals	205 (85.8)	34 (14.2)	239 (100.0)	5

As expected by the researcher, scientists and faculty members used popular search engines, more regularly.

Table 6.6 shows that perhaps not unexpectedly a large number of faculty members (100%) and scientists (98.7%) used Google and ranked it as first. Yahoo is the second highly preferred search engine by faculty members (95.2%) and scientists (91.2%) and it is placed at second rank. This is followed by rediff (90.4%) and WebCrawler (86.6%).

This result is substantiated by the study conducted by Biradar B.S and others (2008) at Kuvempu University, which

reveals that only Google and Yahoo are the most popular and widely used search engines. To full extent faculties (80.85%) and students used Google while 57.89% of students and 40.42% of faculty used Yahoo. Besides, it is also supported by another study conducted by Biradar B.S and Sampath Kumar B.T (2008). Whereas the study of Amritpal (2002) conducted at Guru Nanak Dev University, Amritsar, reveals that 72.50% of scientists used Yahoo search engines followed by Rediff (35%).¹¹⁻¹³

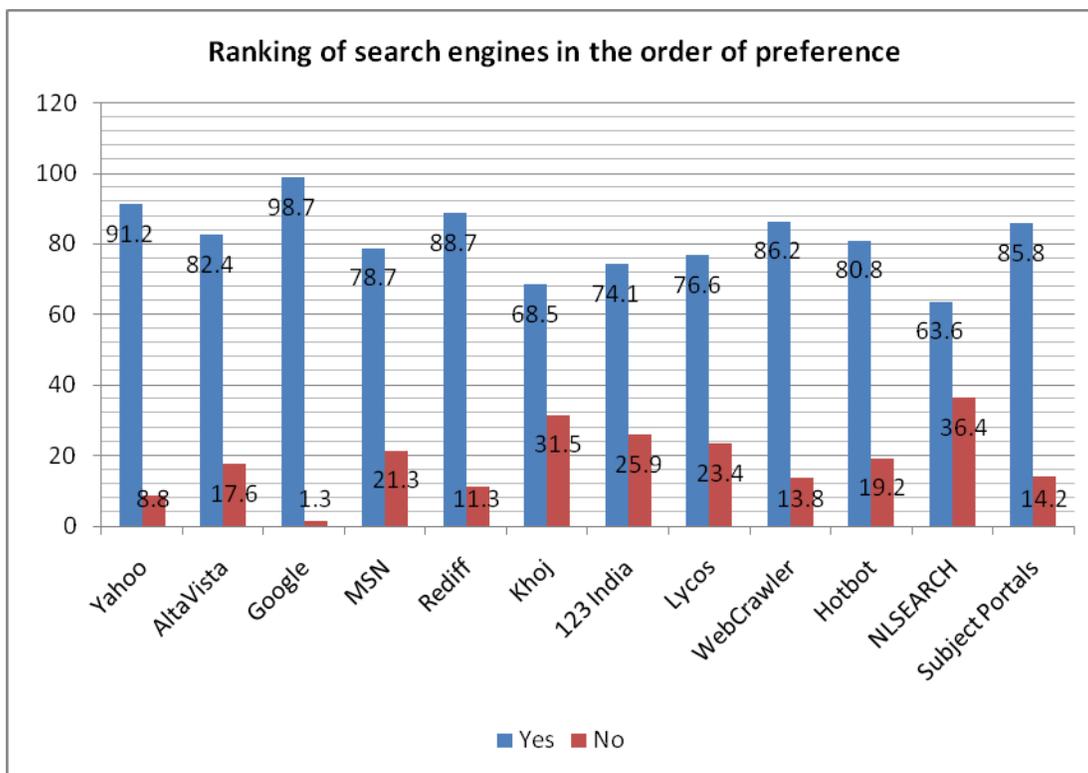


Fig. 6.6. Ranking of Search Engines in the Order of Preference

is followed by rediff (90.4%) and WebCrawler (86.6%) (Table 6.6).

VII. FINDINGS

1. It is found from table 6.2 that a huge number of scientists accessed research articles (96.7%), and research reports (94.6%) with WA 1.03 and 1.09 respectively. These sources are followed by research abstracts (77.8%) and information on training/conferences/seminars (45.2%).

2. The data reveals that large number of scientists used www (95%) and e-mail (69.9%) most frequently. Quite a good number of scientists used discussion forum (47.3%) frequently and occasionally news groups (41.8%) (Table 6.3).

3. The majority (73.2%) of respondents used Internet, described it as wealth of useful current information and ranked it first, followed by effective communication tool (64.4%) as described by users. Further a large number of scientists (61.2%) described Internet as a source for huge information but difficult to obtain, 55.2% of respondents are agreed as it enhance the knowledge. 53% opined that it will be a supplement to library as online library and 52.3% said that it has a great reference value and a mechanism to save time (Table 6.4).

4. The different modes of searching information were also followed by the respondents which indicate browsing websites (58.6%) most oftenly and is ranked first. A large number of scientists used interaction with colleagues (77%), follow up references (67.8%) and publications/magazines (63.6%) as a source for searching information on Internet. (Tables 6.5).

5. The majority (98.7%) of scientists used Google and ranked it first. Yahoo is the second highly preferred search engine by scientists (91.2%) and it is placed at second rank. This

VIII. SUGGESTIONS

1. The timings of the Internet services should be increase if possible services should be round the clock.
2. The service should be free to the scientists only, this services extend research scholars, and students in marine science research libraries
3. More terminals should be Installed for Internet use
4. More efficient and qualified staff should be appointed. They should be present in Internet lab
5. There should be separate network i.e WI-FI campus net in the campus, with twenty four hours browsing facility.
6. the problem of bend width, slow connectivity should be overcome
7. Sites providing only entertainment should be locked. So that research scholars should not unnecessary sit on computers.

IX. CONCLUSION

In the present study, the results of this exploratory study show that the Internet information sources and services used in marine science research and development institute scientists is related to some more common needs and that some information resources and communication needs are development on proper access to internet facilities. The results also suggest that some protected masers have to be taken to increase internet use. Since the internet is one of the most important information resources of

marine science research activities, and marine science scientists requirements and effective usage of internet can create mechanisms that enable the sharing of traditional and local knowledge.

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Table 6.1. Institution and Gender wise distribution of Respondents: Scientists

SI No	Institutions	Scientist/ Scientist B =62			Sr. Scientist/ Scientist (C.D) =94			Scientist-E/ Scientist (E1,E2) =18			Pri. Scientist/ Scientist F =65			All =239		
		M	F	T	M	F	T	M	F	T	M	F	T	M	F	T
1	CESS, Trivandrum	00 (0.0)	00 (0.0)	00 (0.0)	01 (1.1)	01 (1.1)	02 (2.1)	10 (55.6)	00 (0.0)	10 (55.6)	04 (6.2)	01 (1.5)	05 (7.7)	15 (6.3)	02 (0.8)	17 (7.1)
2	CIBA, Chennai	02 (3.2)	01 (1.6)	03 (4.8)	13 (13.8)	10 (10.6)	23 (24.5)	00 (0.0)	00 (0.0)	00 (0.0)	07 (10.8)	03 (4.6)	10 (15.4)	22 (9.2)	14 (5.9)	36 (15.1)
3	CIFT, Cochin	05 (8.1)	00 (0.0)	05 (8.1)	03 (3.2)	03 (3.2)	06 (6.4)	00 (0.0)	00 (0.0)	00 (0.0)	09 (13.8)	05 (7.7)	14 (21.5)	17 (7.1)	08 (3.3)	25 (10.5)
4	CMFRI, Cochin	02 (3.2)	02 (3.2)	04 (6.5)	19 (20.2)	27 (28.7)	46 (48.9)	00 (0.0)	00 (0.0)	00 (0.0)	03 (4.6)	02 (3.1)	05 (7.7)	24 (10.0)	31 (13.0)	55 (23.0)
5	INCOIS, Hyderabad	13 (21.0)	04 (6.5)	17 (27.4)	05 (5.3)	01 (1.1)	06 (6.4)	00 (0.0)	00 (0.0)	00 (0.0)	00 (0.0)	00 (0.0)	00 (0.0)	18 (7.5)	05 (2.1)	23 (9.6)
6	NIO, (Reg off), Cochin	01 (1.6)	00 (0.0)	01 (1.6)	01 (1.1)	00 (0.0)	01 (1.1)	03 (16.7)	00 (0.0)	03 (16.7)	10 (15.4)	06 (9.2)	16 (24.6)	15 (6.3)	06 (2.5)	21 (8.8)
7	NIOT, Chennai	27 (43.5)	05 (8.1)	32 (51.6)	07 (7.4)	03 (3.2)	10 (10.6)	05 (27.8)	00 (0.0)	05 (27.8)	13 (20.0)	02 (3.1)	15 (23.1)	52 (21.8)	10 (4.2)	62 (25.9)
	Total	50 (80.6)	12 (19.4)	62 (100.0)	49 (52.1)	45 (47.9)	94 (100.0)	18 (100.0)	00 (0.0)	18 (100.0)	46 (70.8)	19 (29.2)	65 (100.0)	163 (68.2)	76 (31.8)	239 (100.0)

Note 1: 1 - S-Scientist 2 - SB-Scientist-B, 3 - SC-Scientist-C, 4 - SD-Scientist-D, 5 - SE-Scientist-E, 6 - SE1-Scientist-E1, 7 - SE2-Scientist-E2, 8 - PS-Principal Scientist, 9 - SF-Scientist-F.

Table 6.2. Types of Information Sources Accessed on Internet: Scientists

SI No	Sources accessed on Internet	Scientist/ Scientist B=62			Sr.Scientist/ Scientist (C.D)=94			Scientist-E (E1,E2)=18			Prin.Scientist/ Scientist F=65			Total=239			W.A	Std. Dev	F Test	Rank
		1	2	3	1	2	3	1	2	3	1	2	3	1	2	3				
1	Bibliographical information	15 (24.2)	12 (19.4)	35 (56.5)	15 (16.0)	07 (7.4)	72 (76.6)	05 (27.8)	04 (22.2)	09 (50.0)	13 (20.0)	01 (1.5)	51 (78.5)	48 (20.1)	24 (10.0)	167 (69.9)	2.49	0.81	Significant at 1% probability level 203.220	9
2	Research abstracts	48 (77.4)	14 (22.6)	00 (0.0)	70 (74.5)	24 (25.5)	00 (0.0)	16 (88.9)	02 (11.1)	00 (0.0)	52 (80.0)	13 (20.0)	00 (0.0)	186 (77.8)	53 (22.2)	00 (0.0)	1.22	0.42		3
3	Patents and Standards	30 (48.4)	17 (27.4)	15 (24.2)	36 (38.3)	11 (11.7)	47 (50.0)	05 (27.8)	09 (50.0)	04 (22.2)	23 (35.4)	07 (10.8)	35 (53.8)	93 (38.9)	44 (18.4)	102 (42.7)	2.04	0.90		5
4	Research articles	59 (95.2)	03 (4.8)	00 (0.0)	92 (97.9)	02 (2.1)	00 (0.0)	16 (88.9)	02 (11.1)	00 (0.0)	64 (98.5)	01 (1.5)	00 (0.0)	231 (96.7)	08 (3.3)	00 (0.0)	1.03	0.18		1
5	Research Reports	57 (91.9)	03 (4.8)	02 (3.2)	89 (94.7)	01 (1.1)	04 (4.3)	16 (88.9)	00 (0.0)	02 (11.1)	64 (98.5)	00 (0.0)	01 (1.5)	226 (94.6)	04 (1.7)	09 (3.8)	1.09	0.39		2
6	Software based information	14 (22.6)	23 (37.1)	25 (40.3)	30 (31.9)	30 (31.9)	34 (36.2)	05 (27.8)	05 (27.8)	08 (44.4)	22 (33.8)	24 (36.9)	19 (29.2)	71 (29.7)	82 (34.3)	86 (36.0)	2.06	0.81		6
7	Placements/ Job opportunities	12 (19.4)	07 (11.3)	43 (69.4)	29 (30.9)	03 (3.2)	62 (66.0)	05 (27.8)	13 (72.2)	00 (0.0)	21 (32.3)	02 (3.1)	42 (64.6)	67 (28.0)	12 (5.0)	160 (66.9)	2.39	0.89		7
8	Career Planning / Higher education	13 (21.0)	02 (3.2)	47 (75.8)	28 (29.8)	02 (2.1)	64 (68.1)	03 (16.7)	02 (11.1)	13 (72.2)	20 (30.8)	01 (1.5)	44 (67.7)	64 (26.8)	07 (2.9)	168 (70.3)	2.44	0.89		8
9	Training/ Conferences/ Seminars	25 (40.3)	36 (58.1)	01 (1.6)	42 (44.7)	51 (54.3)	01 (1.1)	11 (61.1)	07 (38.9)	00 (0.0)	30 (46.2)	34 (52.3)	01 (1.5)	108 (45.2)	128 (53.6)	03 (1.3)	1.56	0.52		4

Note: 1. To full extent, 2. To some extent, 3. To little extent

F-Value 203.220 Significant at 1% probability level

Table 6.3. Frequency of Use of Various Internet Services: Scientists

SI	Internet	Scientist/ Scientist B=62	Sr. Scientist/ Scientist (C.D)=94	Scientist-E/ (E1,E2)=18	Prin. Scientist/ Scientist F=65	Total=239	W.A	Std.	F.	Rank
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No	services	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	Dev	Test		
1	WWW	60 (96.8)	02 (3.2)	00 (0.0)	00 (0.0)	89 (94.7)	05 (5.3)	00 (0.0)	00 (0.0)	15 (83.3)	03 (16.7)	00 (0.0)	00 (0.0)	63 (96.9)	02 (3.1)	00 (0.0)	00 (0.0)	227 (95.0)	12 (5.0)	00 (0.0)	00 (0.0)	1.05	0.22	274.414 Significant at 1% probability level	1
2	E-Mail	44 (71.0)	08 (12.9)	10 (16.1)	00 (0.0)	68 (72.3)	07 (7.4)	19 (20.2)	00 (0.0)	12 (66.7)	06 (16.7)	03 (16.7)	00 (0.0)	43 (66.2)	04 (6.2)	18 (27.7)	00 (0.0)	167 (69.9)	22 (9.2)	50 (20.9)	00 (0.0)	1.51	0.82		2
3	Newsgroups	06 (9.7)	11 (17.7)	17 (27.4)	28 (45.2)	05 (5.3)	11 (11.7)	44 (46.8)	34 (36.2)	02 (11.1)	07 (38.9)	04 (22.2)	05 (27.8)	06 (9.2)	06 (9.2)	35 (53.8)	18 (27.7)	19 (7.9)	35 (14.6)	100 (41.8)	85 (35.6)	3.05	0.91		5
4	Discussion Forum	16 (25.8)	22 (35.5)	02 (3.2)	22 (35.5)	15 (16.0)	45 (47.9)	05 (5.3)	29 (30.9)	07 (38.9)	09 (50.0)	01 (5.6)	01 (5.6)	11 (16.9)	37 (56.9)	01 (1.5)	16 (24.6)	49 (20.5)	113 (47.3)	09 (3.8)	68 (28.5)	2.40	1.11		3
5	FTP	05 (8.1)	06 (9.7)	06 (9.7)	45 (72.6)	04 (4.3)	07 (7.4)	25 (26.6)	58 (61.7)	03 (16.7)	04 (22.2)	05 (27.8)	06 (33.3)	00 (0.0)	06 (9.2)	15 (23.1)	44 (67.7)	12 (5.0)	23 (9.6)	51 (21.3)	153 (64.0)	3.44	0.86		7
6	TELNET	00 (0.0)	04 (6.5)	03 (4.8)	55 (88.7)	00 (0.0)	03 (3.2)	22 (23.4)	69 (73.7)	00 (0.0)	02 (11.1)	00 (0.0)	16 (88.9)	00 (0.0)	03 (4.6)	15 (23.1)	47 (72.3)	00 (0.0)	12 (5.0)	40 (16.7)	187 (78.2)	3.73	0.55		10
7	Chatting	09 (14.5)	03 (4.8)	13 (21.0)	37 (59.7)	11 (11.7)	02 (2.1)	38 (40.4)	43 (45.7)	03 (16.7)	00 (0.0)	05 (27.8)	10 (55.6)	06 (9.2)	02 (3.1)	31 (47.7)	26 (40.0)	29 (12.1)	07 (2.9)	87 (36.4)	116 (48.5)	3.21	0.98		6
8	Online databases	24 (38.7)	07 (11.3)	02 (3.2)	29 (46.8)	37 (39.4)	06 (6.4)	06 (6.4)	55 (47.9)	06 (33.3)	06 (33.3)	03 (16.7)	03 (16.7)	21 (32.3)	05 (7.7)	03 (4.6)	36 (55.4)	88 (36.8)	24 (10.0)	14 (5.9)	113 (47.3)	2.67	0.39		4
9	Gopher	03 (4.8)	01 (1.6)	01 (1.6)	57 (91.9)	03 (3.2)	01 (1.1)	21 (22.3)	69 (73.4)	00 (0.0)	02 (11.1)	00 (0.0)	16 (88.9)	03 (4.6)	01 (1.5)	13 (20.0)	48 (73.8)	09 (3.8)	05 (2.1)	35 (14.6)	190 (79.5)	3.69	0.69		9
10	Freeware/ Shareware	06 (9.7)	00 (0.0)	01 (1.6)	55 (88.7)	03 (3.2)	00 (0.0)	20 (21.3)	71 (75.5)	02 (11.1)	00 (0.0)	00 (0.0)	16 (88.9)	03 (4.6)	00 (0.0)	13 (20.0)	49 (75.4)	14 (5.9)	00 (0.0)	34 (14.2)	191 (79.9)	3.68	0.76		8

Note: 1. Most frequently, 2. Frequently, 3. Occasionally, 4. Never
F- Value 274.414 Significant at 1% probability level

Table 6.4. How would you Describe Internet: Scientists

SI	Internet	Scientist/ Scientist B=62	Sr.Scientist/ Scientist (C.D)=94	Scientist-E (E1,E2)=18	Prin.Scientist/ Scientist F=65	Total=239	W.A	Std.	F. Test	Rank
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No		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4		Dev		
1	Wealth of huge useful current information	42 (67.7)	19 (30.6)	00 (0.0)	01 (1.6)	67 (71.3)	26 (27.7)	00 (0.0)	01 (1.1)	17 (94.4)	00 (0.0)	00 (0.0)	01 (5.6)	49 (75.4)	14 (21.5)	00 (0.0)	02 (3.1)	175 (73.2)	59 (24.7)	00 (0.0)	05 (2.1)	1.31	0.58	35.115* significant at 1% probability level	1
2	Huge information but difficult to obtain	10 (16.1)	30 (48.4)	13 (21.0)	09 (14.5)	12 (12.8)	66 (70.2)	10 (10.6)	06 (6.4)	04 (22.2)	04 (22.2)	07 (38.9)	03 (16.7)	10 (15.4)	48 (73.8)	06 (9.2)	01 (1.5)	36 (15.1)	148 (61.9)	36 (15.1)	19 (7.9)	2.16	0.77		8
3	Effective communication tool	34 (54.8)	26 (41.9)	01 (1.6)	01 (1.6)	63 (67.0)	31 (33.0)	00 (0.0)	00 (0.0)	10 (55.6)	08 (44.4)	00 (0.0)	00 (0.0)	47 (72.3)	18 (27.7)	00 (0.0)	00 (0.0)	154 (64.4)	83 (34.7)	01 (0.4)	01 (0.4)	1.37	0.52		2
4	Supplement to library as online library	24 (38.7)	33 (53.2)	01 (1.6)	04 (6.5)	42 (44.7)	50 (53.2)	00 (0.0)	02 (2.1)	08 (44.4)	09 (50.0)	00 (0.0)	01 (5.6)	29 (44.6)	35 (53.8)	00 (0.0)	01 (1.5)	103 (43.1)	127 (53.1)	01 (0.4)	08 (3.3)	1.64	0.66		3
5	Substitute to library resources	19 (30.6)	32 (51.6)	04 (6.5)	07 (11.3)	39 (41.5)	48 (51.1)	02 (2.1)	05 (5.3)	06 (33.3)	05 (27.8)	01 (5.6)	06 (33.3)	25 (38.5)	35 (53.8)	01 (1.5)	04 (6.2)	89 (37.2)	120 (50.2)	08 (3.3)	22 (9.2)	1.85	0.87		7
6	Great Reference Value	23 (37.1)	32 (51.6)	02 (3.2)	05 (8.1)	40 (42.6)	50 (53.2)	01 (1.1)	03 (3.2)	06 (33.3)	08 (44.4)	02 (11.1)	02 (11.1)	27 (41.5)	35 (53.8)	01 (1.5)	02 (3.1)	96 (40.2)	125 (52.3)	06 (2.5)	12 (5.0)	1.72	0.74		5
7	Enhances knowledge	23 (37.1)	34 (54.8)	03 (4.8)	02 (3.2)	41 (43.6)	52 (55.3)	01 (1.1)	00 (0.0)	07 (38.9)	09 (50.0)	02 (11.1)	00 (0.0)	26 (40.0)	37 (56.9)	01 (1.5)	01 (1.5)	97 (40.6)	132 (55.2)	07 (2.9)	03 (1.3)	1.65	0.60		4
8	A mechanism to save time	22 (35.5)	33 (53.2)	02 (3.2)	05 (8.1)	41 (43.6)	49 (52.1)	01 (1.1)	03 (3.2)	06 (33.3)	07 (38.9)	02 (11.1)	03 (16.7)	27 (41.5)	36 (55.4)	01 (1.5)	01 (1.5)	96 (40.2)	125 (52.3)	06 (2.5)	12 (5.0)	1.73	0.74		6

Note: 1. Strongly Agree 2. Agree 3. Partially Agree 4. Never

Table 6.5. Sources used for Searching Information on Internet: Scientists

Sl No	Searching information on Internet	Scientist/ Scientist B=62				Sr.Scientist/ Scientist (C.D)=94				Scientist-E (E1,E2)=18				Prin.Scientist/ Scientist F=65				Total =239				W.A	Std. Dev	F. Test	Rank
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				

1	Using Search Engines	26 (41.9)	23 (37.1)	06 (9.7)	07 (11.3)	24 (25.5)	48 (51.1)	14 (14.9)	08 (8.5)	07 (38.9)	08 (44.4)	00 (0.0)	03 (16.7)	14 (21.5)	30 (46.2)	05 (7.7)	16 (24.6)	71 (29.7)	109 (45.6)	25 (10.5)	34 (14.2)	2.09	0.98	48.937% Significant at 1% Probability level	4
2	Browsing Web sites regularly	26 (41.9)	25 (40.3)	00 (0.0)	11 (17.7)	55 (58.5)	31 (33.0)	00 (0.0)	08 (8.5)	15 (83.3)	01 (5.6)	00 (0.0)	02 (11.1)	14 (21.5)	15 (23.1)	00 (0.0)	06 (9.2)	140 (58.6)	72 (30.1)	00 (0.0)	27 (11.3)	1.64	0.95		1
3	Personal communication	09 (14.5)	25 (40.3)	04 (6.5)	24 (38.7)	09 (9.6)	52 (55.3)	00 (0.0)	33 (35.1)	01 (5.6)	14 (77.8)	00 (0.0)	03 (16.7)	08 (12.3)	40 (61.5)	00 (0.0)	17 (26.2)	27 (11.3)	131 (54.8)	04 (1.7)	77 (32.2)	2.55	1.06		8
4	Publications/ Magazines	23 (37.1)	36 (58.1)	00 (0.0)	03 (4.8)	22 (23.4)	67 (71.3)	00 (0.0)	05 (5.3)	09 (50.0)	03 (16.7)	00 (0.0)	06 (33.3)	16 (24.6)	46 (70.8)	00 (0.0)	03 (4.6)	70 (29.3)	152 (63.6)	00 (0.0)	17 (7.1)	1.85	0.75		2
5	Follow up references	14 (22.6)	38 (61.3)	09 (4.8)	07 (11.3)	17 (18.1)	72 (76.6)	00 (0.0)	05 (5.3)	09 (50.0)	04 (22.2)	00 (0.0)	05 (27.8)	15 (23.1)	48 (73.8)	00 (0.0)	02 (3.1)	55 (23.0)	162 (67.8)	03 (1.3)	19 (7.9)	1.94	0.75		3
6	Participation in Seminar/ Conference	17 (27.4)	26 (41.9)	06 (9.7)	13 (21.0)	16 (17.0)	50 (53.2)	04 (4.3)	24 (25.5)	06 (33.3)	12 (66.7)	00 (0.0)	00 (0.0)	08 (12.3)	40 (61.5)	06 (9.2)	11 (16.9)	47 (19.7)	128 (53.6)	16 (6.7)	48 (20.1)	2.27	0.99		6
7	Interaction with colleagues	06 (9.7)	39 (62.9)	05 (8.1)	12 (19.4)	08 (8.5)	77 (81.9)	02 (2.1)	07 (7.4)	04 (22.2)	11 (61.1)	01 (5.6)	02 (11.1)	01 (1.5)	57 (87.7)	01 (1.5)	06 (9.2)	19 (7.9)	184 (77.0)	09 (3.8)	27 (11.3)	2.18	0.73		5
8	Exhibitions/ Product fares	06 (9.7)	19 (30.6)	02 (3.2)	35 (56.5)	05 (5.3)	45 (47.9)	03 (3.2)	41 (43.6)	01 (5.6)	05 (27.8)	00 (0.0)	12 (66.7)	03 (4.6)	41 (63.1)	01 (1.5)	20 (30.8)	15 (6.3)	110 (46.0)	06 (2.5)	108 (45.2)	2.87	1.07		11
9	Through discussion forums	10 (16.1)	23 (37.1)	16 (25.8)	13 (21.0)	11 (11.7)	36 (38.3)	40 (42.6)	07 (7.4)	04 (22.2)	07 (38.9)	03 (16.7)	04 (22.2)	08 (12.3)	18 (27.7)	36 (55.4)	03 (4.6)	33 (13.8)	84 (35.1)	95 (39.7)	27 (11.3)	2.49	0.87		7
10	Subject Gateways	14 (22.6)	08 (12.9)	18 (29.0)	22 (35.5)	12 (12.8)	08 (8.5)	44 (46.8)	30 (31.9)	03 (16.7)	09 (50.0)	03 (16.7)	03 (16.7)	08 (12.3)	06 (9.2)	39 (60.0)	12 (18.5)	37 (15.5)	31 (13.0)	104 (43.5)	67 (28.0)	2.84	1.00		10
11	Intelligent Guessing	08 (12.9)	20 (32.3)	17 (27.4)	17 (27.4)	08 (8.5)	25 (26.6)	43 (45.7)	18 (19.1)	05 (27.8)	02 (11.1)	04 (22.2)	07 (38.9)	03 (4.6)	15 (23.1)	34 (52.3)	13 (20.0s)	24 (10.0)	62 (25.9)	98 (41.0)	55 (23.0)	2.77	0.92		9

Note: 1. Most Often 2. Often 3. Occasionally 4. Never

Table 6.6. Ranking of search engines in the order of preference

Sl.No	Ranking	Scientists	Rank
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		Yes	No	Total	
1	Yahoo	218 (91.2)	21 (8.8)	239 (100.0)	2
2	AltaVista	197 (82.4)	4 (17.6)	239 (100.0)	6
3	Google	236 (98.7)	03 (1.3)	239 (100.0)	1
4	MSN	188 (78.7)	5 (21.3)	239 (100.0)	8
5	Rediff	212 (88.7)	2 (11.3)	239 (100.0)	3
6	Khoj	168 (28.5)	71 (29.7)	239 (100.0)	11
7	123 India	177 (74.1)	62 (25.9)	239 (100.0)	10
8	Lycos	183 (76.6)	56 (23.4)	239 (100.0)	9
9	WebCrawler	206 (86.2)	33 (13.8)	239 (100.0)	4
10	Hotbot	193 (80.8)	46 (19.2)	239 (100.0)	7
11	NLSEARCH	152 (63.6)	87 (36.4)	239 (100.0)	12
12	Subject Portals	205 (85.8)	34 (14.2)	239 (100.0)	5

Prevalence of Parasitic Infections in Peadiatric Population – A Prospective Study

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Abstract- Introduction: The study was done to determine the prevalence of parasitic infections in the pediatric population, and to correlate their presence with the health status of the children. **Materials and methods:** Stools were collected in wide mouthed disposable containers from the children admitted in pediatric ward with various complaints in Chigateri Government Hospital, Davangere, Karnataka. The samples were screened by saline and iodine preparation for the detection of various parasites. Simultaneously the children were also screened for the presence of Enterobius vermicularis eggs by cellophane tape method early in the morning.

Results: A total of 220 samples were examined and 53 (24.09%) were positive for various parasites 21(39.6%) samples were positive for multiple parasitic infections. The parasitic infections were more common in the age group of 5-10yrs and in male children 40(75.40%) and the most common health problem associated with parasitic infection was found to be anaemia.

Summary: This study indicates effective mass scale deworming and regular screening of parasitic infections is essential to reduce the burden caused by them.

Index Terms- Parasitic infections, Chigateri Hospital, Enterobius vermicularis

I. INTRODUCTION

Intestinal parasitic infections (IPI's) are a serious health problem throughout the world affecting mainly the developing countries^(1,2). These infection are more common in peadiatric population and can lead to anemia, malnutrition and cognitive impairment.⁽²⁻⁴⁾

It is estimated that, around 2 billion people are infected with intestinal parasitic infections.⁽⁵⁾ More than 50% are school age children. About 39 million disability adjusted life years (DALY) are linked to IPI's which are responsible for huge financial burden.⁽⁶⁾

This study was conducted to determine the prevalence of intestinal parasitic infections in peadiatric population in and around Davangere, Karnataka and to correlate them with the health status of the children.

II. MATERIALS AND METHODS

Study Design & Study Population:

A prospective study was planned and conducted from October 2011 to November 2012 in Chigateri Government District Hospital, attached to J.J.M. Medical College,

Davanger, Kanataka. The study population comprised of all children (both sexes under the age group of 14) getting admitted in the peadiatric ward irrespective of their presenting complaints.

III. SAMPLE SIZE AND SAMPLE COLLECTION

A total of 220 stool samples were collected from children of varying age groups. Stool samples were collected in wide mouthed sterile containers. The same children were also examined for the presence of Enterobius vermicularis eggs by the cellophane tape method done early in the morning before the child baths or defecates.

IV. SAMPLE PROCESSING

The stool samples were observed macroscopically for the presence of adult worms and segments of Tinea species. The same samples were also screened microscopically for the presence of ova, cysts and trophozoites by saline and iodine preparations. The samples negative were subjected to further screening after formal ether concentration technique.⁽⁷⁾

The presence of Enterobius vermicularis eggs were screened by two cellophane tapes applied over the perineum one on either side and their sticky side placed on the microscopic slide. One of the slides was screened directly and the other with lactophenol cotton blue mount(LPCB) for the presence of Enterobius vermicularis.

V. RESULTS

THE Table-1: Showing the prevalence of parasitic infections.

Total Samples (220)	Results (%)
Positive	53 (24.09%)
Negative	167 (75.09%)

Pie diagram showing the rates of various parasitic infections:

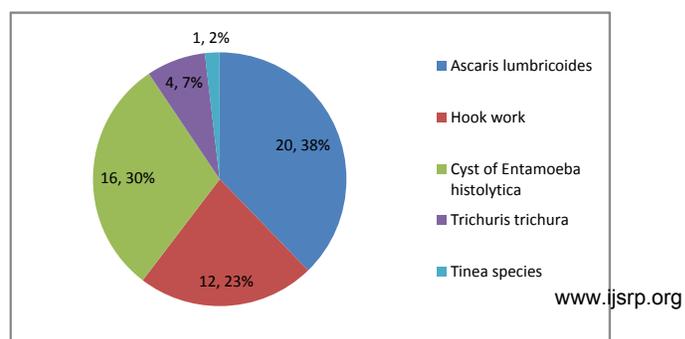


Table-2: Showing Multiple Parasitic Infections:

Ascaris lumbricoides + Hook worm	8 (38.09%)
Trichuris trichura + Hook worm	4 (19.04%)
Cyst of EH + Ascaris lumbricoides	8 (38.09%)
Tinea species + Ascaris lumbricoides	1 (4.7%)

Bar diagram showing the association of parasitic infection with health status:

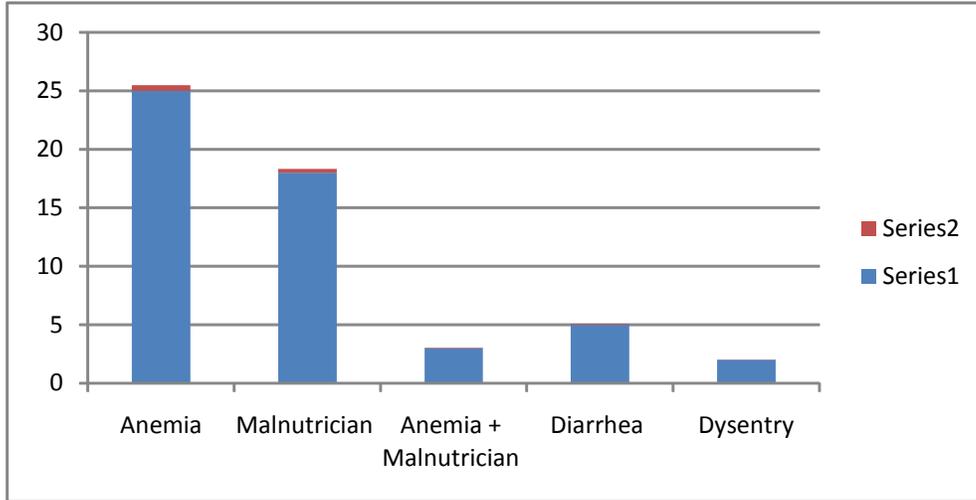


Table-3: Showing the age distribution of parasitic infections:

Age Group	Prevalence	Percentage
<5 Year	12	22.60%
5 - 10 Year	28	52.80%
10-14 Year	13	24.50%



Table-4: Showing the sex distribution of parasitic infections:

Sex Group	Prevalence	Percentage
Male	40	75.40%
Female	13	24.50%

The study showed 0 % prevalence of *Enterobius Vermicularis*

VI. DISCUSSION

In our study which included 220 samples from children under 14 years for parasitic infections the prevalence rate was 53 (24, 09), which was in accordance with the study conducted by Subha et al among school children Chitradurga in Karnataka, which reported prevalence rate of 51.5%.⁽⁹⁾

The most prevalent worm infestation in our study was *A.Lumbricoides* (37.7%) which was high compared to the similar studies by Subha et al that showed 20.1% and Shrivastava in which prevalence rate was 22.2%.⁽¹⁰⁾

39.6% of our study samples showed multiple parasitic infections, which was low when compared to the study by Wani et al, showing 46.7%.⁽¹¹⁾

The most common health problem associated with parasitic infection was anemia (47.17%), followed by malnutrition. 3 children in our study had anemia with malnutrition. (33.9%). These findings were in accordance with a report from Gulbarga, Karnataka, which showed the prevalence of anemia and worm infestation 12

The parasitic infection were common in the age group of 5-10 years, with a prevalence rate of 28 (52.80%) whereas study in Quetta showed a high prevalence rate in the age group of 9-12 years.⁽¹³⁾

The cellophane tape method applied for screening *Enterobius vermicularis* eggs came negative with all the 220 samples screened.

VII. CONCLUSION

Survey on the prevalence of various intestinal parasitic infection in different geographic regions is a prerequisite to obtain an accurate understanding of the burden and cause of intestinal parasitic infections in a particular area. Lack of knowledge of prevalence of parasitic infection in a geographic area may lead to misdiagnosis of intestinal parasitic infections as appendicitis and inflammatory bowel disease (IBD's)⁽¹³⁾.

The most important drawback of IPI's is that, about 90% of infected individuals remain asymptomatic and hence do not present to the hospital.⁽¹⁴⁾

Hence routine stool sample screening of all children presenting to the paediatric outpatient department for ova, cysts, trophozoites and larva remain the gold standard method for the laboratory diagnosis of IPI's.⁽¹⁵⁾

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A Study on Fibrinogen Levels and Platelet Count in Pregnancy Induced Hypertention

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Abstract- Pregnancy is a physiological process in women but it may be associated with certain risks to the health and life of both the mother and child. Hypertensive disorders complicating pregnancy are common and form one of the deadly triad along with hemorrhage and infection that results in maternal and perinatal morbidity and mortality. Pregnancy can induce hypertension in normotensive women or aggravate already existing hypertension or appears for the first time during pregnancy. The identification of this clinical entity and effective management play a significant role in the outcome of pregnancy, both for the mother and the baby. In the developing countries with uncared pregnancy, this entity on many occasions remains undetected till major complications supervene.

In modern obstetric practice, hypertensive disorders of pregnancy are understood to encompass a clinical spectrum of abnormalities ranging from minimal elevation in blood pressure to severe hypertension with multiorgan dysfunction [1].

This study is aimed to evaluate fibrinogen levels and platelet count in hypertensive disorders of pregnancy. Changes in coagulation profile that occur in normal pregnancy includes the biochemical adaptation especially the hematological changes that occur in response to pregnancy are profound. The levels of several blood coagulation factors are increased during pregnancy. Plasma fibrinogen increases about 65% late in pregnancy. The increase in fibrinogen concentration contributes significantly to the striking increase in ESR. There is moderate decrease in platelet count as pregnancy progresses. Hence it is useful to evaluate these biochemical markers to prevent the complications like pre-eclampsia, eclampsia, abruption placenta, intrauterine infection etc.

Index Terms- fibrinogen levels, platelet count, pre-eclampsia, eclampsia

I. INTRODUCTION

Hypertensive disorders during pregnancy are associated with high maternofetal mortality and morbidity in both underdeveloped and developed countries [2]. Approximately 70% of hypertensive disorders are due to gestational hypertension this condition is called pre eclampsia [3]. Pre eclampsia/eclampsia has been called the "**Disease of Theories**". Although it is a relatively common entity and has been the

subject of a large body of research, the search for inciting agent and a unifying pathophysiological mechanism has generated more questions than answers. Even the definition of a disease has been a source of controversy. Nevertheless, research has yielded a great deal of information that has markedly improved maternal and foetal outcomes, and work continues to enhance efforts at prevention of this often devastating condition [1].

Foetal neonatal jeopardy results primarily from compromised placental perfusion and the need for preterm delivery in severe cases. In developed countries, up to 25% of all prenatal deaths are attributable to hypertensive disorders of pregnancy, the major maternal hazards are the consequences of severe hypertension, grand mal seizures and damage to other end organs. In many areas of the world, hypertensive disorders of pregnancy are not the most common cause of maternal death because with modern management, preeclampsia can be ameliorated and eclampsia largely prevented [1].

One way to reduce the impact of arterial hypertension on maternal mortality is to establish the correct diagnosis of hypertensive disorders of pregnancy, and to proceed with an early intervention when it is diagnosed. The clinical signs are considered to be a late manifestation of a disease that has been present since the first trimester of gestation due to "Diagnostic delay". Many tests have attempted to establish the diagnosis of preeclampsia as early as possible, often even before the patient present arterial hypertension. Tests reported for the early diagnosis of hypertensive disorders are Doppler ultrasound assessment of maternal and foetal circulation, uric acid concentration, the supine pressure test, the angiotensin test, microalbuminuria, plasma fibronectin concentration, plasma antithrombin activity, calciuria, prothrombin time, platelet count, fibrinogen levels, APTT and other tests, all of which are of debatable efficacy and practicality [4].

How pregnancy incites or aggravates hypertension remains unsolved despite decades of intensive research. Indeed, hypertensive disorders remain among the most significant and intriguing unsolved problems in obstetrics. This study is aimed to evaluate some biochemical markers in hypertensive disorders of pregnancy which includes:

1. Platelet count
2. Fibrinogen levels.

Changes in coagulation profile that occur in normal pregnancy includes the biochemical adaptation especially the haematological changes that occurs in response to pregnancy are profound the levels of several blood coagulation factors are increased during pregnancy.

Plasma fibrinogen increases about 65% late in pregnancy. The increase in fibrinogen concentration contributes significantly to the striking increase in ESR. Other clotting factors that increase appreciable during normal pregnancy are factors- VII, VIII, IX & X. prothrombin and factors V and XII do not change. Whereas factors XI and XIII decrease slightly. There is moderate decrease in platelet count as pregnancy progresses.

Disseminated Intravascular Coagulation (DIC) is always a secondary phenomenon trigger by specific obstetrics complications which are listed below [5]:

- Preeclampsia
- Eclampsia
- Abruptio placenta
- Intrauterine infection
- Retained dead foetus
- Placenta accrete
- Hydatidiform mole
- Prolonged shock
- Amniotic fluid embolism.

Hence it is useful to evaluate these biochemical markers to prevent the above cited complications.

II. AIMS AND OBJECTIVES

The present study was undertaken at Department of Biochemistry, SVS

Medical College and Hospital, the following are aims.

- A. To study the following parameters in antenatal women after 20 weeks of pregnancy :
 1. Fibrinogen levels
 2. Platelet count
- B. To find out any alterations in the above parameters in pregnancy induced hypertension.
- C. To compare the above biochemical parameters between the test group and control group.
- D. To correlate the outcome of pregnancy with the above biochemical parameters.

III. MATERIALS AND METHODS

The present study is carried out in the Department of Biochemistry, SVS Medical College Mahaboobnagar. All the subjects included in the study are admitted in Department of Obstetrics And Gynaecology, SVS Medical College Mahaboobnagar during the year 2010-2011.

A total number of 20 normal antenatal women without PIH are included in control group and a total number of 20 diagnosed cases of PIH are taken as test group. The biochemical parameters of test group is estimated and compared with those of control group. The test group is selected on the basis of vital signs like blood pressure more than 140/90 mmHg and clinical features like oedema, headache, vomiting, epigastric pain, convulsions etc.

The following biochemical parameters are included in present study.

1. Fibrinogen
2. Platelet count

Cases-20 in number (test group)

Inclusion criteria:

1. Age - 18-35 years.
2. Antenatal women with hypertension with or without proteinuria, pre-eclampsia and eclampsia.

Exclusion criteria:

1. History of chronic hypertension before completion of 20 weeks of pregnancy.
2. History of Diabetes.

Control – 20 in number

Inclusion criteria

Age group: 18-35 years

Antenatal women without hypertension/pre eclampsia/eclampsia.

Exclusion criteria

Patients with cardiovascular/renal/hepatic complications are excluded from the study.

Method of collection of data

Case history and physical examination findings of both cases and controls are obtained.

Sample collection for the estimation of Fibrinogen:

- Venous blood without undue stasis is collected from peripheral vein by vene puncture under aseptic conditions.
- This blood is transferred into an anticoagulated tubes without delaying the mixing of blood with anticoagulant.
- Exactly 9 parts of freshly collected blood is mixed with 1 part of trisodium citrate (0.11 mol/litre).
- The sample is centrifuged for 15 minutes at 3000 rpm and the plasma is separated.
- The separated plasma is transferred in a clean and dry test tube and is tested within 2-3 hours of blood collection.

Instruments used

- Centrifuge machine
- Semi-auto analyser (hemostar, tulip group)

Additional material required

- 10 x 75 mm glass test tubes, pipettes, sample cups, magnet rod.

Sample collection for estimation of platelet count

- Venous blood without undue stasis is collected from peripheral vein by vene puncture under aseptic conditions.

- K2 EDTA is used as an anti coagulant to prepare the anticoagulant blood sample (the dose of K2 EDTA is 1.5 mg/ml blood).
- Anticoagulant blood is mixed up.

Instrument used.

- Auto-analyser (cell counter)

Statistical analysis

Mean and standard deviation of all variables are calculated. The statistical significance is assured using students T-test. P values less than 0.05 are considered significant.

IV. ESTIMATION OF FIBRINOGEN LEVELS

AIM : Determination of fibrinogen level

PRINCIPLE : The addition of thrombin coagulates fresh citrated plasma. The coagulation time is proportional to the fibrinogen concentration. This allows the estimation of plasma fibrinogen by functional clotting assay.

REAGENT : FIBROQUANT™ kit contains:

1. **Thrombin reagent**, which is a lyophilized preparation from bovine source ~ 50 NIH units per vial.
2. **Fibrinogen calibrator**, which is a lyophilized preparation of human plasma equivalent to stated amount of fibrinogen on a mg/dl basis (refer FIBROQUANT™ graph paper supplied with each kit for the value of each lot).
3. **Owren's buffer**, ready to use (pH 7.35).

V. PROCEDURE

1. A 1:10 dilution of plasma specimen with Owren's buffer solution is prepared.
2. To a 10 x 75 mm test tube at 370C 200µl of 1:10 dilution of plasma sample to be tested is added.
3. Incubated at 370C for one minute.
4. To the test tube 100µl of FIBROQUANT™ thrombin reagent (prewarmed at 370C for one minute) is added and timer is started in hemostar semiautoanalyser simultaneously.

5. The timer is stopped at the first appearance of the fibrin web, as the gel clot begins to form and the time is recorded in seconds.

6. Finally the time obtained in seconds is compared with the fibroquant calibration curve.

INTERPRETATION OF RESULTS

The fibrinogen concentration can be read off directly by interpolating the mean clotting time obtained at 1:10 dilution of the sample, from the calibration curve plotted on the graph paper provided with the FIBROQUANT™ kit for fibrinogen concentration.

NORMAL VALUE

150 - 400 mg/dl.

ESTIMATION OF PLATELET COUNT:

AIM : Determination of platelet count by auto analyser (cell counter)

PRINCIPLE : platelets are counted and sized by the impedance method, as shown in figure. This method is based on the measurement of changes in electrical resistance produced by a particle, which in this case is a blood cell, suspended in conductive diluents as it passes through an aperture to create an electrical pathway. As each particle passes through the aperture, a transitory change in the resistance between the electrodes is produced. This change produces a measurable electrical pulse. The number of pulses generated indicates the number of particles that pass through the aperture. The amplitude of each pulse is proportional to the volume of each particle. Each particle is amplified and compared to the internal reference voltage channels, which only accepts the pulses of certain amplitude. If the pulse generated is above the platelet lower threshold, it is counted as a platelet.

PROCEDURE

1. The anticoagulant blood sample is mixed up.
2. The sample is placed under the sample probe.
3. Aspirate key is pressed to start the analyses and the results are displayed on the screen is recorded.

NORMAL VALUE

1.5 to 3 lakhs/cumm

VI. SUMMARY OF RESULTS

Sl.No	Investigation	Statistical Parameter	Control subjects	Test group
1	Systolic Blood Pressure (mmHg)	Mean	109.5	154
		SD	11.46	11.88
		SEM	2.56	2.66
		t-test	12.05	
		p-Value	<0.0001	
2	Diastolic Blood Pressure (mmHg)	Mean	71.0	107.5
		SD	8.52	7.86
		SEM	1.9051	1.7575
		t-test		14.08
		p-Value		<0.0001

5	Fibrinogen(mg/dl)	Mean	276.75	346.5
		SD	37.31	64.16
		SEM	8.34	14.35
		t-test	4.20	
		p-Value	<0.002	
			Control subjects	Test group
6.	Platelet Count (Lacs/cumm)	Mean	2.76	1.86
		SD	0.42	0.29
		SEM	0.09	0.06
		t-test	7.74	
		p-Value	<0.01	

SD : Standard Deviation
SEM: Standard Error of Mean

VII. RESULTS

In the present study the biochemical parameters like Fibrinogen levels and Platelet count were estimated in 20 controls and 20 cases in normotensive and hypertensive pregnant women respectively.

Above table shows the biochemical profile in cases and controls.

I. The mean and standard deviation of systolic blood pressure (mmHg) in controls is 109.5 ± 11.46 as compared to 154 ± 11.88 in test group. The difference is statistically significant, as shown in chart no: 01.

The mean and standard deviation of diastolic blood pressure (mmHg) in controls is 71 ± 8.52 as compared to 107.5 ± 7.86 in test group. The difference is statistically significant, as shown in chart no:

The mean and standard deviation of Fibrinogen levels (mg/dl) in controls is 276.75 ± 37.31 as compared to $346.5 \pm$

showing parity distribution

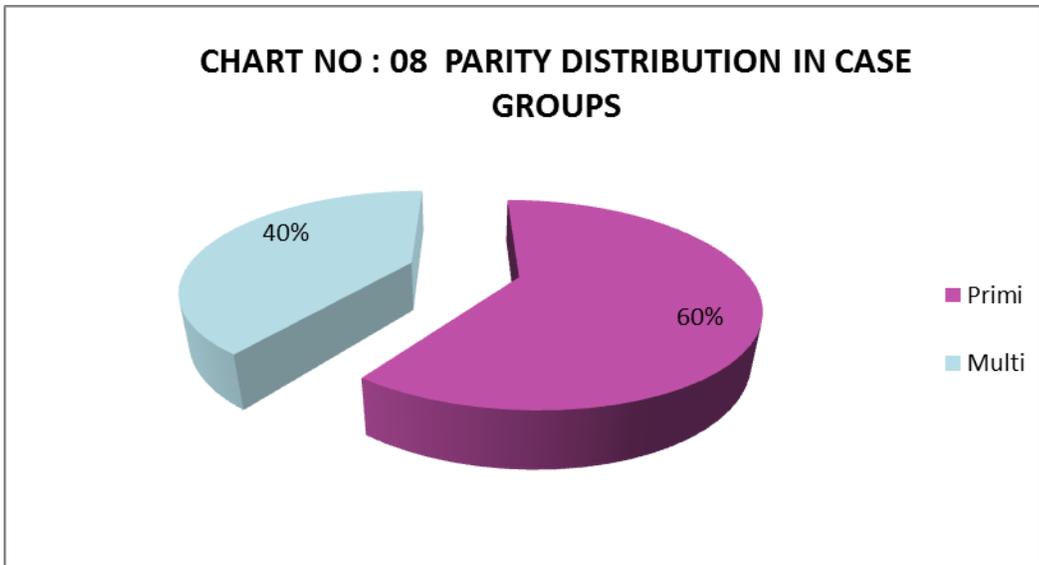
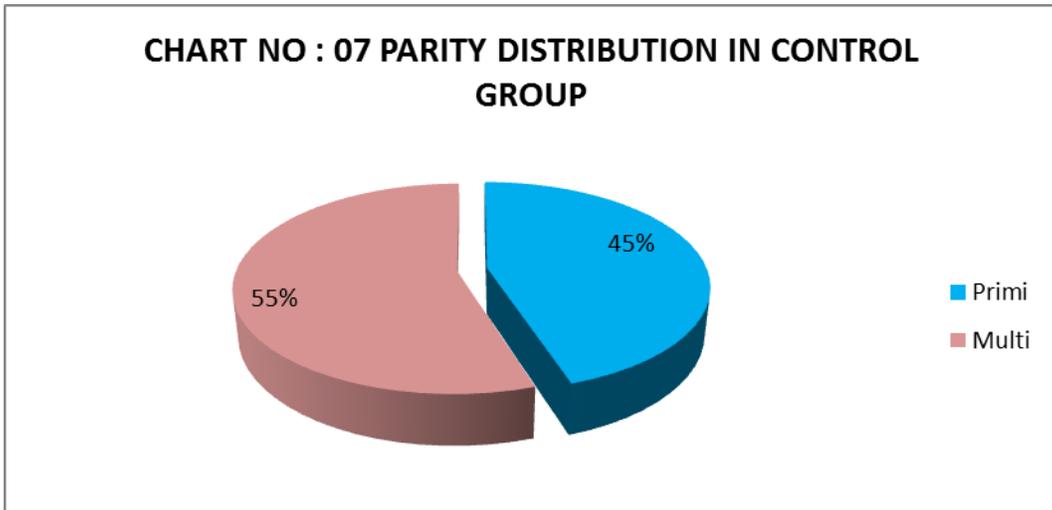
64.16 in test group. The difference is statistically significant, as shown in chart no: 05.

II. The mean and standard deviation of Platelet count (lakhs/cu mm) in controls is 2.76 ± 0.42 as compared to 1.86 ± 0.29 in test group. The difference is statistically significant, as shown in chart no: 06.

III. The mean and standard deviation of age distribution in controls is 24.55 ± 4.86 as compared to 25.45 ± 4.02 in test group, as shown in table no :05 & 06 and chart no: 09 & 10.

IV. From table IV and chart no: 07 & 08, the parity of the two groups was similar. The percentage composition of primigravidae and multigravidae within the group and between the two groups were similar.

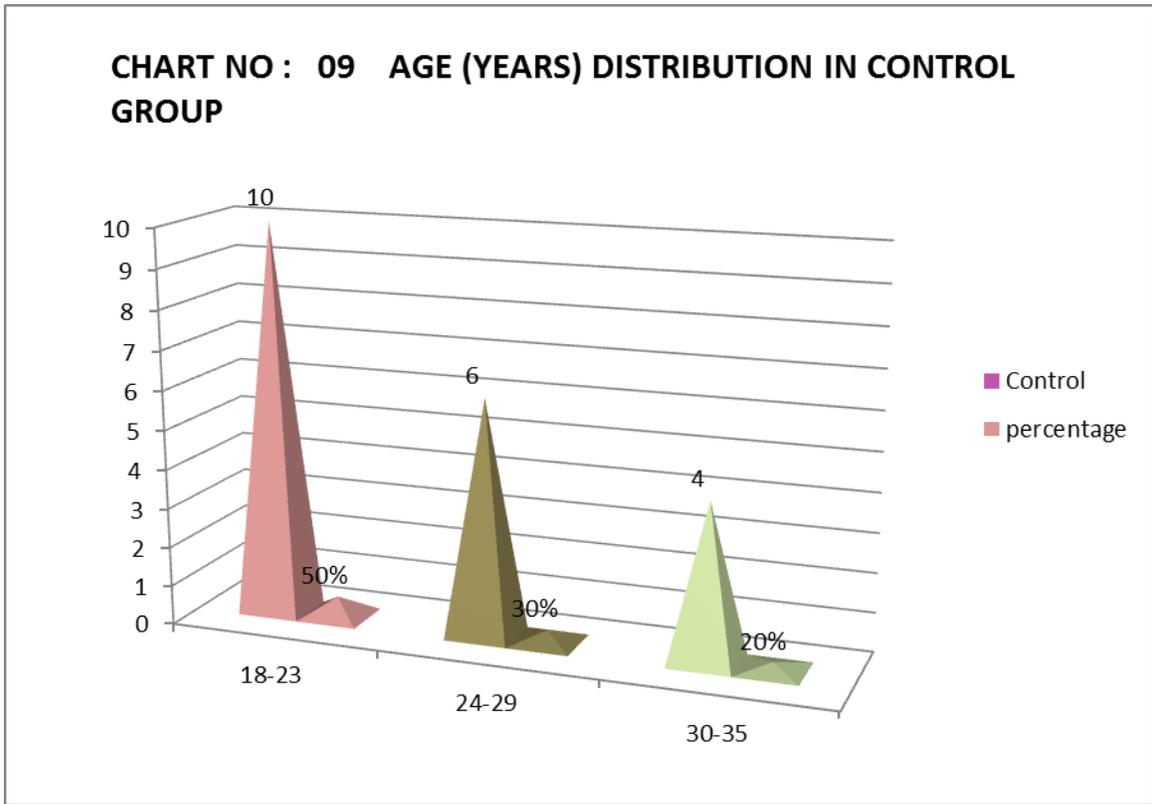
Parity distribution	Control		Cases	
	Number	Percentage	Number	percentage
Primi	09	45%	12	60%
Multi	11	55%	08	40%
Total	20	100	20	100



showing the age distribution of control group

Age in years	No: of control subjects	Percentage
18-23	10	50%
24-29	06	30%
30-35	04	20%
Total	20	100%

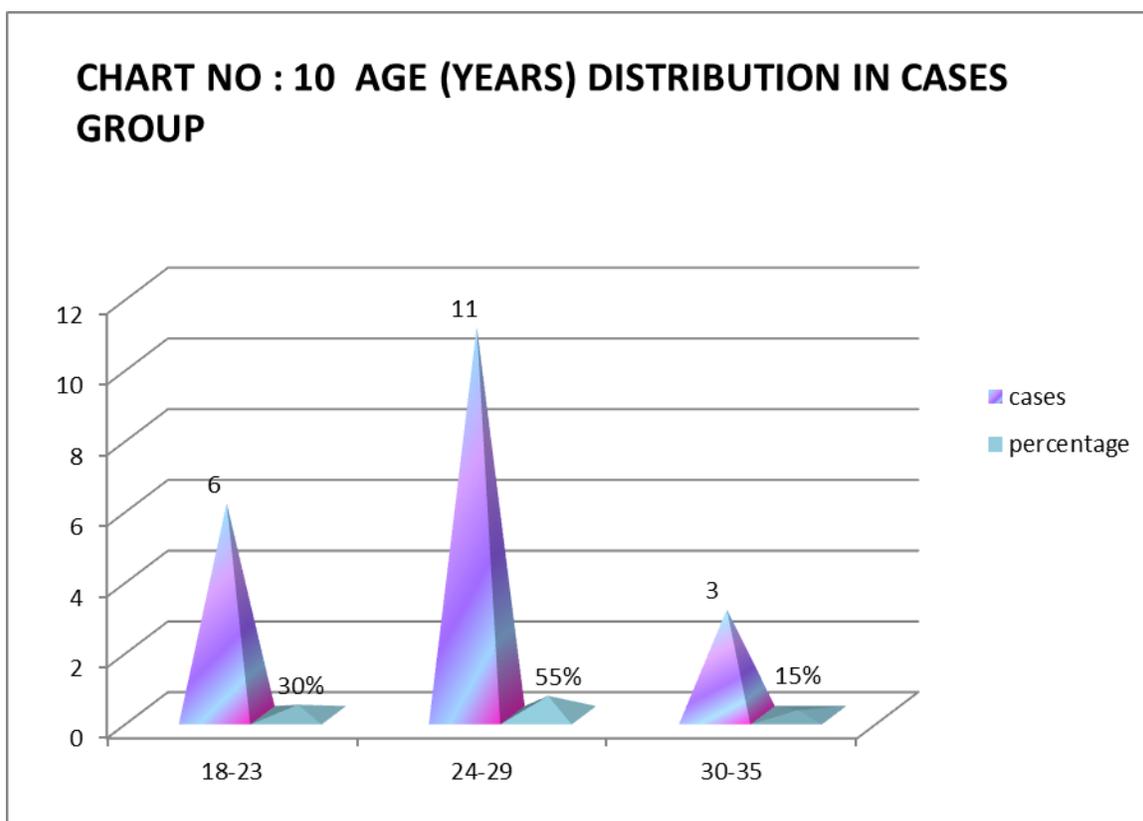
The mean age was 24.55 years with a standard deviation of 4.86 years.



showing the age distribution of cases group

Age in years	No: of control subjects	Percentage
18-23	06	30%
24-29	11	55%
30-35	03	15%
Total	20	100%

The mean age was 25.45 years with a standard deviation of 4.02 years.



VIII. DISCUSSION

Preeclampsia is a serious and life threatening complication in pregnant women. It is a pregnancy specific disorder which rates among one of the major causes of maternal and foetal morbidity and mortality.

More number of cases are seen in underdeveloped and developing countries due to late diagnosis and inadequate antenatal services.

In the present study the biochemical parameters like Fibrinogen Levels And Platelet Count are studied in normotensive and hypertensive(PIH)pregnant women.

The results of the present study are discussed under two groups:

1. Control subjects (normal pregnant women).
2. pregnancy-induced hypertension subjects as cases.

Control group:

A total number of 20 normotensive pregnant women were studied. The age group of these subjects ranges from 18-35 years. All these subjects are normotensive and healthy pregnant women. The results of estimation of Activated Partial Thromboplastin time, Prothrombin time Fibrinogen level and Platelet count are within normal limits.

Case group:

A total number of 20 cases of PIH have been studied. The age group of these subjects ranges from 18-35 years.

All cases showed classical triad of hypertension, proteinuria and oedema. In addition to above symptoms the eclampsia patients are presented with convulsions.

There is significant increase in plasma fibrinogen levels in cases when compared with normal pregnant women, the levels are within normal range and the difference is statistically significant.

There is significant decrease in platelet count in cases when compared with normal pregnant women, the levels are within normal range and the difference is statistically significant.

Biochemical changes consistent with intravascular coagulation and less often erythrocyte destruction may complicate preeclampsia and especially eclampsia. Changes in coagulation profile that occur in normal pregnancy includes the biochemical adaptation especially the haematological changes that occur in response to pregnancy are profound. The levels of several blood coagulation factors are increased during pregnancy.

Plasma fibrinogen increases about 65% late in pregnancy. The increase concentration contributes significantly to the striking increase in ESR. Other clotting factors that increase appreciably during normal pregnancy are factors- VII, VIII, IX, X. Prothrombin and factors- V, XII do not change. Whereas factors- XI and XIII decreases slightly. There is moderate decrease in platelet count as pregnancy progresses.

Maternal thrombocytopenia can be induced acutely by preeclampsia, eclampsia. Overt thrombocytopenia defined by platelet count less than 1,00,000/ μ l is an ominous sign.

Platelet aggregation is increase in preeclamptic women. Immunological processes or simply platelet deposition at sites of endothelial damage may be the cause. Thrombocytopenia in such disorders is associated with a prolonged bleeding time. The clinical significance of thrombocytopenia in addition to obvious impairment in coagulation is that it reflect the severity of pathological process. The lower the platelet count, the greater are

maternal and foetal mortality and morbidity. The addition of elevated liver enzymes to this clinical picture is even more ominous and a combination of events is referred to as HELLP syndrome [Haemolysis, Elevated Liver Enzymes and Low Platelet Count].

Pregnancy outcome: The outcome of pregnancy in the present study among 20 control subjects 9 delivered normally and in remaining 11 subjects the delivery outcome is not known. Where as in 20 cases, 5 subjects delivered normally, 2 subjects underwent LSCS, in 7 cases ELSCS was done, 2 subjects had foetus with IUGR and 4 with IUD.

IX. CONCLUSION

A comparative study was done between a normal pregnant women and women with PIH on the levels of Fibrinogen level and platelet count in blood.

The patients were clinically diagnosed based upon history, clinical symptoms, signs and levels of blood pressure.

In all the blood samples obtained from controls and cases fibrinogen levels and platelet count were estimated by standard methods. For this study the results showed a significant rise in fibrinogen levels whereas decrease levels of platelet count I in cases with PIH. But in the control subjects the values for all above parameters are within normal limits.

From this study it is concluded that estimation of these biochemical parameters plays an important role in the diagnosis of PIH and the evaluation of risk factors, early detection and effective antenatal services, prompt and proper management will decrease the materno-foetal mortality, morbidity and also perinatal mortality.

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Human Anatomic Variations in the Formation of Circulus Arteriosus – A Dissection Method

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Abstract- Introduction & Objective: The circulus arteriosus, exist between the internal carotid arteries and two vertebral arteries, that supplies the remainder. It slows down the blood before it reaches the brain and helps in collateral circulation. The knowledge of the CirculusArteriosus and its variations is essential in clinico –pathological conditions such as surgical hemorrhage, encephalomalacia, infarction of the brain and intra cranial aneurysms as it is one of the major collateral circulations ensuring the complete perfusion of the brain.

Methods: A total of 50 brain specimens were collected, cleaned and dissected. A careful examination of the specimens was done to check for variations in components of the CirculusArteriosus.

Dissection Method: The brains were removed en-mass by adopting the dissection procedures as given in the Cunninghams 'Manual of Practical Anatomy' Volume III: Head and Neck and Brain, 15th edition.

Results: The detail study of Circle of Willis along with morphology, shape, length, caliber, and anomalies were tabulated accordingly. In the present study all the components of the Circulus Arteriosus was studied and discussed in great detail and the variations were noted down.

Conclusion:- The posterior part of the circle was more anomalous than anterior part and the posterior communicating artery was the most anomalous segment when compared to all the segments of the arterial circle.

Index Terms- Circulus Arteriosus, Circle of Willis

I. INTRODUCTION

Much of the brain is supplied by two internal carotid arteries and a central anastomosis, the circulus Arteriosus, exist between these and the two vertebral arteries, that supplies the remainder. This 'Circle' more polygonal than circular, is in the cisterna inter-peduncularis, surrounding the optic chaisma, the neural indundibular stem of hypophysiscerebri and other related neural structures in inter-peduncular fossa.^[1]

Anteriorly the anterior cerebral arteries are joined by the anterior communicating artery; posteriorly the basilar artery divides into two posterior cerebral arteries, each joined to the ipsilateral internal carotid by posterior communicating artery.^[1]

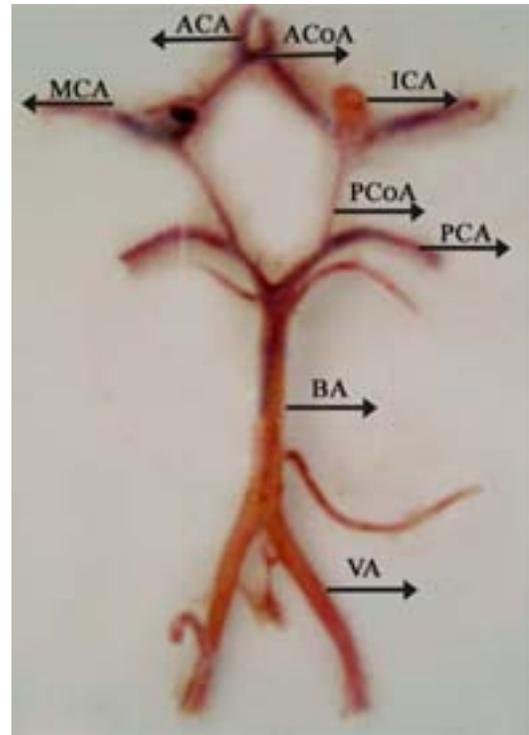


Fig.1 Showing Complete Circle of Willis.

Vessels of this 'circle' vary in calibre, being often maldeveloped, sometimes even absent.^[1] The greatest variation in calibre between individuals occurs in the posterior communicating artery. Sometimes, the diameter of the pre-communicating part of the posterior cerebral artery is smaller than that of posterior communicating artery, in which case blood supply to the occipital lobes is mainly from the internal carotids via the posterior communicating arteries.^[2]

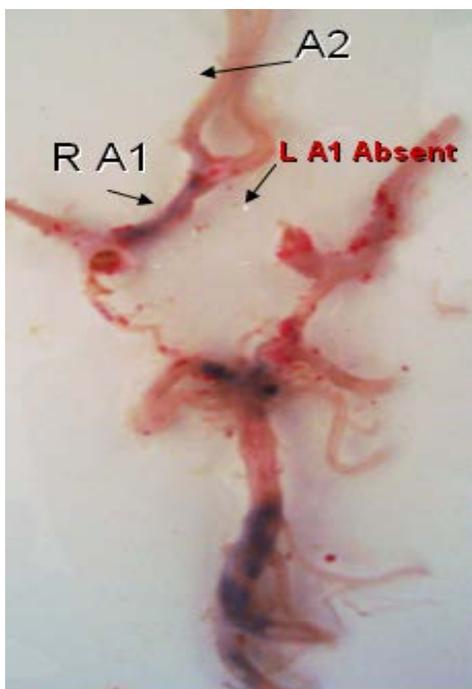


Fig.2. Showing incomplete Circle of Willis

Anatomic variations of Circle of Willis can also be the result of embryological anomalies.^[3] Prematurity is associated with more complete Circle of Willis and fewer anatomic variation; more variations involved major arterial segment, but few variations occur in communicating arteries.^[4] In some instances internal carotid artery provide the major supply to posterior cerebral artery.^[5] Anomalies of the branches of internal carotid artery can lead to serious clinical conditions like stroke.^[6]

Cerebral-vascular diseases present one of the leading problems of the modern mankind. They are followed by the risk of high mortality rate, and as such cause high level of disability with people who survive cerebral – vascular incident (stroke, apoplexy).^[7] The knowledge of cerebro-vascular variants is essential in education, training, diagnosis and treatment. After the occlusion of an internal carotid artery the principal source of collateral flow is through the arteries of the circle of Willis, but the size and patency of these arteries are quite variable.

II. MATERIALS AND METHODS

Fifty randomly selected formalin fixed human brains were collected from the cadavers. The brains were removed en-mass by adopting the dissection procedures as given in the Cunninghams 'Manual of Practical Anatomy' Volume III: Head and Neck and Brain, 15th edition. Brain removal was done by sawing the calvaria manually 1 cm above the supra orbital margin anteriorly and external occipital protuberance posteriorly. Once the calvarium was removed, the dura was opened by making a cruciform incision. The brain was detached by retracting the brain backwards and cutting the falx cerebri from its attachment to frontal crest and crista galli, olfactory nerves, optic nerve, internal carotid artery, oculomotor and trochlear nerves as and when they were encountered. The attached margin of tentorium

cerebella was incised to facilitate removal of brainstem and cerebellum intact with the cerebral hemispheres. While doing so, the remaining cranial nerves were cut as and when they were encountered. The vertebral arteries and spinal medulla were divided. The intact brains thus removed from the cranial cavity. Base of the brain was cleaned, circle of willis identified then numbered and photographed.

The circle of willis was then analysed with special reference to the following factors – whether the circle is complete or incomplete, any asymmetry in the configuration and variations in the size, and number of the component vessels, and absence, duplication or triplication of any of the vessels. A careful study has been done to note the presence of any aneurysms, if present.

III. RESULTS

1. Circulus Arteriosus – Circle Morphology

In the present study of the Circulus Arteriosus, the circle was complete in 43 of the cases (86.00%); out of the 43 complete circles 15 circles were symmetric and 18 asymmetric circles which accounted to 34.88% & 41.86% respectively. The circle was found to be incomplete in 7 of the 50 cases (14.00%).

Table No.1. Circulus Arteriosus – Circle Morphology

Circle Morphology	Complete 43 cases: 86.00%		Incomplete 7 cases: 14.00%
	Symmetric	asymmetric	
No. of cases	15	18	07
Percentage	34.88%	41.86%	14.00%

In the present study, the circle was incomplete in the anterior part in 2 of the 50 cases (4.80%). In specimen 7, the circle was incomplete due to the absence of A1 on the left side, A2 segments on both sides originate from ACA. In specimen 20, the circle was incomplete due the absence of A1 on right side, A2 segments on both sides originate from ACA.

The posterior part of the circle was incomplete in (specimen No.2,10,26,28,37) 5 cases (10.00%). In specimen 2, PCoA & P1 absent on the left side, BA bifurcates unequally. In specimen 10, PCoA absent on the right side P1 absent on the right side. In specimen 26, PCoA & P1 absent on the right side. In specimen 28, PCoA absent on the right side & P1 absent on the left side. Rest of the components of PCoA, P1, and BA normal in their size and origin. In specimen 37, PCoA & P1 absent on the right side.

2. Circulus Arteriosus Shape:-

In the present study, the shape of the Circle in most was a nonagon found in 37 cases (74.50%) and in 6 cases the circle was a polygon (12.00%).

Table No. 2. Circulus Arteriosus Shape:-

Shape of circle	No.of cases	Percentage
Nanogon	37	74.50%
Polygon	06	12.00%

3.Circulus Arteriosus – Anomalous Circle:

In the present study the anterior part of the circle was complete & normal in 39 of the 50 cases (78.00%); the posterior part of the circle was complete in 44 of the 50 cases (88.00%). In the present study the anterior part of the circle was anomalous in 6 cases (22.00%); the posterior part was more anomalous than anterior which was seen in 11 cases (12.00%).

Table No.3. Circulus Arteriosus – Anomalous Part:

	Normal/ Complete	Anomalous
Anterior part	88.00%	12.00%
Posterior part	78.00%	22.00%

A) ACoA–ACA Complex: (Anterior Communicating Artery):

The size of the anterior communicating artery was found to be comparatively less variant than any components of the circle. the average size of the artery was found to be 2 ± 0.17 mm in its external diameter and 4.2 ± 0.23 mm in its length. although, ACoA was absent in 15.00% of the cases, a complete absence of ACoA was found only in 2.00 % of the cases and in 7.00% of the cases, an azygous ACA was found.

B) Anterior Cerebral Artery (A1-Segment):

The artery was found to be hypoplastic in one case on the right side (2.00%); azygous ACA or median trunk formation was seen in 3 cases (6.00%). The artery was missing in one case on the right side (2.00%) and the A2 segment of both the side arose from the contralateral ACA (2.00%).

C) Posterior Communicating Artery [PCoA]:

The average length of the artery was found to be 14.02 ± 0.56 mm on the right side and 14.58 ± 0.53 mm on the left. The average external diameter of the artery was found to be 1.07 ± 0.14 mm on right side and 1.10 ± 0.15 mm on the left.

Both PCoA were hypoplastic in 12.00% of the cases. HypoplasticPCoA-R was seen in 17.00 % and hypoplasticPCoA-L was seen in 5.00%. In 2.00% of the cases, each of the PCoA continued as PCA proper on the ipsilateral side. PCoA arising from basilar artery was seen in 2.00%.

D) Posterior Cerebral Artery (P1segment):

The average length of the P1 segment in the present study was found to be 8.08 ± 0.49 mm on right side and 8.11 ± 0.54 mm on the left. In the present study, the artery was hypoplastic in two cases, one on each side.

The artery originated from the terminal bifurcation of the basilarartery in 46 (92.00%) cases. In 4 cases (8.00%) the artery

originated from ICA, 2 cases on each side accounting for 4.00% each.

IV. DISCUSSION

In this present study entitled “a study of anomalous pattern of Circle of Willis - a dissection method”, the Circle of Willis was studied in 50 specimens of intact brain for its components forming the Circulus Arteriosus. The findings were compared with the previous workers on this subject.

I) Circle Morphology: Completeness

In the present study, out of 50 brain specimens, it was found that the Circle of Willis as complete in 86.00% of the cases and incomplete in 14.00% of the cases. The circle was symmetric and normal in 34.88%. Most of the workers have reported that the normal CirculusArteriosus is present in only 50% or less of the cases.

Fawcett & Blackford in 1905 documented 96.1% of complete Circle of Willis. The circle was symmetrical and normal in 73.4% and was incomplete in 3-8%.^[8]

Bergmann mentions that textbook description of normal and symmetrical Circulus Arteriosus is true in only 34.5% of the cases.^[9]

II) Circle Morphology: Shape

In present study out of the 86.00% of complete circles it was found that the circle was nonagon in 74.50% and in the rest it was polygonal in shape 12%. Osborn mentions that arterial polygon specially a nonagon having ten components & nine segments.^[10]

III) Circle Morphology: Anomalous

Previous workers have found that the anomalies of the circle are more common in the posterior part. Jain et.al, in his study shows anterior and posterior parts of the Circle of Willis to be having anomalies in 29.16% and 51.38% cases respectively.^[11]

Hartkamp demonstrates that the posterior part of the Circulus Arteriosus is more anomalous in older subjects in 47% of the subjects than the anterior in 68% of the subjects.^[12]

Van Raamt et.al, showed that the complete anterior part of circle was seen in 71% of cases and a complete posterior part in 19%.^[13]

In the present study, it was found that the posterior part of the circle was most anomalous in 10.00% cases which are approximately similar to the findings of the other workers.

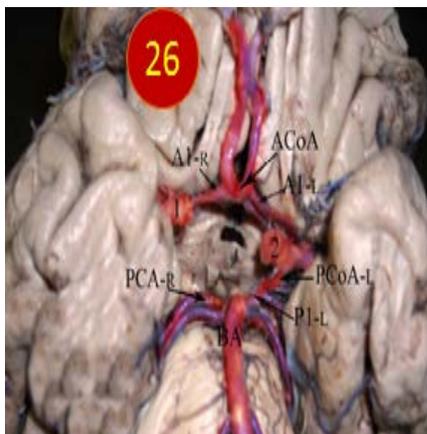


Fig.3. Showing the absence of PCoA and P1 on the right side. (26th specimen)

IV) ACOA-ACA COMPLEX:

1. Anterior Communicating Artery:

In the present study, the size of the anterior communicating artery was found to be comparatively less variant than any components of the circle. The average size of the artery was found to be 2 ± 0.17 mm in its external diameter and 4.2 ± 0.23 mm in its length. Although, ACoA was absent in 4.88% of the cases, a complete absence of ACoA was found only in 2.00% of the cases and in 7.00% of the cases, an Azygous ACA was found.

According to Luzsa's illustrations, the average length of ACoA ranges between 0.75 - 2.75 mm.^[14] KamathS reported 2.5 ± 1.8 mm as the average length of ACoA and 1.9 ± 9 mm as the average external diameter.^[15] Orlandini also gives the mean values for arterial segments of the components of Circulus Arteriosus and documents the mean value for ACoA to be 2.8 ± 1.8 mm.^[16]

Bergmann et.al, in their illustrations state that the average length of ACoA is 2 - 3 mm that may vary from 0.3 mm to 7 mm in length. They also reported that the percentage of the artery with a diameter of 1.5 mm was <44% and the diameter of 1.0 mm was found in <16%.^[9]

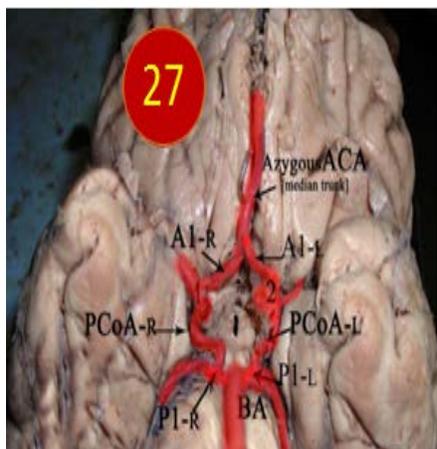


Fig.4. Showing the absence of ACoA and an Azygous ACA is formed by the union of A1 Segments of both sides. (27th Specimen)

2. Anterior Cerebral Artery (A1-Segment):

In the present study, the pre-communicating anterior cerebral artery (A1 segment) was present in 92.00%; the average length of the A1 segment was found to be $14.5 \pm [0.53-r; 0.18-l]$ mm for both sides although the average external diameter differed for right & left; for right it was 1.96 ± 0.08 mm left 2.07 ± 0.08 mm respectively.

Orlandini et.al, gives the mean length of the ACA on the right to be 14.1 ± 2.7 mm. And on the left as 13.6 ± 2.8 mm.^[17]

In the present study the cerebral artery A1 segment was found to be hypoplastic in one case on the right side (2.00%); Azygous ACA or median trunk formation was seen in 3 cases (6.00%). The artery was missing in one case on the left side (2.00%) and the A2 segment of both the side arose from the contralateral ACA (2.00%).

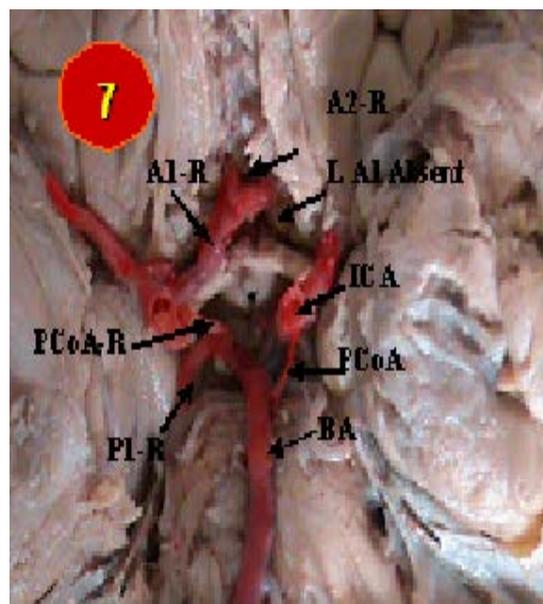


Fig.5. Showing the absence of A1 segment on the left side. (7th Specimen)

Windle reports the absence of the artery in 1%.^[21] Luzsa report state the absence of the artery in 0.7 - 11% and hypoplasia in 8 - 15%.^[14] Arthur reports 9.61% each of aplasia & hypoplasia of A1 segment^[18]. Osborn states the absence of the A1 segment in 1 - 2%.^[10] Vohra from his study inferred the range to be 0.5 - 2.5 mm.^[19]

3. Posterior Communicating Artery [PCoA]:

In the present study, the artery was found to be present in 87.50% and the average length of the artery was found to be 14.02 ± 0.56 mm on the right side and 14.58 ± 0.53 mm on the left. The average external diameter of the artery was found to be 1.07 ± 0.14 mm on right side and 1.10 ± 0.15 mm on the left.

According to Pedroza et.al the external diameter of the PCoA was 1.5 ± 0.8 mm on the right side; 1.6 ± 0.6 mm on the left side and the total length of the PCoA was 12.7 ± 3.2 mm on the right and 12.5 ± 1.7 mm on the left side.^[20] Orlandini et.al, mentions mean values for the length of PCoA to be 13.7 ± 3.5 mm in the right and 13.3 ± 3.5 mm in the left.^[16]

In the present study both PCoA were hypoplastic in 12.00% of the cases. Hypoplastic PCoA-R was seen in 17.00 % and

hypoplastic PCoA-L was seen in 5.00%. In 2.00% of the cases, each of the PCoA continued as PCA proper on the ipsilateral side. PCoA arising from basilar artery was seen in 2.00%.

Windle reported the vessel to be absent in 15% of the cases; both PCoA were absent in 1.5%; 4.5% involving the right and 6.5% on left side and the vessel was hypoplastic in 3.5% of the cases.^[21]

Fawcett & Blackford reported that the vessel was absent in 0.4% on both sides; absent on the right side in 1.8% and on the left side in 1.4% of the cases.^[8] Jain et al reports indicated that the artery presented maximum anomalies in 50% of the cases.^[11]

Stephen & John mentions 23% the PCoA missing on one side.^[22] Macchi et al, hypoplasia of the PCoA was noted in 21% of the cases.^[23] Osborn mentions hypoplasia or absent PCoA in 25-33%.^[10]

4. Posterior Cerebral Artery (P1 – Segment):

In the present study, the pre-communicating artery (P1 segment) was present in 44 of the cases (88.00%) and absent in 6 cases (12.00%). Out of the 6 cases, 4 cases on right side and 2 cases on left side accounted for 12.00% and 4.00% respectively. The average length of the P1 segment in the present study was found to be 8.08 ± 0.49 mm on right side and 8.11 ± 0.54 mm on the left. Similarly the average external diameter of the P1 segment was found to be 2.0 ± 0.09 mm on the right side and 2.2 ± 0.17 mm on the left.

Luzsa illustrates the average length of P1 segment ranging from 1.2 - 2.2 mm similar to the present study finding where the average length was found to be 2 mm.^[14] According to Kamath's the average length on the right side for P1 segment is 6.8 ± 2.7 mm and on the left 6.9 ± 3.1 mm. The average external diameter is 2.1 ± 0.7 mm on the right and 2.2 ± 0.6 mm on the left.^[15]

Orlandini also mentions mean values for P1 segment on the right being 7.7 ± 2.6 mm and 8.1 ± 2.9 mm on the left.^[16]

In the present study, the artery was hypoplastic in two cases, one on each side. The artery originated from the terminal bifurcation of the basilar artery in 46 (92.00%) cases. In 4 cases (8.00%) the artery originated from ICA, 2 cases on each side accounting for 4.00% each.

Windle study shows an anomalous P1 segment in 13.5%; PCA originating from ICA on the right in 5.5% of the cases and left in 2% of the cases.^[21] Fawcett & Blackford study indicates that the artery had an abnormal origin, arising from ICA in 0.14%; 0.85% on the right and 0.57% on the left.^[8]

Riggs' study showed that the unilateral hypoplasia of P1 present was present in 16% of the cases. Vare & Bansal studies show 25% P1 segment anomalies having an abnormal origin from ICA and 5.7% of the cases had both P1 segments arising from the ICA; 13.7% on the right and 5.7% on the left.^[24]

V. CONCLUSION & SUMMARY

The present study on the Circle of Willis involved the components of the circle and its variations. The Circulus Arteriosus was complete in 86.00%. In 74.50% the circle was found to be a nonagon. Normal and complete anterior part of Circulus Arteriosus was observed in 96.00% of the cases and posterior part in 90.00%.

Anomalous anterior part of the Circulus Arteriosus was more common in posterior part (10.00%) than in the Anterior part (4.80%). In spite of careful study, associated aneurysms were not seen in any of the segments of the Circulus Arteriosus.

The posterior part of the circle was more anomalous than anterior part and the posterior communicating artery was the most anomalous segment when compared to all the segments of the arterial circle.

Abbreviations:

1- Right Internal Carotid Artery

2 - Left Internal Carotid Artery

R – Right

L – Left

ACA - Anterior Cerebral Artery

ACoA- Anterior Communicating Artery

A1 - Anterior Cerebral Artery before ACoA.

A2 - Anterior Cerebral Artery after ACoA

PCoA-Posterior Communicating Artery

PCA - Posterior Cerebral Artery

P1 - Posterior Cerebral Artery before PCoA

BA - Basilar Artery

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Psoas Abscess, Bilateral Pyelonephritis with Staphylococcus Aureus Infections

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Abstract- We are herewith submitting a case report of left psoas abscess bilateral pyelonephritis with septic emboli in lungs, spleen and right atrium with osteomyelitis of left femur with staphylococcus aureus infection in a 14 years old lean boy without significant pre disposing factors. He was presented with high grade fever with erythematous rash and swelling of hip joint with pain. Pus culture was positive for staphylococcus aureus and sensitive to antibiotics linezolid, ofloxacin and vancomycin. Patient was improved with surgical drainage of psoas abscess and 4 weeks of antibiotic therapy.

Index Terms- Bilateral pyelonephritis, Psoas Abscess, Staphylococcus aureus infection.

I. INTRODUCTION

Psoas abscesses may arise from a hematogenous source, by contiguous spread from an intra abdominal or pelvic process, or by contiguous spread from nearby bony structures (eg., vertebral bodies). Associated osteomyelitis due to spread from bone to muscle or from muscle to bone is common in psoas abscesses. When Pott's disease was common, Mycobacterium tuberculosis was a frequent cause of psoas abscess. Currently, either S. aureus or a mixture of enteric organisms including aerobic and anaerobic gram - negative bacilli is usually isolated from psoas abscesses in the United States. S. Aureus is most likely to be isolated when a psoas abscess arises from hematogenous spread or a contiguous focus of osteomyelitis a mixed enteric flora is the most likely etiology when the abscess has an intra-abdominal or pelvic source. Patients with psoas abscesses frequently present with fever, lower abdominal or back pain, or pain referred to the hip or knee. CT is the most useful diagnostic technique¹

A case report

A 14 year non diabetic male boy presented with complaints of high grade fever with chills, rash all over the body, pain in the lower abdomen, left hip and burning micturition of 1 week duration.

On examination patient conscious coherent erythematous macular rash all over the body with swelling and tenderness in the left thigh, and unable to flex left hip.

Past History

No history suggestive of Diabetes, HIV, Drug abuse, prolonged hospitalization or trauma.

General Examination

Temp - 102⁰ F ; Pulse - 120/mt regular ; Respiratory Rate - 22/min; No cyanosis; no lymphadenopathy; no clubbing ; no pedal edema ; per abdomen examination - tenderness over the left iliac region and lumbar region . Swelling and Tenderness of left thigh present; no organomegaly ; no free fluid in the abdomen. Patient was not able to flex left thigh.

Investigations

CUE - sugar nil ; albumin Trace ; pus cells - 6 - 8 / hpf + ; CBP - Hb - 12 gm/dL ; WBC count - 11,000 cells / cumm ; Neutrophils - 68% ; lymphocytes - 27% ; monocytes 03% ; Eosinophils - 02% ; Basophils - 0 % ; ESR - 25 mm 1sthr; platelets adequate - RBS - 120 mg/dL ; serum urea - 24 mg/dL ; Sr. Creatinine - 0.6 mg./dl ; Sr. electrolytes - 123 meq/L ; Sr. Potassium- 3.2 meq/L ; Sr. Bilirubin - 0.9 ; Glycosylated Hemoglobin - 5.7% ; ASO - < 200 IU/ML ; Dengue - negative ; Mantoux - negative; ECG - Normal sinus rhythm; Heart Rate - 130/mt sinus tachycardia; HIV - Non reactive; X-ray Chest - Normal; X ray Left Hip - Acute Osteomyelitis left Femur; Pus Culture & Sensitivity - Staphylococcus aureus organisms isolated; Urine Culture - No organisms grown; **Ultrasound Abdomen**-Liver - Normal; Rt Kidney - 12.7 x 7 cms enlarged increased echogenicity dilated pelvis with echogenic focus noted. Lt Kidney -12.3 x 6.8 cms increased echogenicity with dilated pelvis; **Impression** - Bilateral Pyelonephritis. ; **Ultrasound Hip -III**, defined hyperechoic lesion noted in the iliopsoas extending into posterior and anterior compartment of upper 1/3 of thigh; **Impression** - Abscess in the iliopsoas with downward extension ; **CT Scan Abdomen with IV Contrast**- Lungs showing multiple thick walled cavity lesions in basal segments of both lobes, cavitating infarcts suggestive of septic emboli. Small well defined sub-capsular non enhancing wedge shaped hypodensity suggestive of infarct. Large ill-defined hypodense lesion in the left iliopsoas- suggestive of abscess. Extending below in the intermuscular plane involving the anterolateral muscle compartment of thigh; **Impression**-left iliopsoas abscess extending into anterolateral compartment of thigh and around left hip joint with septic emboli and infarcts in the left lungs and spleen ; pus culture sensitive to amoxyclav ; Vancomycin ; Linezolid&Ofloxacin. X ray Chest - Normal ; 2D Echo - prominent eutachian valve, Echogenic focus at RA & IVC junction ,Good LV/RV function. Repeat 2 D Echo after 4 weeks

of antibiotic therapy vegetation's disappeared. venous doppler study - normal.

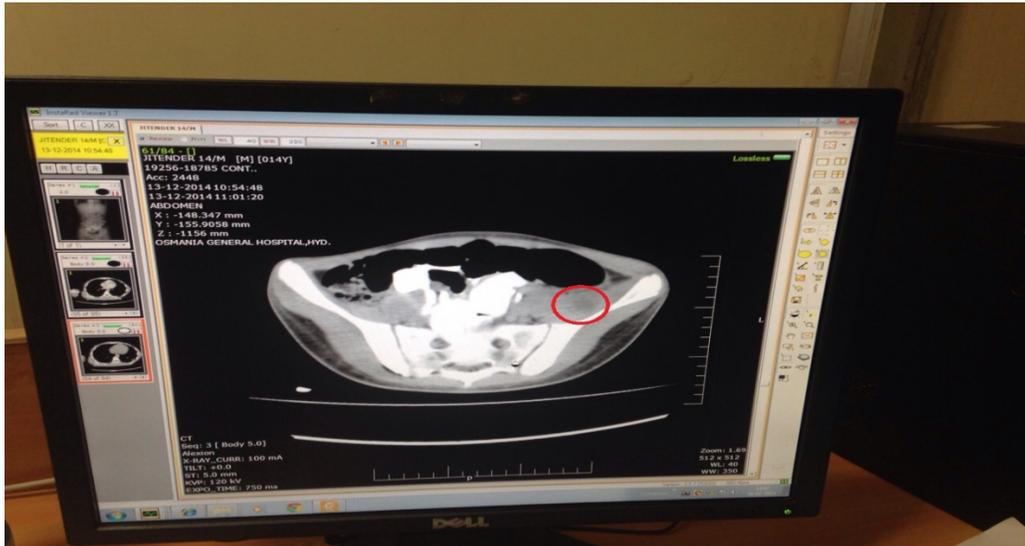
Diagnosis

Left psoas abscess, bilateral pyelonephritis with septic emboli in lungs, spleen and right atrium with osteomyelitis of left femur with staphylococcus aureus infection.

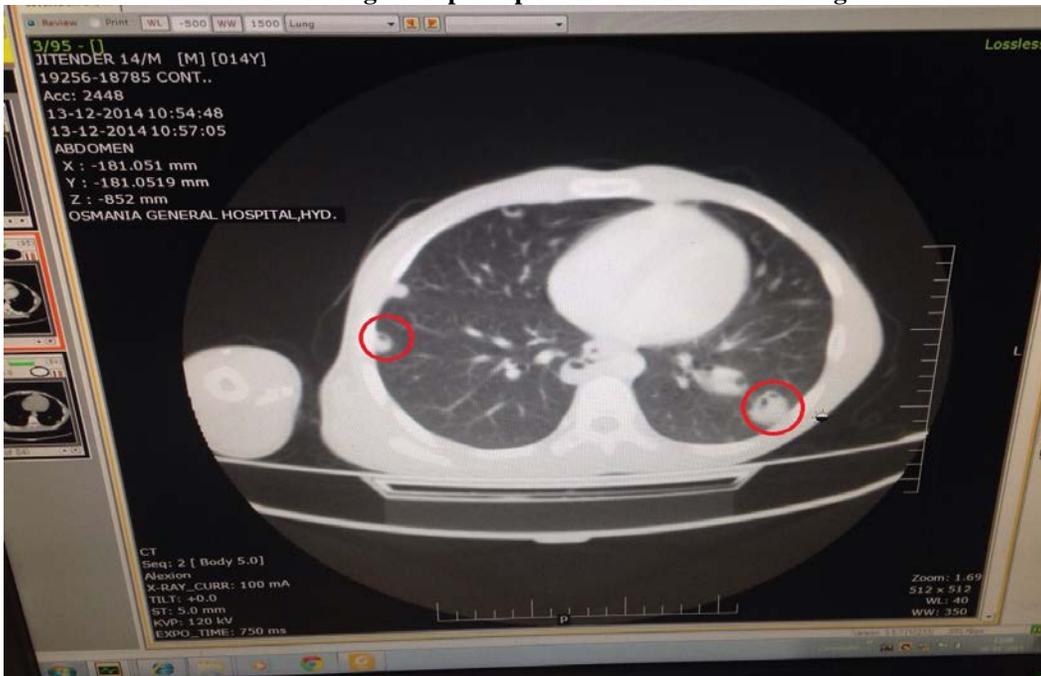
Treatment

Patient underwent surgical drainage of Psoas abscess and kept on antibiotic; IV Ofloxacin followed by Linozolid for 4 weeks; Patient general condition improved rash fever subsided and advised skin traction for left leg by Orthopedician and Discharged.

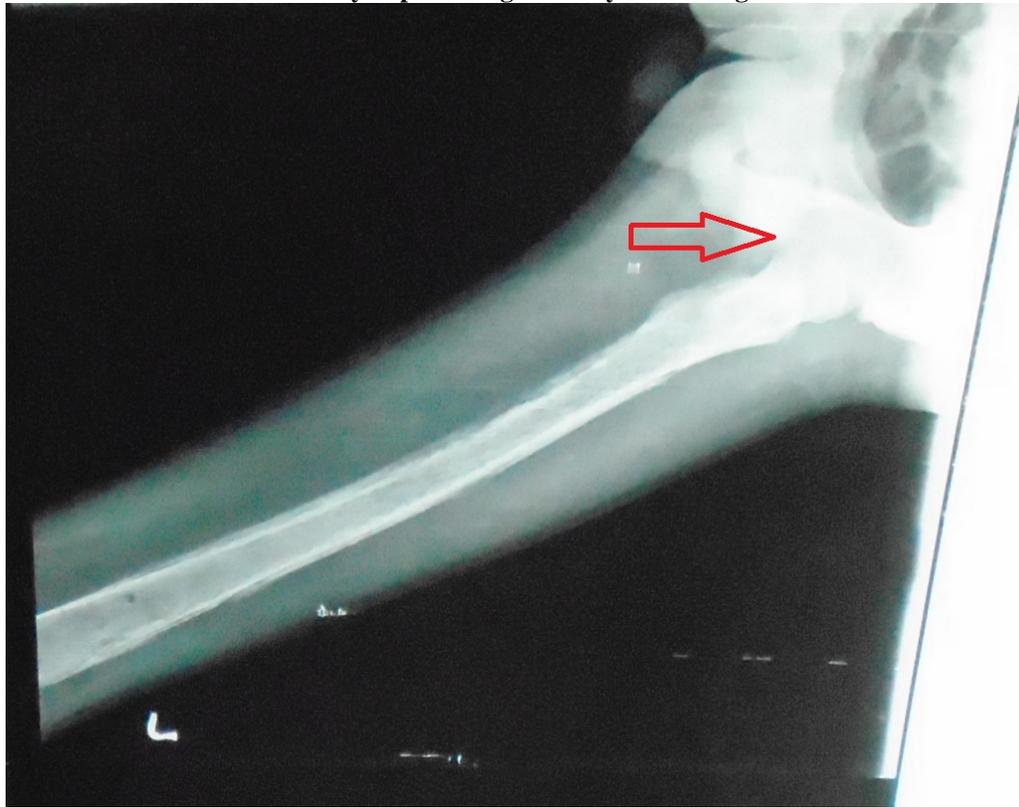
Contrast CT with Left Psoas abscess



Contrast CT showing Multiple Septic Emboli in Bilateral Lung Fields



X Ray Hip showing Osteomyelitis changes



II. DISCUSSION

Association between cluster – forming cocci and abscesses was first observed by a Scottish surgeon, Alexander Ogston. He coined the name Staphylococcus' for the organism (Staphyle, bunch of grapes ;kokkos berry) to distinguish it from Chain forming Streptococci. More than 30 species of Staphylococci can infect humans. However, most infections are caused by Staphylococcus aureus, the most virulent species and an important cause of morbidity and mortality in humans. It is distinguishable from other Staphylococci by its ability to produce coagulase, an enzyme that converts fibrinogen to fibrin. The other less virulent species of Staphylococci are grouped together as coagulase negative Staphylococci (CoNS).

Staphylococcus Aureus infections

S. Aureus forms part of normal human flora, colonizing the anterior nares, axilla, perineum, oropharynx, and vagina and toe webs. 25% to 50% of healthy persons may be carriers and this is relevant to the epidemiology, as source of most infections is endogenous. Factors predisposing to S. aureus colonization are shown.

Factors predisposing to S. aureus Colonisation

Insulin – dependent diabetes, HIV infection, IV drug abuse, Chronic haemodialysis patients, Skin diseases, e.g. eczema, S. aureus has a capacity to induce abscess formation.

S. aureus usually caused localized infections resulting in abscess formation. However, bacteremia and haematogenous

spread may occur, the severity of which is determined by the host response.

Common illness Caused by Staphylococcus Aureus - Skin and soft tissue infections, Folliculitis, Furuncle, carbuncle, Musculoskeletal infections- Septic arthritis, Osteomyelitis, Pyomyositis, Psoas abscess, Respiratory tract infections - Septic pulmonary emboli, Empyema, Bacteremia and its complications - Sepsis, septic shock, Metastatic foci of infection (kidney, joints, bone, lung), Infective endocarditis, Toxin Mediated illness, Staphylococcal scalded – skin syndrome

Iliopsoas abscess is a relatively uncommon condition that can present with vague clinical features. Its insidious onset and occult characteristics can cause diagnostic delays, resulting in high mortality and morbidity²

The Iliopsoas compartment is an anatomic space composed of the psoas major, psoas minor, and iliacus muscles, which mediate hip flexion and are innervated by L2-4.

Iliopsoas abscess may be classified as primary or secondary, depending on the presence or absence of underlying disease. Primary iliopsoas abscess occurs probably as a result of haematogenous spread of an infectious process from an occult source in the body. The group of patients in which primary iliopsoas abscess occurs diabetes, HIV, IV drug abuse, immunosuppression. Crohn's disease is the commonest cause of secondary iliopsoas abscess³.

Iliopsoas abscess is a collection of pus in the iliopsoas compartment. Iliopsoas abscess was first described by Mynter in 1881 who referred to this as psoitis⁴. <http://pmj.bmj.com/content/80/946/459.full-ref-1>

Staphylococcus aureus is the causative organism in over 88% of patients with primary iliopsoas abscess.⁴[http://pmj.bmj.com/content/80/946/459.full - ref-8](http://pmj.bmj.com/content/80/946/459.full-ref-8) Secondary iliopsoas abscess is caused by streptococcus species 4.9% and *E coli* 2.8%.⁵[http://pmj.bmj.com/content/80/946/459.full - ref-8](http://pmj.bmj.com/content/80/946/459.full-ref-8) *Mycobacterium tuberculosis* as a cause of iliopsoas abscess is currently uncommon in the western world, but common in the developing countries. Iliopsoas abscess is common in the young compared with the elderly⁶. It is reported to be commoner in males than females.⁷

Eustachian Valve

The ostium of the inferior vena cava is guarded by a crescent shaped, often fenestrated flap of tissue, the Eustachian valve, which is readily seen by echocardiography. Although generally small the Eustachian valve can become so large that it can produce a double chambered right atrium⁸ it is coincidental finding in this case.

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Biosorption capacity of *Lonchocarpus laxiflorus* Leaves biomass for adsorption of metal ions (Fe^{3+} , Pb^{2+} , Cr^{2+} , Cd^{2+} and Ni^{2+}) from aqueous solution

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Abstract- The adsorption capacity of *Lonchocarpus laxiflorus* leave (LLL) biomass for the removal of metal ions (Fe^{3+} , Pb^{2+} , Cr^{2+} , Cd^{2+} and Ni^{2+}) was investigated and the residual metal ion concentrations was studied using Atomic Absorption Spectrophotometer (AAS). The adsorption capacity was performed by batch experiments as a function of experimental parameters like effect of pH, contact time, initial metal ion concentration and temperature on biosorption of metal ions from aqueous solution. The metal ion sorption capacity by *Lonchocarpus laxiflorus* increases with increase metal ions concentration. The biomass sorption capacity increases, with increases in pH, reaches a maximum and then decreases steadily. The sorption rate was rapid for the first 30 – 40 min and equilibrium was reached within 120 min. The maximum sorption capacity for Fe^{3+} , Pb^{2+} , Cr^{2+} , Cd^{2+} and Ni^{2+} was found to be 61, 99, 98,85 and 100 % respectively. The results from these studies will be useful for removal of toxic metal ions from waste water and can be adopted for secondary treatment. It can also be turned into an environmentally friendly and cost effective sorbent for waste water.

Index Terms- Heavy metal ions, Immobilization, *Lonchocarpus laxiflorus*, Sorption capacity

I. INTRODUCTION

Despite the requirement for healthy environment, the environment has been found to be contaminated with various pollutants. This has now posed a great challenge to human wellbeing. Such pollutants may be found in air, water soil, coastal erosion, overfishing and deforestation as well as disposal of waste, which constitute several heavy metals. Heavy metals released into the environment by industrial and metallurgical process tend to persist indefinitely, circulating and eventually accumulating throughout the food chain (Vijayaraghava *et al.*, 2004). The rate at which effluents are discharged into the environment especially water bodies, has been on the increase as a result of urbanization, industrialization of many sectors such as food, pharmaceutical, leather, textile, cosmetics, paper, printing etc. and waste generated from these industries contain heavy metals which is the cause of the environmental contamination (Vijayaraghava *et al.*, 2004 ; Hasfalina *et al.*, 2012).

At present, these toxic metals have polluted our atmosphere, our water, our soil and our food, and have been reported to toxic

even at low concentration (Jimoh *et al.*, 2011). They accumulate in the food chain and once absorbed into bodily tissues cannot be easily excreted.

The heavy metals of widespread concern to human health are lead, copper, mercury, cadmium, arsenic, chromium and zinc (Jimoh *et al.*, 2011). Among the heavy metals, lead, mercury and cadmium are examples of heavy metals that have been classified as priority pollutants by the U.S Environmental Protection Agency (USEPA) (Keith *et al.*, 1997).

The available conventional treatment method or known as physico-chemical technique consisting of flocculation, ozonation, chemical coagulation, precipitation, evaporation, electrochemical treatment, ion exchange, reverse osmosis, adsorption, etc where each of them have limitations such as high cost and production of hazardous by-products are found expensive and sometimes ineffective, especially when metals are present in solution at very low concentration within the range 1-100mg/cm³ (Jimoh *et al.*, 2012). Therefore, these constraints have caused the search for alternative methods that would be efficient for metal sequestering. Sorption operations, including adsorption and ion exchange, are a potential alternative for water and wastewater treatment (Damirbas, 2008) Adsorption has advantages over other methods. The design is simple, and it is sludge free and can involve low investment in terms of both the initial cost and land (Viraraghvan *et al.*, 2007). Recently plants have been studied for the ability to remove contaminants from the environment (Chandra *et al.*, 2004). Researchers have recognized that immobilizing biomass in a ganular or polymeric matrix may improve biomass performance and facilitate separation of biomass from the solution(Chandra *et al.*, 2004) The American Bureau of Mines has investigated the use of biomass immobilized in porous poly-sulfonate beads (BIOFIX) for extracting toxic and heavy metals from dilute waste streams (Chandra *et al.*, 2004). Gardea-Torresdey *et al.*, 1996, have removed copper ions from aqueous solutions by silica immobilized *Medicago sativa* (alfalfa). Immobilized biomass appears to have a greater potential than raw biomass in packed bed or fluidized bed reactors with benefits such as control of particle size, better capabilities of regeneration, reuse and recovery without destruction of biomass beads (Shan *et al.*., 2002). Anaerobic sludge supplied from a wastewater treatment plant, acts as a novel biosorbent, for Pb^{2+} , Cu^{2+} , Cd^{2+} , and Ni^{2+} removal from aqueous solutions (Osemehon *et al.*, 2013). Rice husk, a surplus agricultural byproduct, is used for the sorption of Cd^{2+} from aqueous solution. Some simple and low-cost chemical modifications resulted in increasing the sorption

capacity of raw rice husk (RRH) have been studied (Kumar *et al.*, 2006). Papaya wood was evaluated as a new biosorbent of heavy metal ions such as Cu^{2+} , Cd^{2+} and Zn^{2+} (Shama *et al.*, 2010)].

The use of non-living biomaterial containing metals-binding compounds would have the advantage of non-requiring care and maintenance as well as being useful in remediating areas with high levels of contaminants that would otherwise kill live systems (Kurrapati *et al.*, 2009). Hence a plant such as *Lonchocarpus laxiflorus*, that grows very well should show a greater ability to recover heavy metals and may be a good source for naturally occurring biological compounds that have potential for contaminant remediation might contain natural metal binding compounds and could be a possible source for bioremediation of heavy metals in waste water. The immobilization of *Lonchocarpus laxiflorus*, biomass involves the trapping of the biomass within the matrix with sodium alginate and calcium chloride solutions to give good biosorbent materials. However, biosorbents are hard enough to withstand the application of pressures, have water retention capacity, high and fast sorption uptake. (Osemeahon *et al.*, 2013). Also because of immobilization, the biosorbents so obtained offer easy and convenient usage compared to free biomass, which is easily biodegradable (Reza *et al.*, 2010). The target in this study is to immobilize the leaves of *Lonchocarpus laxiflorus*, with sodium alginate with the objective of using the products as a sorbent for the removal of metal ions in waste water.

II. MATERIALS AND METHODS

Analytical reagents of grade chemicals obtained from the British Drug House (BDH) and distilled water was used. The reagents are lead nitrate $\text{Pb}(\text{NO}_3)_2$, Potassium dichromate ($\text{K}_2\text{Cr}_2\text{O}_7$), Copper Nitrate $\text{Cu}(\text{NO}_3)_2 \cdot 3\text{H}_2\text{O}$, Mercury(II) Chloride $\text{Hg}(\text{Cl}_2)$, Cadmium Nitrate $\text{Cd}(\text{NO}_3)_2$, Nickel sulphate ($\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$) and Ferric nitrate nonahydrate $\text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$, Sodium alginate, calcium chloride. Metal ion solutions of different concentration were obtained by diluting their respective stock solutions ($1000\text{mg}/\text{cm}^3$). Standard acids and base solutions (0.1M HCl , 0.1M NaOH and 1M HNO_3) were used for pH adjustments.

2.1. PLANT COLLECTION AND TREATMENT

The leaves of *Lonchocarpus laxiflorus* plant were collected from a tree behind Modibbo Adama Federal University of Technology Yola, Nigeria. The plant was washed thoroughly under running water to remove dust and any adhering particles and then rinsed with distilled water. The sample was air-dried for 2 weeks and the dry leaves were ground in an analytical mill and sieved to obtain adsorbent of known particle size range. The biomass powder was kept in an air-tight bottle for further study (Igwe and Abia, 2006).

2.2 PREPARATION OF SODIUM ALGINATE AND CALCIUM CHLORIDE STOCK SOLUTION

Sodium alginate was prepared by weighing 4.00 g and making it up to 100cm^3 mark with distilled water in a volumetric flask and left overnight for complete dissolution. 0.12M calcium chloride was prepared by weighing 26.28 g in to 1000cm^3 volumetric flask and making it up to mark with distilled

water according to a standard procedure described by (Osemeahon *et al.*, 2012).

2.3 IMMOBILIZATION OF THE LEAVES OF LONCHOCARPUS LAXIFLORUS PLANT

Sodium alginate was used for immobilization of the leaves of *Lonchocarpus Laxiflorus* plant. 50cm^3 of sample solution prepared by dissolving 4g of each test sample in 100cm^3 of distilled water and mixed with 50cm^3 of 4% stock solution of sodium alginate and stirred vigorously in 250cm^3 beaker, to obtain a homogeneous mixture. After mixing, the solution was drawn through hypodermic needles and added dropwise to a stirred solution of 1M CaCl_2 . A retention time of 1 h was allowed for the reaction to obtain complete precipitation of the immobilized leaf powder of *lonchocarpus laxiflorus* plant. The beads thus formed i.e. sodium alginates were kept in fresh CaCl_2 solution. Before sorption studies, the beads were removed and allowed to dry at room temperature. The dried solid mass was stored in a polythene bag for further use. (Mishra S. P. 2013).

2.4 PREPARATION OF SYNTHETIC WASTE WATER.

The following metal solutions were prepared:

(i) Lead solution of $1000\text{mg}/\text{cm}^3$ concentration was prepared by dissolving 1.6g lead(II) nitrate $\text{Pb}(\text{NO}_3)_2$ in 250cm^3 of distilled water and make up to mark with distilled water in a 1000cm^3 volumetric flask.

(ii) Chromium solution of $1000\text{mg}/\text{cm}^3$ concentration was prepared by dissolving 2.827g Potassium dichromate $\text{K}_2\text{Cr}_2\text{O}_7$ in 250cm^3 of distilled water and make up to mark with distilled water in a 1000cm^3 volumetric flask.

(iii) Cadmium solution of $1000\text{mg}/\text{cm}^3$ concentration was prepared by dissolving 2.103g of $\text{Cd}(\text{NO}_3)_2$ in 250cm^3 of distilled water and make up to 1000cm^3 in a volumetric flask.

(iv) Nickel sulphate $\text{Ni}(\text{SO}_4) \cdot 6\text{H}_2\text{O}$ solution of $1000\text{mg}/\text{cm}^3$ was prepared by dissolving 0.4478g in 250cm^3 of distilled water and make up to 1000cm^3 in a volumetric flask.

(v) Iron solution of $1000\text{mg}/\text{cm}^3$ concentration was prepared by dissolving 7.21g of ferric nitrate nonahydrate ($\text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O}$) in 250cm^3 of distilled water and make up to 1000cm^3 in a volumetric flask.

III. BATCH SORPTION STUDIES

The experiments were carried out in the batch mode for the measurement of adsorption capacities. From 100 ppm of each metal ion solution, 50ml was taken into a 25ml conical flask and 0.2g of the LLL was added, corked with a rubber bung and shaken with a flask shaker for 2 hours at room temperature (30°C) at 180rpm. The separation of the adsorbents and solutions were carried out by filtration with Whatman filter paper No 42 and the filtrates were stored in sample cans for use. The residual metal ion concentrations were determined using Atomic Absorption Spectrophotometer AAS. Pye Unicam Model SP]. The percentage adsorption was calculated using the following equation:

$$\% \text{Adsorption} = [(C_i - C_f / C_i)] \times 100$$

Where C_i = Initial metal ion Concentration and C_f = Equilibrium metal ion Concentration (mg/l)

3.1 EFFECT OF pH ON IMMOBILIZED LEAVES OF LLP

The effect of pH solution on the sorption capacity of immobilized LLL was investigated in this experiment at room temperature (30°C) and equilibrium time of 2 h. 30 cm³ of the prepared aqueous solution was measured in a conical flask, followed by the addition of 0.5 g of the sample in the flask. The pH was varied from 1 to 7. 0.1 M HCl or 0.1 M NaOH was used to adjust the pH of the metal ion solutions to the desired value of interest. The metal solutions containing the biosorbent in the conical flask were well corked and shake using Gallenkamp flask shaker for 2h and thereafter the mixture was filtered, and then the concentration of each metal ions removed was determined using Atomic Absorption Spectrometer, (model, Shimadzu 6800).

3.2 THE EFFECT OF CONTACT TIME ON IMMOBILIZED LEAVES OF LL PLANT

The effect of contact time was studied using an initial concentration of 20 mg L⁻¹. The time intervals chosen for this experiment were 30, 60, 90, 120, and 150 minutes. 0.5g of the immobilized leaves samples was separately mixed with 50cm³ solution of initial concentration 100 mg L⁻¹. The mixture was shaken constantly in a shaker at 180 rpm speed for the time period of 30, 60, 90, 120, and 150 minutes for all the metal ions. At the end of each contact time, the mixture was filtered and the concentration of the filtered was determined using AAS

3.3 THE EFFECT OF INITIAL METAL IONS CONCENTRATION ON IMMOBILIZED LEAVES OF LLP

The effect of initial metal ion concentration on adsorption was studied as well at equilibrium time of 90 minutes and varying the concentration from 10 - 80 mg cm⁻³. 0.5g of the immobilized leaves samples were each separately mixed with 50cm³ solution of aqueous solution from the prepared 100mg/cm³. The mixture were shaken constantly using a rotary shaker at 180 rpm for 90 minutes for all the metal ions. At the end of the 90 minutes, the mixture was filtered using Whatman filter paper (No:42) and their concentrations determined using the Atomic Absorption Spectrophotometer AAS (Shimadzu AA-680, Japan). The difference between the initial concentration and the final concentration was recorded as the amount adsorbed for each concentration. The result obtain were used to analyzed both Freundlich (1906) and Langmuir (1916) isotherms.

IV. THERMODYNAMIC STUDIES

4.1 EFFECT OF TEMPERATURE ON SORPTION CAPACITY OF LLL

Temperature is a crucial parameter in adsorption reaction, the effect of adsorption of metal on the substrate was determined at 30°C- 80°C. The result was used to investigate the thermodynamic of the sorption process according to (Micheal and Ayebeami, 2005; Sarin V *et al.*, 2006). A volume of 50cm³ of metal ion solution (100mg/cm³) was mixed with 0.5g of sample in a conical flask of 125cm³ to obtain a suspension; the suspension was adjusted to a pH 4.0. The whole flask was shaken

at constant speed 100 x g in a shaking water bath at temperatures of 30, 40, 50, 60, 70, and 80°C respectively. After shaking the flasks for 2hr, as the samples were undergoing agitation on the shaker, they were removed one after the other at different temperatures ranging from 30°C to 80°C. The suspension was filtered using (no.42) whatman filter paper and then centrifuge at 2800 x g for 5min. The supernatants was collected in separate clean test tubes. The metal content at each temperature range was determined using AAS. The experiments were performed in triplicates. The results were used to investigate the thermodynamic of the biosorption process.

The thermodynamic constants such as Gibbs free energy change (ΔG°), enthalpy change (ΔH°) and entropy change (ΔS°) for the system and to ascertain the sorption mechanism. (Sarin *et al.*, 2006).

CALCULATION OF METAL UPTAKE

The amount of metal absorbed by the biosorbent.:

$$q_e = V(C_o - C_e) / M \quad (1)$$

Where, q is the amount of metal ion adsorbed in mg/g; C is the initial metal ion concentration in mg/cm³; Ce is the final concentration in mg/cm³ V is the volume of metal ion solution in liters; M is the mass of the leaves, stem and root of *Lanchocarpus laxiflorus* powder used in gram. The percentage Removal of the metal ion was also determined using;

$$\text{Removal \%} = [(C_o - C_e) / C_o] \times 100 \quad (2)$$

Where, R% is the percentage of metal removed.

V. RESULTS AND DISCUSSION

The LLL was found to provide the lowest residual metal concentration in the case of Nickel, Lead and Chromium (of 0.1010mg/L, 0.0010mg/L and 0.0031mg/L) respectively with % removal from aqueous solution of 99.99, 99.98 and 99.89 respectively as shown on this “fig” 1

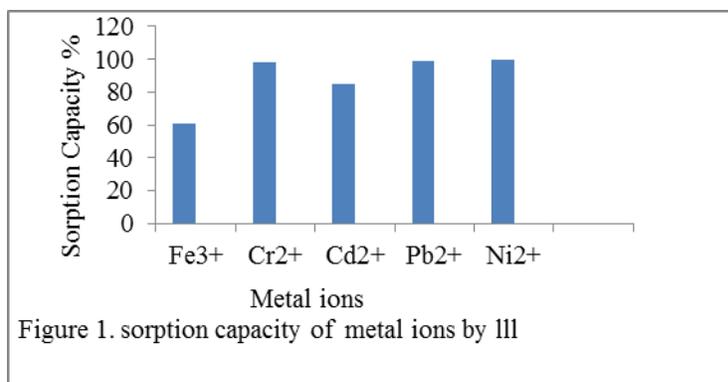


Figure 1. sorption capacity of metal ions by LLL

The Leaves part of the plant were found to provide the lowest removal capacity of iron 61%, followed by cadmium 85% ,lead 99% and nickel which gives removal capacity almost 100% , this could be due to the fact that heavy metal ion such as Ni (II) have

a strong affinity for protein of the cell wall(Kishore et al., 2012). The differences observed in the sorption for the various metal ions study, can be related to the differences in metal hydration free energy, and the type of functional groups present on the adsorbent and the metal chemistry of the solution (Shukla *et al.*, 2005), and the ability of metal to form covalent bond with ligand (Osemeahon *et al.*, 2012) and the nature of the surface sites available (Cooper *et al.*, 2002).

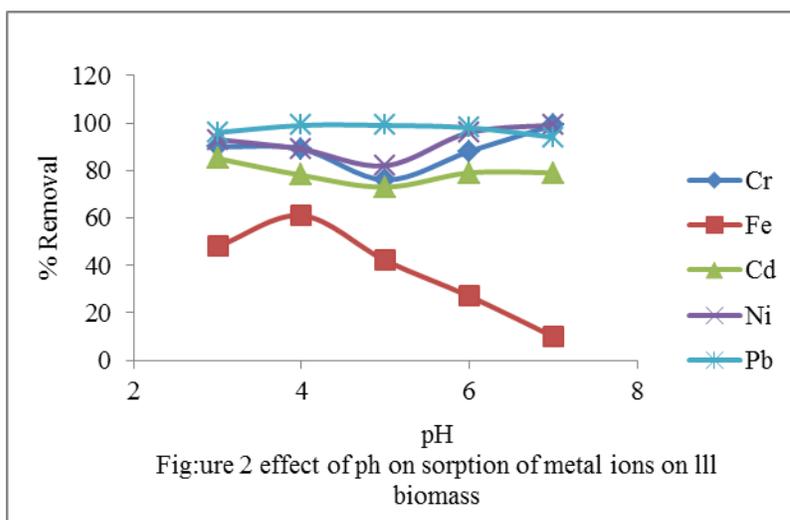
5.1 EFFECT OF pH ON THE METAL ION UPTAKE OF LONCHOCARPUS LAXIFLORUS LEAVE

For biosorption of heavy metal ions, pH is the most important environmental factor. The pH value of a solution strongly influences not only the site dissociation of the biomass surface, but also the solution chemistry of the heavy metals: hydrolysis. The state of metal ions in solution strongly depends on the pH, the acidity and basicity of the various solutions can influence the composition and the properties of the adsorbent surface. Therefore, in order to determine the optimum pH for metal

adsorption, the adsorption was studied at various pH. The effect of pH on metal ion removal by LLL biomass was shown in figure 2. It can be seen that Fe was retained in solution at higher pH compared with other metal ions studied. The sorption capacity for Fe reaches a maximum at 60% at pH 4. The LLL sorption decreases sharply on further increase of the pH. As the capacity increases, reaches a maximum and then decreases steadily. The sorption capacity for pb increase steadily as the pH increased. Sorption capacity for Ni, Cr and Cd decreases sharply and increases as their pH values increases. At lower pH values below 5, there was excessive protonation of the active site at LLL surface and this often refuses the formation of links between metal ions and the active site (Jaber saleh, 2013). At higher pH values above 5-7, linked H⁺ is released from the active site and adsorbed amount of metal ions is generally found to increase. The LLL has a high selectivity for Pb, Cr and Ni with 99.86%, 98.75% and 99.49% at pH 5,7 and 7 respectively. For cadmium the sorption capacity was low compared to Pb, Cr and Ni.

Table 1: The pH for maximum sorption of the metal ions studied by LLL and the corresponding % removal are given below

Metal ion	pH for maximum Sorption	sorption capacity %
LLL		
Cd	3.0	85.08
Ni	7.0	99.49
Pb	5.0	99.86
Cr	6.0	98.75
Fe	7.0	61.00



5.2 effect of contact time

The effect of contact time on the uptake of metal ions chromium, Iron, Cadmium, Nickel and Lead by LLL, has been showed in “fig” 3. This was achieved by varying the contact time from 20-120 minutes. The adsorption of metal ions was increased at specific time and becomes constant when it reaches equilibrium. The initial rapid uptake was due to diffusion of metal ions onto the surface of adsorbent have reach equilibrium. In figure 3, the rapid uptake is about 89.94- 89.98% removal of chromium, 84- 90% removal of iron, 94.23- 94.42% removal of cadmium, 93.46-93.98% removal of nickel and 97.75- 98.41% removal of lead by LLL biomass. The fast initial uptake was due to the accumulation of metal ions on surface of adsorbent which is a rapid step. This may attributed to the highly porous structure

of adsorbents and the particle size, which provide large surface area for the sorption of metals on the binding sites (Nordiana *et al.*, 2013). The adsorption process was faster, it could be because of the largest amount of metal ions attached to the adsorbent within 30minutes. After the adsorption have increases up to 120minutes and almost constant that means it have reached equilibrium and the adsorption did not change with further increase in contact time. The constant stage probably due to the less abundant availability of active sites thus, the sorption becomes less efficient in constant stage (Singh *et al.*, 2006). The non uniform pattern of sorption observed could be attributed to non uniform surface area or binding of the biomass (Aderiah *et al.*, 2012).

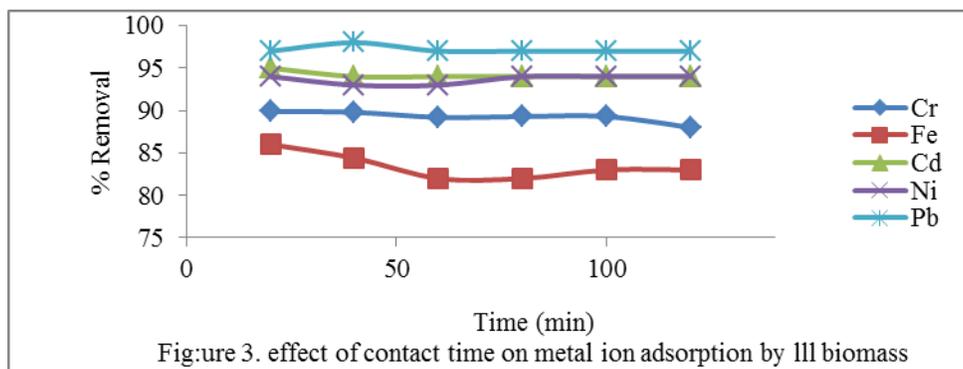
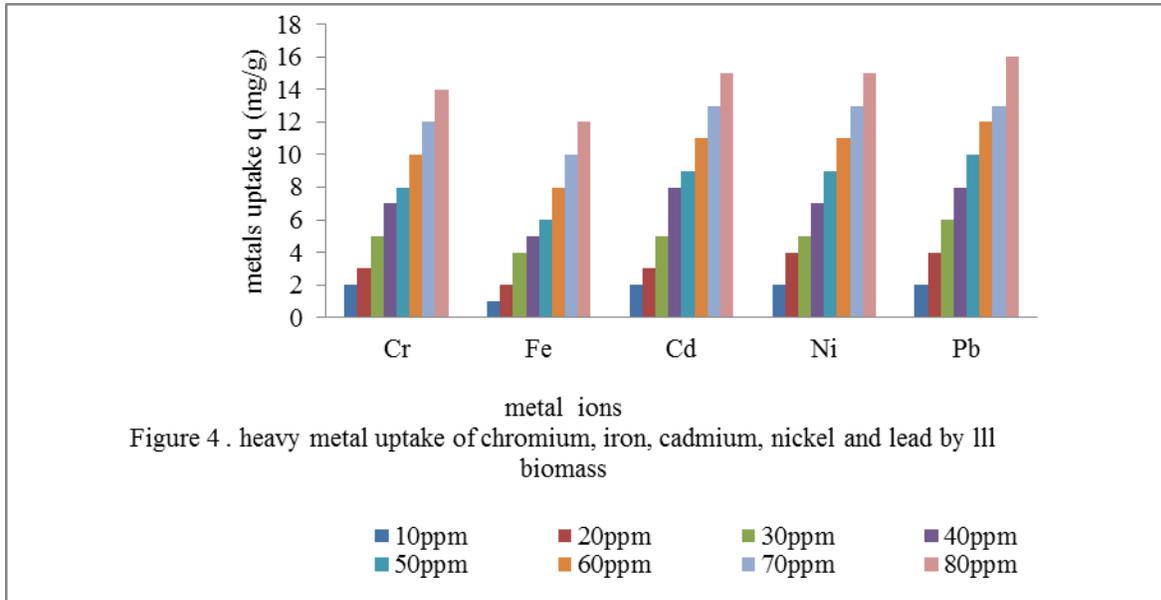


Figure 3. effect of contact time on metal ion adsorption by LLL biomass

5.3 EFFECT OF INITIAL METAL CONCENTRATION ON IMMOBILIZES LLL

The adsorption of metal ions concentration by immobilized *L.Laxiflorus* leaves biomass was studied at different metal concentration ranging from 10-80mg/cm³ at various (maximum) pH values. Sorption and removal of heavy metals by LLL biomass largely depend on the initial concentration of metals in the solution. In this study, metal sorption generally increases with increase in metal concentration in the solution and then became saturated after a certain concentration of metal (Nirmal and Cini, 2012). The differences in the metal ion removal could also be attributed to differences in the size (ionic radii) of the metals. For lead, the least metal uptake was observed at 10mg/L (90%) and highest percent removal at 60mg/L (98%). Metal uptake for Nickel was low at 10mg/L (90%) and exhibited constant values from 40-80mg/L (93%). The order of metal uptake for LLL biomass was found to be Pb>Ni>Cd>Cr>Fe.

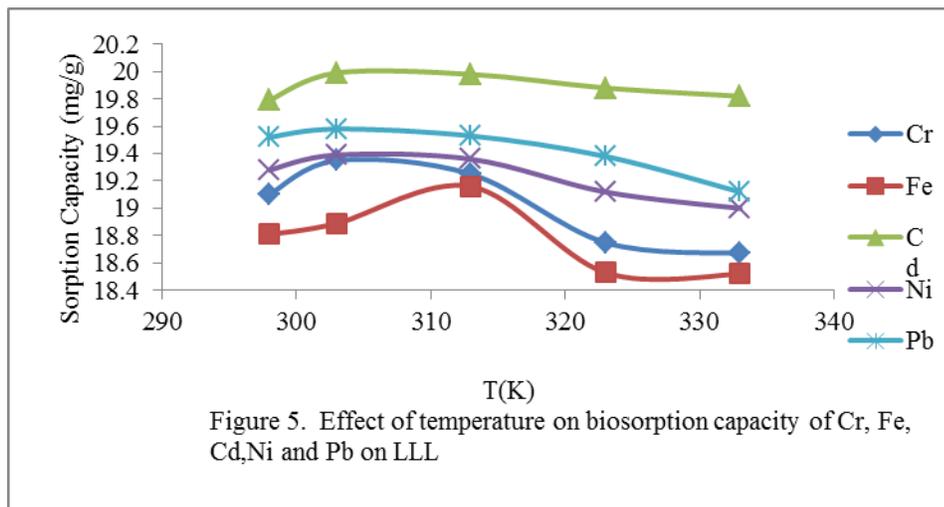
The rapid increases in the uptake of all the metal ions can be attributed to the interaction between the metal ions and the active sites of the adsorbent. This is because the higher the concentration of metal ions, the higher the amount of Cr, Fe, Cd, Ni and Pb present in the solution, thus the more adsorption of the metal ions occur on the adsorption site of the adsorbent. Otherwise at higher metal ion concentration/adsorbent ratio, metal ion adsorption involves higher energy sites. As the metal ion/adsorbent ratio increases result in the decreases adsorption efficiency (Nordiana *et al.*, 2013). These findings indicate that the biomass is effective in dilute metal solutions and also the ratio of sorptive surface of the biomass to metal availability is high. The same results were reported on immobilized biomass of *Rhizopus arrhizus* for chromium (vi) and Nickel biosorption (Prakasham *et al.*, 1999 ; Kumar *et al.*, 2012).



5.4 EFFECT OF TEMPERATURE ON THE SORPTION CAPACITY OF LLL

The effect of temperature on the biosorption capacity of metal ions on LLL was studied at different temperature in the range of 25⁰C - 60⁰C when initial concentration were 100 mg/L at maximum pH values as shown in figures 4. In general, the sorption of the metal ions increases slightly with increase in temperature up to 40⁰C and then started decreasing. Temperature higher than 40⁰C caused a change in the texture of the biomass and reduced its sorption capacity. This is because with increasing temperature, the attractive forces between biomass surface and metal ions are weakened and the sorption decreases (Horsfall *et al.*, 2005). Careful examination of figure 4 revealed that maximum removed was observed between the temperatures of 25

to 40⁰C. The decrease in adsorption with increasing temperature, suggest weak adsorption interaction between biomass surface and the metal ion, which supports physisorption. The effect of temperature on biosorption also depends on the heat of sorption. Usually for physical sorption, heat of sorption is negative and sorption reaction is exothermic and preferred at lower temperature. For chemisorptions, the overall heat of sorption is combination of heat of various reactions taking place at sorption sites. It depends on type of metals and adsorbent, which is the reason for having different behavior of Cr, Fe, Cd, Ni and Pb uptake with different temperatures. In this investigation temperatures of 30 and 45⁰C is the optimal temperature of adsorption for selected heavy metals.



VI. THERMODYNAMICS PARAMETERS

The thermodynamic parameters such as standard Gibbs free energy, ΔG° , enthalpy, ΔH° and entropy, ΔS° changes were estimated to evaluate the feasibility and nature of the adsorption process. The values of enthalpy change (ΔH°) and entropy change (ΔS°) for the adsorption process for all the metals ion studied using *Lonchocarpus Laxiflorus* plant in aqueous solutions were obtained from the slope and intercept of the plot $\ln K_c$ versus $1/T$, and the calculated values of thermodynamic parameters are compiled in Table (2). As shown in the table, the negative values of ΔG° confirm the feasibility of the process and

the spontaneous nature of sorption. The values of ΔH° for the adsorption of the metal ions on LLL, are negative, indicating that the sorption reactions are exothermic and low temperature makes the adsorption easy. Moreover, the negative values of ΔS° and ΔG° demonstrated a decrease in adsorption energy and an increase in the feasibility of adsorption process at lower temperature. The positive values of ΔS° show the increasing randomness at the solid/liquid interface during the adsorption of heavy metals onto LLL, biomass. It also suggests some structural changes in the adsorbate and the adsorbent (Hassan *et al.*, 2011).

Table: 2 Thermodynamic parameters at various temperatures for Cr(II), Fe(III), Cd(II), Ni(II) and Pb(II) biosorption on LLL

Metal ions	- ΔG° (KJ/mol)					- ΔH° (KJ/mol)	ΔS° (J K ⁻¹ mol ⁻¹)
	298K	303K	313K	323K	333K		
Cr	6.7	6.8	6.8	8.3	8.5	8.48	0.52
Fe	6.2	6.45	6.56	6.59	8.3	21.9	4.75
Cd	5.42	11.46	13.31	18.35	22.14	152.32	43.37
Ni	7.58	7.92	8.42	8.74	8.83	19.78	3.60
Pb	9.39	9.39	9.46	9.5	9.61	11.41	0.62

VII. CONCLUSION

Based on the present investigation, it could be concluded that some low cost materials like *Lonchocarpus Laxiflorus* can be used efficiently in the removal of heavy metal ions (Fe^{3+} , Pb^{2+} , Cr^{2+} , Cd^{2+} and Ni^{2+}). The sorption of heavy metal ions by LLL has been shown to be dependent upon pH, with best sorption occurring between pH 3 and 7 and time was 20 -40 min . Also, the sorption mechanism for these metals is a stable, rapid process which implies that the sorption is taking place on the cell wall surface of the *Lonchocarpus Laxiflorus* . The studies have shown that *Lonchocarpus Laxiflorus* possessed the ability to bind appreciable amounts of Fe, Cr, Cd, Pb and Ni ions as compared with other biosorbents. This ability to remove heavy metals from solution indicates the tremendous potential that the *Lonchocarpus Laxiflorus* could have for cleaning the environment and industrial waste effluents from toxic metal ions. Therefore *Lonchocarpus Laxiflorus* could be used as an alternative, inexpensive material to remove high amount of toxic metals from wastewater.

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A Review of Data Mining using Bigdata in Health Informatics

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Abstract- The amount of data produced in health informatics growing large and as a result analysis of this huge amount of data requires a great knowledge which is to be gained. The basic aim of health informatics is to take in real world medical data from all levels of human existence to help improve our understanding of medicine and medical practices. In our paper, we present research using Big data tools and approaches from various sources. Apart from the data gathered in different levels, there are multiple levels of questions addressed.

Index Terms- Big Data, Health informatics, Bio informatics, Neuro informatics, Clinical informatics, Public health informatics, Social media

I. INTRODUCTION

The technology has changed such that the field of health informatics has started to handle the knowledge of big data. By using data mining and big data analytics, diagnosing, treating, helping and healing all patients in health care as become easy. As a result, there is an improvement in healthcare output(HCO). The health care output is the quality of care that health care can provide to end users.

Health informatics is a combination of information science and computer science which deals with various fields like Bio informatics, image informatics, clinical informatics, public health informatics, Translational Bio Informatics (TBI).

Various studies done on Health Informatics uses data from a particular level of human existence. Bio-informatics uses molecular level data, neuro informatics uses tissue level data, clinical informatics uses patient level data, and public level informatics uses population data

TBI uses any of the data from molecular level to entire population. TBI is used to mainly answer clinical level questions. These researches in various subfields are used to improve health care system.

The various subsections in this study are: "Big Data in Health Informatics" which gives an overview on Big Data in Health Informatics, "Levels of Health Informatics data" which discusses the various subfields in Health Informatics, "Using micro level data-Molecules" which describes using data from micro level, "Using Tissue Level data", which uses data from Tissue Level, "Using Patient level data" which describes about patient data, "Using Population level data- social media", which describes about population level data, "Translational Bioinformatics", "Analysis and future work", which describes about the future

work which can be done on Health Informatics using Big Data, "Conclusion", which gives a brief overview of the study.

II. BIG DATA IN HEALTH INFORMATICS

Big data refers to the tools, processes and procedures which allow an organization to create manipulate and manage very large data sets and storage facilities. Big data enables an opportunity for aggregation and integration leading to cost effective and patient care. Demchenko et al.[1] defines big data by five vs: Volume, Velocity, Variety, Veracity and Value. Volume means the large amounts of data used. Velocity means the speed at which new data is generated. Variety means the level of the complexity of data. Veracity is used to measure the genuineness of the data. The value gives how good the quality of data is.

2.1. Sources and techniques for big data in Health Informatics:

2.1.1. Electronic Health Records(EHR)data:

A. Data:

We have different types of data in Health Informatics like Genomic data which describes the DNA sequences, Clinical data which describes structured EHR, unstructured EHR and medical images, Behavior data which describes social network data, mobility sensor data.

B. Billing data-ICD codes:

ICD stands for International Classification of Diseases. ICD is a hierarchical terminology of diseases, signs, symptoms, and procedure codes maintained by the World Health Organization (WHO). Pros: Universally available. Cons: medium recall and medium precision for characterizing Patients.

C. Billing data – CPT codes:

CPT stands for Current Procedural Terminology created by the American Medical Association. CPT is used for billing purposes for clinical services. Pros: High precision and Cons: Low recall.

D. Lab results:

The standard code for lab is Logical Observation Identifiers Names and Codes (LOINC®). The Challenges for lab results are:

- Many lab systems still use local dictionaries to encode labs

- Diverse numeric scales on different labs

Often need to map to normal, low or high ranges in order to be useful for analytics – Missing data, not all patients have all labs. The order of a lab test can be predictive, for example, BNP indicates high likelihood of heart failure, Time L.

E. Medication:

Standard code is National Drug Code (NDC) by Food and Drug Administration (FDA), which gives a unique identifier for each drug. Not used universally by EHR systems – To specific, drugs with the same ingredients but different brands have different NDC. RxNorm: a normalized naming system for generic and branded drugs by National Library of Medicine.

Medication data can vary in EHR systems – can be in both structured and unstructured forms. Availability and completeness of medication data vary – Inpatient medication data are complete, but outpatient medication data are not – Medication usually only store prescriptions but we are not sure whether patients actually filed those prescriptions.

F. Clinical notes:

Clinical notes contain rich and diverse source of information. Challenges for handling clinical notes – Ungrammatical, short phrases – Abbreviations, Misspellings Semi-structured information. Copy-paste from other structure source – Lab results, vital signs. Structured template: – SOAP notes: Subjective, Objective, Assessment, Plan.

2.1.2. Analytic Platform:

The various features of analytical platform are Information extraction which describes Structured EHR, Feature extraction and Unstructured EHR, Feature selection which describes context, patient representation, feature selection, and predictive modeling which describes the classification, regression and patient similarity.

2.1.3. Clinical text mining:

In clinical text mining, description of text mining which is information extraction and clinical text vs biomedical text. The biomedical text means medical literatures. Clinical text is written by clinicians in the clinical settings.

If we consider the data gathered for Health Informatics, big volume refers to the large amounts of data that is records stored for patients. Big velocity is when new data comes in at high speeds. Big variety means the data sets where large amounts of different types of independent attributes of data gathered from different sources and so on... Veracity of data in Health Informatics comes when working with possibly noisy, incomplete data. Such type of data needs to be properly evaluated. Value of data is the main aim because to improve the HCO is the basic aim. Not all studies covered in this field of Health Informatics fit all five of the qualities in [1], all's definition of big data. Data that has value without veracity may need some methods to expand the size of dataset.

In US, using data mining in Health Informatics, can save health care industry upto \$450 billion each year. As of 2011, HCO generated 150 exabytes of data (1 exabyte=1000 peta bytes). This information can be stored in EHRs which can store

44+ petabytes of patient data. Only in bio informatics generate many terabytes of data. With these data coming from different places and in many forms, Health informatics (HI) has to find ways dealing with all this data. We can integrate and combine different sources of data even across different sub fields.

III. LEVELS OF HEALTH INFORMATICS DATA

There are various subfields of Health informatics like bio informatics, Neuro informatics, clinical informatics and public health informatics. There is a confusion which sub field a study should fall under because of the line between each subfield of health informatics which are blurred. So highest level of data is used for deciding subfield membership.

In the research of Health Informatics, there are two levels which are to be considered. One is the level from which the data is collected and the other is the level at which the research question is asked. The question level in a given work may be different from the study corresponding to the data levels. The tissue level data corresponds to human-scale biology question, the patient level data corresponds to clinical questions, population level data corresponds to epidemic scale questions.

3.1. Bioinformatics

Bioinformatics focuses on analytical research in order to know how the human body works using molecular level data in addition to developing methods of effectively handling data.

Data in Bioinformatics is certainly Big Volume as the data is continually growing because the technology being able to generate more molecular data per individual. Mc Donald et al.[2] created a software tool Khmer. This tool is used to solve hardware computational problems through software. The tools in this software preprocess Big Volume genomic sequence data by breaking up long sequences into relatively short strings which can be stored in a bloom filter-based hash table, which helps both the ability and efficiency of Bioinformatics data.

3.2. Neuro-informatics:

Each data instance such as MRI's is quite large and leading to data with Big Volume. The research done on Neuro-informatics concentrates on analysis of brain image data (tissue level). In order to learn how the brain works and find the relation between the information gathered from brain images to medical events, etc., all with a goal of extending the medical knowledge at various levels.

3.3. Clinical Informatics:

The research done on clinical informatics involves making predictions that can help physicians make better, faster, more accurate decisions about their patients through analysis of patient data. Clinical informatics lead to Big Value as their research directly uses patient data. Further efforts can be made to make it more accurate, reliable, efficient. According to Bennett et al.[3] there is about a fifteen year gap between clinical research and the actual clinical care that is in practice. These days decisions are made mostly on general information that has worked before, or based on what work has been done in the past.

3.4. Public Health Informatics-Social media:

The Public Health Informatics applies data mining and analytics to population data in order to gain medical insight. The data is generally gathered from either traditional means i.e., hospitals or gathered from the population i.e., social media. As a default, the population data has Big Volume, Big Velocity and Big Variety. But the data that is gathered from the population through social media possibly has low Veracity leading to low Value, but the techniques for taking the useful information from social media such as Twitter posts can also have Big Value.

IV. LEVELS OF BIG DATA

4.1. Micro level data-molecules

The data gathered from molecular level often experiences the problem of high dimensionality- where the data has large number of independent attributes. This is because the molecule level of data contains thousands of possible molecules which are represented in datasets as features. Some of the applications of molecular level data are Chemo-Informatics, DNA sequence analysis, high-throughput-screening. By using this molecular level data clinical questions are answered.

4.1.1. Using gene expression data for prediction of clinical outcome

The studies in molecular level data uses gene expression data to answer clinical questions. As per now two researches were done both of which focus on cancer. The first study uses gene expression to categorize leukemia into two different subclasses. The second study uses gene expression to predict relapse among patients in the early stages of cancer. Haferlach et al.[4] formulated to place the patients into 18 different subclasses of either lymphoid leukemia or myeloid. He used 3,334 patients among whom two-thirds were used for training i.e., 2,143 patients and the rest one-third i.e., 1,191 patients for testing. From each patient 54,630 gene probe set samples were taken.

People used an all-pairwise classification designing using the mean of difference between perfect match and mismatch intensities with quantile normalization.

The second part of their study was to get the results for testing pool of patients. [4] achieved a median specificity of 99.8% and a median sensitivity of 95.6% which was used for the classification of 14 subclasses of acute leukemia in which 6 were lymphoid and 8 were myeloid. Some authors claim that by using discrepant instances, we can achieve better results. Salazar et al.[5] used a gene expression seeking to predict within a five year period whether or not a patient will relapse back into having cancer. They gathered a total of 394 patients where 188 were for training and 206 were for validation. The training pool was accumulated over a 19 year period from three different institutions from various countries. The validation pool was assembled over 8 years from another institution from another country. The approach used is good strategy and should be employed in future research. The results of these research efforts lead to the idea that microlevel data could give similar results if these procedures were applied to other types of cancers in order to help doctors diagnose and treat their patients.

4.2. Tissue level data:

The studies in this section use tissue level data to answer human scale biology questions creating a full connectivity map of the brain and predicting clinical outcomes. This level of data incorporates imaging data and gives a number of big data challenges like feature extraction and managing complex images. Those studies which combine imaging data with various other data sources also exemplify the Variety aspect of Big data.

4.2.1. Creating a connectivity map of the brain using brain images:

There is a project name Human Connectome Project (HCP) led by WC Minn HCP Consortium. The main aim of this project is to map the human brain by making a comprehensive connectivity diagram and to advance the current knowledge of how the brain functions. There are two phases in this project. The first phase is from 2010-2012 in which methods for data acquisition and analysis were improved. The second phase is from 2012-2015 in which methods were applied to 1200 healthy adults who are aged between 22-35. The subjects in this project are varied from twins to non-twins to check the variation. The expected result of this project is that new and extremely important information can be gleaned from mining the HCP data coming out from HCP research.

By this connectivity map, we can know why some people have brain disorders, giving physicians a possibility for easier diagnosis, early detection of future illness. Till now, 148 participants outcomes are released. Once all the data for the 1200 patients have been generated, there could be similar data created on patients with various ailments and various ages to find the difference between such brains through data mining and analysis.

Annesel[6] says that depending on neuroimaging is not correct. There should also include histological methods of studying actual brain tissue and also says that MRI measurements matching up with that of anatomical measurements is a considerable issue interfering with making a comprehensive connectivity model of human brain. MRI's are large and have high resolution, a higher resolution than histological methods which give results that are neither the same size nor quality and also comments to validate MRI's with study of actual brain tissue. MRI (Magnetic Resonance Imaging) is a medical imaging technique used in radiology to investigate the anatomy and physiology of the body in body health and disease. MRI scanners use strong magnetic fields and radio waves to form images of body. Histology is performed by examining cells and tissues by sectioning and staining followed by exam under light microscope.

According to Van Essen et al.[7], the project looks very promising because new and extremely important information can be gleaned from mining the HCP data coming out from the HCP consortium's research.

Creating a full connectivity map of the brain could lead to information that could help in determining the reasons why people have certain brain disorders are a level previously unattainable, giving physician a possibility for easier diagnosis, early detection of future illness or maybe even prevention of mental or physical ailments. Once the data for all 1200 patients is generated, there could be similar data created on patients with various ailments and various ages to find difference between such brains through data mining and analysis.

4.2.2. Using MRI data for clinical prediction:

The main aim of this section is to answer clinical level questions which covers two studies. The first study uses both MRI data and a list of clinical features with the aim of finding the correlations between physical ailments to that of many locations of the brain. The second study takes MRI data and determine the amount a patient has Alzheimer's disease. Yoshida et al. proposed a model combining patients clinical features and MRI image intensities which consists of voxels. A voxel is an element of volume representing a point on a grid in three dimensional space. This method is based on the algorithm of radial basis function sparse partial least squares (RBF-sPLS) giving their method an advantage over similar methods granting the ability to select not only clinical characteristics but also determine effective brain regions. This is to say that by creating sparse, linear combinations of variables which are explanatory, developed approach concurrently performs feature selection and dimensionality reduction. Both of the tasks are problematic for vast amounts of data, but RBF-sPLS manages efficiently. Estella et al.[8] introduced a method with the goal of predicting to what degree a patient has Alzheimer's disease with three levels of classification which are completely healthy, Mild Cognitive Impairment(MCI) and already has Alzheimer's. they gathered almost 240GB of brain image data for 1200 patients stored by Alzheimer's Disease Neuroimaging Initiative(ADNI).

The various steps include spatial normalization, extraction of features, feature selection and patient classification. After the extraction of features, they found two subcategories like morphological and mathematical where 332 and 108 were gathered respectively. For feature selection they used a method based on Mutual Information(MI) along with some influence from minimal redundancy maximal relevance criterion. MI assisted in determining the dependence between two given variables.

These studies using MRI data show that they can be useful in answering clinical questions as well as making clinical predictions. More research may be needed which was determined by Yoshida et al. to have correlation with kidney disease, anemia and aging, can be determined as clinically significant. In estella et al. various features extracted from MRIs were shown to have the ability to classify patients into varying degrees of dementia.

4.3. Patient level data:

This study covers patient level data to answer clinical level questions including prediction of ICU readmission, prediction of patient mortality rate and making clinical predictions using data streams. As per molecular level data, feature selection can help choose the important features, which also helps in making quicker clinical decisions.

4.3.1. Prediction of ICU readmission and mortality rate

The main aim of this research is to predict ICU readmission, mortality rate after Icu discharge as well as predicting 5 year life expectancy rate. The study done by Campbell et al. [9] focused on ICU patients that were discharged and expected to both live and not return too early afterwards. There are three research directives that were considered. One of them is death after ICU but before hospital discharge. The second one is readmission to ICU within 48 hours of ICU discharge but before discharge from

hospital. The third one is readmission to ICU to any point after ICU discharge but before hospital discharge. An attribute of patient called Apache 2 was considered for prediction of ICU readmission and mortality rate for ICU patients. APACHE2-Acute Physiology and Chronic Health Evaluation 2 score uses physiological variables which are most useful for predicting another non physiological variable and it is increasing age.apart from APACHE 2 there are other scores like SAPS 2 and TISS. In APACHE 2 there are 12 variables considered for prediction. [9] noted that each of the patient potentially fell in more than one of the categories mentioned earlier. But there are three binary models built. The importance these prediction models could have would be help physicians determine which of these patients fall into these three froups. The feature selection method decided was simple logistic regression for all three models to determine which of the 16 attributes had a strong correlation to each prediction. Multiple logistic regression has been chosen for building the prediction models. These methods were tested using the Hosmer and Lemeshow goodness of fit test. According to Bradley [10], the Area Under the ROC curve (AUC) is the best criteria for measuring the classification performance of logistic regression. For determining the quality of the three models, the AUC results for each model are compared to results from APACHE2 score for each prediction. The first model that is predicting death after ICU discharge had an AUC value of 0.74 compared to AUC from APACHE 2 of 0.69. the second model that is for predicting readmission obtained an AUC of 0.67 while APACHE 2 received an AUC of 0.63. the third model of predicting readmission within 48 hours of ICU discharge required an AUC value of 0.62 while APACHE2 earned an AUC of 0.59. The three models with the chosen set of features only achieved minimal improvement over APACHE2 for the prediction of ICU readmission and mortality rate for ICU patients. [9] noted that this improvement may be because APACHE2 uses physiological variables. These variables are most useful for predicting ICU readmission and mortality after ICU discharge.all about 23% of patients fall into these three models and should not have been released from ICU. If they were allowed to stay more, they might have been saved.

Ouanes et al. [11] conducted a research aiming prediction whether a patient would die or return to ICU within the first week after ICU discharge. This research was performed on around 3462 patients who were admitted to ICU for minimum 24 hours. AIC(Akaike Information Criterion) is a method which verifies the quality of statistical methods. The model created was subjected to testing in order to end up with their final set of 6 variables from the original variables of 41. The six variables which were chosen were age, SAPS 2, the need for central venous catheter, SOFA score, discharge at night and SIRS score during ICU stay. These variables were used to make final prediction model using logistic regression. This was used to develop their minimizing ICU readmission(MIR) score. This MIR score is a measurement for determining whether a patient should be discharged from an ICU or not. Through this MIR score, Ouanes et al. was able to achieve good results with good calibration decided by the HL.gof test and an AUC of 0.74 at a 95% confidence interval. The MIR score would have been better if more than one selection method was used.

The studies discussed in this section has the potential to improve clinical discharge procedure, and determines which

patients should be released from the ICU and which patients should receive particular treatment. If we look at the research results of Campbell et al. and Ouanes et al. they covered prediction of ICU readmission and death rate after discharge. The top variables are age, APACHE scores, various physiological variables and a few others. According to Ouanes et al. between a day and seven after discharge from readmission rate and death rate go down means that keeping a patient a little longer could be beneficial. The target of this research is on patients that have preventable death as not all death will be preventable. This research is more important for patients with increasing age as the older patient is less likely a harsh treatment would be beneficial.

4.4. Population level data-Social media

This section uses population level data to answer both clinical level questions and epidemic scale questions. Generally health informatics data is gathered from doctors, clinics, hospitals but recently from even internet. Internet data could be from twitter, google, or anywhere else. This form of Big Data brings additional challenges such as text mining and handling noise and many new breakthrough in the field of medicine. The first study of research is to determine whether message board data can be useful to help patients find information on a given ailment. The second study is testing if using search query data can effectively track an epidemic across a given population. This level of data has high Volume, Velocity, Variety but low Value and Veracity.

4.4.1. Using message board data:

This message board data provides reliable information. This research is used in determining if message board could be useful source of data for helping people find beneficial health information.

Ashish et al. created a platform called Smart Health Informatics Program (SHIP) with the goal of helping patients connect to other patients through internet by means of four websites inspire.com, medhelp.com, and 2 others. They used a pool of 50,000 discussions. The SHIP is a pipeline considering message boards from all four websites. The first step of SHIP is Elementary extraction that will execute some basic text processing for each entry. A unique ID is given to each discussion and post. The next step is Entity extraction to determine which entry has medical significance. Ashish et al. decided to use XAR system by incorporating ontologies from UMLS. After the entries have gone through their process the facts and expressions in each entry are stored in database. For retrieval he extended and open source java based text search engine library. They tested their system on a test case of a patient experiencing severe cough starting Tarceva. Ashish discovered a previously unreported but third most common side effect of the lung cancer chemotherapy drug Tarceva also known as Erlotinib which means onset of severe cough after starting the treatment. But severe cough is also a primary symptom of lung cancer. With a side effect much similar to symptom, doctors complaint that cough as cancer itself. But a team named Abzooba distinguished between drug induced cough and disease induced cough. Big data harvesting helped them separate side effect from symptom. SHIP analyses information about treatments, procedures, side effects, hospitals and physicians from five broad categories

personal experience, advice, information, support and outcome. Each user post receives a yes or no (Y,N) designation, a binary way to express whether or not the post contains relevant information.

Rolia et al. [12] proposed a new system to use social health forums in which there are three steps. The first one is determining patients current medical condition from the personal health record. The second step is that system will ascertain which other users have a similar condition. The final step is that a metric will be implemented evaluating and ranking forum topics.

4.4.2. Using search query to track epidemics:

The research is done using search query data from two search engines: Google and Baidu for predicting whether such data can be useful to predict the occurrence and movement of Epidemics.

Ginsburg et al. developed a method which can analyse a Big Volume of search queries from google with a goal of tracking Influenza-like-illness (ILI). By taking a historical log of a period of 5 years, they conducted a research using data from Center of Disease Control and Prevention (CDC) and using 50 million of the popular searches. The queries were taken into consideration without any modifications and validation for this data was done in 2008. The CDC splits the US into 9 regions where the study was used to make predictions using regions of separation. This model looks to find the probability that a patient visiting a physician is related to an ILI for a particular region using variable: probability that a given search query is related to an ILI within the same region. A linear model is fit using both the log odds for ILI physician visits and ILI related search queries giving: $\text{logit}(I(t)) = \alpha * \text{logit}(Q(t)) + E$, where $I(t)$ is % of ILI physician visits, α is a coefficient, $Q(t)$ is the fraction of queries related to ILI at time t , E stands for the error in the formula. $Q(t)$ is determined by an automated technique without any knowledge of influenza. The authors tested each of the 50 million stored queries alone as $Q(t)$ to see which queries fit with the CDC ILI visit % for each region. The top 45 search queries which are sorted by Z-transformed correlation in nine regions, were chosen to belong to $Q(t)$. This examination of top queries showed connection to influenza symptoms. Ginsburg et al. was able to obtain good fit when compared to that of reported CDC ILI % scoring a mean correlation of 0.90 in all nine regions. Validation was done on data gathered on 42 points per region and mean correlation of 0.97 was achieved compared to reported CDC ILI. The authors proved that search query can be used to determine an ILI epidemic in a more real time manner. The results may be improved if other techniques were used to obtain an optimal set other than chosen 45. This study have shown that search query can be an useful tool for quickly and accurately detecting the occurrence of an ILI epidemic which could even be extended to tracking an epidemic.

4.4.3. Using twitter post data to track epidemics:

The research result is similar to the previous subsection of attempting to detect and track ILI epidemics, but instead of using search query data the researchers used twitter post data. Twitter posts come with context. This is advantage over search engine. There are many posts related to health care. This Big Volume of people when considered, there is a high probability that there can be useful ILI epidemic information being posted. Apart from

this, there may be noisy sensors and through data mining techniques and analysis, useful information can be found.

Signorini et al.[13] has done a research to employ twitter post data across US by searching through particular areas and analyzing data in order to predicate weekly ILI levels both across and within these regions. Their focus is on time period when H1N1 epidemic was happening in the US since they gathered a large amount of tweets from October 1, 2009-May 20, 2010 using Twitter's streaming application programmer's interface(API). The posts were sifted looking for posts containing a preset of key words correlated to H1N1. The tweets if contained any of the following attributes were not considered for analysis: if located outside the US, containing less than five words, from a user with a time zone outside US, not in English, those submitted through API and not containing ASCII characters. The leftover tweets were used to create a dictionary of English words, from which items like hashtags, @user and links are not used. Using this dictionary signorini et al. gathered daily and weekly statistics for each word both in dictionary within each of CDC's 10 regions and throughout the US.

The authors generally use weekly statistics to estimate weekly ILI epidemic status by a general class of SVM(Support Vector Regression). This is a type of classifier which attempts to find a minimal-margin separator, which is a hyperplane in space of instances such that one class is on one side of the hyperplane and the other class is on the other side. A kernel function is used to transform the data into a higher dimensional space. [13] used polynomial kernel function. This model disregards any data points that are already within a threshold E of the model prediction and further builds a nonlinear model to minimize the preselected linear error cost function. Each point is a tweet and features each represent dictionary terms which occur more than 10 times per week. This value of each feature is fraction of total tweets within the given week which contain corresponding dictionary word.

To determine if twitter data can indeed detect ILI epidemics by accurate estimation of CDC ILI values which was done on a weekly basis on a national level and a regional level. They trained their method using 1 million of the tweets for national estimation from October 1, 2009-May 20, 2010 throughout US. To determine the accuracy of the model, Leave-one-out-cross-validation was used. Some authors argue that perhaps smaller amount of tweets containing geolocation information could have generated the slightly higher error rating of 0.37% with a standard deviation of 0.26%.

This study could have incorporated more words to include in their tweet searches rather than just 4 they used as well as use methods to determine the most affective set.[13] used the tweets to follow the public concern for ILI epidemics throughout daily and monthly trends of tweets.

4.5. Translational Bioinformatics:

Some authors say that translational bioinformatics(TBI) is the way of the future for health informatics. It is subfield that deals with High Volumes of biomedical data and genomic data, in which current research areas include developing new techniques for integrating biological data and clinical data as well as improving clinical methodology by including findings from biological research. According to Chen et al. TBI has the same

levels of Health Informatics: Micro Level, Tissue Level, Patient Level and Population Level, and the main goal of TBI is to answer various questions at clinical level. There is a confusion which is dividing line between what is included as clinical information and overall health informatics.

Butte et al. [14] discussed that several TBI studies featured in JAMIA which combine biological data with medical records to achieve medical gains as more data angles are tested. Authors comment that TBI started from a research done by a small group who found how to bridge the gap between computational biology and medicine.

Sarkar et al. discusses that there are three areas of primary research of TBI: determining the molecular level(genotype) impacts on evolution of disease, understanding overall consistency between molecular, phenotype and environmental correlations across different population, learning the impact of therapeutic procedures as can be measured by molecular biomarkers. They believe that TBI is a primary position to possibly determine many of the mysteries of complex diseases or any of the other research with the explosion of both molecular level data and biomedical data.

V. FUTURE WORK

5.1. Molecular level data:

The main challenge is handling Big Volume of data. The future works include developing and testing big volumes of data and make the predictions in a way that is fast, accurate, efficient.

5.2. Tissue level data:

The actual data mining analysis of the connectivity map remains entirely future scope. By extending the work done by [6], a possible discovery of previously unattainable knowledge about brain and how it connects to the health of the human body. This work is for :Creating a connectivity map of the brain using brain images.

The subsection "Using MRI Data for clinical prediction", difficulty is handling Big Volume of MRI data. The challenges include developing of actual data mining and analysis for brain images.

5.3. Patient level data:

It could be beneficial if The data from all levels are used. Only one feature selection technique was used. It will be better if multiple feature selection techniques are used to find which one works the best with medical data. In future anyone must be able to look at patient's medical attributes and make subjective decisions.

5.4. Population level data:

The message board data existing work does have the potential to supply patients with reliable medical information, more real world testing should be implemented. New ways to find the optimal set of keywords/queries to use for predicting the occurrence of ILI epidemic must be done. Also work must be done if research done in one area of work can be translated to another. In twitter data, more work should be done on developing methods to best determine what keywords to use for study as

well as texting more text classification methods in order to reduce noisy posts.

5.5. Translational bioinformatics:

The data from all levels of human existence must be considered. Through this way, questions from all levels can be easily answered. Not only combining molecular level data with other levels, by attempting to make connections across as many levels of data as possible, we get Big Volume, Velocity, Variety, Veracity and Value.

VI. CONCLUSION

We discussed a number of recent studies being done with the most popular subbranches of Health Informatics, using Big Data from all accessible levels of human existence to answer questions throughout all levels. The use of Big Data provides advantages to Health Informatics by allowing for more test cases or more features for research, leading to both quicker validation of studies.

Health care is a data-rich domain. As more and more data is being collected, there will be increasing demand for Big Data Analytics.

Efficiently utilizing data can yield some immediate return in terms of patient outcome and lowering care costs.

ACKNOWLEDGEMENT

We are greatly indebted to our KLUniversity that has provided a healthy environment to drive us to achieve our ambitions and goals. We would like to express our sincere thanks to our incharges Mrs. Anuradha, Mr. Kameshwara Rao, Mr. D.B.K.Kamesh for the guidance and support that they have provided in completing this paper.

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Knee osteoarthritis with special emphasis to physiotherapy treatment focusing various stimulation technique

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Abstract- Knee osteoarthritis (OA) is associated with quadriceps atrophy and weakness, so muscle strengthening is an important point in the rehabilitation process²³. Since pain and joint stiffness make it often difficult to use conventional strength exercises, neuromuscular electrical stimulation (NMES) including various stimulating technique for quadriceps muscle may be an alternative approach for these patients.

Treatment options include conservative approach (eg, medication,activity modification, functional rehabilitation, functional bracing, physiotherapy) and surgery (eg, TKR,Osteotomy etc for chronic cases where conservative approach fail). Studies comparing conservative treatments with more aggressive operative interventions are required to fully evaluate the efficacy of these treatments. In this review, I focus on various new treatment techniques for knee osteoarthritis. So this review is to introduce some new physiotherapy techniques helpful for management of knee osteoarthritis.

Index Terms- Knee osteoarthritis, electrical stimulation for quadriceps, physiotherapy for knee osteoarthritis, knee taping

I. INTRODUCTION

Purpose of the review: The purposes of this review are to: (1) describe treatments that physical therapists may(mainly electro-physical modalities focus) use to enhance the benefit of rehabilitation, (2) discuss current research(Mainly focused on stimulation technique) related to physical therapy treatment for knee osteoarthritis, and (3) identify characteristics from recent research that may influence the responsiveness of individuals with knee osteoarthritis to physical therapy

Recent findings :Physical therapists provide a variety of interventions, such as manual therapy techniques, balance, coordination, and functional retraining techniques, knee taping techniques, electrical stimulation, and foot orthotics to assist in overcoming some of the barriers that make participation in exercise and physical activity difficult. Recent research implies that a number of factors may influence the responsiveness to physical therapy treatment for individuals with knee osteoarthritis. Factors such as the mode of treatment delivery, treatment compliance issues, mechanical characteristics such as joint laxity and malalignment, and radiographic severity are discussed. (G. Kelley Fitzgerald and Carol Oatis)

Knee osteoarthritis (OA) is a painful condition causing disability and muscle weakness. Radiographic evidence of OA occurs in the majority of people by 65 years of age and in about

80% of those who are more than 75 years of age^{1, 2}. Pathologic changes in OA involve the whole joint in the form of focal and progressive hyaline articular cartilage loss with concomitant changes in the bone underneath the cartilage, including development of marginal outgrowths, osteophytes, and increased thickness of the bony envelope (bony sclerosis). Soft-tissue structures in and around the joint are also affected³. Knee OA is an important cause of disability in older people due to chronic joint pain, loss of range of motion, and muscle weakness.

Exercise therapy aims at reduction of pain and disability.This is achieved through improvement of muscle strength, joint stability, range of joint motion, and aerobic capacity. Certainly, in patients with OA, regular exercise can improve pain control, proprioception, controlled strength, instability, and endurance, all of which improve functional independence^{4,5}.

The term of biofeedback (BF) refers to the use of appropriate instrumentation to transduce muscle potentials into auditory or visual signals for the purpose of increasing or decreasing voluntary activity. BF improves the rate of functional recovery of the quadriceps femoris muscle significantly during the muscle strengthening exercises⁶. The mechanism of pain relief with electrical stimulation (ES) is explained by the gate-control theory developed by Melzac and Wall. ES causes facilitation in substantia gelatinosa at the level of medulla spinalis by stimulating A- α and A- β fiber, which do not transmit pain sense and reduces pain sense by inhibiting A- Δ and C fiber which transmit pain sense in presynaptic area. Electrical stimulation increases muscle strength, and decreases joint stiffness and spasm in muscle as well⁷.

Osteoarthritis (OA) is characterized by damaged articular cartilage of synovial joints. About 17% of people aged over 45 years suffer from pain and loss of function due to symptomatic knee osteoarthritis⁸ and 40% of people aged over 65 years have symptomatic OA of the knee or hip^{9,10}. The prevalence of arthritis and more especially OA increases with age¹¹.

Transcutaneous electrical nerve stimulation (TENS) is a non-pharmacological, inexpensive and safe form of analgesia¹². The pain modulating effect of TENS is assigned to peripheral components which may be regulated by central mechanisms¹³. The inhibitory effect of tens is based on the 'Gate Control Theory' of pain perception as described by Melzack and Wall¹⁴. This theory suggests that stimulation of large (A-beta) afferent cutaneous fibers activate the inhibitory-interneurons in the dorsal horn of medulla. This may weaken the transmission of nociceptive signals from small diameter A-delta and C-fibers. As

OA is a dynamic process that involves phases of inflammation with possible increase of pain during these phases, TENS may be indicated as a facilitator for exercise. The use of TENS to relieve knee pain in osteoarthritis of the knee is recommended in various clinical guidelines as a conservative treatment to relieve knee pain^{15,16}. However, Rutjes et al.¹⁷ conclude in their meta-analysis that adequate evidence to support the use of any type of transcutaneous electrostimulation in patients with knee osteoarthritis is lacking.

Individuals with osteoarthritis (OA) of the knee joint commonly display marked weakness of the quadriceps muscles, with strength deficits of 20 to 45% compared with age and gender-matched controls¹⁸. Persistent quadriceps weakness is clinically important in individual with OA as it is associated with impaired dynamic knee stability¹⁹ and physical function. Moreover, the quadriceps have an important protective function at the knee joint, working eccentrically during the early stance phase of gait to cushion the knee joint and acting to decelerate the limb prior to heel strike, thereby reducing impulsive loading²⁰. Weaker quadriceps have been associated with an increased rate of loading at the knee joint and recent longitudinal data have shown that greater baseline quadriceps strength may protect against incident knee pain, patellofemoral cartilage loss²¹ and tibiofemoral joint space narrowing.

The role of the quadriceps muscle in mediating risk for knee osteoarthritis (OA) is a common subject of investigation. The quadriceps muscle is a principal contributor to knee joint stability and provides shock absorption for the knee during ambulation. Clinically, weakness of the quadriceps muscle is consistently found in patients with knee OA. Research has shown that higher quadriceps muscle strength is associated with a reduced risk for incident symptomatic knee OA. However, there is limited evidence to suggest that quadriceps muscle plays a significant role in the incidence of radiographic knee OA. In addition, greater quadriceps muscle strength is associated with a lower risk for progression of tibiofemoral joint space narrowing and cartilage loss in women²².

Knee osteoarthritis (OA) is associated with quadriceps atrophy and weakness, so muscle strengthening is an important point in the rehabilitation process²³. Since pain and joint stiffness make it often difficult to use conventional strength exercises, neuromuscular electrical stimulation (NMES) may be an alternative approach for these patients. Additionally, NMES training increased the knee extensor torque by 8% and reduced joint pain, stiffness, and functional limitation²³. In conclusion, OA patients have decreased strength, muscle thickness, and fascicle length in the knee extensor musculature compared to control subjects. NMES training appears to offset the changes in quadriceps structure and function, as well as improve the health status in patients with knee OA.

II. METHODS

The literature pertaining to knee OA from 1984 to 2013 has been included. Searches were conducted for the period upto 2013 of the PEDro, Medline, Cinahl and Cochrane databases and relevant articles in English were retrieved. Literature mainly related to various stimulation technique in management of knee osteoarthritis were reviewed.

Search up to December 2013 was undertaken to identify relevant trials for this review. The following methods were used:

the MEDLINE database was searched using combinations of the key words “rehabilitation”, “physical therapy”, “osteoarthritis”, “stimulation”, “quadriceps” and “knee OA ” from 1984

the Cochrane Collaboration’s register of trials and reviews was searched using the key words “knee osteoarthritis” and “knee osteoarthritis rehabilitation”;

the Physiotherapy Evidence Database (PEDro) was searched on the basis of “electrical stimulation for knee OA” and “physical modalities for OA ” categories.

In addition, reference lists and bibliographies of related journal articles and books were searched manually for additional trials.

All studies in the English concerning effectiveness of the electrical stimulation and various physiotherapy approach for knee osteoarthritis patients were included.

Exclusion criteria were: studies related to surgical and medical management for OA was excluded

The new literature has been combined with the earlier knee OA position statement to produce the following document.

1.NMES TECHNIQUE FOR QUADRICEPS MUSCLE

NMES on quadriceps muscles for 20 minute including three sessions weekly for three month. Neuromuscular electrical stimulation procedures on quadriceps (two electrodes on the muscle attachment sites). Electrodes are placed over the vastus medialis near the knee and on the proximal thigh over the vastus lateralis in several studies. A portable electrical stimulator (Ionoson, Physiomed, Germany) delivered biphasic symmetric rectangular pulses (frequency of impulses 2500Hz, train of pulses frequency 50 Hz). The stimulus output is interrupted every 10 ms to create “bursts” of stimulation every second. The 10ms off period was not detectable by the subject. A total of 10 maximal contractions sustained for 10 seconds each with a 50 second off time defined a treatment session (according to methodology of stimulation prepared by Yakov Kots in year 1989 called in literature “Russian stimulation” and recognized as one of the types of the NMES. The intensity was between 55 and 67mA (mean of 58.89 mA). Stimulation was performed with a current which produced strong, visible motion effects. Electrodes were made of conductive carbon rubber (8 × 6 cm). Before application of electrodes the skin was cleaned by use of alcohol. The total time of single procedure was 20 minutes. Quadriceps was stimulated at 60° of knee flexion. The procedures were repeated 3 days a week for three month.

Study: Neuromuscular electrical stimulation was studied as a treatment option for osteoarthritis by Dr. Laura Talbot from The Johns Hopkins University. NMES is achieved by sending small electrical impulses through the skin to the underlying motor units (nerves and muscles) to create an involuntary muscle contraction. Thirty-four adults with radiographically (x-ray) confirmed symptomatic knee osteoarthritis were involved in the study. The study participants were randomly given standard arthritis education (12-week Arthritis Self-Management Course) with or without NMES. The NMES group used a portable electrical muscle stimulator 3 days a week for quadriceps training and strengthening. Over 12 weeks, the intensity of

isometric contraction was increased incrementally to 30-40 percent of maximum. The results indicated that:

- The stimulated-knee extensor showed a 9.1 percent increase in 120 degree QF peak torque compared to a 7 percent loss in the education only group.
- The chair rise time decreased by 11 percent in the NMES group, while the education only group had a 7 percent reduction.
- Both groups improved their walk time by about 7 percent.
- Severity of pain reported following intervention (either NMES or education) did not differ between groups.

The research team led by Talbot concluded that a home-based NMES treatment plan appears promising for increasing quadriceps femoris strength in adults with knee osteoarthritis without making arthritis symptoms worse.

2. APPLICATION OF RUSSIAN CURRENT STIMULATION FOR QUADRICEPS MUSCLES

Russian current (medium frequency alternating current) is a type of electrical stimulation which has been advocated for use in increasing muscle force. It was originally developed for improving muscle strength in Russian Olympic athletes and was found to increase force gain up to 40% in elite athletes.²⁴ The stimulation was given for duration of 10 minutes (10/50/10 regimen-10 sec "on" followed by 50 sec "off" and again 10 sec "on".)

3. BIOFEEDBACK TRAINING FOR QUADRICEPS MUSCLES

The patient seated with the hip at 90° and knee at 25-30° of flexion. Two superficial electrodes (Enraf Myomed-432) should be placed sequentially over the patient's rectus femoris, vastus medialis, and vastus lateralis muscles. The patients were asked to perform an isometric contraction. The patient should suppress his or her knee on the rolled pillow that is placed under the knee and hold it contracted in that position for 10 s. Fifty s of relaxation should be given to the patient. The patient should be asked to try to increase the visual and auditory signals that she perceived at every contraction. Outcome measures for pain were visual analogue scale (VAS) pain score in activity, at night, at rest and Western Ontario McMaster osteoarthritis index (WOMAC) pain score²⁵.

Disability and stiffness were assessed with WOMAC physical function and stiffness score. One repetition maximum (RM) and 10 RM were used for measuring quadriceps strength (Elliott KJ et al 2002). 1 RM and 10 RM performed bilaterally. Objective assessment of functional performance was obtained by timing the patients walking as fast as they could for 50 m, ascent and descent of a straight flight of stairs consisting of 10 steps.

4. MOTOR POINT STIMULATION FOR QUADRICEPS MUSCLES(ELECTRICAL STIMULATION FOR QUADRICEPS)

The patient was seated on the treatment chair with the hip at 90° and knee at 60° of flexion. The ankle of the patient was stabilized with a 5-kg load to prevent the isotonic contractions of the quadriceps muscle. Two of the four electrodes were placed

on rectus femoris and vastus medialis muscles and the other two were placed on the vastus lateralis muscles' motor points (Endomed-CV 405). The asymmetric biphasic wave was applied with the frequency of 50 Hz and 200 μs of phase time. The intensity of the current was arranged separately one by one for each patient until apparent muscle contraction was established (70-120 mA). The stimulation was applied as 10 s of contraction and 10 s of relaxation.(Dilek Durmuş et al. Clin Rheumatol 2007)

5. TENS FOR QUADRICEPS MUSCLE

It has been suggested that a specialized therapy is needed in combination with conventional resistance exercise to overcome decreased neural drive to the muscle.²⁶⁻²⁷ Sensory transcutaneous electrical nerve stimulation (TENS) applied to the knee has been reported to excite inhibited motor neuron pools and immediately increase maximal quadriceps voluntary activation in people with arthritic knees.²⁸ Spatiotemporal gait parameters, such as walking speed, have been found to improve following resistance training augmented with sensory electrical stimulation.²⁹ Currently it remains unknown whether therapeutic exercise in conjunction with sensory TENS will affect peak knee flexion angle and external knee flexion moments, parameters thought to dictate energy attenuation during gait.

Evidence: The Select System TENS units (EMPI, Inc., St. Paul, MN, USA) were provided to all participants in the active TENS and placebo groups. Active TENS consisted of a continuous, biphasic pulsatile current (150 Hz, 150 ms).^{30,28} The active TENS group used self-selected stimulus amplitude that resulted in a strong sensory but submotor stimulation.²⁸ Participants were instructed on how to increase and decrease stimulus amplitude, which could be adjusted between 1 and 60 mA. Participants in the placebo group received the same stimulators, and were instructed to increase the stimulus amplitude until they felt a small sensory stimulation. Following 30 seconds of stimulation, placebo TENS units were programmed to automatically decrease the current until no current was emitted. The gradual decrease in current lasted approximately 10 seconds. Participants were told that the current parameters were set to a subsensory level and the unit was delivering the treatments as long as the indicator light was on. Participants were instructed to maintain the amplitude at a level of '3' throughout the day.

The four electrodes were applied over the superior and inferior medial poles of the patella as well as the superior and inferior lateral poles of the patella in both groups and the electrical currents in the two channels were crossed.^{30,28}

6. PULSED ELECTRICAL STIMULATION IN THE MANAGEMENT OF OSTEOARTHRITIS OF THE KNEE

(Robyn E. Fary et al Arthritis & Rheumatism Vol. 63, No. 5, May 2011, pp 1333-1342)

Evidence: PES is delivered through capacitive coupling using surface electrodes and conduction gel. While often being grouped with transcutaneous electrical nerve stimulation (TENS) , it does differ from TENS and interferential therapy in its specific electrical current parameters and its proposed method of action . In particular, it is delivered at subsensory intensity. That

subsensory electrical stimulation is reported to be effective in managing pain suggests a local mechanism of action. This mechanism is at present poorly understood. However, there are many pain-mediating receptors in the periphery that may be affected by an externally applied electrical field by virtue of their endogenous electrical potential and the role of polarization in receptor function and nociceptor stimulation. It is possible that externally applied electrical stimulation interferes with this process and thus reduces pain perception. PES is also reported to be a potential disease modifier through its capacity to up-regulate chondrocyte activity. This assertion has yet to be tested in humans, mainly because long-term effectiveness and compliance with use have yet to be established. Additionally, Farr et al in a prospective, longitudinal study referred to a dose-response relationship, suggesting that increasing PES use results in better pain management.

Intervention. A commercially available TENS stimulator (Metron Digi-10s) was modified by a biomedical engineer to deliver PES current parameters as follows: pulsed, asymmetrically biphasic, exponentially decreasing waveform with a frequency of 100 Hz and pulse width of 4 msec. Current was delivered via 120 mm × 80 mm multiple-use conductive silicone electrodes inserted into larger calico pockets (175 mm × 100 mm) to increase the contact surface area and reduce current density. Electrodes, positioned over the anterior distal thigh (anode) and anterior to the knee joint itself (cathode), were coupled to the skin using hypoallergenic conduction gel and secured with specially made neoprene wraps. The placebo device was identical in appearance and method of use; however, the current flow was programmed to turn off after 3 minutes. Since this was a subsensory treatment, this change was not detectable by participants. PES is also reported to be a potential disease modifier through its capacity to up-regulate chondrocyte activity.

Another study PES

A double-blind, randomized, placebo-controlled trial by Fary et al. (2011) evaluated the effectiveness of pulsed electrical stimulation in the symptomatic management of osteoarthritis (OA) of the knee. Thirty-four patients were randomized to PES and 36 to placebo. Primary outcomes measured pain by visual analog scale (VAS). Other measures included Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) scores for pain, function, and joint stiffness, Short-Form 36 health survey and perceived effect on quality of life and physical activity. Over 26 weeks, both groups showed improvement in pain scores. There were no differences between groups for changes in WOMAC pain, function, and stiffness scores, SF-36 physical and mental component summary scores, patient's global assessment of disease activity or activity measures. Fifty-six percent of the PES-treated group achieved a clinically relevant 20- mm improvement in VAS pain score at 26 weeks compared with 44% of controls. The authors concluded that PES was no more effective than placebo in managing osteoarthritis of the knee.

Farr et al. (2006) reported on a prospective, cohort study examining the use of PES for the treatment of osteoarthritis of the knee in 288 patients. The device was used for 16 to 600 days with a mean of 889 hours. Improvement in all efficacy variables

was reported. A dose-response relationship between the effect and hours of usage was observed as cumulative time increased to more than 750 hours. Improvements in the patient's or physician's global evaluation of the patient's condition occurred in 59% of patients who used PES less than 750 hours and in 73% of patient's who used it more than 750 hours. The lack of a control group weakens the evidence of this study.

7.MAGNETIC PULSE TREATMENT(Nicolo Pipitone and David L. Scot.Magnetic Pulse Treatment for Knee Osteoarthritis: A Randomised, Double-Blind, Placebo-Controlled Study. Current medical research and opinion vol. 17, no. 3, 2001, 190–196)

Treatment was administered by unipolar magnetic devices manufactured and supplied by Snowden Healthcare Ltd (Nottingham, UK). These are exclusively pain therapy devices that generate pulses of magnetic energy via a soft iron core treated with 62 trace elements. Pulses are selectable at three base frequencies (3 Hz, 7.8 Hz and 20 Hz). They have a rise time of 1 µs, a decay time of 10 µs, a low magnetic output (< 0.5 gauss) and a range of activity of up to 30cm around the unit. Medicur devices run on 9 V batteries and switch off automatically after a 10 min period. Each device is fitted with a control light that shows as long as the device is in operation. Based on previous evidence from uncontrolled observations, patients were instructed to use the Medicur magnetic devices three times a day (once in the morning, once in the afternoon and once in the evening) for the whole duration of the study. The 7.8Hz frequency was prescribed for the morning and afternoon treatment, while the 3 Hz frequency was prescribed for the evening. The Medicur devices require no wires or electrodes and need only be held close to the area to be treated, which facilitates the patients' compliance. Since the magnetic energy emitted by this device can penetrate as far as 30 cm, both knees could be treated simultaneously whenever necessary by holding the device between the knees or by placing the device on one knee while keeping the knees together. A Velcro band was provided to hold the device in place, but its use was left to the discretion of the patients. They explained to the patients that they should not expect the devices to cause any noise or particular sensation. Patients were instructed to record the treatment in a special sheet to facilitate assessment of compliance and not to change their basic therapeutic regimen for the duration of the study. The use of medications was checked at each assessment, although no formal pill counts were done. Finally, we encouraged patients to report any adverse event that they might experience during the treatment with the magnetic devices.

In conclusion, this study has demonstrated a statistically significant benefit in terms of reduction of pain and disability in patients with knee OA resistant to conventional treatment in the absence of significant side-effects. Given the study design, the results obtained in our population cannot possibly be generalised to all patients with painful conditions. Further studies using different types of magnets, treatment protocols and patient populations are needed to prove or refute the efficacy of PEMF therapy in different conditions.

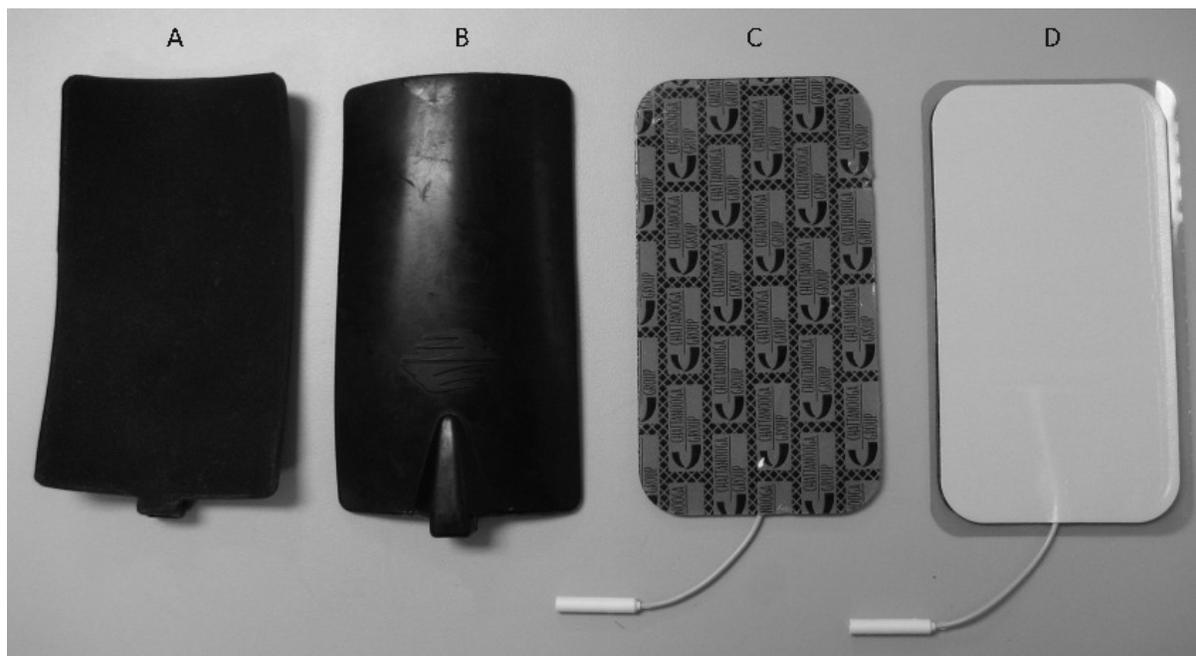
8.IFT

A multi-center, randomized single-blind, controlled study by Burch et al. (2008) to investigate the benefits of the combination of interferential (IF) and patterned muscle stimulation in the treatment of osteoarthritis (OA) of the knee. The study randomized 116 patients with OA of the knee to a test or control group. The devices used to deliver the electrical stimulation were pre-programmed to deliver either IF plus patterned muscle stimulation (test group) or low-current TENS treatment (control group). Both groups were treated for 8 weeks. Subjects completed questionnaires at baseline and after 2, 4 and 8 weeks. Primary outcomes included the pain and physical function subscales of the Western Ontario MacMaster (WOMAC) OA Index and Visual Analog Scales (VAS) for pain and quality of life. The mean changes from baseline to last visit in quality of life VAS rating were similar between the two groups (18.17 vs. 18.16). Patients in the test group had a greater decrease in the overall pain VAS (27.91 vs. 23.19; $P=0.29$) at their last visit, but the difference between treatment groups did not achieve statistical significance. However, if only patients who completed the study (49 in test group and 50 in control group) were included for the analysis, the difference between groups in mean change from baseline increased from 4.71 to 9.40 for overall pain VAS rating and achieved statistical significance ($P = 0.038$). Although the study design was a randomized controlled trial of sufficient size, the study was manufacturer sponsored, with intervening treatment variables, 10% drop out rate and the treatment effect did not reach sufficient significant difference.

9.APPLICATION OF TAPPING TECHNIQUE FOR KNEE OSTEOARTHRITIS

Patellofemoral taping techniques are frequently used in knee rehabilitation programs. It has been recommended that these techniques be used to supplement exercise for individuals with knee OA to reduce pain during exercise and functional activities³¹. The taping techniques are relatively simple to apply and can be taught to patients for self-management purposes. Recently, a single-blind, randomized controlled trial was performed to determine the effectiveness of patellofemoral taping for relieving knee pain and improving self-reported measures of physical function and general wellness³². Subjects were randomly assigned to receive the taping treatment, receive a placebo taping treatment, or to receive no taping. The tape was worn continuously over a 3-week period, with reapplication of the tape performed weekly. The treatment period was 3weeks, with an additional 3-week follow-up period. Concomitant treatments that were administered to subjects were not described. A relatively large effect for the taping group compared with the control group was achieved for knee pain (effect size = 1.00 to 1.19) and the physical function score for the WOMAC (0.83). The taping group was 7 times more likely to have a reduction in pain compared with the no tape group. The placebo taping group was 4.5 times more likely to have a reduction in pain compared with the no tape group. Although there appears to be a placebo effect in applying tape to the knee, the therapeutic tape provided an effect above the level of placebo in this study³². Approximately 30% of subjects in the taping group did not have patellofemoral involvement yet the taping appeared to reduce their symptoms. This may indicate patellofemoral taping has a general effect on reducing knee pain. The mechanism for pain modulation using taping is not known at this time.

Fig 1. Type of electrode used in electrical stimulation



10.MANUAL THERAPY OPTION FOR KNEE OSTEOARTHRITIS

[Henry Pollard et al. The effect of a manual therapy knee protocol on osteoarthritic knee pain: a randomised controlled trial. J Can Chiropr Assoc 2008; 52(4)]

Intervention Group

The intervention group received a MIMG(Macquarie Injury Management Group) chiropractic knee protocol, explained in Figures 2 and 3. It consists of a non-invasive myofascial mobilisation procedure and an impulse thrust procedure performed on the symptomatic knee of participants. It cases were OA was bilateral; mobilisation was perform on both knees. The mobilisation procedure directed a small, sustained load and specific force to the patellofemoral articulation in a pre-determined direction of movement. This load was achieved through the active extension and flexion of the knee in the range starting from 90⁰of knee flexion to available full extension.

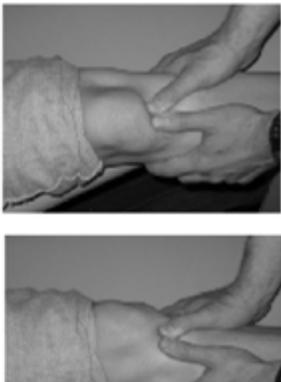
During this movement, the patella is actively mobilised in a supero-inferior direction in a plane directed tangentially to the patella. In this position, minimal compressive load is placed upon the patellofemoral articulation, as this movement is usually perceived as painful in osteoarthritic patients. This allows the subject to actively articulate through knee flexion and not excessively tighten the quadriceps to cause a vector that compresses the patella onto the femur. A positive orthopaedic test finding is pain reproduction upon compressing patellofemoral structures. The mobilization procedure stretches the joint capsule in the sagittal plane, gently mobilises any restriction to normal movement within the limits of patient tolerance and likely loosens adhesions of the patellofemoral articulation. In addition, it may be used on anterior thigh musculature to effectively mobilise tight myofascial thigh structures.

Figure 2 Macquarie Injury Management Group Knee Protocol Part One: Myofascial Mobilisation Technique

Technique Table 1: Myofascial Mobilisation Technique	
Description of technique	Illustration of the technique
<p>The patient lies supine near the homolateral edge of the couch.</p> <p>The practitioner sits on the homolateral side of the couch with the cephalad thigh under the leg of the patient's involved limb and superior to the patients knee.</p> <p>The patients lower hamstring area rests on the practitioners thigh with their knee able to rest in 90° of flexion.</p>	
<p>The practitioner has a choice of two contacts:</p> <ol style="list-style-type: none"> 1. A pincer contact with the thumb and index either side of the medial and lateral superior poles of the patella 2. A reinforced web contact supporting the medial and lateral superior poles of the patella. The second position is recommended for those practitioners with a hypermobile thumb. 	 
<p>The patient is then instructed to begin actively extending their knee through the pain free range of motion while the practitioner maintains contact at the patella.</p> <p>The force through the patella is in a plane applied at a tangent to the angle of the knee to avoid a compressive load.</p>	
<p>The patient extends the knee as far as possible in a pain free manner from the initial starting position. The practitioner maintains the contact at the patella during this movement.</p> <p>This is repeated up to ten times.</p> <p>Patients are able to cease participation at any point during the application of the procedure. In addition, an impulse thrust may be applied at any point through the range of motion</p>	 
<p>Alternatively, the initial contact can be taken with a bias towards medial or lateral rotation of the patella.</p> <p>This picture demonstrates a contact applied with medial rotation. Generally, the practitioner adopts a start position where the patella is held medially to enhance medial rotation or laterally to enhance lateral rotation. This position is held through the subsequent flexion and</p>	

extension ranges of motion, rather than trying to actively apply such traction or rotation throughout the range of motion.

Figure 3 Macquarie Injury Management Group Knee Protocol Part Two: Myofascial Manipulation

Technique Table 2: Myofascial Manipulation	
Description of technique	Illustration of the technique
<p>The patient lies supine near the homolateral edge of the couch, with the involved knee overhanging the edge of the couch.</p> <p>The practitioner stands on the homolateral side of the couch with the patients leg (at the level of the lower calf) gripped between the thighs to apply a distractive force to produce traction over the tibio-femoral joint.</p>	
<p>The practitioner contacts the knee with hands either side. Both thumbs contact on the tibial tuberosity and the fingers wrap around the knee to the distal end of the popliteal space.</p> <p>Care should be exercised not to place too much digital pressure in the popliteal space.</p> <p>An impulse type thrust is then delivered, directed in the caudal direction to mobilise the joint in a near full extension position.</p>	
<p>Alternatively, the initial contact can be taken with a bias towards medial or lateral rotation of the tibio-femoral joint.</p> <p>Generally, the practitioner adopts a start position where the tibia is held with medial rotation or lateral rotation. This position is held through the subsequent traction and impulse thrust</p>	

11.APPLICATION OF SHORTWAVE

Before start the treatment the therapist evaluated the safety measures of the shortwave diathermy device. Patient’s thermal sensation of the treatment part was evaluated and all metal objects, materials, clothing and electronic devices from treatment part were removed. Patient was positioned in supine lying and short wave diathermy pads were applied in contraplanner method for 20 minutes on affected knee. The spacing between the pads and treatment part is maintained by the placing of eight folded towels. Intensity was maintained and adjusted to produce comfortable warmth based on patient’s feedback.

12.APPLICATION OF ULTRASOUND

The patients positioned comfortably to receive therapeutic ultrasound with parametric settings of 1 MHz in frequency, continuous mode and 1.5 W/cm² of intensity with 5cm² sized transducer for 10 minutes of treatment duration. After coating the skin with coupling media (Aquasonic gel), Ultrasound was delivered by moving the treatment head over the anterior, superior and posterior regions of the affected joint in slow, circular and overlapping fashion.

13. ELECTRODE PLACEMENT AND PROCEDURE FOR STIMULATION OF QUADRICEPS STUDY (Brian G et al. 2011)³³

Procedures³³

Stimulating Electrode Setup. Before the stimulating electrodes were applied, the skin was shaved and, if necessary, debrided and cleaned. All participants were seated in the dynamometer while the investigator marked the positions for the electrodes. The exact electrode positions were marked with a felt-tip pen, allowing the investigator to replicate positioning between electrode type and electrode configuration conditions. The vastus configuration consisted of positioning the superior aspect of the proximal electrode at the height of the greater femoral trochanter, with the medial electrode border in line with the anterosuperior iliac spine. The distal electrode was positioned with the inferior aspect of the electrode 3 cm superior to the patella and the medial border of the electrode in line with the midline of the patella. The rectus configuration consisted of positioning the superior aspect of the proximal electrode at the height of the greater femoral trochanter, with the midline of the electrode aligned with the anterosuperior iliac spine. The distal electrode was positioned with the inferior edge 3 cm superior to the patella and the midline of the electrode in line with the midline of the patella. New self-adhesive electrodes were simply applied to the marked areas. However, before placement, a layer of conductive gel was applied over the stimulating electrode surface of the carbon-impregnated electrodes, and after being placed on the marked points, they were applied to the leg by the same investigator and secured with an elastic bandage. The cathode of the stimulating electrodes always was positioned distally, whereas the anode was positioned proximally, regardless of the electrode condition.

Quadriceps Activation Testing ³³. Participants were secured in the chair of the dynamometer unit with hips flexed to 85° and knees flexed to 90°. All landmarks were aligned according to the specifications of the manufacturer and previously reported in the literature. A graded warmup was conducted using the first electrode condition assigned to the participant to ensure that participants could exert maximal effort during the test and were accustomed to the stimulus. A series of submaximal contractions at 25%, 50%, and 75% of their perceived maximal voluntary isometric contractions (MVICs) were paired with submaximal stimuli at 25%, 50%, and 75% of the maximal testing voltage of 125 V. In addition to submaximal trials, participants performed 3 to 5 practice MVICs until the investigator was confident that each participant could exert maximal effort. During testing, an exogenous stimulus was applied to the quadriceps when the test administrator observed that a maximal force plateau had been reached. All participants were given oral encouragement from the investigator and were provided visual feedback from a computer screen depicting a force tracing in real time. Participants were encouraged to generate force to reach a target that was scaled to be slightly higher than the MVICs produced during their practice trials. Two acceptable trials separated by a 60-second rest period were performed and averaged for each electrode condition. The same 125-V stimulus was applied to the resting quadriceps muscle 60 seconds after the 2 active contraction trials. This series of contractions was performed 4 times to test both electrode configurations and electrode types.

III. DISCUSSION

Knee osteoarthritis is a common complaint managed by physiotherapist and need for effective management is clear. Physiotherapy encompasses a variety of interventions such as manipulative therapy, exercise therapy, electro-physical modalities, foot orthosis, braces and education. The efficacy of these and other interventions is important as evidence based practice becomes increasingly important.

IV. CONCLUSION

The treatment of knee osteoarthritis is currently limited to the management of symptoms rather than reducing disease progression. An evidence based approach to management should include patient education about OA and its management, including pain management, options to improve function, decrease disability, and prevent or retard progression of the disease. Common current treatment strategies involve pharmacological treatments, non-pharmacological treatments and surgical interventions. Analgesic and anti-inflammatory drugs are widely used in management, despite known serious adverse effects associated with long term NSAID use and doubts about their efficacy. Paracetamol is the primary oral analgesic and, if successful, the preferred long term analgesic. NSAIDs are considered in patients unresponsive to paracetamol. Current best evidence suggests NSAIDs may be beneficial in the reduction of pain in the short term, but there is no support for their long term use.

Beside this technique there are other measure to overcome osteoarthritic knee which include patient education, do and donts, use of assistive device including use of can and knee cap and various multidisciplinary health care including physiotherapy approach.

CLINICAL IMPLICATION

Electrical stimulation treatment could be used alone or in combination with exercise treatment in clinical setting and isometric exercises could be undertaken as a home program. (Turk J Phys Med Rehab 2008;54:54-8)

APPENDIX

OA: Osteoarthritis, NSAID: Non Steroidal Anti-inflammatory Drug, TENS: Transcutaneous Electrical Nerve Stimulation

ACKNOWLEDGMENT

I would like to thanks Dr. Kabul Chandra Saikia, Principal Cum Chief Superintendent, Guwahati Medical College & Hospital for valuable guidance. This article is a part of my Ph.D work

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Evaluation of Larvicidal Properties of Leaves and Root Ethanolic Extracts of Some Plants Herbs against Fourth Instar Mosquito Larvae.

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Abstract- This study was aimed at determining the larvicidal properties of *Balanites aegyptiaca*, *Calotropis procera* and *Eucalyptus globulus* leaves and roots ethanolic extracts against fourth instar mosquito larvae. Twenty batches of fourth instar larvae were exposure to various concentrations of 2,4,6,8 and 10ppm for 24hrs and were assayed according to WHO guidelines for testing laboratory and field mosquito larvicides. Larval mortality was observed after 24hrs and recorded. Results are mean of three replicates. Percentage mortality was calculated using Abbott's formula, while the LC50 was determined by a log dosage probit mortality regression line at 95%CI. One way ANOVA was performed to determine the difference in larval mortality between plant parts. Results obtained shows that *B. aegyptiaca* leaves and roots elicited the highest percentage mortality of 60% and 73% at 10ppm respectively. The lowest mortality was recorded in *E. globulus* leaves and roots as 63% and 64.67% at 10ppm respectively. *B. aegyptiaca* roots shows a significant difference from the other two plant parts, while values from the leaves are statistically not significant from each other at $P < 0.05$. *B. aegyptiaca* root achieved LC50 at the lowest concentration of 6.91ppm with LCL=4.48 and UCL= 5.31. *E. globulus* leaf achieved LC50 at the highest concentration of 7.94ppm, LCL=4.39 and UCL=5.25. The result of this finding revealed that all the experimental plant parts possessed larvicidal properties at different range. The mortality is concentration dependant; therefore higher mortality can be achieved with higher concentrations. The result of this study concludes that *B. aegyptiaca* root and leaves can be considered to be more potent in terms of larvicidal activities, then *C. procera* and lastly *E. globulus* roots and leaves. Further study will be carried out with increase in number of hours to determine the mortality.

Index Terms- *Balanites aegyptiaca*, *Calotropis procera*, *Eucalyptus globulus*, Larvicidal properties, LC50.

I. INTRODUCTION

Mosquitoes are the major vector for the transmission of malaria, dengue fever, yellow fever, filariasis and Japanese encephalitis (Das, 2003). Mosquito alone transmit diseases to more than 700million people annually and the disease are endemic in more than 100 countries(Jang *et al.*,2002).Mosquito in the larval stage are attractive targets for pesticides because

they breed in water and thus, are easy to deal with them in this habitat(Nandita,2008).). Continued and repeated use of conventional mosquitocides such as organophosphorus (op) and carbamate insecticides, insect growth regulators and bacterial larvicides has often resulted in the widespread development of resistance and has undesirable effects on non-target organisms. (Rozendal, 1997; WHO, 2006).

Plants are rich source of alternative agents for the control of mosquitoes, because they possess bioactive chemical which act against a number of species including specific target insect and are more environmentally friendly when used in pest control (Lok and Singh, 2003). Mosquitoes control has become increasingly difficult because of the indiscriminate uses of synthetic chemical insecticides which have an adverse impact on the environment and disturb the ecological balance. The majority of the chemical pesticides are harmful to man and animals, some of which are not easily degradable and spreading toxic effects. The increased use of these insecticides may enter into food chain, and thereby causing an irreversible damage to vital organs. They even result in the mutation of genes and these changes become prominent only after a few generations (Ghosh, 1991). In recent years, use of many synthetic insecticides in mosquito control programme has been limited. It is due to lack of novel insecticides, high cost of synthetic insecticides, concern for environmental sustainability, harmful effects on human health, and other non-target populations, their non biodegradable nature, higher rate of biological magnification through ecosystem (Brown, 1986). Roark (1947) described approximately 1,200 plants species having potential insecticidal value, while Sukumar *et al.* (1991) listed and discussed 344 plant species that only exhibited mosquitocidal activities. Shaalan *et al.* (2005) reviewed the current state of knowledge on larvicidal plant species, extraction processes, growth and reproduction inhibiting phytochemicals and botanical.

Desert date (*Balanites aegyptiaca* (L) Del.), of the family *Balanitaceae*, is indigenous to all dry land south of Sahara and extending southwards (Hall and Walker; 1991). It is an evergreen tree adapted to various climatic conditions especially in arid regions with extremely high temperature and scarce water, thus helps in combating desertification (Gour and Kant, 2012). The tree is widely distributed in many tropical countries of Africa and Asia (Moktar and Abdalla, 2013). The flowering time generally occurs during November-April, while the fruiting takes place during December-July (Moktar and Abdallah, 2013). The tree is

rich in medicinal ingredients and contains other useful products with multi use in rural lives and industry. Among such useful products, high level of oil (30-60%) can be extracted from seeds with valuable application as cooking oil as well as biofuel (Moktar and Abdallah, 2013). Secondary metabolites like rotenone, bergopin, steroids and flavonoids were detected in different parts of the tree (Moktar and Abdallah, 2013). Also, *B. aegyptiaca* is named as an African-Asia saponin producing plant due to its high constituent of saponin compounds. These multiple chemicals have proved different biological activities including molluscicidal, larvicidal, mosquitocidal and insect antifeedant properties, besides other industrial uses (Moktar and Abdallah, 2013). Gajalakshim et al. (2003) reported that *B. aegyptiaca* contain active component, saponin that prove to have insecticidal properties against *Tribolium castaneum*. Chothani and Vaghasiya (2011) also assert that fruits kernel of *B. aegyptiaca* show larvicidal properties against *Anopheles arabiense* and *Aedes aegypti*. Molluscicidal activities of *B. aegyptiaca* against the snail *Lemnaea acuminata* was also reported by Gajalakshim et al. (2013).

Calotropis procera plant is generally known as milkweed, rubber bush Sodom apple. It is a member of family *Asclepiadaceae* whose members are distributed throughout the world in tropical and sub-tropical regions. It is abundant in warm climate areas having dry, sandy and alkaline soils (Yasin et al., 2012). It is mostly noted in waste and fallow lands along roads, streets residential colony parks, sand dunes as well as in crop field as weed (Sastry and Kavatheker, 1990). *Calotropis procera* is a soft-wooded, evergreen, perennial shrub. It has one or a few stems, few branches and relatively few leaves, mostly concentrated near the growing tip. The bark is corky surrounded and light gray. A copious white gap shows whenever stems or leaves are cut (Parrotta, 2011). Oyindo et al. (2009) reported that the root of *C. Procera* is helpful in combating headache, malaria fever and convulsion. Latex of *C. Procera* has wound healing activities and anti-diabetic, smooth muscle relevant activity and anti-tussive activity against cough induced bronchi irritation (Rahaman, 2012). The pesticidal, antiviral, anti-arthritis laxative properties was also reported by Upadhyay (2011). The leaves and roots of *C. Procera* contain bioactive components like saponin, alkaloids, phenols, tannins, carbohydrate, terpenoids and flavonoids, which are known to possess medical and pesticidal properties (Azmathullah, 2011).

Eucalyptus globulus was discovered on the island of Tasmania in 1792 by French explorer and was one of the first eucalypt species to be formally described. The primeval eucalypt forest of Tasmania was amongst the tallest forest in the world and *E. globulus* tree up to 101m in higher were recorded (Kumar et al., 2011). By the late 1800's, trees 60-90m high were regularly harvested from south eastern Tasmania and shipped throughout the world for what piles (100-120 feet in length and 20 inches squared). The timber was also in great demand for railway sleepers, street paving blocks and mine supporters (Kumar et al., 2002). Various species of *Eucalyptus* are cultivated, particularly in sub-tropics and warm temperate regions, on account of their economic value. *Eucalyptus* species are remarkable for their rapid growth. Some species of them in their natural habitat attain gigantic sizes and are among the tallest trees of the world (Kumer et al., 2011).

Most of the species are popularly called "gum trees" although the exudation from them is not a gum, but an astringent; a tanniferous substance called "Kino". There are over 500 species of *Eucalyptus* (Kumer et al., 2011). Medicinal plants have been used as a source of remedies since ancient times. (Abu-Shanah et al., 2004). The ancient Egyptians were familiar with many medicinal herbs and were aware of their usefulness in treatment of various disease (Kumer et al., 2011). Kumar et al. (2011) shows that *E. Globulus* has anthelmintic potentials as well as anti bacterial and anti fungal activity. Mozan (1994) also reveals that *E. Globulus* leaves have potent action against *Culex quinquefasciatus* and *Culex teritaeniorhynchus*. The effects of botanical derivatives against mosquito have been reviewed by Sukumar et al. (1991). Extracts from leaves, flowers and roots of plants were found to have mosquito larvicidal activity (Sharma et al., 1998).

II. MATERIALS AND METHOD

2.1 Collection of Plant Materials.

The leaves and roots of *Balanites aegyptiaca* (Balanitaceae), *Calotropis procera* (Asclepiadaceae) and *Eucalyptus globulus* (Myrtaceae) were collected from and around Modibbo Adama University of Technology, Yola, Adamawa State, Nigeria. The plant parts were authenticated by the department of Plant Science of Modibbo Adama University of Technology Yola. Voucher specimens were deposited at the herbarium of the department.

2.2 Preparation of the Stock Solution and Test Concentration.

The leaves and roots of the plant material was shade dried, pulverized and sieved to get a fine powder from which the extract was prepared. Methanol and ethanol extract of the plant were obtained by taking 200mg of the powdered leaves and roots in a separate container and add 20ml of the solvent to it. Screw the cap vial and shake vigorously to dissolve or disperse the material in the solvent. The mixture was then filtered through Whatman filter paper and the filtrate was evaporated under reduced pressure on water bath to obtain the crude extract. The stock solution was serially diluted in ethanol and methanol separately (2ml solution to 18ml solvent). Test concentration was obtained by adding 0.1 – 10ml of the appropriate dilution to 200ml distilled water (WHO, 2005).

2.3 Collection and Rearing of Larvae

Larvae of mosquitoes were collected from any available stagnant water within Modibbo Adama University of Technology and transported to the laboratory of the institution. Larvae were reared in a plastic bowl containing tap water and covered by fine nylon mesh. The larvae were feed with food containing mixture of cabin biscuit and dried yeast until 4th instar larvae was reached. (Adeleke et al., 2008; WHO, 2005)

2.4 Larvicidal Bioassay

The larvicidal activity of the plants crude extracts was assessed according to method recommended by World Health Organization (2005), with slight modifications. 20 fourth instar larvae were transferred by means of a strainer or droppers to small disposable test cups or vessels, each containing 200ml of water. The depth of the water in the cups was maintained between 5cm and 10cm. 0.2ml of the stock was then added to 200ml in the cups to obtain the desired target dosage starting

with the concentrations of 2ppm, 4ppm, 6ppm, 8ppm and 10ppm respectively. Three replicates for each concentration and equal number of control were simultaneously set up with tap water, to which 1ml of the solvent was added. Larval food was then added to each test cup. After 24 hours exposure, larval mortality was then recorded. Moribund larvae were counted as dead larvae for calculating percentage mortality. The result was then recorded on the data recording forms. If the control mortality is between 5% and 20%, the mortalities of the treated groups is then corrected according to Abbott's formula. Corrected Mortality (%) = $\frac{X-Y}{X} \times 100$. Where X= percentage survived in the untreated control and Y percentage survival in the treated sample (Abbott's, 1925).

2.5 Data Analysis

LC₅₀ value was calculated from a log dosage – probit mortality regression line at 95%CI of upper confidence limit (LCL) and lower confidence level (UCL). Using a computer software programme, standard deviation of the mean LC₅₀ values were calculated. One way ANOVA was performed to determine the difference in larval mortality between plant parts. Result with P< 0.05 will be considered statistically significant.

$$\text{Percentage mortality} = \frac{\text{number of dead larvae}}{\text{number of introduced}} \times 100$$

III. RESULTS

3.1 Larvicidal Activity of Ethanolic Leaf Extracts on Fourth Instar Larvae of Mosquito.

Table 1 and fig.1 shows the percentage mortality of the 4th instar larvae of mosquito exposed for 24hrs to various concentrations of ethanol extracts of the tree plants. The larvicidal activity of *E. globulus* leaves showed, 26.67%, 36.67%, 43.33%, 51.67%, and 63% mortality when exposed to various concentrations of 2,4,6,8 and 10ppm respectively. The

2ppm revealed the lowest mortality of 26.67% of the larvae, however, 63% mortality was observed in 10ppm after 24hrs exposure (fig 1). The *B. aegyptiaca* leaves recorded a result of 28.33%, 36.67%, 48.33%, 51.67% and 66% for the same concentrations of 2,4,6,8 and 10 respectively. Lowest mortality of 28.33% was recorded in 2ppm and the highest mortality of 66% in 10 ppm. Extracts of *C. Procera* showed the lowest mortality of 28.33% at 2ppm while the highest percentage mortality of 64.67% was achieved at 10ppm.

3.2 Larvicidal Activities of Ethanolic Root Extract on Fourth Instar Larvae of Mosquito

Table 2 and fig 2 showed the result of percentage mortality of ethanol extracts of the three experimental plants parts on mosquito larvae. *E. globulus* showed percentage mortalities to be 26.17%, 41.67%, 50%, 51% and 64.67% for concentrations of 2,4,6,8 and 10ppm. *C. procera* showed 38.33%, 48.33%, 50%, 55% and 65% for the same concentrations, while *B. aegyptiaca* root showed 30%, 43.33%, 43.33% 48.33% and 73.67%. Highest mortality was obtained in *B. aegyptiaca* root and the lowest percentage of 64.67% in *E. globulus* at 10ppm. (Fig 2).

3.3 LC50 with fiducial limits (95%) Of the tested plant extracts against mosquito species.

Table 3: Shows the lethal concentration LC50 with fiducial limit of the tested plant extract against mosquito species. The LC50 value of 7.94ppm with LCL of 4.39 and UCL of 5.25 were recorded for *E. globulus* leaves. In the same way, *B. aegyptiaca* leaves achieved LC50 at 6.70 ppm with LCL of 4.42 and UCL of 5.25, while *C. procera* leaves shows 6.99ppm with LCL of 4.42 and UCL of 5.31. *E. globulus* roots achieved LC50 at 7.24ppm at 4.39LCL and 5.18UCL, *B. aegyptiaca* root showed an LC50 at 6.61 with LCL of 4.48 and UCL of 5.31. *C. procera* root killed 50% at 6.92ppm at LCL of 4.62 and UCL of 5.25.

Table 1 Percentage Mortality of 4th Instar Larvae of Mosquito Species Exposed For 24hrs to Different Concentrations of Ethanolic Leaf Extract in ppm.

Concentration in ppm	Observed Percentage Mortality of Larvae & S.E		
	<i>E. globulus</i> leaves	<i>B. aegyptiaca</i> leaves	<i>C. procera</i> leaves
Control	0.00 ± 0.00 ^a	0.00 ± 0.00 ^a	0.00 ± 0.00 ^a
2ppm	26.67 ± 0.89 ^a	28.33 ± 0.09 ^a	28.33 ± 0.08 ^a
4ppm	36.67 ± 0.77 ^a	36.67 ± 0.89 ^a	41.67 ± 0.70 ^b
6ppm	43.33 ± 0.64 ^a	48.33 ± 0.89 ^b	50.00 ± 0.06 ^b
8ppm	51.67 ± 0.09 ^a	51.67 ± 0.81 ^a	55.00 ± 0.00 ^b
10ppm	63.00 ± 1.00 ^a	66.00 ± 1.00 ^a	64.67 ± 0.09 ^a

Values with the same superscript on the same row are not significantly different from each at p<0.05, Values are mean of 3 replicates. (N=3± S.E)

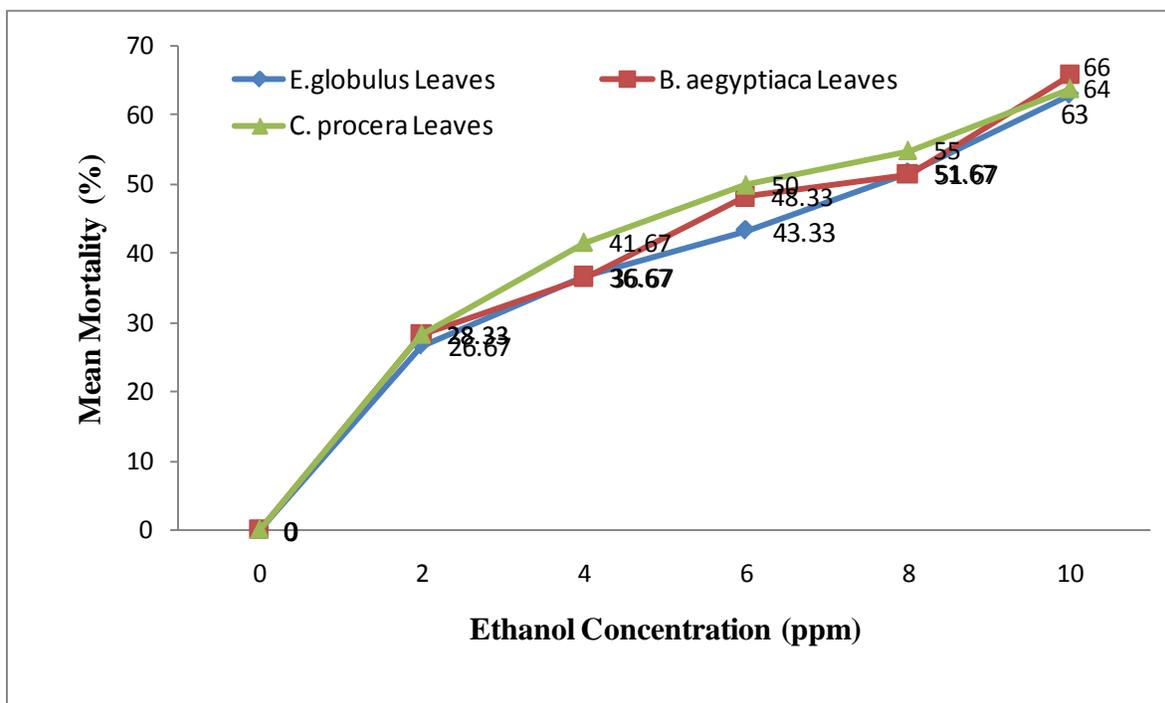


Figure 1 Graph showing the larvicidal activity of *Eucalyptus*, *Balanites*, and *Calotropis* leaves ethanol extracts against the fourth instar larvae of mosquito at different concentration in ppm.

Table 2 Percentage Mortality of 4th Instar Larvae of Mosquito Species Exposed For 24hrs to Different Concentrations of Ethanol Root Extract in ppm

Concentration in ppm	Observed Percentage Mortality of Larvae & S.E.		
	E. globulus root	B. aegyptiaca root	C. procera root
Control	0.00 ± 0.00 ^a	0.00 ± 0.00 ^a	0.00 ± 0.00 ^a
2ppm	26.17 ± 1.64 ^a	30.00 ± 0.00 ^b	38.33 ± 1.00 ^c
4ppm	41.67 ± 0.09 ^a	43.33 ± 0.19 ^a	48.33 ± 0.89 ^b
6ppm	50.00 ± 0.00 ^a	43.33 ± 0.64 ^b	50.00 ± 0.10 ^a
8ppm	51.67 ± 0.89 ^a	48.33 ± 0.03 ^b	55.00 ± 0.00 ^c
10ppm	64.67 ± 1.89 ^a	73.67 ± 0.08 ^b	65.00 ± 0.10 ^a

Values with the same superscript on the same row are not significantly different from each at p<0.05, Values are mean of 3 replicates. (N=3± S.E)

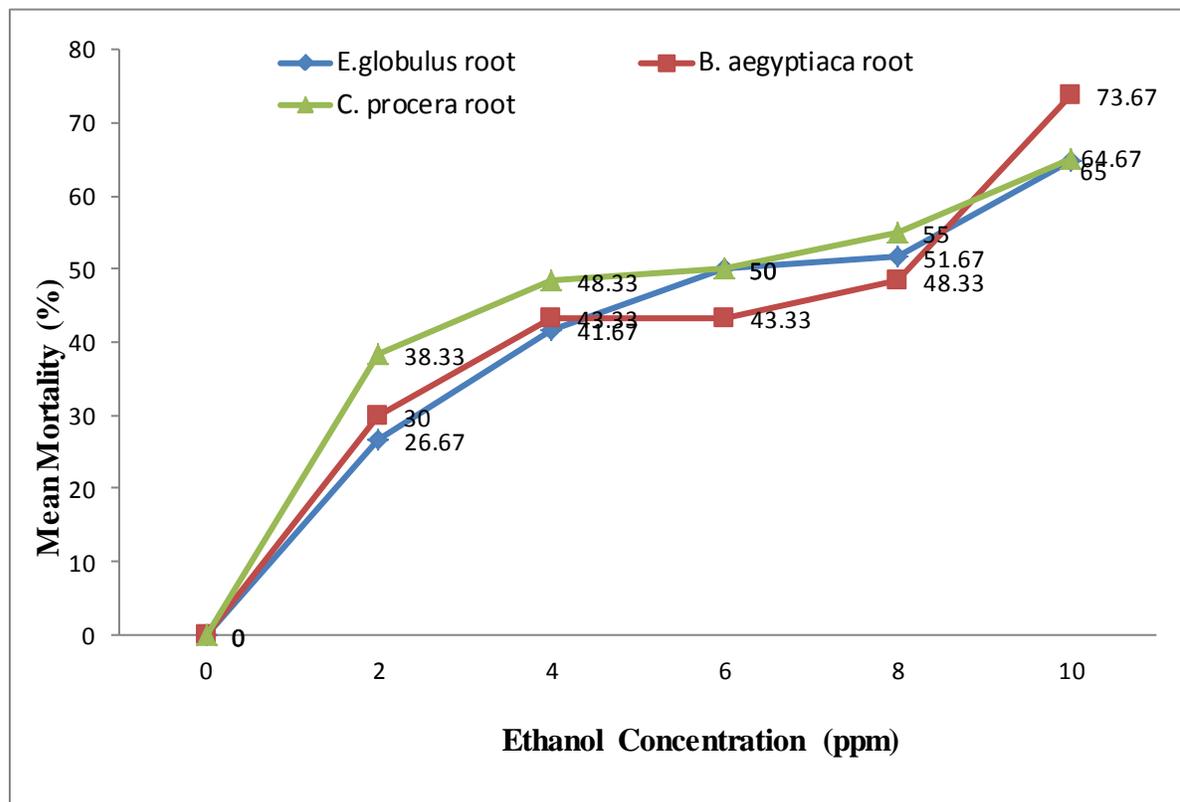


Figure 2 Graph showing the larvicidal activity of *Eucalyptus*, *Balanites*, and *Calotropis* root ethanol extracts against the fourth instar larvae of mosquito at different concentration in ppm

Table 3 LC50 with fiducial limits (95%) Of the tested plant extracts against mosquito species.

Plant Extract	LC50(ppm)	95% Confidence limit	
		LCL(ppm)	ULC(ppm)
<i>E. globulus</i> leaves	7.94	4.39	5.25
<i>B. aegyptiaca</i> leaves	6.70	4.42	5.25
<i>C. procera</i> leaves	6.99	4.42	5.31
<i>E. globulus</i> root	7.24	4.39	5.18
<i>B. aegyptiaca</i> root	6.61	4.48	5.31
<i>C. procera</i> root	6.92	4.69	5.25

LC50= Lethal concentration of 50% Mortality. LCL= lower confidence limit, ULC= upper confidence limit, at $p < 0.05$.

IV. DISCUSSION

Plant bioactive components may serve as a suitable alternative to chemical insecticide as they are relatively safe and available everywhere in the world. The efficacy of botanicals however, generally depends on the plant part (Chapagain and Wiesman,2005), extract concentration, age of plant or location found, solvent used and species of larvae tested. (Babarinde et.al.,2011; Gupta et al.,1990; Olaitan and Abiodun,2011). Most studies report active compounds as steroidal saponins. Saponins are freely soluble in both organic solvents and water, and they work by interacting with the cuticle membrane of the larvae, ultimately disarranging the membrane, which is the most

probable reason for larval death (Hostettmann et al., 1995). This work reveals the potency of larvicidal properties of *E. globulus*, *B. aegyptiaca* and *C. procera* leaves and roots ethanolic extracts. The results show a dosage dependant pattern by observing high mortality with increase in concentrations. The highest percentage mortality for the leaves of the experimental plants was recorded in *B. aegyptiaca*, values obtained from *E. globulus* and *C. procera* are not significantly different from each other at $P < 0.05$ (fig1). The result of *B. aegyptiaca* leaves was in agreement with the findings of Wiesman et al. (2006) that showed 100% mortality on the larvae of *Aedes aegypti*. The result was also in line with the findings of Monzon et al. (1994), that *E. globulus* leaves were found to be the least effective against *Aedes aegypti* when compared with *Anona squamosa*, *Azadirachta indica* and

Codiacum variegatum. The ethanolic extracts from the roots against 4th instar larvae exposed for 24hrs reveals that (Table2) *E.globulus* exhibited the lowest percentage mortality, than *C. procera* and the highest mortality was recorded in *B. aegyptiaca*, as compared to all the experimental plants parts. Earlier studies have shown that tissues of *B. aegyptiaca* plant contains high amount of saponins, therefore the high rate of mortality observed in all tissues of the plant may be attributed to the presence of saponin compound (Liu and Nakanishi,1982; Kamel et al., 1991; Farid et al., 2002). Results obtained from *E. globulus* and *C. procera* are not significantly different from each other at $P < 0.05$. *B. aegyptiaca* root exhibit a significant difference at $P < 0.05$. The LC50 value for *B. aegyptiaca* leaves was lowest with 6.90ppm and that for root is 6.25ppm(Table3). Both the leaves and the root of the experimental plants parts revealed some larvicidal tendencies at different concentration, however, *B. aegyptiaca* root and leave are considered more potent in larvicidal properties compared to the remaining plant parts.

V. ACKNOWLEDGEMENT

The kind assistance of Mallam Murtala Lawan Raji Senior Laboratory Technologist, biochemistry department Moddibo Adama University of Technology, Yola, Adamawa State, Nigeria and Mallam Ibrahim Ahmed Hayatu of MAUTECH in the larvicidal bioassay is warmly acknowledged.

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FACEBOOK- A Modern Age Techno Market

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Abstract- Social media, a technology which is a complicated frontier, a tool that has yet to be understood to its fullest capacity. Facebook ranks as the number one Social networking site. Facebook the present happening social networking site now boasts over 800 million active users, half of whom log in on any given day and are exposed to a plethora of apps, pages, groups and events designed to entertain, build communities or spread word Media website. The paper is a study of Facebook's functioning as the most valuable market research tool that has ever existed. The study about interactivity that Facebook allows wall posting, commenting, liking, etc., brands now possess a highly valuable market research tool which is completely free. The distribution of marketing messages through wall posts, polls and the highly effective video facility, brands can immediately gauge reaction and success of their campaigns from those users who opt to like, comment upon or share said content

Index Terms- Facebook, marketing, media, online, commodity, business

I. INTRODUCTION

In present competitive world, marketing has got several complex and multi-dimensional features and policies which are having huge impact in successful mediation between the consumers and producers of a particular product/commodity. A marketing system prefers a competitive marketing system driven by profits and incentives, which makes it superior to a coercive state controlled system. Marketing is about proper utilization of technology and showing innovative skills for reaching wider population of consumer world. Different tools and mechanisms are adopted which are unique and different organizations/companies which make their targets achievable. One such tool in computerized society is face book.

Facebook has reached to wider section of people and it is competing with Google in certain components like number of users, daily usage, and active participation of users. Facebook has got a wider public attention which is making companies/advertisers to shift their product ads from Google to facebook. Today's generation may/may not have a voter id card but every youth irrespective of gender has a facebook account.

II. FACEBOOK INCREASES POTENTIAL CUSTOMERS

Marketing is more beneficial when we reach to consumers who have purchasing power. Normal customers are very much different from potential customers. A market generally consists of all the potential customers sharing a particular need or want who might be willing and able to exchange to satisfy the need or want. A potential customer is a person who may buy a particular

thing. There is high possibility of that person in buying that thing. A market certainly aspires to reach such people who have a need for that particular thing and may buy that thing now or in future.

Facebook provides a user friendly path for customers who aspire to buy a particular product or who shows interest in purchasing a commodity. This user friendly path is provided by allowing them to search for what they need and they can even share their interests by mentioning their facebook profile. More important is that the facebook users more often are from urban middle classes who have the capability to buy the product which are in their need. There are three million users around the world that spend at least few minutes on facebook; most of them are potential customers.

Facebook has a free tool that can give us some quick and dirty statistics on facebook using demographics. The tool is called facebook ad manager. This facebook ad manager has audience-so that you can target your facebook ad to particular users that also gives the approximate number of users that fit your target market. The tool itself is free and you don't need to go through with buying an ad to use the targeting tool.

Facebook users will have a self identity by liking the pages, sharing interests and joining groups, through this concept one can easily capture and advertise to users who are interested to buy different products. Facebook also has active participation of users in expressing their views on those different products so that without any surveys easy feedback can be obtained by monitoring the views of users. According to an estimate of facebook, over one billion people like and comment an average of 3.2 billion times every dayⁱ. Facebook ads are paid messages that business can use to connect with these users, and targeting your ads will help you reach the right people.

III. ADVANTAGES OF USING FACEBOOK AS A MARKETING TOOL

Facebook advertising can help you to create a page on your own on the name of the product/commodity you wish to advertise. It also helps to increase your page likes and reach people who aren't yet connected to you on the site, push your postings to more fans, increase event attendance, send traffic to a mobile application that promotes your business, and direct viewers to your website. Moreover you can have an option to create innovative and attractive posts which would attract more number of users and make them try your product.

Business must decide which type of facebook ad will be most effective. Small ads and "sponsored stories" that appear on the right side of a facebook page can be targeted to specific audiencesⁱⁱ. Promoted posts push your status update-including links, photos and videos to more of your fans. Making a post

short and precise will make users to read and full length posts might have a probability that most users may ignore reading it.

Business people also have an option to put an ad directly into viewers' facebook newsfeeds. Once someone clicks on your ad, where do you want them to go? The options are to your facebook page, a custom application or tab, an event or a different website. Choosing an ad image and headline are very important. Images attract viewers and people are more likely to stop at your ad when the image is eye catching. Use first person headlines to engage customers. Determine the best advertising avenue by experimenting with different ads. Set up multiple ads with different images to monitor the effectiveness of your image, headline and text stop and start ads after reviewing the ad statistics.

Facebook allows any organization to have an own profile page on the network. Using the profile a company can showcase photos, videos and other media on their site, while interacting with other facebook users. It is an extremely powerful marketing tool when you put in the right hands. Unfortunately this is not always the case. You can connect to an audience of consumers and find out what they want, what they like about products and services. You can promote your services and special offers using your page in conjunction to facebook advertisement.

In addition to this, the Facebook app will allow developers to create sub-pages, or application that can perform other tasks for you. This is only limited to your imagination. This is the main power of facebook. You can use apps to promote competitions, special offers, generate leads, add maps and locators, and even set up shop right there on the social platform. There is also another advantage for using facebook as marketing tool. According to a statistics, 55 minutes is the average amount of time a typical facebook user spends on the site every single dayⁱⁱⁱ. Increased SEO [search engine optimization] and visibility online, who doesn't like taking advantage of free marketing tools? Creating a facebook allows you to get better search engine rankings. If you use SEO and informative content on your business facebook, it will rank highly in search engine results and improve your visibility. Real time search which helps improve your search engine optimization and reputation. If you allow public content availability, real time search results will display your business facebook page in results when a relevant search is performed

The statistics of a survey shows that the average facebook user has 130 friends approximately. That means if your page is "liked" by one person, it will show up on the newsfeed to their friends, opening you up to exposure to hundreds of people every time someone else "likes" your facebook page. It's like virtual word of mouth, and it's something every business should take advantage of.

Facebook promoted posts will let facebook page owners pay a flat rate in order to have a single post reach a certain number of users, increasing a specific post's reach and impressions. If a fan of your page happens to be looking at their newsfeed when you post about your product, they are likely to see it, but even then there is no guarantee if their newsfeed is swamped by other posts. That's where promoted posts come in-it ups your chances of being seen on a user's newsfeed. Facebook promoted posts are shown to existing fans, with an added option to reach friends of fans.

Sponsored stories are a type of facebook ad that shows user interactions, such as a facebook like to the user's friends. While the action performed by a friend liking a page or claiming an offer is automatically posted in users newsfeed, these posts easily gets overlooked. Sponsored stories gets preferred positioning, capable of appearing in newsfeed and the right side bar.

IV. ONLINE TRANSACTIONS AND BANKING THROUGH FACEBOOK

Advertising of products and carrying out business through facebook, can also allow users to pay for the product through facebook. This is a user friendly task which can be accommodated by developing a user friendly application in facebook. Thus it makes the task of online transactions and banking easier through facebook. A user can select the product he likes and can purchase it on the spot by using these apps. These kinds of apps in facebook are provided certain banks like common wealth bank and ICICI bank. The recent flick in India was of ICICI bank. It has almost lured facebook with new banking app.

ICICI bank customers will certainly "like" their bank more as it is allowing them to use the social media network Facebook to execute transactions^{iv}. The biggest private lender by assets launched a new banking app that lets customers transact via facebook application, called pockets by ICICI bank. It allows clients to transfer funds, book movie tickets, recharge mobile phones and split and track group expenses and allows people to send notifications when payments to the group are pending.

This application would enable the young consumers who spend a lot of time on facebook to carry out a wide set of transactions without having to leave the social networking site. Just like most online facilities, there are risks associated with it. Those who wished to transact must ensure that their devices are safe. Fundamentally, this is just like using facebook as an application platform, like Farmville. The banks will take steps like encryption and one time passwords. Accessing the application requires a PIN that the customer has selected and transactions require a onetime password. These banks also help and contribute in using facebook as a marketing tool.

V. NEW COMMUNICATION STRATEGIES FOR CONNECTING WITH CUSTOMERS ON FACEBOOK

600 million potential customers are on facebook; retailers are flocking to the site and aggressively experimenting with new communication strategies^v. There are five ways they are connecting with customers on facebook.

Promotions: - For retailers the main task is to treat the followers differently than other customers by providing special access to offers and information. Using facebook as a one way communication channel is an unmeasured step, but broadcasting deals already found in other channels is not a particularly effective engagement model. A smarter approach is to reward followers by, for instance, providing facebook only discounts and sneak peaks at upcoming products. Participatory promotions are particularly effective as they add excitement to online purchasing and an incentive for costumers to invite other friends.

Crowd sourcing:-

Wal-mart and gap have used crowd sourcing tactics on facebook, inviting large groups to participate in shaping an offer or strategy. the wal-mart crowd savers program, for example, offers potential deals to facebook users that is only activated if enough fans “like “the promotion-in effect joining together to reach a goal-much likegroupon’s model. Similarly last year, gap asked its facebook followers to comment on its new logo design. After a barrage of negative feedback from followers, gap invited them to submit their own designs. Responding to customer’s outcry, the retailer ultimately restored its original logo.

Check-ins:-

Mobile device check-ins is a popular way to electronically announce your arrival at a location. This has enormous potential values for retailers, if they identify customers at all, typically don’t do it until checkout, at which point it’s too late to influence a purchase. Facebook deals enables retailers to provide electronic coupons and loyalty points when customers check in at arrival, increasing store traffic and sales, and giving retailers a clearer picture of their customer’s behavior.

Games:-

Games like Farmville and mafia wars hosted on facebook are immensely successful, creating an ideal opportunity for retailers to do something they know well: marry entertainment and merchandising. Last summer eleven partnered with game maker zynga to extend social games into the physical world items such as slurpees and biggulls which were branded with Farmville, mafia wars, and yo ville designs that had redemption codes for in-game rewards. Meanwhile, teen fashion retailer wet seal has been developing its own facebook game, chic boutique. The retailer is hoping customers will compete with each other online to design outfits compiled from items in its catalogue, increasing awareness of wet seal’s offerings and driving sales.

Social shopping:-

The most obvious use of facebook is also the most elusive to create more than just an e-commerce store within a facebook frame. Over the past two years several retailers have made it possible for customers to browse a subset of products on the company’s facebook page, but they usually rely on their e-commerce site to complete the transaction^{vi}. This is a step in the right direction, but to take real advantage of facebook, retailers must make it easier for people on the site to communicate with each other about products, promotions and reviews, and seamlessly make purchases.

All companies, not just retailers, should be using social media like facebook to listen to what customer are saying about their products and brand but attract them by using promotions, contests, games and involve them to keep them loyal and take advantage of the power of influential .These are the early days, and while it’s uncertain what will work best, it’s likely the retailers that don’t experiment with social commerce will find their customers defecting to those that do.

Facebook exchange [fbx]-a new advertising platform in re-engaging potential customers:-

Recently facebook began beta testing and launched its new advertising platform –facebook exchange [fbx], with a few select technology companies for the first time ever. Advertisers could use their own data to reach their audience on facebook through fbx, an advertiser can retarget users who previously browsed

their sites with a more relevant and unique facebook ad unit coupled with facebook’s massive reach. Over 1 billion users visit the site monthly, retargeting through fbx can truly put the right ad, in front of the right user, at the right time.

Since the initial beta phase great success is achieved through fbx campaigns, because the ad-units always show above the fold or the page viewable without scrolling, and users are more aware of the ad-slots, we’ve seen higher quality clicks from the campaigns which have come up recently.

Facebook exchange is a way of buying ads on facebook through the use of real time bidding. Through fbx, advertisers can target their audience on facebook using data collected outside of facebook. As an fbx qualified buyer, AdRoll is one of the select group of tech companies that has access to this premium inventory.

Retargeting on the facebook works on the same way as other retargeting. If a visitor comes to your site and learns about your products, but leaves before purchasing it, AdRoll can display your ads on facebook later. This will certainly help to bring your visitors back to your site and it will keep your brand top of mind. This is one of the most innovative and most efficient ways to address the potential users in advertising them the products.

VI. DRAWBACKS OF USING FACEBOOK AS A MARKETING TOOL

The main disadvantage of using social media like facebook as marketing tools is the time required to navigate and manage the intricacies of each medium. Account or page owners ultimately have the control of what remains on their public profile; there is little control over who posts information or what those posts contain. It is relatively easy for a competitor, angry customer or disgruntled employee to post accusatory comments that are inflammatory, derogatory or otherwise slanderous to your business on your facebook wall. Maintaining vigilant control over the content that appears on your facebook page takes the time and effort of the approved content monitors, which can be costly and time consuming for small business owners.

Cost of Maintenance: Content pages must continually be updated with new information that readers will find useful, beneficial or interesting for facebook marketing to be effective. This requires development of a detailed innovative social media marketing strategy-a costly investment for small advertising budget.

Competition: Marketing platforms executed via facebook are open to easy duplication by competitors. Rival business owners can easily pose as “friends” or “followers” to gain access to your content: photos, artwork and other images posted to your site are easily accessed and reused by visitors and can show up in other places you may not approve of. This in turn leads to duplication and competitors will get a chance to overthrow your business.

While basic facebook pages are free of charge for personal users, business accounts that feature advertising opportunities come with a price tag attached. This added promotional expense can be a disadvantage for the small business owners.

The main disadvantage that lies while using facebook as a marketing tool is threat from hackers. In present scenario hackers are targeting even most secure government sites and they pose a huge risk for the facebook pages of any company/organization.

There is a possibility of acquiring confidential information from the pages by hacking. Even there is a threat from the hackers might post obscene, vulgar content and spoil the reputation of that company. When it comes to financial marketing, hackers pose even bigger threat by decoding the passwords and acquiring the personal details and account numbers of the users and their bank accounts which in turn results in huge loss to the consumer as well as the marketing agency. Security threat is evident from hackers' community

Some avid social network members feel that marketing and advertising is intrusive to their privacy. According to a study, 8 out of 10 facebook users feel ambivalent to uneasy about sharing personal information and place facebook in low security confidence^{vii}. The practice of shaping ads and campaign off member information collected from facebook has stirred wave confidentiality, controversy and marketing efforts can be met with bitterness and offensive reactions.

Advocacy of the fair use of facebook should increase when it comes to using it as a marketing tool. The companies should address the loopholes of the facebook so that they can draw just benefits out of it. Facebook is no where a magic gem that can help even a bad company with low quality products and poor servicing to make the products get sold. The first and the last way to ensure the success of your business will always be to ensure the quality of the end product and shall offer complete customer satisfaction.

VII. CONCLUSION

The facebook has certainly created a revolution in the fields of information, technology and social networking. Gone are those days when products are purchased by going to retailers, now the retailers themselves are using efficient methodology and innovative skills in bringing the whole information about the products at the very browser of the consumer, with just one click you can have a bountiful information about the products and you can purchase them by staying at your home.

Marketing and publishing ads in facebook makes your business more enthusiastic and reduce boredom as you can advertise your products by staying in contact with your friends in facebook, at the same time profession and pleasure is achieved which will in turn provide relief from workloads and mental tensions at work place.

The value a facebook page brings to a product of a company will depend on the marketer's ability to foster a productive social network such as facebook that enables the nurturing of the followers affinity to the product. Proper page maintenance is a must in order to sustain a constant conversation with the followers and to address their problems by serving them and making a view of their grievances towards the products.

Thus in today's technologically developed world, Facebook becomes a source of medium for transmitting the information through ads and procuring the required details by having a quick look towards a particular page and interlink age between facebook apps is also helping the user to purchase the product then and there itself. Though it has some disadvantages and security risks, user should monitor the authenticity of products carefully and shall purchase them, thus marketing institutions gets benefited by using facebook as a marketing tool.

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Nonylphenol-induced hepatotoxicity in the freshwater fish, *Oreochromis mossambicus*

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Abstract- Adult freshwater fish, *Oreochromis mossambicus* was exposed to nonylphenol at sublethal concentration (0.15 mg/ L) for 24 h, 96 h and 7 days. Nonylphenol significantly decreased the weights of liver and also hepato-somatic index at the end of 7 days, however no such changes were observed at 24 and 96 h of treatment. Decreased weight may be due to necrosis or atrophy of hepatocytes, which is evidenced by the histopathological observations. The activities of antioxidant enzymes decreased after 24 h and 96 h whereas at 7 days of exposure the activities of antioxidant enzymes begin to increase and the levels of hydrogen peroxide and lipid peroxidation decreased to normal level like that of control groups. In general, repeated doses of nonylphenol for 7 days, may induce a defensive response in *Oreochromis* meanwhile, acute exposure caused inhibition of antioxidant activities. The present study also showed a significant decrease in the marker enzyme, alkaline phosphatase after 96 h indicating the decreased state of inter and intracellular membrane transport and the activity of enzyme increased to normal level at 7 days. In histopathological observation, the control liver exhibited a normal architecture with hepatocytes presenting a homogenous cytoplasm and a large central or subcentral spherical nucleus. In the treated group an increase in cytoplasmic vacuolization, necrosis and decrease in the number of hepatocyte nucleus was observed. This could be possibly owing to the toxicity of nonylphenol and also due to the generation of reactive oxygen species in fish hepatocytes.

Index Terms- Nonylphenol, liver, oxidative stress, alkaline phosphatase, antioxidant

I. INTRODUCTION

Animals when exposed to the environmental pollutants have been recognized to induce alteration of different magnitudes in the physiological and biochemical status of the being. Therefore, to assess the environmental impact of those compounds on animals, certain biomarker parameters are used that provide quantitative response as well as valuable information on the acute/chronic adverse effects caused by those pollutants. However, the changes in biochemical, physiological or histopathological alterations are considered as an adaptive mechanism which allows the fish to cope with real or perceived stressors so that the normal homeostatic state could be maintained¹. Fishes exposed to toxicants are expected to undergo stress, which are a state of re-established homeostasis and a complex suite of maladaptive responses. Under stress, some of the biochemical responses may be compromised, becoming detrimental to the fish's health and well being, at this point the fish is termed as distressed. In the present study, the response of

fish to one of the environmental pollutants nonylphenol was evaluated on hepatic antioxidant status.

Nonylphenol is widely used as a chemical intermediate in the production of nonylphenol ethoxylates and other compounds. It is an important class of non-ionic surfactants widely used in industrial applications such as paper and textile manufacture, paints, resins, coatings, adhesives, plastic additive in modified polystyrene and polyvinyl chloride and also as industrial cleaners. An important source of nonylphenol in the environment is unreacted nonylphenol in plastic, which may result in direct human exposures when the chemical leaches out of plastic in close contact with foods. Ever since nonylphenol was first synthesized in 1940, its use and production have been increasing almost exponentially. The annual production of nonylphenol reached 154,200 tons in the USA, 73,500 tons in Europe, 16,500 tons in Japan and 16,000 tons in China. However, many other countries including India use and produce nonylphenolic compounds in large amounts and no action has been taken by the government to reduce or eliminate their usage.

Nonylphenol is moderately lipophilic and in the higher organisms the bioconcentration levels may include biomagnification through the food chain, and also uptake of sediment containing higher levels than in the water thus accumulate in both freshwater and marine organisms². Nonylphenol was found to mimic the natural hormone 17 β -estradiol by competing for the binding site of the estrogen receptor due to their structural similarity³. Nonylphenol has been shown to reduce the epididymal sperm count along with induction of an oxidative stress in the epididymal sperm of rat⁴. However, co-administration of vitamin E prevented nonylphenol-induced oxidative stress in testis of rat⁵.

Nonylphenol at sublethal concentration caused genetic damage in freshwater fish, *Oreochromis mossambicus* as evidenced by micronucleus test and Salmonella mutagenicity test⁶. Nonylphenol also have damaging effects on important physiological process and reproductive tissues, induce apoptosis in many organisms, affects sperm motility, gene expression of pituitary hormones and oxidative damages of organs. It also interfere with synthesis, secretion, transport, metabolism, binding action or elimination of natural blood-borne hormones that are present in the body and are responsible for homeostasis, reproduction, and developmental process. The study aimed to determine duration-dependent effects of nonylphenol on the hepatic antioxidant status of the freshwater fish, *Oreochromis mossambicus*. It also examined the extent to which the nonylphenol toxicity pave mode to the histopathological alterations in fish hepatocytes.

II. METHODS

Fresh water fish, *Oreochromis mossambicus* weighing 6.5 ± 2 g and length 7.5 ± 1 cm were collected from Kaloos fish farm, Malappuram District, Kerala, India. Fishes were acclimatized to the laboratory conditions for four weeks with constant supply of water and good lighting system. During the period of acclimatization, fishes were fed everyday with standard fish pellets. Bath was changed every 24 hour, which was dechlorinated, respectively.

The physico-chemical features of the tap water were estimated as per APHA⁷. Water temperature in the test ranged from $28 \pm 2^\circ\text{C}$ during the experiment, oxygen saturation of water ranged between 70 and 100 %, pH is 6.5 to 7.5 which were monitored using a standardized procedures. The LC_{50} values in the respective time intervals were determined by probit analysis, with a confident limit of 5 % level⁸, which was 1.5 mg/ L. One-tenth of the dosage (0.15 mg/ L) nonylphenol was chosen to represent sub-lethal concentration.

The specimens were not fed a day prior to and during toxicity tests to reduce faecal and excess food contaminating the test solution. Ten specimens were placed in each tub and were maintained in each test and control groups, they were then aerated using tubed motorized pumps. Monofilament netting was used to cover the tanks to prevent the specimens from jumping out of test solutions. The behaviour of specimens was observed and death was also recorded throughout the study.

Treatments:

There were four groups, three tanks each with toxicant doses maintained for 24 h, 96 h and 7 days, respectively and a tank with control fishes. Single dose with different durations were used in present study. Ten fish specimens were used for every test and also in control groups. The first groups of fishes were maintained in toxicant-free water and were used as control and the second group was treated with nonylphenol at 0.15 mg/ L for 24 h. The third group was treated with nonylphenol at 0.15 mg/ L for 96 h and fourth group was treated with nonylphenol at 0.15 mg/L for 7 days. Biochemical estimation of liver was performed at the end of every treatment and the histopathology was also done at the end of experiments, maintaining the control group.

Tissue processing:

A 1% (w/ v) homogenate of liver was prepared in ice-cold normal saline with the help of a motor-driven glass Teflon homogenizer on crushed ice for a minute. The homogenate was centrifuged at 8000 g for 15 min at 4°C to obtain the supernatant, which was then used for the analyses.

Biochemical analysis:

Total protein concentration in the tissue was estimated by the method of Lowry et al.⁹. The levels of lipid peroxidation were measured via the thiobarbituric acid color reaction for malondialdehyde (MDA) at 535 nm, according to the method of Ohkawa et al.¹⁰. Hydrogen peroxide generation was assayed by the method of Pick and Keisari¹¹. Superoxide dismutase (EC 1.15.1.1) was assayed by the method of Marklund and

Marklund¹². Catalase (EC. 1.11.1.6) was assayed by the method of Claiborne¹³. The activity of alkaline phosphatase (EC.3.1.3.1) was assayed by the method of Bessey et al.¹⁴.

Histopathology:

Liver tissue collected by sacrificing the fish was fixed in 10 % buffered formalin for 24 hours. Tissue was dehydrated in ascending grades of alcohol and was cleared in xylene until they became translucent. It was then transferred to molten paraffin wax for 1 hour to remove xylene completely and then impregnated with wax. Then the blocks were cut in a rotary microtome to prepare sections of thickness 4 to 6 microns. The sections were stained with haematoxylin and eosin and mounted in DPx. The structural alteration was observed under light microscope in the sections of liver of fish and was compared with those of control tissues. Photomicrographs were taken using Cannon shot camera fitted to the Carl Zeiss Axioscope 2 Plus Trinocular Research Microscope.

Statistical analyses:

Statistical analyses were performed using one-way analysis of variance (ANOVA) followed by Duncan's Multiple Range test using statistical package SPSS 17.0. Differences were considered to be significant at $p < 0.05$ against control group. Data are presented as mean \pm SD for ten animals per group. All biochemical estimations were carried out in duplicate.

III. RESULTS

Nonylphenol at the sub lethal concentration of 0.15 mg/ L at 24 h and 96 h showed no remarkable changes in the weights of liver and hepato-somatic index, but a significant decrease was observed after 7 days of treatment (Table 1). The activities of superoxide dismutase and catalase decreased significantly at 24 h and 96 h, however after 7 days of treatment the activities of superoxide dismutase and catalase significantly ($p < 0.05$) increased when compared with control groups (Table 2).

The level of hydrogen peroxide and lipid peroxidation increased significantly ($p < 0.05$) at 24 h, 96 h of nonylphenol treatment in liver of fishes and no significant changes were observed after 7 days of treatment (Table 2). In liver tissue the activity of alkaline phosphatase showed a significant ($p < 0.05$) decrease after 96 h of exposure whereas no changes were observed at 24 h and 7 days of nonylphenol treatment than that of control group (Table 2).

In the control group, the liver exhibited a normal architecture and there were no pathological abnormalities, with hepatocytes presenting a homogenous cytoplasm, and a large central or subcentral spherical nucleus (Figure 1A). The hepatic parenchyma of fish exposed to nonylphenol after 7 days showed a tremendous decrease in number of hepatocyte nucleus (Figure 1B). Additionally, fishes exposed to nonylphenol also showed hepatocellular necrosis (Figure 1C) and an increase in cytoplasmic vacuolization (Figure 1D).

Table 1 Effect of nonylphenol on the body weight and tissue weights of the fresh water fish, *Oreochromis mossambicus*

Weights	Nonylphenol (0.15mg/ L)			
	Control	24 h	96 h	7 days
Liver (mg)	113 ± 0.12	101 ± 0.29	107 ± 0.09	82 ± 0.18*
Hepato-somatic index (g)	1.45 ± 0.54	1.24 ± 0.39	1.28 ± 0.81	0.987 ± 0.22*

Data are expressed as Mean ± SD for 10 animals/ group. Asterisks (*) denote the p value set significant at 0.05 level of significance against the control group.

Table 2 Effect of nonylphenol on the biochemical parameters of the fresh water fish, *Oreochromis mossambicus*

Parameters	Nonylphenol (0.15mg/ L)			
	Control	24 h	96 h	7 days
Superoxide dismutase ^a	0.376 ± 0.091	0.054 ± 0.022*	0.071 ± 0.007*	0.5 ± 0.158
Catalase ^b	13.168 ± 2.01	0.385 ± 0.233*	0.576 ± 0.365*	13.63 ± 4.30
Hydrogen peroxide ^c	7.32 ± 3.44	13.34 ± 3.52*	17.22 ± 1.53*	5.90 ± 1.84
Lipid peroxidation ^d	18.17 ± 2.76	66.71 ± 17.9*	78.78 ± 5.33*	15.60 ± 3.06
Alkaline phosphatase ^e	18.1 ± 0.34	16.41 ± 0.87	10.17 ± 0.38*	14.79 ± 0.47

Data are expressed as Mean ± SD for 10 animals per group. Asterisks (*) denote the p value set significant at 0.05 level of significance against the control group.

- a nmol pyrogallol oxidised/ min/ mg protein
- b μmole of hydrogen peroxide consumed/ min/ mg protein
- c nmole hydrogen peroxide generated/ min/ mg protein
- d nmol of malondialdehyde produced/ min/ mg protein
- e μmole of p-nitrophenol liberated/ 30 min/ mg protein

FIGURE 1A Control liver showing normal architecture. No pathological abnormalities, hepatocytes showing a homogenous cytoplasm, and a large central or subcentral spherical nucleus (40x magnification)

FIGURE 1B Hepatic parenchyma of fish exposed to nonylphenol after 7 days showed a complete disappearance of nucleus (40x magnification)

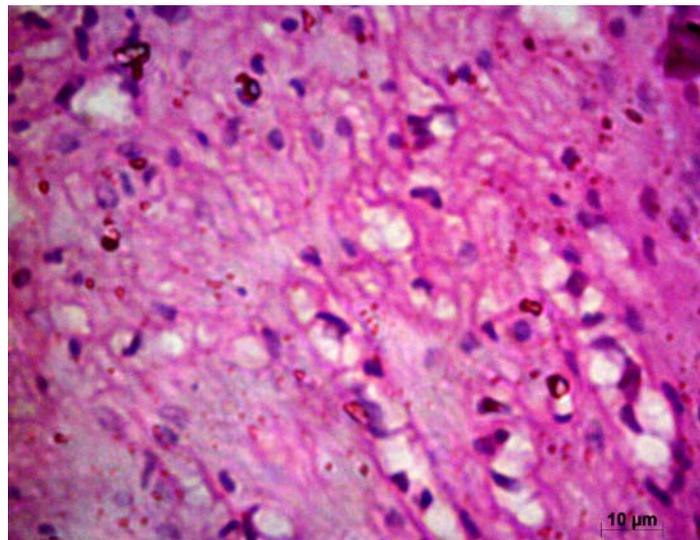
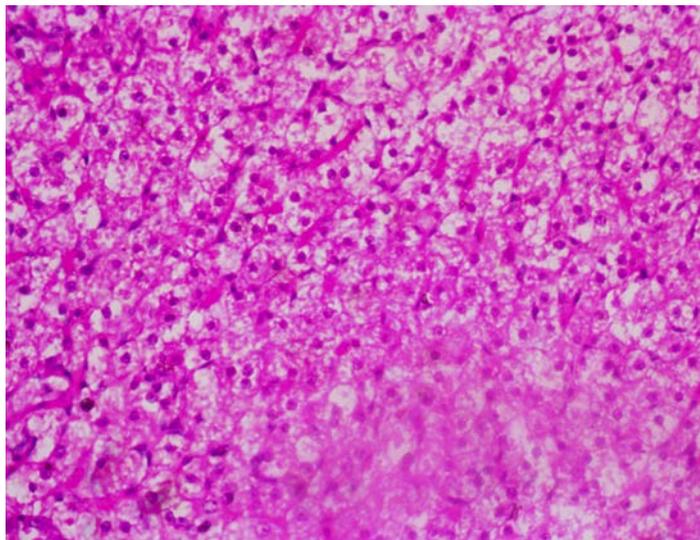


FIGURE 1C Exposure to nonylphenol for 7 days showed hepatocellular necrosis (40x magnification)

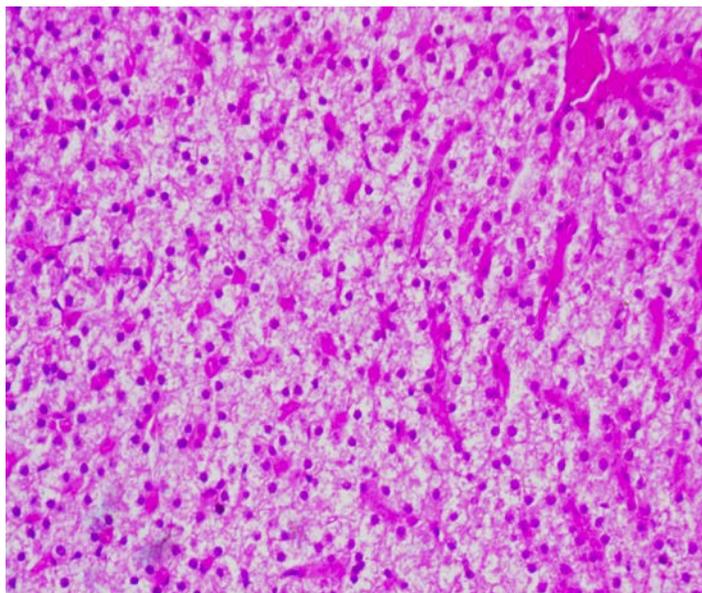
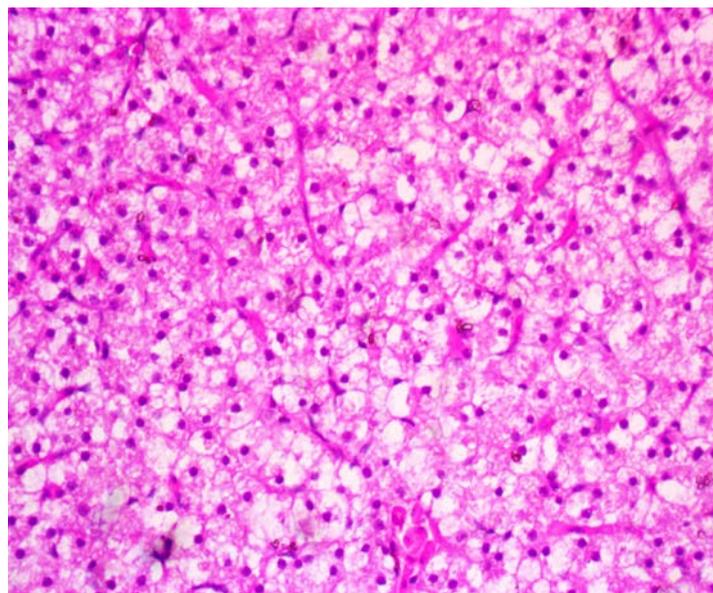


FIGURE 1D Exposure to nonylphenol for 7 days showed increase of cytoplasmic vacuolization in hepatocytes (40x magnification)



IV. DISCUSSIONS

Nonylphenol are ubiquitous and they are known to resist degradation and bioaccumulate, as it also possesses ability to produce physiological effects that made a subject of considerable recent attention. Several studies have reported that nonylphenol is directly toxic to fish where aquatic communities are exposed indirectly through runoff from land treated with sewage sludge. Even low concentrations of nonylphenol lead to estrogenic effects that might have long-term consequences, such as disrupting population dynamics or interactions within the aquatic communities. Many studies have reported the effects of nonylphenol on reproduction and development in vertebrates including mammals besides their interactions with the endocrine system, however, little is known about the effect of nonylphenol on the antioxidant status in fishes. However one of our previous reports stated that nonylphenol induced oxidative stress in gill of fish¹⁵. Therefore, the goal of the present study was to scrutinize the effect of nonylphenol on the generation of reactive oxygen species (ROS) in hepatocyte of the fresh water fish, *Oreochromis mossambicus*.

Liver is considered as the main and important detoxifying organ and is essential for both the metabolism and the excretion of toxic substances in the body; and several categories of hepatocellular pathology are now regarded as reliable biomarkers of toxic injury and are representative of biological endpoints of contaminant exposure¹⁶. The effects of environmental pollutants may be assessed based on the changes in the health status of humans or ecosystems, or selected species. Health is a qualitative endpoint but must be expressed in a measurable way. For example, endpoints such as the production of reactive oxygen species in fish are used in the present study to quantify the effect of the toxicant, nonylphenol on the freshwater fish, *Oreochromis mossambicus*. As additional evidence the histopathological changes were also analyzed. In the present

study the decreased weights of liver and also the hepato-somatic index could be possibly due to necrosis or atrophy of hepatocytes which is evidenced by the histopathological observations.

Environmental pollutants generally cause oxidative stress by an increase in peroxidative processes within cells. Some of the important cell components such as proteins and DNA are damaged due to the potent oxidants as hydroxyl radicals that are being produced in electron transfer reactions¹⁷. Lipid peroxidation has often been used as a biomarker of environmental stress, reflecting damage to cell membranes from free radicals and is an important feature in cellular injury¹⁸. The extent of damage caused by oxyradical production is dependent on antioxidant defences, which include antioxidant enzymes and free radical scavengers. Therefore, antioxidant enzymes are some of the most common biomarkers used in environmental monitoring. These enzymes usually respond rapidly and sensitively to biologically active pollutants¹⁹. In the present study the activities of antioxidant enzymes decreased after 24 h and 96 h in the hepatocytes of nonylphenol-treated fishes whereas at 7 days of exposure the activities of antioxidant enzymes begin to increase and the levels of hydrogen peroxide and lipid peroxidation decreased to normal level like that of control groups. In general, repeated doses of nonylphenol for 7 days could have induced a defensive response in *Oreochromis* meanwhile acute exposure caused inhibition of antioxidant activities and elevation of reactive oxygen species in fish hepatocytes.

The present study also showed a significant decrease in the marker enzyme, alkaline phosphatase in the liver after 96 h of nonylphenol exposure. Alkaline phosphatase serves as diagnostic tool to assess the toxicity stress of chemicals in the living organisms²⁰. Alkaline phosphatase is a hydrolytic lysosomal enzyme and is released by the lysosomes for the hydrolysis of foreign material. Subsequently the enzyme activity may begin to drop either as a result of having partly or fully encountered the

toxin or as a result of cell damage. Alkaline phosphatase is also involved in the mediation of membrane transport and transphosphorylation. A decreased alkaline phosphatase activity in liver of nonylphenol-treated fish for 96 h and the activity of enzyme increased to normal level at 7 days of exposure indicate the decreased state of inter and intracellular membrane transport. This could be possibly due to the toxicity of nonylphenol at acute exposure and the stress is overcome during sub-chronic exposure.

Histopathological observations disclose that the control liver exhibited a normal architecture and there were no pathological abnormalities, with hepatocytes presenting a homogenous cytoplasm and a large central or subcentral spherical nucleus. The hepatic parenchyma of fish exposed to nonylphenol after 7 days showed an increase of cytoplasmic vacuolization. Additionally, hepatocellular necrosis and decrease in the number of hepatocyte nucleus was also observed. During the present investigation the widespread vacuolization might be likely due to accumulation of glycogen in hepatocytes²¹. Hepatocellular lipid vacuolization commonly occurs in fish as a histopathological response to aquatic pollutants. Also, the widespread vacuolization of the liver might be a common response in fish hepatocyte to various chemical stressors, which indicates a higher hepatocellular lipid, water and/ or glycogen content²². Anomalies such as irregular shaped hepatocytes, cytoplasmic vacuolization and nucleus in a lateral position, close to the cell membrane were also described in *Oreochromis mossambicus* when exposed to malathion²³.

V. CONCLUSIONS

It is evident from the present study that the generation of oxygen free radicals induced lipid peroxidation in liver tissues and this might be due to the sub lethal toxicity of nonylphenol in the fresh water fish, *Oreochromis mossambicus*. However, on the basis of statistical observation it is, therefore, understood that the activity of antioxidant enzymes brings to the normal level at 7 days of exposure in the hepatocytes, stating that the liver could have begin to detoxify the exposed toxicant. These data do not warrant a causal connection per se, but taken together with reports in the literature, they strongly suggest a consequence of imbalance in pro-oxidant and antioxidant balance in liver tissues at acute exposure of nonylphenol in the freshwater teleost fish.

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A Study of Cardiovascular Function in Diving Reflex Response

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Abstract- Humans like most other air-breathing vertebrates exhibit a syndrome known as diving reflex. In man, facial immersion has shown to be sufficient stimulus for onset of reflex. During immersion there is significant slowing of heart rate, and at the periphery, blood vessels undergo constriction. In all animal, diving reflex is triggered specifically by cold water contacting the face. Water that is warmer than 21 °C (70 °F) does not cause the reflex, and neither does submersion of body parts other than the face. The precise mechanism for this effect has been debated. The heart rate and blood pressure is compared here in this study to determine the difference in autonomic changes during breath holding and diving reflex. In this study, 80 healthy subjects (38 males and 42 females) from 18 to 25 years were examined to evaluate the effect of facial cooling and apnea in development of diving reflex. Facial immersion was accomplished through the voluntary action of subject into a shallow water bath. The subject was told to remain submerged as long as it was comfortably possible to do so. Throughout experiment, water temperature was maintained. Mean of heart rate and standard deviation was calculated for each of the experimental conditions. At rest, mean heart rate was 77.7 ± 10.95 , mean heart rate during hands submersion with breath hold was 70.5 ± 13.63 . Mean heart rate with face submersion was found to be 61.46 ± 14.32 . Diastolic blood pressure is compared at rest and facial submersion, while breath holding. There is increase in diastolic blood pressure during facial submersion while breath holding (84.85 ± 16.98) than that at rest (74.04 ± 9.78). The result obtained shows heart rate decreases during facial submersion with breath holding compared to that at rest and blood pressure increases during facial submersion with breath holding.

Index Terms- Heart rate, Diving reflex, Breath holding, Submersion, Blood pressure

I. INTRODUCTION

In man, facial immersion has shown to be sufficient stimulus for onset of diving reflex.¹ During immersion there is significant slowing of heart rate as well as peripheral vasoconstriction. These adjustments are thought to occur as a result of medullary reflexes.² A reflexive response to diving in many aquatic mammals and birds, characterized by physiological changes that decrease oxygen consumption, such as slowed heart rate and decreased blood flow to the abdominal organs and muscles, until breathing resumes. Though less pronounced, the

reflex also occurs in certain non-aquatic animals, including humans, upon submersion in water.

Upon initiation of the reflex, three changes happen to a body. Bradycardia is the first response to submersion.³ It is suggested that cardiovascular adjustments occurs immediately upon facial contact with cold water with human heart rate slowing down ten to twenty-five percent.⁴ Slowing the heart rate lessens; the need for bloodstream oxygen, leaving more to be used by other organs. When under high pressure induced by deep diving, capillaries in the extremities start closing off, stopping blood circulation to those areas. Toes and fingers close off first, then hands and feet, as well as gastrointestinal tract and ultimately arms and legs stop allowing blood circulation, leaving more blood for use by the heart and brain. Lastly, the lungs alveoli fill up with blood plasma, which is reabsorbed when the animal leaves the pressurized environment.⁵

It has been postulated that receptor systems for the reflex are sensitive to cold stimuli, apnea and input from facial mechanoreceptor.^{6,7} When the face is submerged, receptors that are sensitive to cold within the nasal cavity and other areas of the face supplied by cranial nerve V (trigeminal) relay the information to the brain and then innervate cranial nerve X (the vagus nerve), which is part of the autonomic nervous system.⁸ In this study, the effects of diving reflex and breath holding in heart rate (HR) and blood pressure (BP) in healthy adults are compared. Objective of the study was to compare the effects of diving reflex and breath holding in HR and BP in healthy adults, for which different experimental conditions were performed in the subjects, which are comparison of heart rate at rest and facial submersion with breath holding, comparison of heart rate at rest and hands submersion with breath holding, comparison of heart rate while hands submersion and face submersion with breath holding, comparison of heart rate while hands submersion without breath holding and face submersion with breath holding, and lastly, comparison of blood pressure at rest and facial submersion with breath holding.

II. MATERIALS AND METHODS

Eighty students (38 males & 42 females) aged between 18-25 years were randomly selected for the study among those enrolled in Kathmandu University. Individuals taking medication and those having pulmonary, cardiovascular and other illnesses were excluded from the study. After elaborate explanation of the procedure to the subjects and obtaining consent from these individuals' heart rate and blood pressure were recorded

simultaneously. Facial immersion was accomplished through the voluntary action of subject into a shallow water bath. Each subject was instructed to immerse his or her face whenever ready without previous hyperventilation. The subject was told to remain submerged as long as was comfortably possible. Throughout experiment, water temperature was maintained. The experiment was conducted in each individual in the illustrated steps. Subject was given time for stabilizing their normal respiratory rate and to ease with surrounding. Then, heart rate and blood pressure was measured which accounts as normal heart rate and blood pressure. The subject was instructed to hold his breath as long as possible after a normal inspiration. Then, measurement of blood pressure and heart rate during breath holding was taken. Subject was allowed to rest for 2 minutes so that he/she regain his/her normal composure. Measurement of blood pressure and heart rate was taken while submersion of hands in cold water without breath holding (< 21°C). Subject was asked again to submerge hands in cold water but this time asked to hold his breath too and measurement of blood pressure and heart rate in this condition was noted. Subject was allowed to rest for 5 minutes. Measurement of Blood pressure and Heart rate during submersion of face (not other body parts) was noted while breathe holding in cold water. Measurement of blood pressure and heart rate immediately after submersion of face without breath holding (within 15 seconds) was noted. Two vessels, towel, tap water, ice, ice box, thermometer, stopwatch and sphygmomanometer were materials required to perform the procedure.

III. RESULTS

From the data obtained different statistical parameters were calculated. Mean of heart rate and standard deviation was calculated for each of the experimental conditions which are shown in table 1.

Table 1: Heart rates observed during various stages of experiment

Conditions	Heart rate
At rest	77.7±10.95
Hands submersion without breath hold	74.33±11.68
Hands submersion with breath hold	70.5±13.63
Face submersion	61.46±14.32

*Values are means ± S.D.

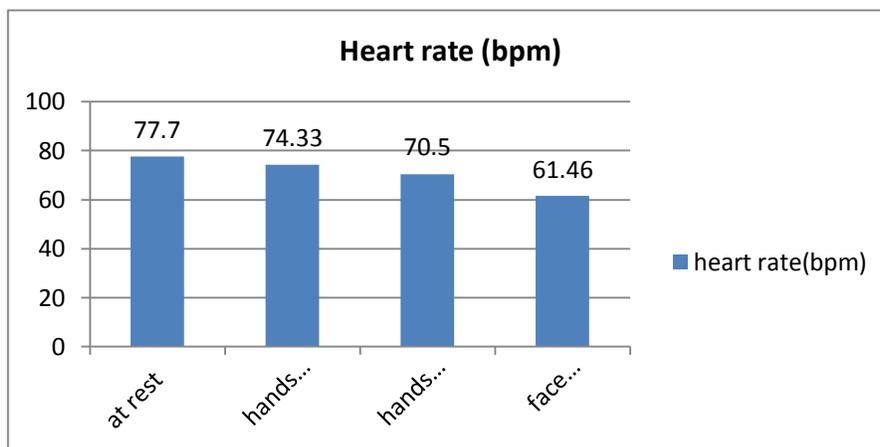


Figure1: Mean value of heart rate (in bpm) obtained at different experimental conditions

At rest, the mean heart rate of 77.7±10.95 is significantly higher than mean heart rate of 61.46±14.32 during face submersion. Hands submersion with breath hold was found to be mean rate of 70.5±13.63 which was lesser than the hands submersion without breath hold (74.33±11.68).

As shown in table 2, blood pressure obtained at rest was mean systolic 115.75±10.69 and during facial submersion while breath holding, mean systolic 125.33±14.36. Similarly, mean diastolic pressure recorded at rest and during facial submersion while breath holding were 74.04±9.78 and 84.85±16.98 respectively.

Table 2: Blood pressure obtained in two different conditions

Conditions	Systolic BP	Diastolic BP
At rest	115.75±10.69	74.04±9.78
Facial submersion while breath holding	125.33±14.36	84.85±16.98

Table 3 illustrates the significant difference in mean values and blood pressure obtained during different experimental conditions for heart rate

Table 3: t-values calculated compared with t-tabulated value at 0.05 significant level with d.f=78

Cases	t-value	Result	p-value
1.HR compared at rest and facial submersion while breath holding	8.4551	Significant	< 0.05
2.HR compared between at rest and hands submersion while breath holding	4.1381	Significant	< 0.05
3.HR compared between hand submersion without breath holding and facial submersion while breath holding	7.2947	Significant	< 0.05
4.HR compared between hands submersion while breath holding and facial submersion without	6.1692	Significant	<0.05
5.Systolic BP compared at rest and facial submersion while breath holding	6.2592	Significant	<0.05
6.Diastolic BP compared at rest and facial submersion while breath holding	4.1381	Significant	<0.05

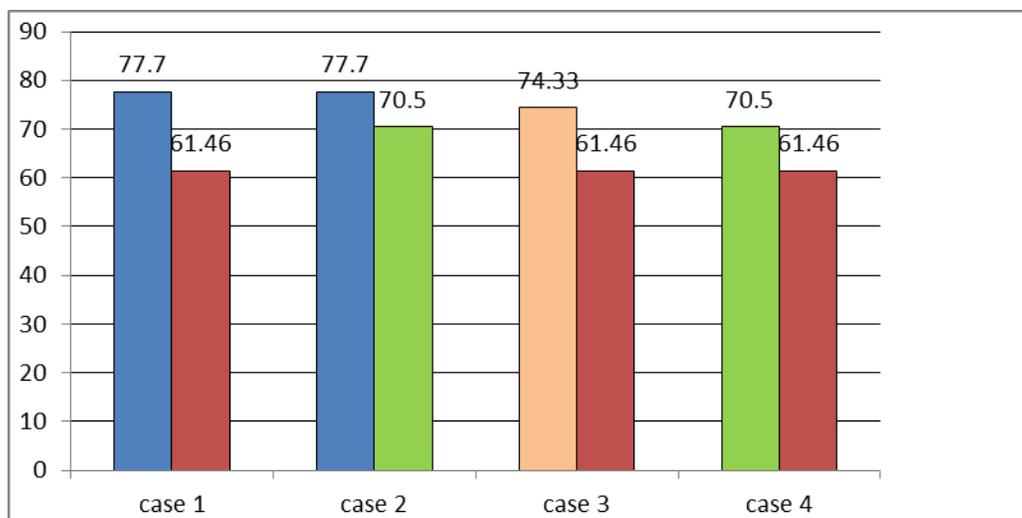


Figure 2: comparison of mean heart rate in four different cases

Case 1: heart rate at rest and during facial submersion while breath holding, Case 2: heart rate at rest and during hands submersion while breath holding, Case 3: heart rate during hands submersion without breath holding and during facial submersion while breath holding, Case 4: heart rate during hands submersion while breath holding and during facial submersion while breath holding.

IV. DISCUSSION

The result obtained signifies that there are significant differences between two parameters in each of the cases. It would be more of value if the knowledge of increase or decrease between the two conditions be obtained which would further add significance to the hypothesis stated. Nonetheless interpretation of values obtained can be done with the graph plotted and on the basis of medical physiology.

Heart rate is compared at rest and during facial submersion while breath holding. In figure 2, case 1 graph shows that heart rate decreases during facial submersion with breath holding than that at rest. The exact mechanism of slowing of heart rate is yet not fully understood. Heart rate slows down in order to lessen the blood supply to other parts of the body.²

The first response to the face submersion is bradycardia.³ It is suggested that cardiovascular adjustment occurs immediately upon facial contact with cold water with heart rate slowing.⁴

Heart rate is compared at rest and during hands submersion while breath holding. This statement observed from this experiment is in contrast to the statement given from previous study. Previous research states that submersion of body parts other than face does not elicit diving reflex.² Heart rate may have been decreased owing to the fact that during breath holding, apneic condition is developed i.e. decreased blood supply to the body. So, to compensate for the decreased blood supply condition heart rate slows. It is also to be noted that heart rate has fallen significantly with only peripheral skin being in contact with cold water. From this point of view, it may not be necessary that activation of trigeminal nerve through facial submersion be the only factor to trigger diving reflex but decreasing temperature in peripheral skin be also the another factor to elicit diving reflex. However, further scientific study is required to support this statement. Heart rate is compared between hands submersion without breath holding against face submersion with breath holding. Also, heart rate is compared between hands submersion with breath holding and face submersion with breath holding. There is decrease in heart rate during face submersion while breath holding than that of hand submersion with and without breath holding. It may be explained by the fact that trigeminal nerve activation found exclusively at face may be reason as to why heart rate level is more decreased in facial submersion while breath holding than that of hand submersion without breath holding and hands submersion with breath holding. Trigeminal nerve is extremely sensitive toward the cold sensation.⁶ This cold sensation stimulates the afferent part of trigeminal nerve thereby may stimulate the cardiac center present in the medulla which is responsible for bradycardia. Figure 1 also shows that there is more decreased level of heart rate during hands submersion while breath holding than during hands submersion without breath holding. This could be explained by the fact that breath holding leads to oxygen deficit leading to decreased heart rate. However, further scientific study is required to support this statement. There is increase in diastolic blood pressure during facial submersion while breath holding than that at rest as depicted in table 2.

During facial submersion while breath holding there is stimulation of trigeminal nerve which will activate cardiac center and cause peripheral vasoconstriction. The peripheral vasoconstriction leads to decreased blood supply to body extremities so that more of blood is supplied to more important

organs like brain and heart. This peripheral vasoconstriction raises diastolic blood pressure.^{2,6} When sympathetic system is stimulated both arteries and veins are constricted. Venous constriction leads to increased venous return which increases stroke volume. This increased stroke volume may be responsible for rise in systolic blood pressure which is represented in the table 2. On the physiological basis, systolic blood pressure rises by sympathetic stimulation. It is also true that sympathetic stimulation not only increases systolic blood pressure but also increases heart rate. But, in this case there is decrease in heart rate. So, sympathetic stimulation may not be the reason to increase systolic blood pressure. Increase cardiac output is responsible for increase in systolic blood pressure. Cardiac output depends upon heart rate and stroke volume. For this case, heart rate cannot be considered as a factor responsible to increase systolic blood pressure as there is decrease in heart rate. So, the factor that may cause increase in cardiac output increasing blood pressure should be stroke volume and this increased stroke volume is due to increase in venous return.⁹

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A Study of Optical Character Patterns identified by the different OCR Algorithms

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Abstract- Optical Character Recognition (OCR) is a technology that provides a full alphanumeric recognition of printed or handwritten characters. Optical Character Recognition is one of the most interesting and challenging research areas in the field of Image processing. Image Acquisition, Pre-processing, Segmentation, Feature Extraction and Classification are stages of OCR. In this paper, how character patterns are identified in the classification stage by different algorithms is presented. Template Matching Algorithm, statistical Algorithm, Structural Algorithm, Neural Network Algorithm and Support Vector Machine Algorithm are presented in this paper.

Index Terms- Neural Network Algorithm, Optical Character Recognition, Statistical Algorithm, Structural Algorithm, Support Vector Machine, Template Matching.

I. INTRODUCTION

Optical Character Recognition (OCR) is a process of converting scanned document into text document so it becomes editable and searchable. OCR is the mechanical or electronic translation of images of handwritten or printed text into machine-editable text. Recognition engine of the OCR system interpret the scanned images and turn images of handwritten or printed characters into ASCII data (Machine readable characters).

An image is passes from number of stages like Image Acquisition, pre-processing, segmentation, feature extraction and classification to perform OCR. Images of OCR system might be acquired by scanning document or by capturing photograph of document in Image Acquisition stage. Pre-processing is necessary to modify the raw data to correct deficiencies in the data acquisition process due to limitations of the capturing device sensor. Pre-processing step involves binarization, noise removal, normalization etc. Segmentation is the process of separating lines, words and characters from image. Feature extraction can be considered as finding a set of features that define the shape of the underlying character as precisely and uniquely as possible. Being the most important step of the recognition process, selection of the features is the important factor in achieving the high recognition performance. Classification stage uses the features extracted in the feature extraction stage to identify the character. The classification stage is the decision making part of a recognition system. Classification is the part of the OCR which finally recognizes individual characters and outputs them in machine editable form.

II. PREVIOUS WORK

Faisal Mohammad et.al. [1] have presented pattern matching algorithm for typewritten and handwritten characters. The binary image is divided into 5 tracks and 8 sectors. The track-sector matrix is then matched with existing template. The existing template consists of each track-sector intersection value, each track value and each sector value. If all these parameters are found to match with the template values then the resultant is the character identified.

Mr. Danish Nadeem and Miss. Saleha Rizvi [2] have proposed typewritten/handwritten character recognition using template matching. The aim is to produce a system that classifies a given input as belonging to a certain class rather than to identify them uniquely, as every input pattern. The system performs character recognition by quantification of the character into a mathematical vector entity using the geometrical properties of the character image. Recognition rate of typewritten Standard English alphabets fonts is 94.30%, typewritten Unknown English alphabets fonts is 88.02% and handwritten English alphabets is 75.42%.

Rajib et.al. [3] have proposed Hidden Markov Model based system for English Handwritten character recognition. They have employed global as well as local feature extraction methods. HMM is trained using these feature and experiment is carried out. They have created a data-base of 13000 samples collected from 100 writers written five times for each character. 2600 samples have been used to train HMM and the rest are used to test recognition model. The recognition rate is achieved 98.26% using proposed system.

Pritpal Singh and Sumit Budhiraja [4] have proposed K Nearest Neighbour algorithm to recognise handwritten Gurumukhi script. They calculate the Euclidean distance between the test point and all the reference points in order to find K nearest neighbours, and then arrange the distances in ascending order and take the reference points corresponding to the k smallest Euclidean distances. A test sample is then attributed the same class label as the label of the majority of its K nearest (reference) neighbours. The recognition rate is achieved by proposed system is 72.54%.

Jonathan J. Hull, Alan Commike and Tin-Kam HO [5] have presented Structural analysis algorithm. The structural

analysis algorithm has been fully implemented and tested in the proposed work.

Parveen Kumar, Nitin Sharma and Arun Rana [6] have proposed handwritten character recognition system using multi layer feed forward back propagation neural network without feature extraction. For the neural network, each character is resized into 70x50 pixels, which is directly subjected to training. That is, each resized character has 3500 pixels and these pixels are taken as features for training the neural network. The proposed system has 4 layers – one input layer, one output layer and two hidden layers, having 200 neurons in the first hidden layer and 100 neurons in the second hidden layer. The recognition rate is 80.96%.

Yusuf Perwej and Ashish Chaturvedi [7] have proposed neural networks for developing a system that can recognize handwritten English alphabets. Each English alphabet is represented by binary values that are used as input to a simple feature extraction system, whose output is fed to neural network system. The recognition rate is 82.5%.

Akash Ali et al. [8] have proposed handwritten Bangla character recognition using Back propagation Feed-forward neural network. First, Create binary image then, extract the feature and form input vector. Then, apply the input vector in the neural network. The experimental result shows that the proposed recognition method gives 84% accuracy and less computational cost than other method.

Nasien et al. [9] have proposed a recognition model for English handwritten (lowercase, uppercase and letter) character recognition that uses Freeman chain code (FCC) as the representation technique of an image character. Support vector machine (SVM) has been chosen for the classification. The proposed recognition model, built from SVM classifiers was efficient enough to show that applying the proposed model, a relatively higher accuracy of 98.7% for the problem of English handwritten recognition was reached [10].

Anshuman Sharma [11] has proposed handwritten digit Recognition using Support Vector Machine. In this proposed work the SVM (binary classifier) is applied to multi class numeral recognition problem by using one-versus-rest type method. The SVM is trained with the training samples using linear kernel.

III. OCR ALGORITHMS

In Feature Extraction stage, unique features of the characters are identified. These features used in classification stage to identify the character. So, Classification is called decision making stage of the OCR process. Here, how optical character patterns identified by different OCR Algorithms in classification stage is presented.

A. Template Matching Algorithm

Template matching algorithm is also known as pattern matching algorithm. Template matching is a system prototype that useful to recognize the character or alphabet by comparing two images. Template matching is the process of finding the

location of sub image called a template inside an image. Once a number of corresponding templates is found their centers are used as corresponding points to determine the registration parameters. Template matching involves determining similarities between a given template and windows of the same size in an image and identifying the window that produces the highest similarity measure. In Template matching, the character itself is used as a “feature vector”.

Template matching algorithm simply identify the character by comparing character patterns with already stored template.

B. Statistical Algorithm

The purpose of the statistical algorithms is to determine to which category the given pattern belongs. By making observations and measurement processes, a set of numbers is prepared, which is used to prepare a measurement vector [12]. Statistical algorithm uses the statistical decision functions and a set of optimality criteria which maximizes the probability of the observed pattern given the model of a certain class.

Statistical algorithms are mostly based on three major assumptions:

1. Distribution of the feature set.
2. There are sufficient statistics available for each class.
3. Collection of images to extract a set of features which represents each distinct class of patterns.

Statistical Methods

1. K-Nearest Neighbour

The k-Nearest Neighbors algorithm (k-NN) is a non-parametric method used for classification. The input consists of the k closest training examples in the feature space. In k-NN classification, the output is a class membership. An object is classified by a majority vote of its neighbors, with the object being assigned to the class most common among its k nearest neighbors (k is a positive integer, typically small). If k = 1, then the object is simply assigned to class of that single nearest neighbor [13]. The idea behind k-Nearest Neighbor algorithm is quite straightforward. To classify a new character, the system finds the k nearest neighbors among the training datasets, and uses the categories of the k nearest neighbors to weight the category candidates [14].

2. Clustering Analysis

The goal of a clustering analysis is to divide a given set of data or objects into a cluster, which represents subsets or a group. The partition should have two properties. Homogeneity inside clusters: the data, which belongs to one cluster, should be as similar as possible. Heterogeneity between the clusters: the data, which belongs to different clusters, should be as different as possible [15]. Thus, the characters with similar features are in one cluster. Thus, in recognition process, the cluster is identified first and then the actual character.

3. Hidden Markov Modeling

A hidden markov model(HMM) is a statistical model in which the system being modeled is assumed to be a Markov process with unobserved state. The Hidden Markov Model is a finite set of states,each of which is associatd with a probability

distribution. Transitions among the states are governed by a set of probabilities called transition probabilities. In a particular state an outcome or observation can be generated, according to the associated probability distribution. It is only the outcome, not the state visible to an external observer and therefore states are "hidden" to the outside; hence the name Hidden Markov Model [16].

Mathematically Hidden Markov Model contains five elements.

1. Internal States: These states are hidden and give the flexibility to model different applications. Although they are hidden, usually there is some kind of relation between the physical significance to hidden states.
2. Output: $O = \{O_1, O_2, O_3, \dots, O_n\}$ an output observation alphabet.
3. Transition Probability Distribution: $A = a_{ij}$ is a matrix. The matrix defines what the probability to transition from one state to another is.
4. Output Observation: Probability Distribution $B = b_i(k)$ is probability of generating observation symbol $o(k)$ while entering to state i is entered.
5. The initial state distribution ($\pi = \{\pi_i\}$) is the distribution of states before jumping into any state.

Here all three symbols represents probability distributions i.e. A , B and π . The probability distributions A , B and π are usually written in HMM as a compact form denoted by lambda as $\lambda = (A, B, \pi)$ [17].

C. Structural Algorithm

The recursive description of a complex pattern in terms of simpler patterns based on the shape of the object was the initial idea behind the creation of structural pattern recognition [18].

Structural algorithm classifies the input patterns on the basis of components of the characters and the relationship among these components. Firstly the primitives of the character are identified and then strings of the primitives are checked on the basis of pre-decided rules [12]. Structural pattern recognition is intuitively appealing because in addition to classification, this approach also provides a description of how the given path constructed from the primitives [19]. Generally a character is represented as a production rules structure, whose left-hand side represents character labels and whose right-hand side represents string of primitives. The right-hand side of rules is compared to the string of primitives extracted from a word. So classifying a character means finding a path to a leaf [12].

D. Neural Network Algorithm

An Artificial Neural Network (ANN) is an information processing paradigm that is inspired by the way biological nervous systems, such as the brain, process information. It is composed of a large number of highly interconnected processing elements (neurons) working in unison to solve specific problems [20]. A neural network is a powerful data modeling tool that is able to capture and represent complex input/output relationships. The motivation for the development of neural network technology stemmed from the desire to develop an artificial system that could perform "intelligent" tasks similar to those performed by the human brain.

Neural Network consists three layers - input layer, hidden layer (optional) and output layer.

1. Input Layer

The input layer is the conduit through which the external environment presents a pattern to the neural network. Input layer take input from the external world and encode it into a convenient form. Every input neuron should represent some independent variable that has an influence over the output of the neural network.

The number of input neurons for the OCR is the number of pixels that might represent any given character. A character which represents by a 5*7 grids has 35 pixels. So it has 35 input neurons.

2. Hidden Layer

Hidden layer can't see or act upon the outside world directly. These inter-neurons communicate only with other neurons. Deciding the number of neurons in the hidden layers is a very important part of deciding your overall neural network architecture. Both the number of hidden layers and the number of neurons in each of these hidden layers must be carefully considered [21].

3. Output Layer

The output layer of the neural network is what actually presents a pattern to the external environment. The number of output neurons should be directly related to the type of work that the neural network is to perform.

The number of output neurons used by the OCR program will vary depending on how many characters the program has been trained to recognize. The default training file that is provided with the OCR program is used to train it to recognize 26 characters. Using this file, the neural network will have 26 output neurons.

Neural network algorithm identifies the character by training the neural network. Feed forward Neural Network, Feedback neural network and Self Organizing Map are the types of neural network.

E. Support Vector Machine

Support vector machines (SVMs also support vector networks) are a set of related supervised learning methods used for classification.

SVMs are relatively new approach compared to other supervised classification algorithms, they are based on statistical learning theory developed by the Russian scientist Vladimir Naumovich Vapnik back in 1962 and since then, his original ideas have been perfected by a series of new techniques and algorithms [22].

Support vector machines have proved to achieve good generalization performance with no prior knowledge of the data. The principle of an SVM is to map the input data onto a higher dimensional feature space nonlinearly related to the input space

and determine a separating hyperplane with maximum margin between the two classes in the feature space[23] [24]. This approach, in general, guarantees that the larger the margin is the lower is the generalization error of the classifier [25].

SVM algorithm is robust, accurate and very effective even in cases where the number of training samples is small.

IV. CONCLUSION

This paper presents study of OCR algorithms. How character patterns are identified by different OCR Algorithms in classification stage. Template matching algorithm is used for typewritten characters only. Structural algorithm, statistical algorithm, neural network algorithm and support vector machine is also used for handwritten characters. We can use any of the above algorithms as per our OCR program requirement.

Table 1.Comparative study of OCR Algorithms

OCR Algorithm	How it identifies the pattern of the character	Works for	Features
Template Matching Algorithm	By Comparing derived image features and templates	Only for typewritten characters	Easy to Implement, It only works on fonts of which it has templates.
Statistical Algorithm	By making observation and measurement	For typewritten and handwritten characters	It works even when prior data or information is not available about the character in the the training data.
Structural Algorithm	By Identifying the component of the character	For typewritten and handwritten characters	It uses structural shape pattern of the objects.
Neural Network Algoritm	By training Neural Network	For typewritten and handwritten characters	It also works when new fonts encountered, It is used to perform OCR due to their high noise tolerance.
Support Vector Machine	By mapping the input data onto a higher dimensional feature space and determine a separating hyperplane with maximum margin	For typewritten and handwritten characters	It is effective even in cases where the number of training samples is small; It achieves good generalization performance with no prior knowledge of the data.

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Phytochemical and Antibacterial Studies of *Lantana camara* L. Leaf Fraction and Essential Oil

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Abstract- The study was conducted to determine the antimicrobial activity of varying concentrations of *Lantana camara* Linn. leaf extracts against *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli* and *Salmonella gallinarum*. Broth microdilution method was used to determine the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) was evaluated through streaking of bacterial suspension onto Mueller-Hinton agar. Phytochemical tests were done to identify bioactive compounds present in the extracts. Results showed that among extracts used, *L. camara* leaf ethanolic fraction (EF) and essential oil (EO) demonstrate antibacterial activity. The MIC of essential oil ranges from 312.5µg/mL - 10,000µg/mL better than ethanolic fraction at 1,250µg/mL - 5,000µg/mL. *Bacillus subtilis* is the most sensitive organism inhibited at 312.5 µg/mL while *Salmonella gallinarum* showed less sensitivity with MIC starting at 5000 µg/mL. The MIC-MBC ratio revealed that the extracts possess bactericidal activity against test bacteria. Phytochemical evaluation indicates the presence of saponins, tannins and terpenoids in EF and terpenoids in EO. These compounds are believed to be responsible for the broad spectrum activity of the plant extracts.

Index Terms- *L. camara*, leaf ethanolic fraction, essential oil, phytochemical screening, MIC-MBC

I. INTRODUCTION

The number of emerging multi-drug resistant microbial strains is continuously increasing and has become one of the most serious threats to successful treatment of infectious diseases⁸. This increase is mainly attributed to indiscriminate use of broad-spectrum antibiotics²⁴. The use of synthetic drugs is not only expensive but often found with adulterations and side effects. New formulations of antimicrobial agents derived from natural plant products is therefore necessitated to address this issue^{5,11}. The World Health Organization underscores the importance of herbal plants as best source of a variety of drugs and promotes further scientific investigations unto determination of properties, safety and efficacy of plant drugs¹².

Lantana camara (Verbenaceae) is one of the well-known medicinal plants in traditional medicine⁶. Its resilient nature makes the plant invasive and widely distributed in the pantropic. However, this characteristic turns the plant a problem weed because it dominates native species and disrupts biodiversity¹⁸.

New strategies should be developed to optimize the usefulness of this plant such as exploring its pharmacologic potential. *L. camara* besides being inexpensive possesses non-phytotoxic compounds that are found to exhibit inhibitory effect on pathogens²⁶. In the Philippines, not only *L. camara* is known as an ornamental weed but is also popular in folkloric treatment as cure to various ailments including rheumatism, wound, fever, and asthma¹⁷. Other studies reported its antitumor, analgesic, antifungal, and hepatotoxic activities¹⁴.

Our study investigated the antibacterial activity of varying concentrations of *L. camara* leaf extracts against *Bacillus subtilis*, *Staphylococcus aureus*, *Escherichia coli*, and *Salmonella gallinarum*. Preliminary antibacterial screening of the plant has been done by other researchers through disc diffusion method but our work demonstrates the minimum inhibitory concentration and minimum bactericidal concentration to partially establish the mode of action of the plant drug. It significantly reports *L. camara* leaf ethanolic fraction as potential antibiotic. Moreover, we subjected the extract in a series of qualitative phytochemical tests to determine groups of bioactive compounds present in the plant.

II. METHODS

Plant Collection

Fresh leaves of *L. camara* were collected at the vicinity of Barangay Pangasugan, Baybay City, Leyte. The leaves were chopped, weighed and air-dried until 20% of moisture content is left.

Preparation of Extract and Essential Oil

L. camara leaves were sequentially extracted using hexane, ethanol and water. Leaves were first infused in hexane (1:7 w/v) for 24 hours and filtered in Buchner funnel and Whatman filter paper (No. 54). Leaf residues from previous extraction were infused in ethanol (ethanolic fraction) and water (aqueous fraction). The extracts were filtered and concentrated in rotary evaporator at 40°C until volume reached 10mL. The extracts were placed in clean amber bottle and evaporated to dryness.

Essential oil was extracted using modified steam distillation technique. Collected oil was transferred to sterile bottle until analyzed.

Test Bacteria

Bacillus subtilis, *Staphylococcus aureus*, *Escherichia coli*, and *Salmonella gallinarum* were obtained from the Microbiology Laboratory of the College of Veterinary Medicine, Visayas State University, Baybay City, Leyte. Bacterial inoculum was prepared by inoculating Mueller Hinton broth with each organism and turbidity was adjusted to 1.5×10^8 CFU/mL Mc Farland standard.

Tube Preparation of Leaf Extract and Essential Oil

Ten tubes were pipetted with 1mL of Mueller Hinton broth. The first tube was dispensed with 1mL of *L. camara* leaf extract and essential oil obtained from stock solution (20,000µg/mL). Subsequently, 1mL of the content from the first tube was transferred to the second tube and continued until 10 tubes were filled. The final concentration ranged from 10,000µg/mL to 19.53µg/mL.

Antibacterial Activity

Antibacterial activity of *L. camara* crude hexane extract, ethanolic fraction, aqueous fraction, and essential oil was evaluated through minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC). MIC, which is the lowest concentration with clear content, was evaluated in two-fold microdilution method. Briefly, 100 µg/mL each of the prepared extract concentration and bacterial inoculum were mixed with Mueller-Hinton broth in microtiter plates. Wells with clear content were streaked into Mueller-Hinton agar to determine MBC which is the first concentration without visible growth in the agar. Distilled water was used as negative control and penicillin (gram positive) and streptomycin (gram negative) were reference control. All experiments were repeated three times and incubated at 37°C for 24 hours.

Phytochemical Profiling of Lantana Leaf Extracts with Antibacterial Activity.

From the above assay, only those extracts with potential antibacterial reactions (*L. camara* leaf ethanolic fraction and essential oil) were profiled using thin layer chromatography (TLC) and qualitative phytochemical tests. An aliquot (1µl) of each extract was blotted separately onto TLC plate and soaked in a chamber containing 5mL of the benzyl and chloroform (1:1v/v). The plate was visualized at daylight, UV light and KMNO₄ and retention factor (R_f) value was recorded. Furthermore, extracts were subjected to Salkowski test (test for terpenoids), gelatin and ferric chloride tests (tannin) froth and hemolysis tests (saponin), Dragendorff and Mayer’s tests (alkaloid), and Bate-Smith and Metcalf tests (flavonoids). The screening tests determine the components available in the plants with bioactivity or ethno-medical applications.

Statistical Analysis

The modal MIC was determined by selecting at which point among 10 concentrations of each leaf extract most likely shows inhibition of bacterial growth.

III. RESULTS AND DISCUSSION

Antibacterial Activity

Notably, only leaf ethanolic fraction and essential oil among four extracts of *L. camara* leaves showed antibacterial activity against

B. subtilis, *S. aureus*, *E. coli*, and *S. gallinarum*. Table 1 summarizes the MIC and MBC of *L. camara* leaf ethanolic fraction and essential oil. The MIC of essential oil ranges from 312.5µg/mL – 10,000µg/mL better than leaf ethanolic fraction at 1,250µg/mL – 5,000µg/mL. The lowest MIC of essential oil was against *B. subtilis* (gram positive) at 312.5µg/mL and 2,500µg/mL against *E. coli* (gram negative). Conversely, it takes an MIC of 1,250µg/mL and 5,000µg/mL for leaf ethanolic fraction to inhibit the same organisms. *B. subtilis* is remarkably the most susceptible organism and *S. gallinarum* is least susceptible for both extracts. Gram positive bacteria are more sensitive to the extracts than their counterpart.

The reference antibiotics generally showed better MIC values than *L. camara* extracts with lowest MIC at 156. 25 µg/mL against gram positive and 625 µg/mL against gram negative bacteria. This reaction is apparent for commercial antibiotics which action is potentiated and maximized. MBC was not done since the mode of action of the antibiotics is pre-determined.

Table 1. MIC and MBC of *L. camara* leaf ethanolic fraction, essential oil and reference control against test bacteria.

Concentration (µg/mL)	Test bacteria							
	<i>B. subtilis</i>		<i>S. aureus</i>		<i>E. coli</i>		<i>S. gallinarum</i>	
Leaf ethanolic fraction	MIC	MBC	MIC	MBC	MIC	MBC	MIC	MBC
10,000	-	-	-	-	-	-	-	-
5,000	-	-	-	+	-	+	-	+
2,500	-	-	-	+	+		+	
1,250	-	-	+		+		+	
625	+	+	+		+		+	
312.50	+		+		+		+	
156.25	+		+		+		+	
78.12	+		+		+		+	
39.06	+		+		+		+	
19.53	+		+		+		+	
Essential oil								
10,000	-	-	-	-	-	-	-	-
5,000	-	-	-	-	-	+	+	
2,500	-	-	-	-	-	+	+	
1,250	-	-	-	+	+		+	
625	-	-	+		+		+	
312.50	-	-	+		+		+	
156.25	+	-	+		+		+	
78.12	+	+	+		+		+	
39.06	+		+		+		+	
19.53	+		+		+		+	
Reference control	Penicillin				Streptomycin			
10,000	-		-		-		-	
5,000	-		-		-		-	
2,500	-		-		-		-	
1,250	-		-		-		+	
625	+		-		-		+	
312.50	+		-		+		+	
156.25	+		-		+		+	
78.12	+		+		+		+	
39.06	+		+		+		+	
19.53	+		+		+		+	

The MBC determines the nature of the antibacterial activity of the extract through the MIC and MBC ratio. Figure 1 and 2 demonstrate the MIC-MBC ratio of leaf ethanolic fraction and essential oil. In the ethanolic fraction, the MBC is equal to MIC in *B. subtilis*, four-fold higher in *E. coli* and two-fold higher in *S. aureus* and *S. gallinarum*. The MIC-MBC ratio of essential oil is

equal in *B. subtilis* and *S. gallinarum*, two-fold and four fold higher in *E. coli* and *S. aureus*, respectively. Most organisms were inhibited at 5,000µg/mL and were killed at 10,000µg/mL. The antibacterial activity of *L. camara* extract against test bacteria implies that the plant contained broad spectrum bioactive compounds that can be developed as alternative to synthetic drugs.

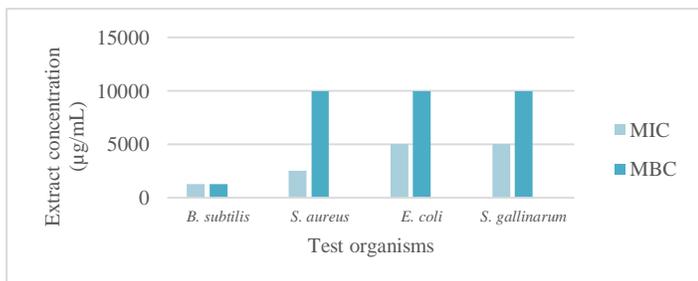


Figure 1. MIC-MBC ratio of *L. camara* leaf ethanolic fraction.

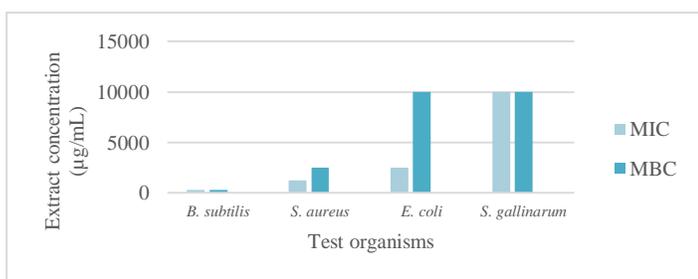


Figure 2. MIC-MBC ratio of *L. camara* essential oil.

Various literatures indicate that an extract has bactericidal activity when the MBC value is the same or generally not more than four-fold higher than the MIC; and bacteriostatic when more than four-folds or many-fold higher than the MIC^{2, 23, 16, 25}. The closer the MIC to its MBC, the more bactericidal it is¹⁰. From this context, this study demonstrates that *L. camara* leaf ethanolic fraction and essential oil possess bactericidal compounds against test organisms.

Phytochemical Screening of Lantana Leaf Ethanolic Fraction and Essential Oil

The TLC profiling of *L. camara* leaf ethanolic fraction and essential oil resulted in the presence of a number of phytochemicals with different retention factor (Rf) values reflecting polarity of compounds. From ethanolic fraction, four spots with varying colors and Rf values ranging from 0.10 – 0.35 were seen when viewed in daylight. Six additional spots with Rf values from 0.46 – 0.89 were seen under UV light and eight spots (Rf 0.10-0.72) were viewed after dipping the chromatogram in potassium permanganate (Table 2). The essential oil showed no visible spots under daylight but 10 spots with varying colors and Rf ranging from 0.05 – 0.98 were seen under UV light. In potassium permanganate, seven spots (Rf 0.05-0.54) with varying colors were visible. Subsequently, the profile demonstrated two similar compounds from the extracts with Rf values of 0.46 and 0.81 under UV light. Compound showing high Rf values have low polarity while those with lower Rf values

have higher polarity^{9,13}. Rf values ranging from 0.3 – 0.9 indicates the presence of less polar compounds such as terpenes or terpenoids which may be the case for the two similar compounds (Rf 0.46 and 0.81) found

Table 2. Phytochemical profiles of *L. camara* leaf ethanolic fraction and essential oil in TLC.

Extract	Spot	Rf values (cm)	Visualization method		
			Daylight	UV light	KMNO ₄
Leaf ethanolic fraction	Spot 10	0.89	None	Yellow	None
	Spot 9	0.81	None	Faint blue violet	None
	Spot 8	0.72	None	Faint blue	Faint yellow
	Spot 7	0.65	None	Faint yellow	Yellow orange
	Spot 6	0.57	None	Faint green	Faint yellow
	Spot 5	0.46	None	Faint blue	Brownish yellow
	Spot 4	0.35	Dark Green	Grayish green	Dark yellow
	Spot 3	0.22	Light green	Yellow	Light Brown
	Spot 2	0.20	Yellow rean	Blue	Light Brown
	Spot 1	0.10	Light ellow	Green	Faint Brown
Essential oil	Spot 11	0.98	None	Dark blue violet	None
	Spot 10	0.91	None	Violet	None
	Spot 9	0.81	None	Faint blue violet	None
	Spot 8	0.74	None	Faint blue	None
	Spot 7	0.54	None	Light gray	Yellow orange
	Spot 6	0.46	None	Faint blue	Brownish yellow
	Spot 5	0.42	None	Faint violet	Brownish Orange
	Spot 4	0.32	None	Faint violet	Orange
	Spot 3	0.24	None	Light blue	Light brown
	Spot 2	0.18	None	Faint violet	Light orange
Spot 1	0.05	None	Light violet	Light brown	

in both ethanolic fraction and essential oil. This observation is further manifested in the qualitative phytochemical tests of the extract where saponins, tannins and terpenoids were detected in the ethanolic leaf fraction and terpenoids alone in the essential oil (Table 3).

Table 3. Qualitative phytochemical tests of *L. camara* leaf ethanolic fraction and essential oil.

Extract	Phytochemicals	Detection test	Reaction	Description
Leaf ethanolic fraction	Saponins	Froth test	+	Dense, honeycomb-like froth
		Hemolysis test	+	Hemolyzed area
	Tannins	Gelatin test	+	Trace, cloudy
		Ferric chloride test	+	Greenish-brown with orange precipitate
	Alkaloids	Dragendorff's test	-	No change
		Mayer's test	-	No change
Flavonoids	Bate-Smith and Metcalf test	-	No change	
Terpenoids	Salkowski test	+/-	Red-brownish green	
Essential oil	Terpenoids	Salkowski test	+	Reddish-brown

Several findings have reported the presence of terpenoids in essential oil^{20, 22}. The antimicrobial activity of essential oil is attributed to the presence of secondary metabolite of terpenoids present in the extract such as monoterpenes α -pinene, β -pinene, p-cymene, sesquiterpenes humulene epoxide, and 1,8-cineole^{21, 27, 22}. Considering the large number of different groups of chemical compounds contained in essential oil, oftentimes the antibacterial activity is not attributable to one specific

mechanism but that there are several targets in the cell³. Furthermore, it is important to note that the hydrophobicity of essential oil and its components enables partition in the lipids of the bacterial cell membrane and mitochondria that disturbs these structures and renders them more permeable³. Leakage of ions and other cell contents can then occur which causes the death of the organism¹⁴. The α -pinene and β -pinene are known to interfere cellular integrity and induce toxic effects on the membrane structure and functions leading to inhibition of ion transport process.

It is important to note that the use of ethanol as organic solvent concentrates more water soluble compounds including saponins and tannins²⁴. Saponin is a major component of plant that acts as antibacterial secondary metabolite²⁸. The mode of action of its antibacterial effects involves membranolytic properties, rather than simply altering the surface tension of the extracellular medium¹. Tannins, belonging to a condensed group, are polymeric phenolic derivatives with astringent properties and have the ability to inactivate microbial adhesions, enzymes, and cell envelope transport proteins⁴.

Gram positive bacteria are generally more susceptible since their outer peptidoglycan layer is not an effective barrier⁷. Gram negative bacteria, on the other hand, possess tough outer membrane formed by lipopolysaccharide layer along with proteins and phospholipids. This structure hinders the access of most compounds to the peptidoglycan layer of the cell wall¹⁵.

IV. CONCLUSION

The findings of this study elucidate that *L. camara* leaf ethanolic fraction and essential oil contain phytochemicals responsible for the broad antibacterial spectrum of the plant. The research data provides basis for developing the plant products into useful drug that may yet resolve issues on drug resistance.

ACKNOWLEDGMENT

The authors are grateful to the College of Veterinary Medicine and the Philippine Rootcrops Center at Visayas State University, Baybay, Leyte for the use of their laboratory facility.

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Satisfaction of Rural Pregnant Women as Quality Indicator of Provided Antenatal Care

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Abstract- Providing good quality health care is of critical importance for the future economic and social well-being of any country. Patient satisfaction is considered an important indicator of health care. High quality antenatal care is a fundamental right for women to safeguard their health, help women maintain normal pregnancies and reduce the rate of maternal morbidity and mortality. The rural areas are characterized by shortage in physical and human resources such as physicians, nurses, and specialists. Pregnant women's satisfaction is one of the indicators of measuring quality of antenatal care. **Aim of the study:** is to assess the satisfaction of rural pregnant women with provided antenatal care. **Methodology:** An interview sheet to assess the pregnant women satisfaction was used containing five parts. A sample of (420) pregnant women who attended at least two visits for antenatal care were selected randomly from fourteen (14) rural health units at Tanta city. **Results:** Majority (94.3 % and 85 %) of the pregnant women were satisfied with the way nurses treated them and cleanliness of follow up room respectively. More than three quarters (76.4 %) of them were satisfied with working time in the unit and 72.1 % of them were satisfied with laboratory investigations. While 35.7%, 31.4%, 30.7%, and 26.4% of them were *not satisfied* with equipments and apparatus especially ultrasound, Waiting area, follow up services, and health services during pregnancy respectively. **Conclusion:** More than one half of the pregnant women had moderate satisfaction score with antenatal care services provided at rural health units. The majority of them did not attend health education session. **Recommendations:** Ministry of Health and Population should pay more attention to the rural health units in order to promote the antenatal care services through providing the necessary resources. Applying of health education sessions for all pregnant women is intensively recommended.

Index Terms- antenatal care, pregnant women, rural women, satisfaction.

I. INTRODUCTION

Assuring and promoting quality in health care services continues to be a priority for any health care system. The World Health Organization has emphasized the importance of quality in the delivery of health care, defined by the criteria of effectiveness, cost and social acceptability. Providing good quality health care is of critical importance for the future economic and social well-being of any country. An increase in the quality of health care can result in increased patient satisfaction. This will in turn promote the appropriate use of the health services. ^(1, 2)

Many researchers are seeking evidence that outcomes of nursing care are of good quality and represent a cost-effective use of resources. It is important to assess certain dimensions of quality in relation to structure, process, and outcome. Health outcomes can be grouped into four categories: health status, health-related knowledge, health-related behavior, and satisfaction with the care. Satisfaction with care describes how satisfied consumers are with their overall experience with care provided by the agency or plan. ⁽³⁻⁵⁾ Patient satisfaction is considered an important indicator of the efficient utilization of health services, as it assesses an individual's attitude to health services received and the extent to which these services meet the person's requirements and needs. ^(6, 7)

In recent decades, determining the level of patient satisfaction has been found to be the most useful tool for getting patients' views on how to provide care. This is based on two major principles: patients are the best source of information on quality and quantity of medical services provided and patients' views are determining factors in planning and evaluating satisfaction. ^(8, 9)

In developing countries, assessing and improving the quality of health care was a low priority, both for policy makers and for technical agencies. The World Health Organization reported that health care is still characterized by the following defects: uneven coverage and quality of services; inaccessibility of services, particularly for the under-privileged and rural communities in many countries in the Eastern Mediterranean Region. In general, the care was more likely to have been performed for urban than for rural births, with particularly low levels found for births in rural Upper Egypt. ⁽¹⁰⁻¹²⁾

In Egypt, differences exist in the quality of care given by different health units, e.g. rural versus urban settings. According to Egypt's National Human Development Report (2005), the concentrations of poor populations are mainly in rural areas. Because of the poor performance of rural areas, a good health policy should provide the poor with some form of health security, particularly to protect them from paying for catastrophic medical episodes. ^(13, 14) Generally, in rural areas, there are shortage in physicians and nurses, as well as family practice physicians, nurse practitioners, and specialists, especially obstetricians, pediatricians, psychiatrists, and social service professionals. ⁽¹⁵⁾

It was reported according to Egypt Demographic and Health Survey (EDHS) 2008, that 26.4 % of the pregnant women had no antenatal care, and the rural health units were the source of antenatal care for 7.4 % of those pregnant women who received it. Rural health units were also the source for tetanus toxoid (TT) injection for 38.9 % of the pregnant women who had received TT from public sector. ⁽¹²⁾ It is generally recognized that the

antenatal care services currently provided in many parts of the world fail to meet the standards recommended by WHO and results reflect the poor antenatal and delivery care services.⁽¹⁶⁾

High quality antenatal care is a fundamental right for women and one of the important factors to safeguard their health, help women maintain normal pregnancies and reduce the rate of maternal morbidity and mortality. It was reported that lack and poor quality of antenatal care contribute to maternal deaths. The way in which maternity care is provided is influenced by policies, availability and quality of services, and most importantly, the health-care-seeking behaviours of the women.⁽¹⁷⁻²¹⁾

One of the indicators of measuring quality of antenatal care is **pregnant women's satisfaction** which includes: percent of clients satisfied with the services received, perception of clients satisfied with the waiting time, percent of clients who felt that privacy was adequate for counseling/clinical examination.⁽²²⁾ Their satisfaction with provided care should be assessed to provide clear image about the quality of provided care. So, more attention is needed for the pregnant women during antenatal care period especially in the rural health units.

Aim of the study: is to assess the satisfaction of rural pregnant women with provided antenatal care.

Research question: What is the level of rural pregnant women satisfaction regarding provided antenatal care?

Study Design: Cross sectional descriptive study.

II. MATERIALS AND METHOD

Materials:

Setting of the study:

This study was conducted in fourteen (14) rural health units affiliated to the Ministry of Health (MOH) at Tanta city. The mentioned rural health units were selected randomly from total number of (28) units in Tanta city.

Subjects:

A random sample of (420) pregnant women who attended the previous health units were included in the study. Equal percent from each unit was selected from the pregnant women (thirty women from each unit). The criteria of inclusion were those pregnant women who attended at least two visits for antenatal care.

Tool of the study:-

Interview sheet for pregnant women satisfaction was developed by the researcher to assess the pregnant women's satisfaction regarding the nursing care provided to them in the rural health units. It included five parts as follows:

Part 1: Socio demographic characteristics of the pregnant woman such as: woman's age, education, occupation, and number of family members.

Part 2: Present history: as duration of pregnancy by weeks, number of visits, number of received doses of tetanus immunization, and if the woman follows up her pregnancy at a private doctor?

Part 3: Services provided to the woman during present pregnancy: as measuring blood pressure, weighing, blood analysis for hemoglobin level, urine analysis for sugar and albumin, giving iron tablets from the unit, visiting the woman's

home by a nurse, waiting time spent, and if the pregnant woman received counseling from the doctor at each visit.

Part 4: Pregnant women's satisfaction regarding services provided during pregnancy at the rural health unit: as satisfaction with: the health services, nurses and doctors communication (dealing), keeping the woman's privacy, waiting and examination area, cleaning of clinics and bathrooms, infection control measures, analysis and sample taking, equipments and apparatus used as ultrasound, working times in the unit, and follow up services.

Part 5: Pregnant women's satisfaction regarding health education provided: as attending health education sessions, receiving health education individually from a nurse, the subjects of the education received, and the satisfaction regarding this education. The women were also asked about their suggestions for improving the services provided to the pregnant women at the rural health unit.

Method

Administrative and Ethical consideration:

-Prior to data collection the necessary approval was secured from Undersecretary of Ministry of health and the managers of the selected rural health units to facilitate the process of data collection.

-The tool was tested for content validity by five experts in the field of community health nursing and public health. It was 85.7 %.

-Test-retest method was used to test the reliability of the tool.

-The days of the tetanus immunization sessions in each health unit was selected to collect the data to assure the availability of the pregnant women.

-Interview with each pregnant woman was conducted individually in a suitable place in each unit to fill the sheet.

-The objective of the study was explained to the pregnant women. The anonymity and confidentiality of responses, voluntary participation and right to refuse to participate in the study was a right to all participants.

-The data was collected over a period of (8) months from December 2013 to July 2014.

Pilot study:

-A pilot study was conducted on 10% of the pregnant women to test the tool for its clarity, organization and to detect the time needed for each interview. Accordingly modification was done. They were excluded from the original sample.

-The time required to complete the questionnaire was about (20 - 25) minutes.

Statistical analysis:

- The data collected were coded and tabulated using the statistical package for social science (SPSS version 20) and used for data entry and analysis.

Scoring system:

1- The pregnant women answers' regarding their satisfaction with antenatal care services was scored as: (1) for **yes**, (2) for **no**, and (3) for **do not know**.

2- The **score** of pregnant women satisfaction with antenatal care services was classified as the following:

- Low score** < 50 %
- Moderate score** 50 % - 75%
- High score** > 75 %

The table shows that the age of the majority (83.6 %) of women ranged from 20 years to less than 35 years old with the mean age 23.96 ± 3.98 years. (60 %) of them had secondary education. The majority (90.7 %) of women not working. The majority (87.1 %) of them had the number of family members from 1 to 3 members with the mean number 2.55 ± 0.812 member.

III. RESULTS

Table (1) demonstrates the distribution of the pregnant women according to their socio- demographic characteristics.

Table (1): distribution of the pregnant women according to their socio- demographic characteristics

Items	No (n = 420)	%
Age by years:		
< 20	45	10.7
20 -	351	83.6
≥ 35	24	5.7
Mean \pm SD = 23.96 \pm 3.98		
Educational level:		
- Illiterate or read and write	39	9.3
- Basic	51	12.1
- Secondary	252	60.0
- University or higher	78	18.6
Job:		
- Work	39	9.3
- Do not work	381	90.7
Number of family members:		
1 to 3	366	87.1
4 to 6 members	54	12.9
Mean \pm SD = 2.55 \pm .812		

Table (2) shows the distribution of the pregnant women according to their present history.

The table shows that the duration of the present pregnancy for more than one half (52.9 %) of the women ranged from 28 weeks to less than 38 weeks and it ranged from 20 weeks to less than 28 weeks for 40.7 % of the women. About 62.9 % of the women visited the rural health unit twice during this pregnancy

and 21.4% of them visited it three times. Majority (89.3 %) of them received tetanus toxoid during this pregnancy from the unit. The majority (87.1 %) of the pregnant women was following up her pregnancy on private doctor.

Table (2): distribution of the pregnant women according to their present history

Items:	No (n = 420)	%
Duration of the present pregnancy by weeks:		
< 20	27	6.4
20 -	171	40.7
28 - < 38	222	52.9

Number of visits:		
2	264	62.9
3	90	21.4
4	39	9.3
5 & more	27	6.4
Receiving tetanus toxoid during this pregnancy from the unit:		
Yes	375	89.3
No	45	10.7
If the woman follow up her pregnancy on private doctor:	366	87.1

Table (3) demonstrates the distribution of the pregnant women according to services provided to them during each visit in the present pregnancy.

This table shows that measuring blood pressure and weighing were the most frequently reported services by the women done for the majority (78.6 % and 87.9 % respectively). Blood analysis for hemoglobin level was done for slightly less than two thirds of women. Only 14.3 % of them were tested for

urine analysis for sugar and albumin, and 6.4 % of them received iron tablet from the unit. Only one fifth of them received care or counseling from a doctor. The duration of waiting time before antenatal care for 60.7% of the women was short period.

Table (3): distribution of the pregnant women according to services provided to them during each visit in the present pregnancy

Services Provided / each visit:	No (n = 420)	%
Measuring blood pressure	330	78.6
weighing	369	87.9
Blood analysis for hemoglobin level	273	65.0
Urine analysis for sugar and albumin	60	14.3
Receiving care or counseling from a doctor	84	20.0
Home visit by the nurse	42	10.0
Given iron tablet from the unit	27	6.4
Duration of waiting time before antenatal care		
Short period	255	60.7
Moderate period	135	32.1
Long period	30	7.1

Table (4) presents the distribution of the pregnant women according to their satisfaction with antenatal care services provided at the rural health units.

The table shows that more than two thirds (68.6 %) of the women were satisfied with the health services provided during pregnancy in the unit. Majority (94.3 % and 85 %) of them were satisfied with the way **nurses** treated them and cleanliness of follow up room respectively.

More than three fifths (62.1 %) of the women were satisfied with Waiting area in relation to its cleanliness, ventilation,

adequate light, and availability of seats. Less than one third (32.9%) were satisfied with the cleanliness of bath rooms. Only 14.3% were satisfied with the equipments and apparatus especially ultrasound. More than three quarters (76.4 %) of them were satisfied with working time in the unit.

Table (4): distribution of the pregnant women according to their satisfaction with antenatal care services provided at the rural health units (no = 420)

Satisfaction with:	Yes		No		Do not Know	
	No	%	No	%	No	%
1- Health services during pregnancy	288	68.6	111	26.4	21	5.0
2- The way Nurses treated them	396	94.3	21	5.0	3	0.7
3- The way doctors dealing with them	174	41.4	21	5.0	225	53.6
4- Confidentiality	183	43.6	12	2.9	225	53.6
5- Waiting area	261	62.1	132	31.4	27	6.4
6- Cleanliness of examination room	144	34.3	24	5.7	252	60.0
7- Cleanliness of follow up room	357	85.0	45	10.7	18	4.3
8- Cleanliness of bath rooms	138	32.9	30	7.1	252	60.0
9- Infection control measures	258	61.4	57	13.6	105	25.0
10- Laboratory investigations	303	72.1	36	8.6	81	19.3
11- Equipments and apparatus especially ultrasound	60	14.3	150	35.7	210	50.0
12- Working time in the unit	321	76.4	51	12.1	48	11.4
13- Follow up services	291	69.3	129	30.7	0	0.0

Table (5) represents the distribution of the pregnant women according to their satisfaction with health education provided during antenatal care at the rural health units.

The table shows that the majority (95 %) of the women did not attend any health education session. While about one half (52.1 %) of them received health education from the nurse individually. More than three quarters (75.3 %) of those who received health education from the nurse individually, received information related to nutrition, 32.9 % of them received

information related to pregnancy follow up, 30.1 % and 24.7 % of them received information related to immunization, rest and sleep respectively.

Table (5): distribution of the pregnant women according to their satisfaction with health education provided during antenatal care at the rural health units

Items	No	%
Attendance of health education session:	(no=420)	
Yes	21	5.0
No	399	95.0
Receiving health education from the nurse individually :		
Yes	219	52.1
No	201	47.9
If yes what is the subject? *	(n= 219)	
- Nutrition	165	75.3
- Immunization	66	30.1
- Rest and sleep	54	24.7
- Pregnancy follow up	72	32.9
- Drugs & Smoking	12	5.5
- Danger signs	24	11.0
Satisfaction with health education knowledge & method:	(n= 219)	
Yes	192	87.7
No	27	12.3

* More than one answer was allowed

Table (6) demonstrates the distribution of the pregnant women according to their satisfaction score with antenatal care services provided at the rural health units.

It shows that more than one half (53.6 %) of the pregnant women had high score. Only 10% of them had low score. women had moderate satisfaction score, while 36.4% of them

Table (6): distribution of the pregnant women according to their score of satisfaction with antenatal care services provided at the rural health units

Total score:	No (no = 420)	%
Low < 50 %	42	10.0
Moderate 50 % - 75%	225	53.6
High > 75 %	153	36.4

Table (7) demonstrates the distribution of the pregnant women according to their suggestions for improving the antenatal care services at the rural health units.

The table shows that 41.4 % of the pregnant women suggested availability of ultrasound for improving the antenatal care services. 30 % of them suggested availability of enough obstetricians. More than one quarter (26.4 %) of them suggested more care and attention of the pregnant woman should be provided for improving the antenatal care. 15.7 % of them suggested availability of supplies and equipments. Only 10 % and 9.3 % of the women suggested providing health education for the pregnant women and availability of drugs and tonics for improving the antenatal care services.

Table (7): distribution of the pregnant women according to their suggestions for improving the antenatal care services at the rural health units (n = 420)

Items	No	%
Suggestions for improving the antenatal care: *		
1- Availability of ultrasound	174	41.4
2- Availability of enough obstetrician	126	30.0
3- More care and attention of the pregnant woman	111	26.4
4- Availability of supplies and equipments	66	15.7
5- Providing health education for the pregnant women	42	10.0
6- Availability of drugs and tonics	39	9.3
7- Availability of delivery services	27	6.4

* More than one answer was allowed

IV. DISCUSSION

High quality care is a fundamental right for every pregnant woman to safeguard their health and to help women to maintain normal pregnancies and reduce the rate of maternal morbidity and mortality. (17, 18, 22)

According to MOH, one of the main principles of primary health care strategies 2009-2014 (Health for All) is services recipients' satisfaction. Undoubtedly, patients perspectives mirror the quality of the care received and provided. Any care offered should be acceptable for the recipients. (23)

The present study revealed that the **age** of the majority of the pregnant women ranged from 20 years to less than 35 years old. Hoque et. al., (2008), who made an audit of antenatal care in a rural district of KZN, South Africa reported that the age of 66%

of the pregnant women ranged from 20 to 34 years old. (24) The mean **age** of the pregnant women in this study was 23.96 ± 3.98 years, while it was 29.08 ± 3.95 years in another study in Sindh, Pakistan (2007). (25) This may be related to the early marriage and occurrence of pregnancy in young age in the rural areas where this study was conducted.

As regard pregnant women's **education**, it was found in this study that more than half of them had secondary education and less than one fifth of them had university education. This high number of educated women reflects the increase in the awareness of the rural population about woman's rights as female education. In Sindh, Pakistan (2007), 43.5% of women were illiterates, 47.2% had primary education and 9.3% had secondary education and the majority of the pregnant women were housewives. (25) This is in accordance with the results of this study. Hoque et. al.,

(2008), also reported in their study in rural district of KZN, South Africa that the majority of the pregnant mothers were unemployed. (24) Rajaefard et. al., (2007), who studied preterm delivery risk factors in Shiraz, Islamic Republic of Iran, reported also that the majority of pregnant women either with low or high risk were housewives. (26) The highly educated women may have knowledge about antenatal care which enable them seeking care at the proper time and to be oriented about the high risk factors and actions to be taken when necessary. Housewives may have the time and the opportunity to care for themselves and to reduce the work factors that may endanger their pregnancy.

As regard to the **number of antenatal visits** to the health unit, less than two thirds of the studied women in the current study visited the rural health unit twice during this pregnancy. This could be an indicator of perceived low importance from the pregnant women point of view to antenatal follow up at the health units. It was noticed that majority of them followed up their pregnancy at private doctors. This may be also due to that the pregnant women attended the unit mainly for receiving tetanus toxoid immunization.

Meanwhile, the number of antenatal care visits according to 2008 EDHS was 4 visits or more for 66 % of the studied women. (12) According to El-Kak et. al., (2004), who studied patterns of antenatal care in low- versus high-risk pregnancies in Lebanon, that most of the studied women had 9 antenatal care visits with an obstetrician, starting in the first trimester. (27)

The majority of the pregnant women in the present study received tetanus toxoid either one or two doses during this pregnancy from the unit. Only 10.7 % of the pregnant women did not receive tetanus toxoid during this pregnancy. This shows a decline to the results of 2008 EDHS which revealed that 18.8% of the studied women did not receive tetanus toxoid. (12) WHO (2009), reported that 48 % of the pregnant women in Egypt were immunized with two or more doses of tetanus toxoid. (28) Hasnain et. al., (2007), also found in their study about causes of low tetanus toxoid vaccination coverage in pregnant women in Lahore district, Pakistan that 87% of the studied women received 2 doses of TT. (29)

In this study, the majority of the pregnant women follow up their pregnancy on private doctor. According to 2008 EDHS, private sector was the source of antenatal care for 54.5% of the studied women. (12) This may be related to increase trust in private sectors and lack of trust in governmental institutions because of its lack of care, unavailability of resources, and insufficient obstetricians and trained personnel.

Indicators measuring quality of antenatal care include: percent of clients who had their blood pressure checked, and percent of clients received iron/folic acid supplements/tetanus injection. (22) A study in Pakistan (2007), studied pattern of antenatal care provided at public sector hospital Hyderabad Sindh, revealed that routine antenatal investigations were provided to the majority of women like urine, blood, and blood pressure. (25)

In the present study, measuring blood pressure and weighing were the most frequently reported services by the women. Meanwhile blood analysis for hemoglobin level was done for slightly less than two thirds of the women. Only small percentages of them were tested for urine analysis for sugar and albumin, and less frequently was receiving iron tablet from the

units. These findings highlight the need for more effective and greater use of available laboratory resources and guidelines related to antenatal care. This is similar to the results of a study in Sindh, Pakistan (2007), which revealed that 63% of women were found dissatisfied with the services available. (25)

The **waiting time** is also used as an indicator of the quality of services. A study in Sindh, Pakistan (2007), showed that about 86.2% of women said that they have to wait for more than two hours for checkups. (25) While in this study, the duration of waiting time before antenatal care for most of the women was perceived as either short period or moderate.

However, the present study revealed that more than two thirds of the women were satisfied with the antenatal health services provided by the health units. And nearly one half of the pregnant women had moderate **satisfaction** score with antenatal care services. This could be explained by that those pregnant women may not be aware of the quality of care they should receive. They usually go to the unit for receiving immunization, and when their need is met they become satisfied with the services. This could also be due to they know that the health units which are affiliated to the Ministry of Health are lacking of resources and no more services could be expected from them.

The results of Hildingsson et. al., (2005), related to Swedish women's satisfaction with medical and emotional aspects of antenatal care in Sweden, showed that the majority of participants were satisfied with their antenatal care. (7) The results of Abd Elgwad M E, (2009), showed that pregnant women were satisfied with antenatal nursing care during pregnancy in MCH centers. (30) While in Sindh, Pakistan (2007), about one half of the women were dissatisfied with the services available. (25)

One of the indicators measuring quality of antenatal care is provider's interpersonal skills as the percent of clients treated with respect. World Health Organization, Geneva (2006), reported that communication is one of the principles of good care. (31) This study showed that the majority of the pregnant women were satisfied with the way nurses treated them. Nanbakhsh et. al., (2008), who assessed the women's satisfaction with reproductive health services in Urmia University of Medical Sciences, stated that 34.0% of women were unsatisfied or completely unsatisfied with their health care provider. (8)

The majority of the women in this study were satisfied with cleanliness of follow up room. It showed also that nearly one third of the women were satisfied with examination room and more than three fifths of them were satisfied with waiting area. The results of Abd Elgwad M E, (2009), in Elgharbeia, revealed that half of the pregnant women satisfied with physical setting environment in the studied MCH centers. (30) Gadallah et. al., (2003), who assessed patient satisfaction with primary health care services in two districts in Lower and Upper Egypt, reported that patient satisfaction was high for waiting area conditions and performance of doctors and nurses. Their results revealed also that level of privacy in the consultation room was described as unsatisfactory by 33% of patients. (32)

Gadallah et. al., (2003), reported that the main patients' complaints centered on the unavailability of prescribed drugs and laboratory investigations. (32) While in the present study, nearly three quarters of them were satisfied with laboratory investigations. The least services that pregnant women were unsatisfied with, were the unavailability of equipments especially

ultrasound. So, the first suggestion of the pregnant women for improving the antenatal care of this study was availability of ultrasound. Baldo (2001), stated that ultrasound scanning attracts women to early antenatal care in addition to its other benefits, such as reducing the number of induced births.⁽³³⁾

One of the indicators measuring quality of antenatal care is information given to the client.⁽²¹⁾ Related to receiving **health education** during pregnancy, this study revealed that the majority of the women did not attend any health education session, as health education classes were not provided by nurses at the units. While about one half of them received health education from the nurse individually. The results of the Sindh, Pakistan (2007), study revealed that only 31% of women received instructions about perinatal care.⁽²⁵⁾ These results show that nurses working in rural health units were either negligent or lacking the educational skills. So, one of the women's suggestions for improving antenatal care in this study, is providing health education for the pregnant women. Nanbakhsh et. al., (2008), in Urmia University of Medical Sciences stated that factors that needed to be improved were: using educational materials e.g. pamphlets and brochures at reproductive health consultations; and improving information given to the clients.⁽⁸⁾

The present study resulted in more than one quarter of the pregnant women suggested more care and attention of the pregnant woman should be provided for improving the antenatal care. This is similar to the results of Hildingsson et. al., (2005), in Sweden who revealed that strongest predictors of dissatisfaction were women's opinions that midwives had not been supportive and had not paid attention to their clients' needs.⁽⁷⁾

V. CONCLUSION

More than one half of the pregnant women had moderate satisfaction score with antenatal care services provided at rural health units. The majority of them did not attend health education session; while, nearly one half of them received health education individually from the nurse. Women provided some suggestions for improving antenatal care services in the rural health units as: availability of ultrasound, availability of enough obstetricians, more care and attention of the pregnant woman, availability of supplies and equipments, and providing health education for the pregnant women.

VI. RECOMMENDATIONS

Based on the results of this study, the following recommendations are suggested:

- 1- Ministry of Health and Population should pay more attention to the rural health units in order to make the needed resources for antenatal care available.
- 2- Health education sessions for all pregnant women should be applied and encouraged from the stakeholders.
- 3- Assertive and continuous supervision of the nurses' performance must be applied at all rural health units especially in antenatal care clinics.

- 4- More female obstetricians are needed at the rural health units, so, MOHP should pay more incentives for those doctors to encourage them to provide care for rural women.

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Solar Tracking System

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Abstract- “ Solar Tracking System” is a power generating method from sunlight. This method of power generation is simple and is taken from natural resource. This needs only maximum sunlight to generate power. This paper helps for power generation by setting the equipment to get maximum sunlight automatically. This system is tracking for maximum intensity of light. When there is decrease in intensity of light, this system automatically changes its direction to get maximum intensity of light.

Index Terms- Decade Counter, 555 Timer, LDR, Solar Tracking System, Stepper Motor.

I. INTRODUCTION

Solar Panels are a form of active solar power, a term that describes how solar panels make use of the sun's energy; solar panels harvest sunlight and actively convert it to electricity. Solar Cells, or photovoltaic cells, are arranged in a grid-like pattern on the surface of the solar panel. Solar panels are typically constructed with crystalline silicon, which is used in other industries (such as the microprocessor industry), and the more expensive gallium arsenide, which is produced exclusively for use in photovoltaic (solar) cells.

Solar panels collect solar radiation from the sun and actively convert that energy to electricity. Solar panels are comprised of several individual solar cells. These solar cells function similarly to large semiconductors and utilize a large area p-n junction diode. When the solar cells are exposed to sunlight, the p-n junction diodes convert the energy from sunlight into usable electrical energy. The energy generated from photons striking the surface of the solar panel allows electrons to be knocked out of their orbits and released, and electric fields in the solar cells pull these free electrons in a directional current, from which metal contacts in the solar cell can generate electricity. The more solar cells in a solar panel and the higher the quality of the solar cells, the more total electrical output the solar panel can produce. The conversion of sunlight to usable electrical energy has been dubbed the Photovoltaic Effect.

A solar tracker is a device that orients a payload toward the sun. The use of solar trackers can increase electricity production by around a third, and some claim by as much as 40% in some regions, compared with modules at a fixed angle. In any solar application, the conversion efficiency is improved when the modules are continually adjusted to the optimum angle as the sun traverses the sky. As improved efficiency means improved yield, use of trackers can make quite a difference to the income from a large plant.

Commercial purpose of solar tracking system:

- Increase Solar Panel Output.
- Maximum efficiency of the panel.
- Maximize Power per unit area.
- Able to grab the energy throughout the day.
-

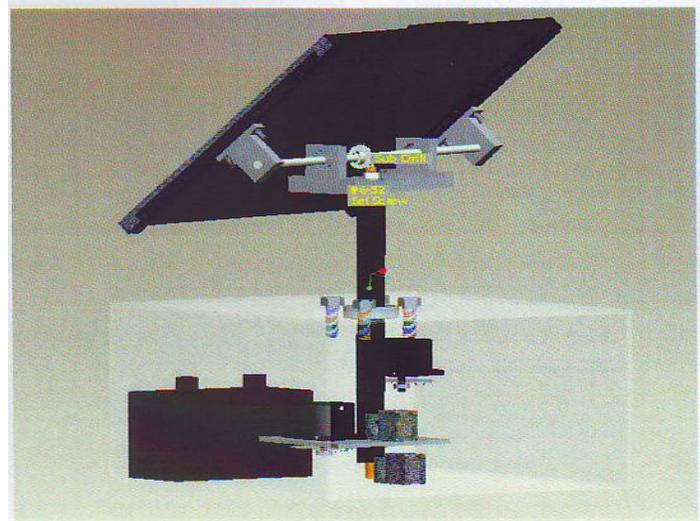


Fig. 1: Solar tracking system

The sun's position in the sky varies both with the seasons (elevation) and time of day as the sun moves across the sky. Hence there are also two types of solar tracker:

- Single Axis Solar Tracker
- Dual Axis Solar Tracker

Single Axis Solar Tracker: Single axis solar trackers can either have a horizontal or a vertical axle. The horizontal type is used in tropical regions where the sun gets very high at noon, but the days are short. The vertical type is used in high latitudes (such as in UK) where the sun does not get very high, but summer days can be very long.

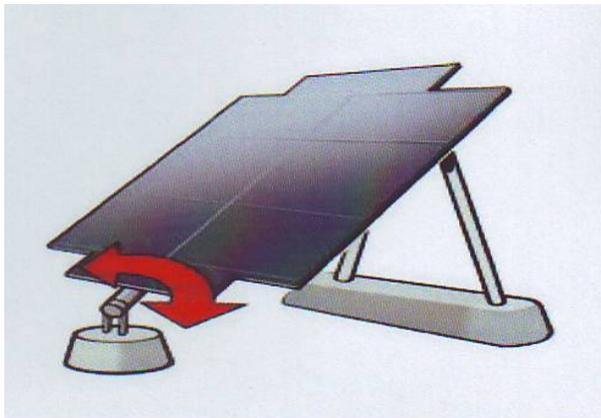


Fig. 2: Single axis solar tracker

Dual Axis Solar Tracker: Double axis solar trackers have both a horizontal and a vertical axle and so can track the sun's apparent motion exactly anywhere in the world. This type of system is used to control astronomical telescopes, and so there is plenty of software available to automatically predict and track the motion of the sun across the sky. Dual axis trackers track the sun both east to west and north to south for added power output (approx 40% gain) and convenience.



Fig. 3: Dual axis solar tracker

Solar tracker drives, can be divided into three main types depending on the type of drive and sensing or positioning system that they incorporate.

- **Passive Trackers:** Use the sun's radiation to heat gases that move the tracker across the sky.
- **Active Trackers:** Use electric or hydraulic drives and some type of gearing or actuator to move the tracker.
- **Open Loop Trackers:** Use no sensing but instead determine the position of the sun through pre recorded data for a particular site.

Passive Trackers: Passive trackers use a compressed gas fluid in two canisters each placed in west and east of the tracker.

The mechanism is in such a way that if one side cylinder is heated other side piston rises causing the panel to tilt over the sunny side. This affects the balance of the tracker and caused it to tilt. This system is very reliable and needs little maintenance.

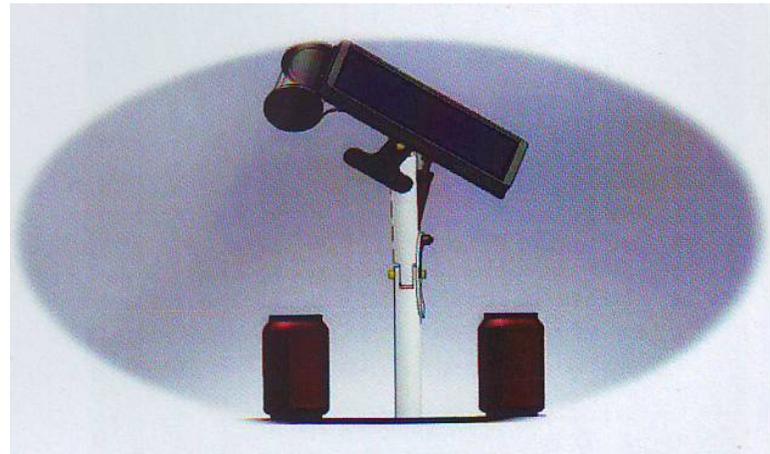


Fig. 4: Passive tracker

Active Trackers: Active trackers measure the light intensity from the sun by using light sensors to determine where the solar modules should be pointing. Light sensors are positioned on the tracker at various locations in specially shaped holders. If the sun is not facing the tracker directly there will be a difference in light intensity on one light sensor compared to another and this causes to determine in which direction the tracker has to tilt with the help of the stepper or dc motor in order to be facing the sun.



Fig. 5: Active tracker

Light dependent resistor is made of a high resistance semiconductor. It can also be referred to as a photoconductor. If light falling on the device is of the high enough frequency, photons absorbed by the semiconductor give bound electrons enough energy to jump into the conduction band. The resulting free electron (and its hole partner) conduct electricity, thereby lowering resistance. Hence, light dependent resistors is very useful in light sensor circuits. LDR is very high resistance, sometimes a sensor is a device that measures a physical quantity and converts it into a signal which can be read by an observer or by an instrument.

The 555 timer is a very cheap, popular and useful precision timing device that can act as either a simple timer to generate single pulses or long time delays, or as a relaxation oscillator producing stabilized waveforms of varying duty cycles from 50 to 100%. The 555 timer chip is extremely robust and stable 8-pin device that can be operated either as a very accurate monostable multivibrator to produce a variety of applications such as one shot or delay timers, pulse generation. The single 555 timer chip in its basic form is a Bipolar 8-pin mini dual-in-time package (DIP) device consisting of some 25 transistors, 2 diodes and about 16 resistors arranged to form two comparators, a flip-flop and a high current output stage.

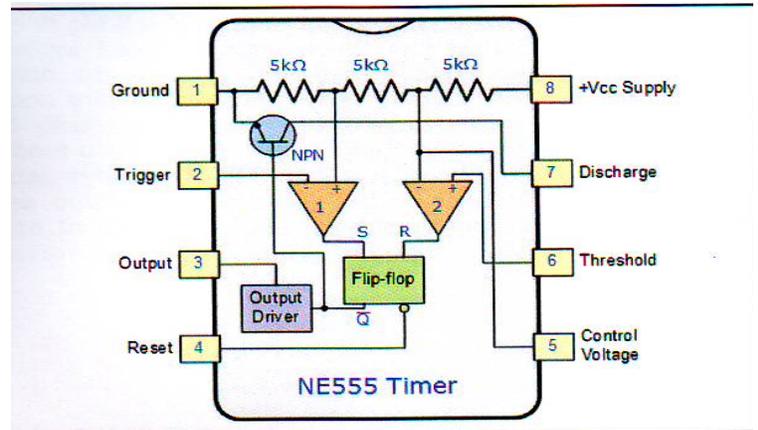


Fig. 6: 555 timer block diagram

- Pin 1: Ground. The ground pin connects the 555 timer to the negative (0V) supply.
- Pin 2: Trigger. The negative input to comparator no.1. A negative pulse on this pin sets the internal flip-flop when the voltage drops below 1/3 VCC causing the output to switch from a LOW to a HIGH state.
- Pin 3: Output. The output pin can drive any TTL circuit and is capable of sourcing or sinking up to 200mA of current at an output voltage equal to approximately VCC-1.5V so small speakers, LEDs or motors can be connected directly to the output.
- Pin 4: Reset. This pin is used to reset the internal flip-flop controlling the state of the output, pin 3. This is an active-low input and is generally connected to a logic 1 level when not used to prevent any unwanted resetting of the output.
- Pin 5: Control voltage.
- Pin 6: Threshold. The positive input to comparator no.2. This pin is used to reset the flip-flop when the voltage applied to it exceeds 2/3VCC causing the output to switch from HIGH to LOW state. This pin connects directly to the RC timing circuit.
- Pin7: Discharge. This pin is connected directly to the collector of an internal NPN transistor which is used to discharge the timing capacitor to ground when the output at pin 3 switches LOW.
- Pin 8: Supply +VCC. This is the power supply pin and for general purpose TTL 555 timers is between 4.5V and 15V.

The 555 timer name comes from the fact that there are three 5 kilo ohm resistors connected together internally producing a voltage divider network between the supply voltage at pin 8 and ground at pin 1. The voltage across this resistive network holds the positive input of comparator two at 2/3VCC and the positive input to comparator one at 1/3VCC. The two comparators produce an output voltage dependent upon the voltage difference at their inputs which is determined by the charging and discharging action of the externally connected RC network. The outputs from both comparators are connected to the two inputs of the flip-flop which in turn produces either a HIGH or LOW level

output at Q based on the states of its inputs. The output from the flip-flop is used to control a high current output switching stage to drive the connected load producing either a HIGH or LOW voltage level at the output pin.

The CD4017B is a 5-stage divide-by-10 Johnson counter with 10 decoded outputs and a carry out bit. These counters are cleared to their zero count by a logical 1 on their reset line. These counters are advanced on the positive edge of the clock signal when the clock enable signal is in the logical 0 state. The configuration of the CD4017B permits medium speed operation and assures a hazard free counting sequence. The 10/8 decoded outputs are normally in the logical 0 state and go to the logical 1 state only at their respective time slot. Each decoded output remains high for 1 full clock cycle. The carry out signal completes a full cycle for every 10/8 clock input cycles and is used as a ripple carry signal to any succeeding stages.

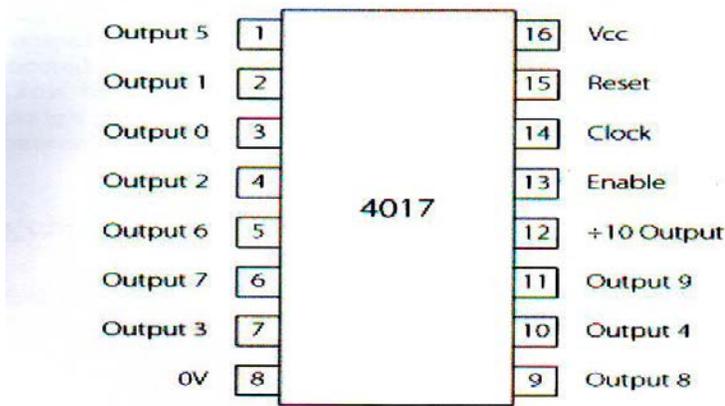


Fig.7: Pin configuration

- Pin 1: Output 5 (the 6th sequential output).
- Pin 2: Output 1 (the 2nd sequential output).
- Pin 3: Output 0 (the 1st sequential output).
- Pin 4: Output 2 (the 3rd sequential output).
- Pin 5: Output 6 (the 7th sequential output).
- Pin 6: Output 7 (the 8th sequential output).
- Pin 7: Output 3 (the 4th sequential output).
- Pin 8: Ground (0V).
- Pin 9: Output 8 (the 9th sequential output).
- Pin 10: Output 4 (the 5th sequential output).
- Pin 11: Output 9 (the 10th sequential output).
- Pin 12: /10 output (CO).
- Pin 13: Latch enable (LE).
- Pin 14: Clock in (CLK).
- Pin 15: Reset (RST).
- Pin 16: VCC (voltage between +3V and +15V).

When a clock signal (square wave pulse train) is provided at pin 14 (clock input), each of the other 10 output pins goes to logic 1 in turn. At any time only one output pin can be at logic 1; all the others remain at logic 0. If LEDs were connected to each output, each to light up in turn. If these were placed in a straight row in the correct sequence the effect would be for a ripple of light to run through the row, we use 555 timer in monostable mode.

The Darlington pair is basically a combination of two bipolar transistors. This circuit is used for amplifying currents, i.e. the amplified current from the first transistor is further amplified by the second transistor.

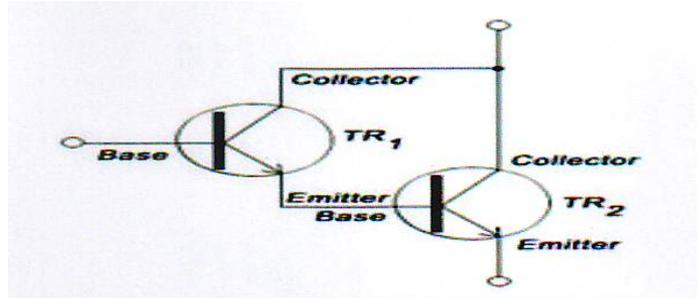


Fig. 8: Darlington Pair

ULN2003 is a high voltage and high current Darlington array IC. It contains seven open collector Darlington pairs with common emitters. A Darlington pair is an arrangement of two bipolar transistors. ULN2003 is commonly used while driving stepper motor.

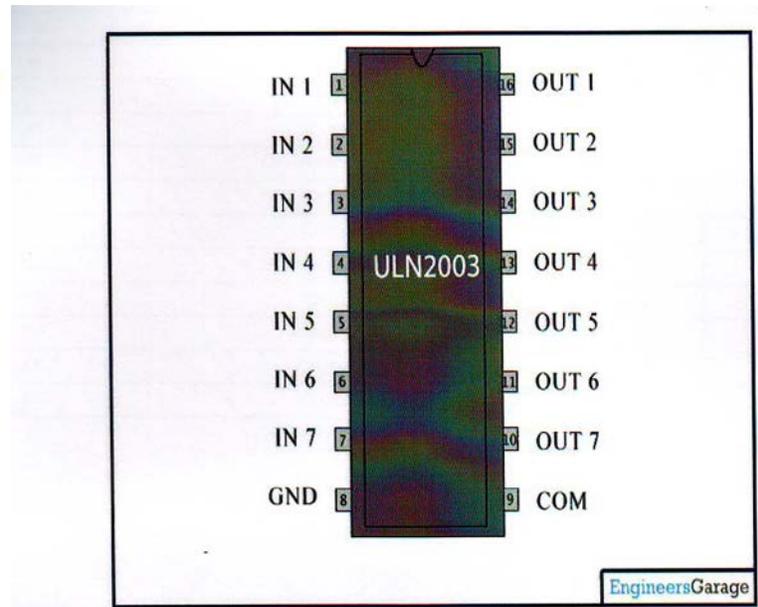


Fig. 9: Motor driver IC

- Pin 1: Input 1: Input for 1st channel.
- Pin 2: Input 2: Input for 2nd channel.
- Pin 3: Input 3: Input for 3rd channel.
- Pin 4: Input 4: Input for 4th channel.
- Pin 5: Input 5: Input for 5th channel.
- Pin 6: Input 6: Input for 6th channel.
- Pin 7: Input 7: Input for 7th channel.
- Pin 8: Ground: Ground (0V).
- Pin 9: Common: Common freewheeling diodes.
- Pin 10: Output 7: Output for 7th channel.
- Pin 11: Output 6: Output for 6th channel.
- Pin 12: Output 5: Output for 5th channel.

- Pin 13: Output 4: Output for 4th channel.
- Pin 14: Output 3: Output for 3rd channel.
- Pin 15: Output 2: Output for 2nd channel.
- Pin 16: Output 1: Output for 1st channel.

Stepper motors effectively have multiple toothed electromagnets arranged around a central gear-shaped piece of iron. The electromagnets are energized by an external control circuit, such as using 555 timer. To make the motor shaft turn, first, one electromagnetic is given power, which makes the gear's teeth magnetically attracted to the electromagnet's teeth. When the gear's teeth are aligned to the first electromagnet, they are slightly offset from the next electromagnet. So, when the next electromagnet is turned on and the first is turned off, the gear rotates slightly to align with the next one, and from there the process is repeated. Each of those slight rotations is called a step, with an integer number of steps making a full rotation. In that way, the motor can be turned by a precise angle. Stepper motors are constant power devices. As motor speed increases, torque decreases. Most motors exhibit maximum torque when stationary, however the torque of a motor when stationary (holding torque) defines the ability of the motor to maintain a desired position while under external load.

II. METHODOLOGY & RESULTS

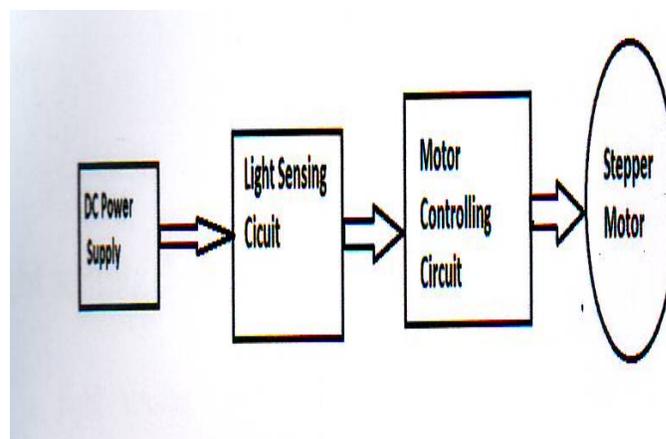


Fig. 11: Block diagram of solar tracking system

Components used: i) Light sensing circuit:-

- LDR
- 555 Timer

ii) Motor controlling circuit:-

- Decade counter
- Darlington pair (TIP 120, TIP 120)
- ULN2003 Driver IC
- Stepper motor (5W, 12V)

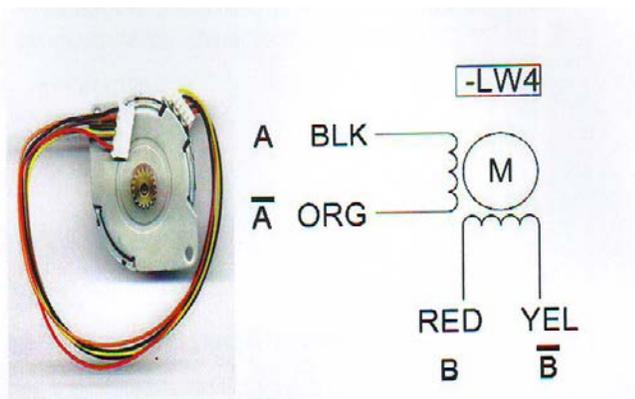


Fig. 10: Stepper motor & its internal diagram

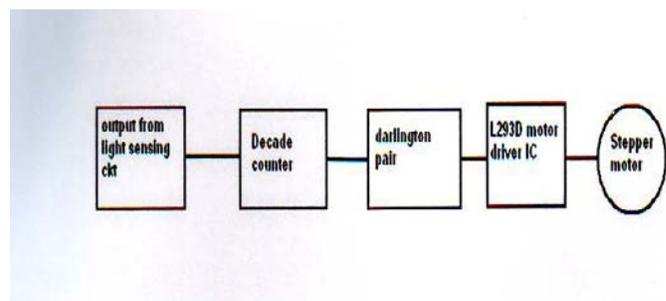


Fig. 12: Block diagram for motor control

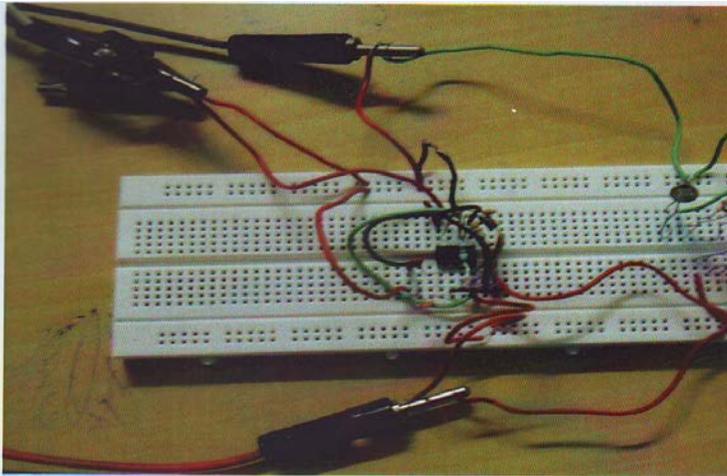


Fig. 13: Light sensing circuit

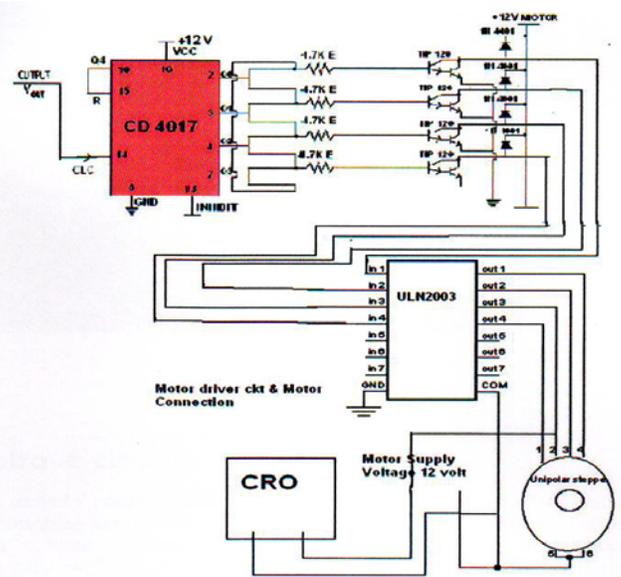


Fig. 15: Motor controlling circuit

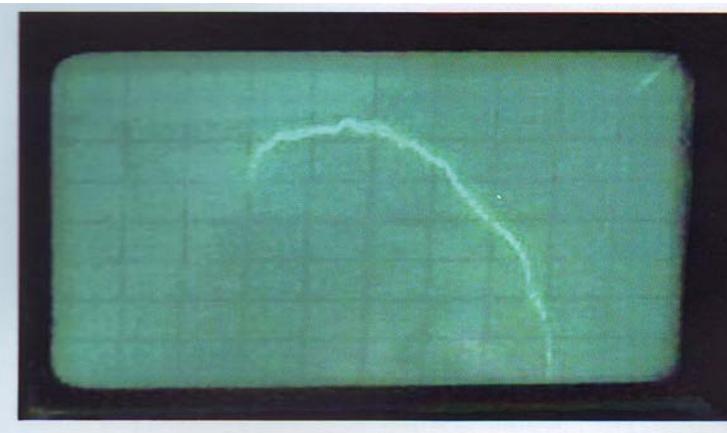


Fig. 14: Output pulse from light sensing circuit

Working of light sensing circuit: In this circuit constant current is given across LDR and constant voltage is given across 555 timer. 555 timer is used for monostable circuit. In monostable circuit a triggering pulse is needed; this pulse is given by LDR arrangement. LDR is negative temperature coefficient device, so when the circuit is kept under light, resistance across the LDR decreases. As current across the LDR is constant and resistance decrease with light intensity, voltage starts to change its state, this voltage is working as triggering pulse in monostable circuit. From monostable multivibrator circuit we get voltage waveform, which remains in high state at first, then changes its state with varying light intensity.

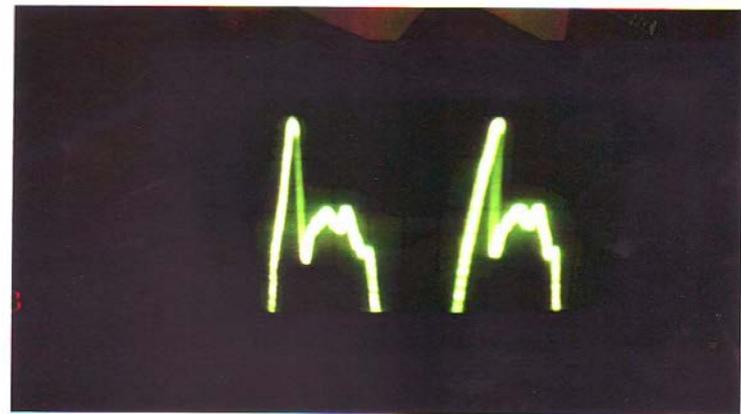


Fig. 16: Output pulse from CRO

Working of above circuit: Here Cd4017 is a decade counter, this counter gives medium speed operation and hazards-free counting sequence, output pulse from light sensing circuit act as clock pulse in decade counter (i.e. at pin no. 14). Here output is taken from (00, 01, 02, 03) pins which are connected through resistance to Darlington pair. Darlington pair is used to obtain high current gain because current obtained from decade counter is amplified by Darlington pair (which is a arrangement of bipolar transistor). This high current gain is needed for driving more load. Diode is connected across the Darlington pair to remove spike in case of inductive load. Resistance is connected in the base of Darlington pair to control the leakage current across CE. Output pulse of Darlington pair is connected across (1,2,3,4) pins of ULN2003 (which acts as motor driver IC). This gives more current gain as it is a Darlington pair IC to drive the load. Stepper motor is connected with it, which moves in a step. As output of decade counter changes sequentially, speed increases motor torque decreases which gives movement to load (i.e. solar panel).

III. CONCLUSION

In this paper of solar tracking system I reached up to the movement of stepper motor. Due to higher cost we couldn't afford a solar cell. Nonetheless, the working will be same if we connect a solar cell, as all parameters have been achieved. The aim of my paper was movement of motor by signal from light sensing circuit when the intensity of light is maximum, which has been successfully achieved.

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Scaling Studies of Effecting Factors* on Large Scale Production of Medicinally Active Compound in Garlic (*Allium sativum*)

AGRO-CLIMATIC VARIATION LIKE TEMPERATURE AND SOIL AND IDENTIFICATION OF HIGH MEDICINALLY ACTIVE COMPOUND (ALLIIN/ALLICIN) CONTAINING VARIETY

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Abstract- Garlic contains medicinally active compounds like Alliin/Allicin, Di-allyl Disulfide, 2-vinyl-4H-1, 3-dithiin, Ajoene.

Alliin (Allicin) is cholesterol lowering and antihypertensive (Ref. see Sukhdev, 1997, Sculz et al, 1998 and Hung, 1999).

Alliin is an amino acid, in presence of enzyme Alliinase, Alliin converted into Allicin and it has produce characteristic smell of garlic.

Various samples of Garlic (varieties) collected from various locations (Climatic Condition) and Alliin is estimated from different parts of the plant.

Index Terms- Garlic (*Allium sativum L.*) Alliin, Allicin

I. INTRODUCTION

The Objective of this study was “To identify the reason of medicinally active compound i.e. Alliin/Allicin content variations in various *Alliums* species which was cultivated in different region of Indian states.

Earlier it was estimated medicinally active content i.e. Alliin/Allicin in various samples of *Alliums*’ species which was cultivated in different regions of Indian States (Ref. comparative study of Alliin content in different varieties of garlic’s by Rajesh Kumar Singh and Dr. S .N .Hiremath, ijsrp December-2013).

The purpose for continuation of the study was to identify high medicinally active compound (Alliin / Allicin) containing variety and affecting factors (Ecotype or Genotypes) are responsible for Alliin/Allicin content variations in Garlic.

Key word: Garlic, Alliin, Allicin, Dialyl cysteine etc.

Garlic contains Alliin (*S*-allyl-l-cysteine sulfoxide), Alliin is an amino acid, which converted into Allicin (Di allyl sulphide) in presence of enzyme Alliinase, Allicin produce characteristic smell of garlic while garlic is injured or Crushed.

It is organo-sulphur compound that contributes to its therapeutic value and pharmacological importance.

Alliin production in different varieties of Garlic plant organ (leaf), which was grown under similar conditions were evaluated after 8 weeks.

II. MATERIALS AND METHODS

- A. Soils preparations for Garlic cultivation
- B. Pots selection for Garlic cultivation
- C. Collection of Garlic Seeds samples for cultivation
- D. Monitoring of Agro-climatic conditions.
- E. Analytical Method
- F. Sample collection
- G. Testing of collected samples

A. Soil Preparation for Garlic cultivation

About 50 square feet Soil was collected from agro-field of a farmer from Manpura Village, Tehsil Nalgarh Distt. Solan, State-Himachal Pradesh, country India. The earlier crop of this farming field was Maize.

It was blended with about 15 square feet rotted cow dung and one kg chemical fertilizer i.e. DAP (Di-ammonium phosphate).

After proper blending, it was moisturized with five liter of potable water.



Soil Preparation snap shot A-1



Selected Pots (Snap shot B-1)



Soil Preparation Rotted Dung mixing (snap shot A-2)

B. Pot selection for Garlic Cultivation

Soil Pots Height -12" inch, top diameter-15" inch, bottom diameter-4.5" inch were purchased from local market

Equal quantities of blended soil (Step A) were loaded into each pot up to similar level. Refer soil loading in Selected Pots (Snap shot B-2) and equal soil level in selected pots (snap shot B-3)



Soil loading in selected pots (Snap shot B-2)



Final Soil Level in Selected Pots (Snap shot B-3)

C. Collection of Garlic Seed samples for cultivation

Different variety of garlic collected from different market sown as mentioned below in Table No 1:-

Sr No.	Local Name	Variety	Collection Point
1	Lahsun	White hard neck (Yamuna)	Sabji Mandi Pinjore
2	Lahsun	Silk Soft Neck (Agrifood-1)	M/S Kheti Sewa Centre Pinjore
3	Desi Lahsun	Silk Soft Neck (Kumaoni)	Sabji Mandi Kalka
4	Desi Lahsun	White hard neck	Sabji Mandi Kalka
5	Pahadi Lahsun	Silk Soft Neck (Elephant Garlic)	Sabji Mandi Kalka
6	Lahsun	Silk Soft Neck	Sabji Mandi Pinjore
7	Pahadi Lahsun	White hard neck (Agrifood Parvati)	Sabji Mandi Kalka

Table No:1 Garlic Seed Samples.

Different varieties of Garlic were collected from different regions of the country along the states of Haryana, Himachal Pradesh and Utrakhnad. Refer samples snap shots (C-1) as agro-climatic

conditions (soil fertility and Temperature) vary from state to state.

The Medicinally active compounds (Alliin/Allicin) from collected sample of garlic were estimated and reported by ⁶Rajesh Kumar Singh and Dr. S. N. Hiremath, [ijsrp-p2442 volume 3 Dec2013 titled as “Comparative study of Alliin containing different Varieties of Garlics (*Allium sativum L.*)”].



Garlic samples collected from various locations (C-1)

From above samples few variety were eliminated and rest were cultivated in similar agro-climatic conditions for finding the medicinally active compound content variations in above samples of Garlic Refer Fig 1.0

Various treatments were given to all pots plant like watering, thinning and dressing and time to time aeration of soil.

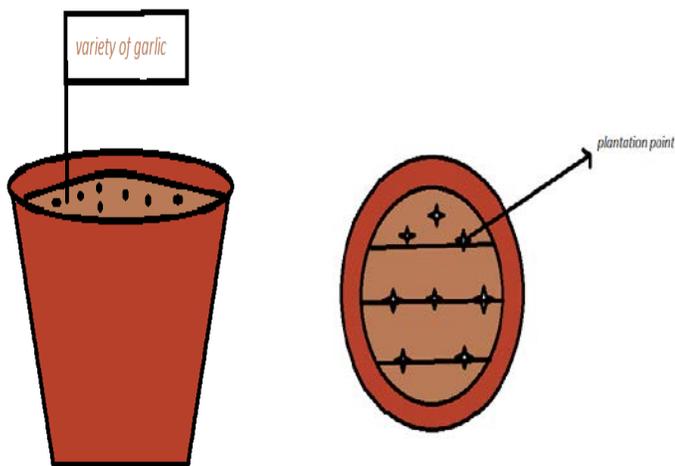


Fig 1.0: Schematic Diagram of Plantation

D. Monitoring of Agro-climatic conditions

Temperature (Minimum and Maximum) was recorded on daily basis of that area. Refer Table No 2.

Date	Temperature °C	
	Minimum	Maximum
3 rd Week of October	10-14	25-30
4 th Week of October	8-13	24-28
1 st Week of Nov	8-11	23-27
2 nd Week of Nov	8-11	24-27
3 rd Week of Nov	8-10	24-26
4 th Week of Nov	8-10	21-25

Table No 2 : (Average Temperature of different weeks)

E. Analytical Method

The active secondary metabolite Alliin was estimated from biomass of Garlic (leaves) and Quantified chemically by using nitrite titration method. Reference: USP 29-NF24 <451> Nitrite Titration.

F. Sample collection for estimation of Alliin:

Watering was done in each pot on alternate days, and samples (leaves) were collected for analysis of Alliin/Allicin content after 45 days. Ref. image below:



Image: Garlic plant after 45 days of Sowing:

G. Testing of collected samples

Samples (Fresh leaves) were cut from Harvested plants of all type of Garlic from all pots separately and Alliin were estimated from above biomass of Garlic by using of Nitrite titration.

Each ml of 0.01 M Sodium Nitrite solutions equivalent to 0.001722 g of Alliin.

Analytical results were tabulated in Table No.3

III. Analytical Results of Garlic Bio mass (leaves)

Observed Results were tabulated in Table No. 3

Variety	Content of Alliin (%) in Leaves
Agrifood- I (Seed Shop Pinjore)	0.21
Sabji Mandi Kalka	0.29
Kumaoni Garlic(Nainital)	0.16
Elephant Garlic(Pahadi Lahsun)	0.35

Table 3: Content of Alliin in different varieties of Garlic

IV. DISCUSSION

Content of Alliin in leaves of different varieties of Garlic was found different, though grown in similar agro climatic conditions Highest Alliin content was found in Elephant Garlic and the minimum Alliin containing garlic is Kumauni Garlic.

V. CONCLUSION

From the obtained results it is clear that Content of Alliin varies in different plant varieties of Garlic grown in similar agro climatic conditions, hence it can be concluded that content of Alliin is due to Genotypic variations rather than Ecotype variations.

ACKNOWLEDGEMENT

In performing our research, we had to take help and guideline of some respected persons who deserve our sincere gratitude. The completion of our research gives us much pleasure. So I would like to thank Mr. Ulhās Dhuppad, Executive Vice President-CMC for helping through numerous consultations and guidance for the completion of above research.

In addition we would like to thank, Mr. Ashutosh Tripathi Research Officer, Mr. Mahesh Saruk Research Associate, Formulation Development and entire team of Glenmark Pharmaceuticals Ltd, Research Centre, Sinner (Maharashtra) where we got necessary help and support.

Lastly we must acknowledge the efforts of Mrs. Punam Rajesh Kumar Singh, Rajat Kumar, Smriti Kumari and Aparna without whose support the extensive travelling & the outbound stays required for the above research would not have been possible.

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Isolation and Characterization of Beta-Sitosterol from ethyl acetate extract of root bark of *Terminalia glaucescens*

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Abstract- The aim of this study is to identify and characterized the bioactive compounds from the root bark of the plant. Preliminary phytochemical screening of the root bark extract of *Terminalia glaucescens* revealed the presence of steroids, terpenoids, saponins, flavonoids, tannins and cardiac glycoside. The plant has wide folk medicinal use in traditional medicine. The air dried root bark was pulverized to powder, subjected to hot extraction (soxhlet) with methanol, and fractionated into n-hexane, ethyl acetate, and n-butanol fractions. Ethyl acetate as bioactive fraction based on sensitivity test was subjected to TLC and column chromatography. The isolated compound was colourless powder, which was further subjected to IR, UV, ¹³CNMR and ¹HNMR for proper characterization and elucidation of the structure. The compound was concluded as β-Sitosterol.

Index Terms- Terminalia glaucescens, Isolation and Characterization

I. INTRODUCTION

Medicinal plants have been in use for the eradication of human sufferings since ancient times. In light of their established therapeutic efficiency, the pharmaceutical industries started to use crude extracts of medicinal plants for manufacturing drugs (Ali, et al., 2000). The root bark of *Terminalia glaucescens* have been used in traditional medicine for treatment of dysentery, fever, diarrhea, wound, tooth decay, ulcers, typhoid fever and various stomach related problems.

Terminalia glaucescens is flowering plant tree (angiosperm) belong to family Combretaceae. It is commonly found in West Africa especially in Savannah regions. The plant is the most important medicinal species of the genus *Terminalia*. It is abundant in Nigeria. The plant is commonly called bausha (Hausa), Idi Odan (Yoruba), Edo (Igbo) while the local dilate where the plant was collected is called palma (Bura – Babur). *Terminalia glaucescens* is a tree up to 20 m high, bole usually short and gnarled. The bark is dark grey, deeply fissured; slash yellowish or reddish rapidly turning darker. Sometimes shoots and young foliage have densely hairy leaves, about 8.5-15 cm long, and 2.5-7.5 cm broad. Flowers are greenish-white, very small and strongly scented with brown hairs at the base of the style. Wood is pale yellow-brown, hard and coarse textured.

The purpose of this study is to identify and characterize the bioactive compound (s) from the root bark of *Terminalia*

glaucescens. In this paper, we report the isolation and characterization of known compounds from the plant namely β-sitosterol.

II. EXPERIMENTAL

Collection, Identification and preparation of plant materials.

The plant materials were collected from Hyera Road of Shaffa District, Hawul Local Government Area, Borno State of Nigeria. The plant was identified and the herbarium (voucher) specimen number UDUS/Bio/12/113 was prepared and deposited at the Herbarium of Botany Unit, Department of Biological Sciences, Usmanu Danfodiyo University, Sokoto, by A. M. Umar (Taxonomist). The root bark of the plant was air dried under shed, then pulverized into powder with the aid of pestle and mortar. The powder obtained from the plant was then sieved and stored in polythene bags until required for use (African pharmacopoeia, 1985)

Extraction and Isolation

Six hundred gram (600g) of powdered root bark was extracted by soxhlet extractor used 1500ml of methanol as solvent at temperature of 85 °C, was concentrated using hot air sterilizing cabinet at 60°C and yield 123.11gram of methanol crude extract. Split method of separation was adopted according to (Abubakar, 2009). The n- hexane was directly added to crude methanol extract and was vigorous stirring before filtration and the filtrate are all n-hexane soluble portion, which is the n-hexane fraction while the residue was allowed to dry and same method was repeated with ethyl acetate, n- butanol and finally the residue obtained is methanol fraction. N-hexane, ethyl acetate, n - butanol, and methanol fractions were obtained and were concentrated at 60°C in hot air sterilizing cabinet. 100 ml burette was use as a Column with 50g of silica gel as a stationary phase while mobile phase was petroleum ether hundred percent followed by 9:1 ratio of petroleum ether and ethyl acetate as eluting solvent. The column was parked by wet parking method, after parking was allowed overnight with 3g of concentrated ethyl acetate fraction was dissolved in pet ether solution and soaked with cotton wool was placed on top of silica gel in the column. Between the cotton and the top of silica gel there was disc made of filter paper and the bottom of the column there was also another cotton wool. 2.4ml per minute each were collected in collection bottles range from 1 to 50. The column fraction's

profiles were monitored by TLC to confirming the similarities of elutes based on the number and color (s) of the spot (s).

Thin Layer Chromatography

Commercially pre-coated TLC silica gel plate was used a line was drawn with a pencil 2cm at the bottom from one end of the plate. The sample(s) were dissolved in little ethyl acetate solution and was spotted on the line drawn on the plate by capillary tube and then allowed to dry. The dry plates were placed into the chroma tank contained (9:1) ratio of chloroform and methanol, the tank was covered. The solvent rose up on the plate by capillary action, when the solvent front was just about 2cm to the upper end of the plate, the plate was removed and a line was drawn to mark the position of the solvent front. The plates were allowed to dry and the spots were developed by spread with 5% H₂SO₄ as spraying reagent. The R_f value of the spots were measured using meter rule.

Tests for steroid

Salkowski reaction: A few crystals were dissolved in chloroform and a few drops of concentrated sulfuric acid were added to the solution. A reddish color was seen in the upper chloroform layer (Harbone, 1984).

Liebermann burchard reaction: A few crystals were dissolved in chloroform and a few drops of concentrated sulfuric acid were added to it followed by addition of 2-3 drops of acetic anhydride. Solution turned violet blue and finally green (Harbone, 1984).

Spectroscopic characterization

The spectroscopic methods were used to elucidate the structure of isolated compound. Among the spectroscopic techniques IR, ¹H-NMR, ¹³C-NMR and UV were carried out. The infra red spectrum was recorded on FTIR -8400S, Shimadzu, Japan, from Central Lab. UDUS. ¹H-NMR and ¹³C-NMR spectra were recorded using CDCl₃ as solvent on Topspin (300MHz) Bruker, Germany. from University of Pretoria, South Africa. and UV spectra on UV/vis (SP3000plus) Kyoto, Japan from pharm. Chem. UDUS.

III. RESULTS AND DISCUSSION

The IR absorption spectrum showed absorption peaks at 3373.6cm⁻¹ (O-H stretching.); 2940.7 cm⁻¹ and 2867.9cm⁻¹ (aliphatic C-H stretching); 1641.6cm⁻¹ (C=C absorption peak); other absorption peaks includes 1457.3cm⁻¹ (CH₂); 1381.6cm⁻¹ (OH def), 1038.7cm⁻¹ (cycloalkane) and 881.6 cm⁻¹.

¹HNMR (CDCl₃, 300MHz) has given signals at δ 3.2(1H, m, H-3), 5.26 (1H, m, H-6), 5.19(1H, m, H-23), 4.68(1H, m, H-22), 3.638(1H, m, H-3), 2.38(1H, m, H-20), 1.8-2.0 (5H, m) ppm. Other peaks are observed at δ 0.76-0.89 (m, 9H), 0.91-1.05 (m, 5H), 1.35-1.42 (m, 4H), 0.69-0.73 (m, 3H), 1.8-2.00 (m, 5H), 1.07-1.13 (m, 3H), 1.35-1.6 (m, 9H) ppm.

¹³CNMR (CDCl₃, 100MHz) has given signal at 150.98, 145.2 (C-5), 139.8 (C-22), 121.7, 118.89(C-6), 79.03 (C-3), 55.3(C-14), 55.18(C-17), 50.45 (C-9), 48.3 (C-9), 40.8 (C-20), 40.1(C-12), 39.2 (C-13), 38.9 (C-4), 38.6 (C-12), 37.18 (C-1), 37.12 (C-10), 36.3(C-8), 35.59(C-20), 34.29 (C-22), 34.24

(C-7), 32.66 (C-8), 29.86 (C-25), 29.71 (C-16), 28.41 (C-2), 28.1 (C-15), 27.4 (C-28), 26.1 (C-11,26), 21.6 (C-27), 19.32 (C-19), 17.71 (C-21), 15.6 (C-18, 29).

Phytochemical analysis (Salkowski's test and Liebermann-Burchard test) of the compound confirm its steroidal nature. Since, the NMR machine indicated steroidal nucleus and the compound gives positive test for steroids so all of the other structures other than steroids were rejected. Based upon the functional group analysis it was found that the nature of oxygen was hydroxyl, also supported by IR spectroscopy (Shimadzu, IR). This implies presence of one double bond in the structure. So, the steroids with other functional groups were rejected. Also on considering the nature of oxygen as hydroxyl and presence of one double bond, the general formula for the compound is C_nH_{2n-6}, the exact molecular mass for the formula is found to be 414.37 and the chemical formula could be tentatively C₂₉H₅₀O. Therefore it must be a tetra cyclic compound. Based on the melting point and other related data (IR, NMR, UV and MS) the structure of the isolated compound is proposed as

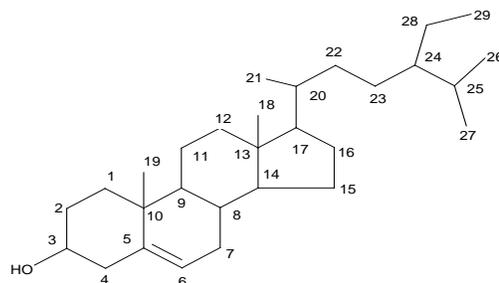


Fig. 1 β-sitosterol (Stigmast-5-en-3β-ol)

The compound is a colourless crystalline compound, λ_{max} in CHCl₃: 220 nm. On subjecting to IR spectroscopic analysis, absorption bands appeared at 3570.36 – 3186.51 cm⁻¹ that is characteristic of O-H stretching, 2864.39 cm⁻¹ is due to aliphatics or C-H stretching or (CH₃), 1585.54 cm⁻¹ due to double (C=C) stretching, 1016.52cm⁻¹ due to (C-O). Other absorption frequencies include 3838.47cm⁻¹ due to combination of absorption and 2353.23cm⁻¹ due to overtone of the absorption, at 1269.2 cm⁻¹ is a bending frequency for cyclic (CH₂)_n. The absorption frequency at 783.13 cm⁻¹ signifies cycloalkane. The out of plane C-H vibration of unsaturated part was observed at 609.53cm⁻¹. These absorption frequencies resemble the absorption frequencies observed for β-sitosterol as resembled data published by (Arjun *et al*, 2010).

The ¹HNMR spectrum (300MHz, CDCl₃) of compound fig. 1 has revealed a one proton multiplet at δ 2.41, the position and multiplicity of which was indicative of 3H of the steroidal nucleus. The typical 6H of the steroidal skeleton was evident as a multiplet at δ 5.39 that integrated for one proton. The spectrum further revealed signals at δ 1.47 and δ 1.19 (3H each) assignable to two tertiary methyl group at C- 18 and C-19 respectively. The ¹HNMR spectrum showed two doublets centered at δ 0.90 (J = 6.7Hz) and δ 0.89 (J = 6.7Hz) which could be attributed to two methyl groups at C-26 and C -27 respectively. The doublet at δ 1.62 (J = 6.5Hz) was demonstrative of a methyl group at C-21. On the other hand, the triplet of three proton intensity at δ 0.88 could be assigned to the primary methyl group at C- 29. This

compound is having six methyl, eleven methylene and three quaternary carbons with a hydroxyl group. The above spectral features are in closed agreement to those observed for β – Sitosterol according to (Manoharan et al., 2005 and Escudero *et al.*, 1985).

The $^{13}\text{C-NMR}$ has shown recognizable signals 179.21 and 129.69 ppm, which are assigned C5 and C6 double bonds respectively. The value at 24.67 ppm corresponds to angular carbon atom (C19). Spectra show twenty nine carbon signal including six methyls, nine methylenes, eleven methane and three quaternary carbons. The alkene carbons appeared at δ 179.21 and 129.69. The structure was simulated using ACD/NMR program to obtain the chemical shifts of both proton and carbon. On comparison the standard data matched with the simulated data which supports the proposed structure of this compound as β – Sitosterol.

IV. CONCLUSION

Stigmast-5-en-3 β -ol (β -Sitosterol) was isolated and characterized from ethyl acetate extract of root bark of *T. glaucescens*. β -Sitosterol reduce carcinogen-induced cancer of the colon. It shows anti-inflammatory, anti-pyretic, antiarthritic, anti-ulcer, insulin releasing and oestrogenic effects and inhibition of spermatogenesis. Beta-sitosterol is mainly known and used for its cholesterol lowering property. But studies have shown that the phytochemical may have other health benefits: easing symptoms of benign prostatic enlargement, reducing risk of cancer and prevention of oxidative damage through its antioxidant activity.

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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- Immobilized Lipase; 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 overcome 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.

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	Austrian Waste Management Act 1990 last revised by GBI. Nr. 434/

	treatment as waste is required by the public interest. EWC is not mentioned	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	Environmental Protection

	EWC	Regulations (1991)
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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%.

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].

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
- Capitate 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 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].

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.

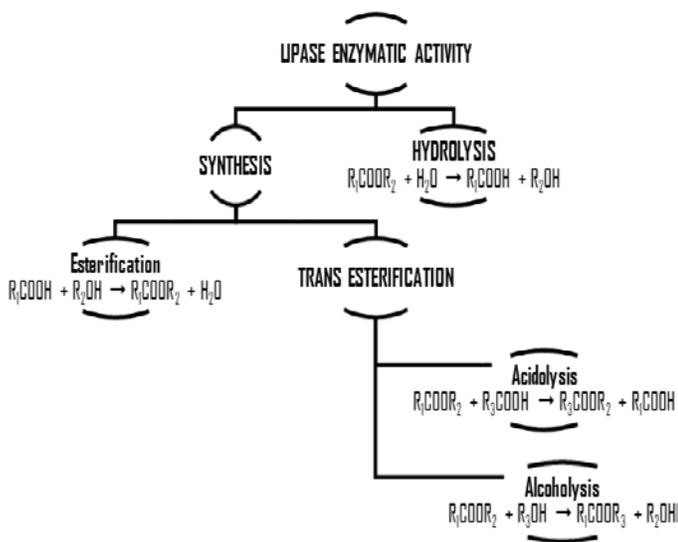


Figure 1: Reaction classifications of lipase enzymatic activity

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	<i>Candida antarctica</i> (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 <i>et al.</i> , [16]
Waste cooking oil	<i>Pseudomonas cepacia</i> /Imm. on ceramic 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	<i>Candida</i> 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 <i>et al.</i> , [38]
Recycled restaurant grease	<i>Pseudomonas cepacia</i> (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 <i>et al.</i> , [14]
Waste vegetable oil (acidic oil)	<i>Candida antarctica</i> (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 transfered to a fresh substrate mixture every 48 hrs.	>98.5 wt% after a24hrs	Watanabe <i>et al.</i> , [39]
Waste vegetable oil (In waste bleaching earth)	<i>Rhizopus oryzae</i> / 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	<i>Thermomyces lanuginosus</i> /Imm. 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 <i>et al.</i> , [70]
Waste edible oil	<i>Candida antarctica</i> (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 <i>et al.</i> , [13]
Waste cooking oil	<i>Candida</i> 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 <i>et al.</i> , [71]
Waste cooking oil	<i>Penicillium expansum</i> / 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 <i>et al.</i> , [72]

(high acid value)			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	
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 °C, 200 rpm.	92.8% (imm.) & 95% (free)	Yagiz <i>et al.</i> , [40]

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 Szweczyk [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 CO₂ 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 biodisel 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 ceramic 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 FFAE, 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].

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 CO₂, 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].

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

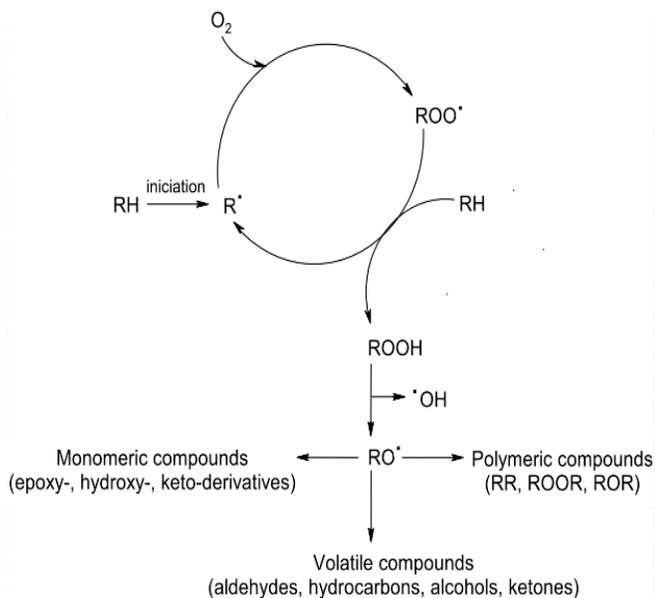


Figure 2: Reaction Pathway for free radical autoxidation

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

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

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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Effect of Hormone and Cutting Length on the Rooting of *Tinospora Crispa*

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Abstract- An experiment on *Tinospora crispa* cuttings using three cutting lengths, two hormone treatments and control (without hormone) was carried out in the nursery of Forest Research Institute Malaysia (FRIM). The length of cutting used was: 7.5 cm, 15 cm and 22.5 cm. The base of each cutting was treated with two types of powdered hormones: 1) Seradix 1 (0.1% indole butyric acid-IBA), 2) Seradix 2 (0.3% IBA) and 3) control (without hormone). These cuttings were planted in cleaned river sand medium in a non mist propagation system. Results twelve weeks after planting showed that cuttings of 22.5 cm length produced significantly higher rooting (81%) than the other two length (59% and 38%). Similar results were obtained with the number of roots where 22.5 cm length had significantly most number of roots (1.9) compared to the other two lengths (1.3 and 1.2). This experiment showed that *Tinospora crispa* can be propagated by cuttings as an alternative source of planting materials for domestication purposes.

Index Terms- Vegetative propagation, rooting percentage, non mist propagation system

I. INTRODUCTION

Tinospora crispa belongs to the family of [Menispermaceae](#). It is an indigenous plant which grows wild in Malaysia, known by vernacular names such as 'akar patawali' or 'akar seruntum' (Noor & Ashcroft 1989). It is also known by its numerous synonyms, *Menispermum crispum* Linn., *Tinospora cordifolia* F. Vill., *Tinospora tuberculata*, *Tinospora rumphii* and other local names like Makabuhai, Andawali, Putarwali, Kattukkodi, Vasanavalli, Boraphet and Wan kab hoi yai (Asif Iqbal *et al.* 2012). This plant is a woody climber with shiny green leaf, can be found in tropical and subtropical India and parts of the Far East, and in primary rainforests or mixed deciduous forests throughout the Philippines, tropical Asia at altitudes up to 1000 m. It is also widely distributed in Indonesia including Borneo, Thailand and Vietnam (Dweck *et al.* 2012). It has being cultivated as a medicinal plant in Thailand, Sri Lanka and India (Umi Kalsom *et al.* 1999). In Malaysia, its stem has been traditionally used for various therapeutic purposes such as treatment for diabetes, hypertension, stimulation of appetite and protection from mosquito bites

Recent studies have shown that *T. crispa* has the potential to be a source of natural antioxidants and nutrients, besides having

a moderate anti-proliferative effect on selected human cancer cell lines (Zulkhairi *et al.* 2008). Besides that, supplementation of *T. crispa* extract was able to reduce or retard the progression of atherosclerotic plaque development induced by dietary cholesterol (Zulkhairi *et al.* 2009). Due to its potential uses, the demand for this species is increasing yearly. The present experiment was carried out to observe the effect of hormone and cutting length on the rooting of *T. crispa* cuttings. Hormone and length of cuttings are among the important factors that affect the rooting ability of cuttings (Hartmann *et al.* 1990).

II. MATERIALS AND METHODS

An experiment using leafless cuttings of *Tinospora crispa* was carried out in the nursery of Forest Research Institute Malaysia (FRIM) on 9 August 2011. The cutting materials were obtained from two year old plants planted in the nursery of FRIM (Figure 1). Three cutting lengths were used: 7.5 cm, 15 cm and 22.5 cm. The base of cutting is cut at right angle and treated with different commercial powdered hormones: 1) Seradix 1 (0.1% indole butyric acid-IBA), 2) Seradix 2 (0.3% IBA), and 3) control (without hormone). The Seradix was purchased from Agrimart Sdn Bhd, Petaling Jaya, Selangor, Malaysia. A total of 270 cuttings were used and they were arranged in Randomised Complete Block Design in 3 blocks with 90 cuttings per block. These cuttings were planted in cleaned river sand medium in a non mist propagation system constructed based on the system used by Leakey *et al.* 1990. The whole system was shaded with black plastic netting with 20% light intensity. The relative humidity in the system was more than 80%. The light was measured with a SKP 215/200 light sensor (Skye Instrument, UK). The relative humidity was measured using Hobo LCD Datalogger, USA.

Observations on cuttings were made fortnightly starting two weeks after planting and the experiment was terminated at week twelfth since most of the cuttings had rooted. Variables collected were number of cuttings rooted, unrooted and dead cuttings. Data collected had been subjected to analysis of variance followed by Duncan Multiple Range Test (DMRT) to see the effect of treatments on rooting. The statistical package use was SAS version 9.1.3. The results were considered significant when $p \leq 0.05$.



Figure 1 Cuttings of *Tinospora crispa* taken from the stock plants

III. RESULTS AND DISCUSSION

Analysis of variance showed that there was significant difference among the length of cuttings. The cuttings with 22.5 cm length produced significantly higher rooting than the 7.5 and 15 cm length. Similar results were obtained with the number of roots where 22.5 cm length had significantly most number of roots (1.9) compared to the other two lengths (1.3 and 1.2) (Table 1). The plant growth regulator treatments did not have any

significant effect on all the variables measured (Table 2). The use of hormones also did not accelerate the rate of rooting since rooting started at week four in all treatments. There was also no significant different in the interaction between hormone and length of cuttings. Figure 2 shows the rooted cutting of *Tinospora crispa* and Figure 3 is the potted rooted cuttings two years after potting,

Table 1 Effect of cutting length on rooting ability of *Tinospora crispa* twelve weeks after planting.

Cutting length (cm)	Rooted cuttings (%)	Unrooted cuttings (%)	Dead cuttings (%)	Mean number of roots per rooted cutting
7.5	37.8a	36.7a	25.6a	1.2a
15.0	58.9a	25.6ab	15.6a	1.3a
22.5	81.1b	14.4b	4.4a	1.9b

Means followed by the same letters in each column are not significantly different at $P \leq 0.05$

Table 2 Effect of hormones on rooting ability of *Tinospora crispa* twelve weeks after planting.

Hormones	Rooted cuttings (%)	Unrooted cuttings (%)	Dead cuttings (%)	Mean number of roots per rooted cutting
Seradix 1	56.7a	24.4a	18.9a	1.3a
Seradix 2	62.2a	23.3a	14.4a	1.5a
Control (without hormone treatment)	58.9a	28.9a	12.2a	1.6a

Means followed by the same letters in each column are not significantly different at $P \leq 0.05$



Figure 2 Rooted cutting of *Tinospora crispa*



Figure 3 Rooted cuttings of *Tinospora crispa* two years after potting

The difference in rooting percentage with the length of cuttings could be due to the carbohydrates reserves in the longer cuttings which is more compared to the shorter ones (Hartmann *et al.* 1990). In other species such as *Khaya ivorensis*, its long cuttings rooted in higher percentages than short cuttings (60% versus 45%) (Tchoundjeu & Leakey 1996). Similar results were obtained with *Azadirachta indica* where cutting length of 25 cm significantly produced more rooting than the 12 cm and 5 cm cuttings. In fact no rooting was obtained with 5 cm cuttings (Palanisamy & Kumar 1977). Further evidence showed that a cutting's storage capacity of carbohydrates is an important determinant of rooting has been found in stem cuttings of *Eucalyptus grandis* (Hoad & Leakey 1996).

Experiments with other tree species have indicated highly contrasting responses to hormone treatments. The effect of hormones on rooting of cuttings varies with species. Some species like *Gonystylus bancanus* (Nor Aini *et al.* 2010), *Hibiscus tiliaceus* (Aminah *et al.* 2007), *Milicia excelsa* (Ofori *et al.* 1996) and *Nauclea diderrichii* (Leakey 1990) could produce high rooting percentage without hormone treatment. On the other hand, only 10% rooting was obtained if cuttings of

Cordia alliodora were not treated with hormone (Mesen *et al.* 1997). In some species, for example *S. macrophylla* (Lo 1985), *S. leprosula* (Aminah *et al.* 1995) and *Casuarina equisetifolia* (Aminah *et al.* 2009), hormone treatment only accelerated the rate of rooting. However in *Shorea parvifolia* and *S. macroptera*, hormone treatment not only increased rooting percentage but it also accelerated the rate of rooting (Aminah *et al.* 2006).

IV. CONCLUSION

Results of this experiment showed that *Tinospora crispa* can be propagated from cuttings and the recommended length is 22.5 cm. Seradix 2 can be used as hormone treatment. The technique will be more useful for production of elite clones.

ACKNOWLEDGEMENTS

The authors would like to thank the Ministry of Science, Technology and Innovation (MOSTI), Malaysia for the financial support.

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Structural Design of a Glass Facade

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Abstract- Façade Engineering is the art of resolving aesthetic, environmental and structural issues to achieve the enclosure of habitable space. Today lightness and transparency are properties that both architects and clients try to obtain. This has rapidly increased the use of glass in facades. By using steel as a load bearing structure, it is possible to keep the transparency restricting structures slim. The aim of this master's thesis is to gather together information on research, design and codes about the structural design in steel-glass facades. The use of glass in facades causes many problems due to the material properties of glass. Glass differs from other building materials in aspect of being an extremely brittle material and breaking without a forewarning. This material property of brittleness has to be taken into account when designing large glass facades. The requirements of designing load-bearing structures are normally gotten from either the glass supplier or the producer of glass pane elements, who both are thereby responsible for the strength and functionality of the fastening.

Index Terms- Façade, Brackets, Load Bearing Structures, glass Façade.

I. INTRODUCTION

Façade is a French origin word meaning the front face. The use of glass in the exterior facades provided more of light and good ambience to the occupant of the building which gave rise to the increasing use of glass. For the architectural point of view the use of glass gave aesthetic view to the building itself. A structure supported by aluminum frame work which is made up of Mullion and Transom is called as a curtain wall. Mullion is a vertical support or we may call it as a column, while the transom is a horizontal support likely to a beam. The first curtain walls were made with steel mullions, and the plate glass was attached to the mullions with asbestos or fiber glass modified glazing compound.

II. TYPES OF CURTAIN WALL GLAZING

Curtain wall meaning a set of aluminum profile like Mullion, Transom, Glass panel.

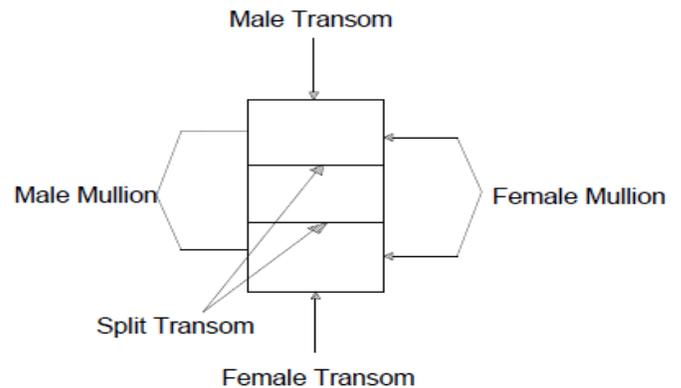


Figure: 1.1 Parts of Unitized System

There are three types of curtain wall

- 1.1 Stick System
- 1.2 Unit Panel System (Unitized)
- 1.3 Unit Mullion System (Semi unitized)

Above three we used the unit panel system which is also called as unitized system.

This system comes pre-assembled; it can be pre-glazed at the factory or shop, or glazed on-site. As such, it minimizes field labor and erection costs, and promises a shorter installation period than the stick system. Quality control issues can be significantly reduced in terms of site labor, especially with pre-glazed units, but assembly at the plant and transportation (due to bulk) increases its cost. Another disadvantage to pre-assembly is any site changes become difficult to accommodate. Assembly must be carried out in a specific sequence to ensure a proper fit. In a unitized system, the manufacturer must rely on qualified installers to ensure that the air seals are properly installed between the split mullions. Nevertheless, the unitized system is the most popular façade system according to manufacturer and it has performed satisfactorily when installed correctly.

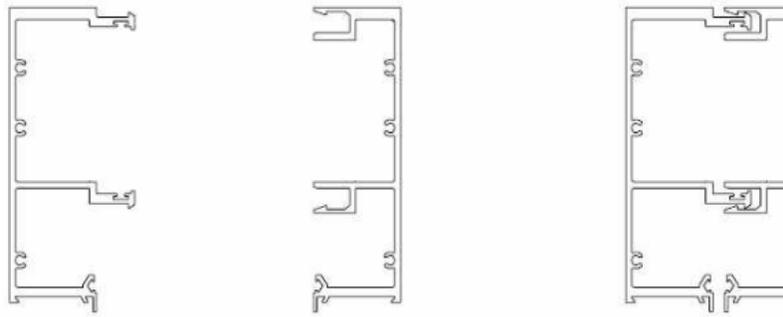


Figure: 1.2 E-Type Unitized System

Male Mullion and Female Mullion combine forms the unitized systems.

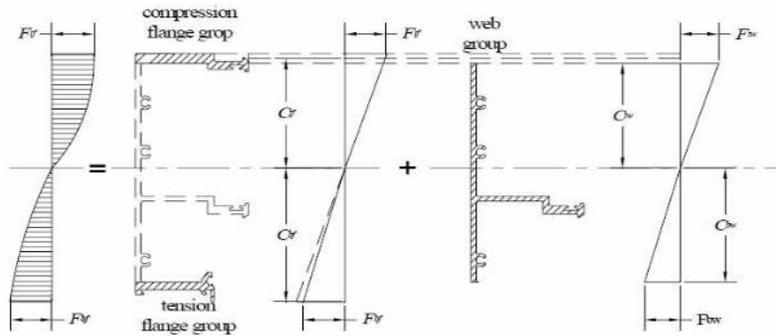


Figure: 1.3 Assumption of Stress Distribution

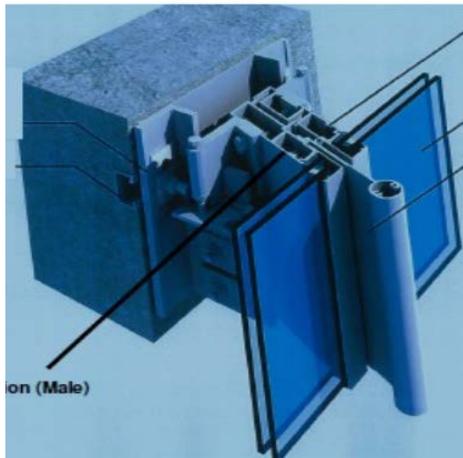


Figure: 1.4 Fixing details of unitized curtain wall system



Figure: 1.5 Unitized Curtain Wall Panel.

III. STRUCTURAL DESIGN

The Curtain Wall is designed to resist and handle all the imposed loads on it as well as keep air and water from penetrating in the building. The loads imposed on the curtain wall are transferred to the building structure through structural interface (i.e. brackets) which attaches the mullions to the building. The curtain wall is designed for the following Loads.

1. Dead Load
2. Wind Load

Applicable Standard Codes

IS 875-1987 (Part -1 Dead Loads) Indian Standard Code of Practice for Design
 IS 875-1987 (Part -3 Wind Loads) Indian Standard Code of Practice for Design

IS 8147-1976 Indian Standard Code of Practice for use Aluminum alloys
 IS 800-1984 Indian Standard Code of Practice for general construction in steel
 Software's used for Analysis & Design:

STAAD Pro V8i (For Structural Analysis)

WIND PRESSURE CALCULATIONS FOR FRAMING

A) Building Parameters :

Length	l	52500	mm	Ratio		For External Pressure
Width	w	16150	mm	h/w	3.56	Coefficient from Table-4 of
Height	h	57475	mm	l/w	3.25	IS 875-Part3

Typical Mullion Analysis

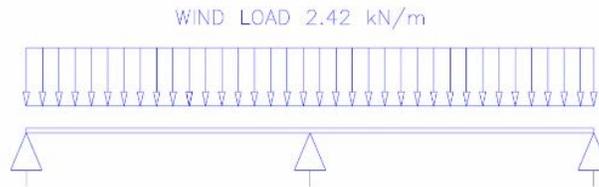


Figure: 1.6 UDL Due to Wind Load

Max Span (L) = 3.65m
 Max Cross Span (S) = 1.05m
 Number of transom per unit = 2
 Max BM = 4.02 kN/m
 Deflection Calculation of Mullion
 Max Deflection = 6.11mm From STAAD PRO
 Permissible Deflection (Lesser) = Span/175 = 20.86mm or 19mm
 Therefore Max deflection = 19.00mm
 > 6.11mm

From STAAD Results

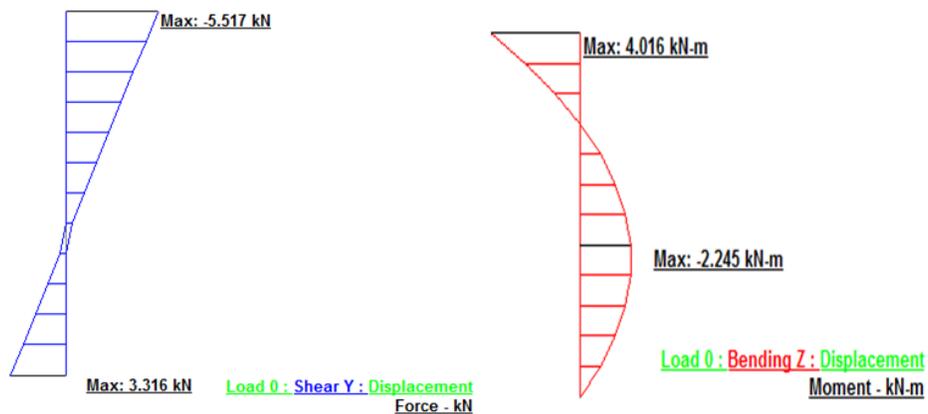


Fig:1.7 Shear Force Diagram For Mullion Fig: 1.7 Bending Moment Diagram For Mullion

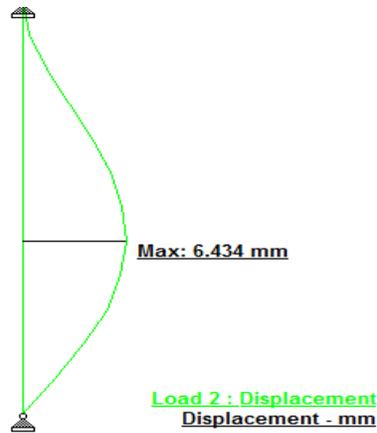


Figure: 1.8 Deflection Diagram For Mullion

Design of Glass: Using Code ASTM 1300

Glass module: 1.05m (a) x 1.220m (b)

Type of Glass = (10mm) + (12mm Air Gap) + (6mm)

Wind load = 2.305 kPa

The max centre deflection of the glass = 4.00 mm

Max allowable centre deflection of the glass = Span / 90 or 25mm whichever is less

= 1050/90 = 11.66 mm

Base Plate Design

Width (B) = 300 mm

Depth (D) = 300 mm

Thickness = 8 mm

Max BM = 0.46 kNm (BM/2)

Check For Connection Bolt

Max Vertical Shear Force = 2.6 Kn (V)

Max Horizontal Shear Force = 2.6 kN (H)

Resultant max shear (V) = 5.7 kNm

Check for mullion bending stress

Min Thickness = 2.5 mm

Dia of hole = 11.5 mm

No. of bolts = 2

No. of interference = 2

Bearing Stress = 49.14 N/mm²

Permissible bearing Stress (6063 T6) = 139 N/mm²



Figure: 1.9 Ex. Of Glass Façade building

IV. CONCLUSION

1. Glass has become a major element in designing modern commercial or public buildings. Load-bearing structures are wanted to be delicate systems with a transparent feel.

2. The use of steel in load-bearing structures improves the transparency of facades because it has been possible to keep the load-bearing structure slender.

3. The main aspect in designing steel and glass joints is to consider the special material properties and behavior of glass.

4. Glass fractures brittle without a forewarning. These properties and behavior concern normal float glass as well as laminated glass and safety glass.

ACKNOWLEDGMENT

At the completion of this M.E. (Civil-Structure) project, I feel obliged to extend my gratitude towards all those who made valuable contribution throughout the duration of the Project.

I would like to express my deep and sincere gratitude to my Guide Dr. Mrudula S. Kulkarni, Her wide knowledge and logical way of thinking have been of great value for me. Her understanding and personal guidance have provided a good basis for the present thesis.

I would like to express my deep and sincere gratitude to Mr. Vishal Sutar (S.B.U. Head, Façade Concept Design Pvt. Ltd, Navi Mumbai) for giving me an opportunity to work as an intern in his organization. His valuable inputs, precise guidance, incessant encouragement and vigilant supervision were instrumental in carrying out this work. I truly appreciate all the efforts, he and his staff took in helping me.

I would like to express my special thanks to my Husband Mr. Santosh Shejwal (Sr. Design Engineer at Tata BlueScope steel) for his assistance received during the study, which is highly appreciable.

I owe my gratitude to my family who have always stood by me and have encouraged me in my every endeavor. Last but not

the least, I express my thanks to all of my friends for their support during my project.

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Different Compositions of Bismuth-Lead Binary Alloy and their Mechanical Properties

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Abstract- In the present work, the different composition of Bismuth-lead binary alloys are grown by Zone- Refining Technique under a vacuum atmosphere on the basis of percentage of molecular weight 9:1, 5:5 and 1:9 ratios. The EDAX of these samples are done and the results are reported. The effect of temperature and load on the hardness of the grown alloy has been studied. Further the comparative studies of work hardening coefficients are reported.

Index Terms- EDAX, hardening coefficient, Micro hardness, Bi-Pb alloy, mechanical properties, Work hardening coefficient

I. INTRODUCTION

An alloy is a substance that has metallic properties and is composed of two or more chemical elements, of which at least one is metal. Authors have grown Bismuth-lead alloys by Zone- Refining Technique on the basis of percentage of molecular weight 9:1, 5:5 and 1:9 ratios. Zone refining is only one of a class of techniques known as zone melting in which a molten zone is passed down a solid rod. Zone melting is used routinely to collect impurities in high purity materials. Energy dispersive X-ray spectroscopy an analytical technique used for the elemental analysis or chemical characterization of a sample. There for the EDAX of the grown alloys are carried out. The results of EDAX are discussed in the result. For classifying materials, hardness test are performed more frequently than any other mechanical tests. In the present work, the micro hardness of the grown alloys are measured by Vaiseshika Vicker's micro hardness tester. Vickers Hardness is a measure of the hardness of a material, calculated from the size of an impression produced under load by a pyramid shaped diamond indenter. The work hardening coefficient (n) of the material is related to the load (p) by the relation $P=ad^n$, Where 'a' is an arbitrary constant. The work hardening coefficients of the grown alloys are investigated.

II. MATERIALS AND METHODS

The materials used for the present work are Bismuth and lead. Bismuth has a high electrical resistance, and has the highest Hall Effect of any metal. Bismuth rich alloys (>50 wt %) have the unique feature that they expand on solidification(Mustafa Kamal *et al.*, 2004).When Bismuth is alloyed with other metals such as lead, tin or cadmium, it forms low-melting alloys, which are extensively used for safety devices in fire detection and extinguishing systems(Rizk Mostafa Shalaby *et al.*,2009;

Mustafa Kamal *et al.*,2005).

Lead and its alloys can be fabricated by almost all commercial processes. It can, for instance, be extruded, drawn, rolled, cast, stamped, and spun and can be applied as a coating to other metals. Thick layers of lead can be bonded to steel or other metals to form lead claddings.

Bi-Pb alloy was prepared on the basis of percentage of molecular weight 9:1, 5:5 and 1:9 ratio. These samples were carefully melted in the oxidation furnace and shaken well in zone tube. These samples are successfully grown by Zone- Refining Technique under a vacuum atmosphere ($\sim 4 \times 10^{-2}$ mbar). The metals were melted together in a quartz tube which is 1.5 meter long and 2 cm diameter. The Electric motor which has very low rpm and having speed of 1.5 cm/hr, 1 cm/hr, 0.5 cm/hr and 0.25 cm/hr connected to the heating coil with very low friction trolley. The one end of the trolley is connected to the motor and the other end of this trolley is connected to the load. A series of molten zone passes in uniform one direction and also set the temperature up to melting temperature inside the tube. Apparatus of Zone - Refining Technique is shown in Fig.1. Samples grown by zone refining techniques are shown in Fig. 2.

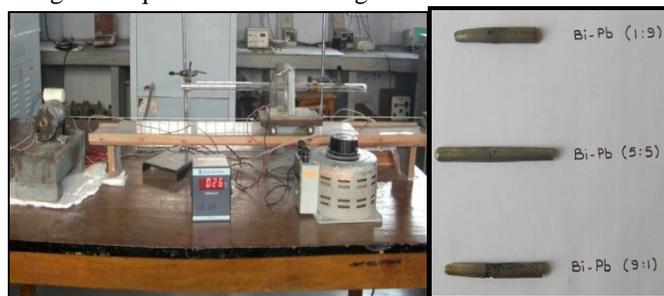


Figure 1 Zone - Refining Apparatus

Figure 2 Bi-Pb alloy

EDAX is a qualitative analysis and conformation test of mixture of two metals. The EDAX of the grown alloys are investigated as shown in figure-3 and discussed in the result.

To study the effect of temperature on the hardnesses of grown alloys the heating coil is used. The line diagram of the coil is 0.5 cm with 6 cm in length. In order to determine the effect of temperature on the micro-hardness of the grown alloys, they were carried out from temperature 303 K at an interval of 5 K by keeping the load of 0.020 kg, loading time of 10 seconds (Pandya G.R *et al.*, 2000). The graph of Hardness vs. temperature are plotted as shown in Figure-3. Then the effect of different loads from 0.005 kg at the

interval of 0.005 kg by keeping constant temperature and loading time of 10 seconds is studied (Adiyodi, A.K. *et al.*, 2009; Shah N. *et al.*, 2007) The graphs of Hardness Vs Load are plotted as shown in figure-4.

The work hardening coefficient (n) of the material is Related to the load (p) by the relation

$$P=ad^n \tag{1}$$

Where 'a' is an arbitrary constant. From (1)

$$\log p=\log a+n \log d \tag{2}$$

By comparing (2) with

$$y=mx+c, \tag{3}$$

Where, $y=\log p$, $x=\log d$ and $m=n=\text{slop}$ of the graph which represents the work hardening coefficient. (Ambujam K. *et al.*, 2006; Ushashree P.M. *et al.*, 2002; Pricilla Jeyakumari *et al.*, 2004). So from graphs of $\log p$ Vs $\log d$, the work hardening coefficients and the graphs are discussed in the result part and

III. RESULT

Energy dispersive X-ray spectroscopy of the grown alloys is shown in Figure 3. Data are shown in Table 1.

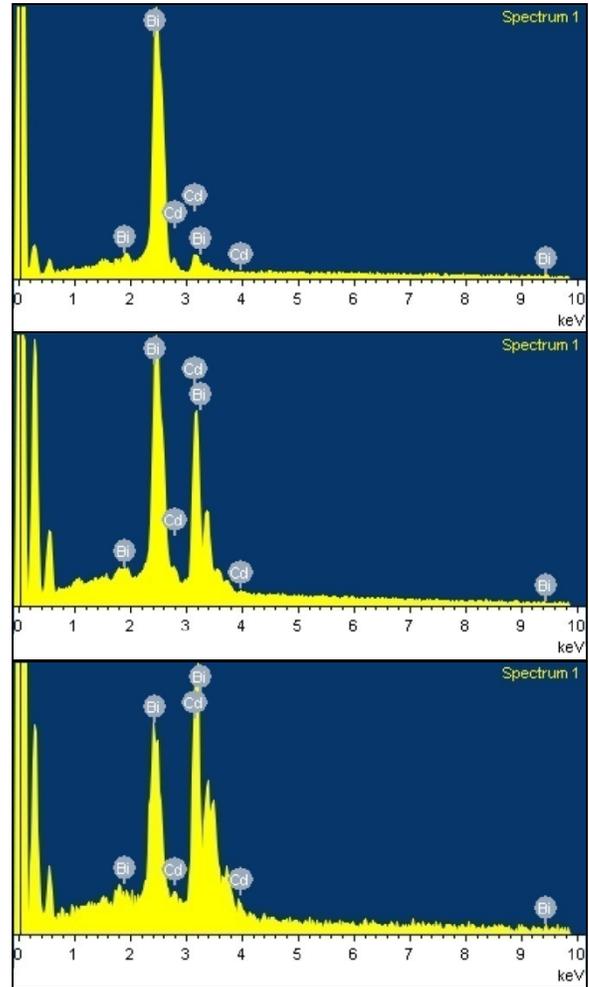


Figure 3 (a) EDAX for Bi-Pb (9:1) (b) EDAX for Bi-Pb (5:5)
 (c) EDAX for Bi-Pb (1:9)

Table 1: Data from EDAX for the grown alloys

Bi-Pb Composition					
9:1		5:5		1:9	
Weight %	Atomic %	Weight %	Atomic %	Weight %	Atomic %
77.54-	77.39-	93.68-	93.63-	20.07-	19.93-
22.46	22.61	6.32	6.37	79.93	80.24

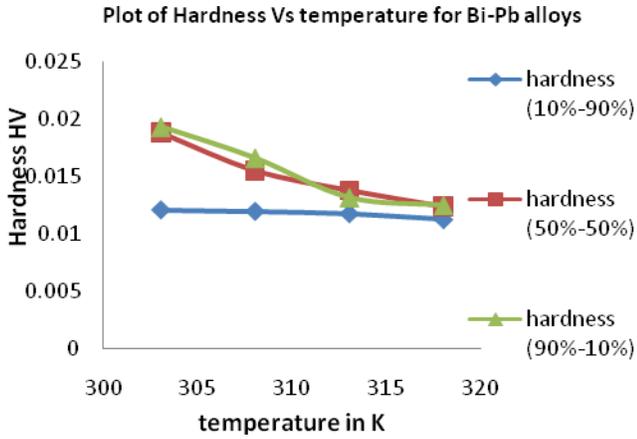


Figure 4 Graphs of Hardness vs. Temperature

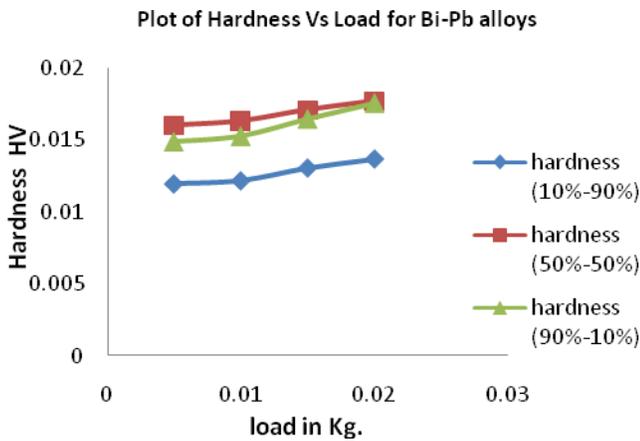


Figure 5 Graphs of Hardness vs. Load

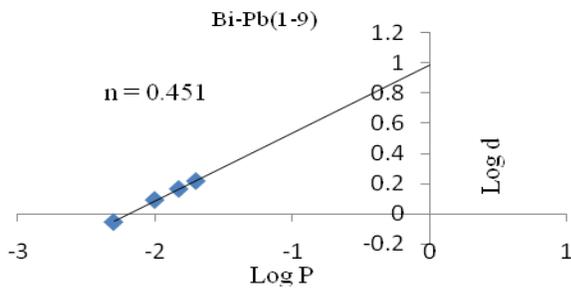


Figure 6 Plot of Log d vs. Log p for (1:9) Bi-Pb

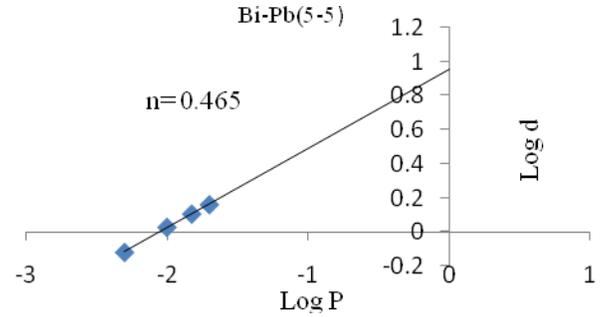


Figure 7 Plot of Log d vs. Log p for (5:5) Bi-Pb

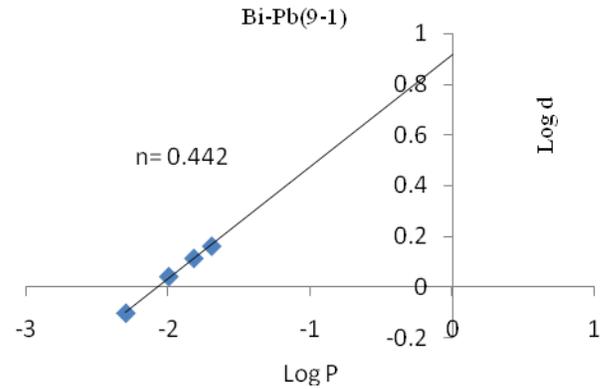


Fig. 8 Plot of Log d vs. Log p for (9:1) Bi-Pb

IV. CONCLUSION

The work hardening coefficient of 5:5 Bi-Pb alloy is 0.465 which is approx 0.5. The work hardening exponent (n) is known to be a good indicator for the work formability of materials. A material with a higher 'n' value is preferred for manufacturing processes which involve plastic deformation (M.R. Akbarpour *et al.*, 2008).

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A Study on Serum FSH, LH and Prolactin Levels in Women with Thyroid Disorders

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Abstract- Thyroid disorders both hypo and hyperthyroidism are frequently seen in women, the incidence of hypothyroidism is being much higher than hyperthyroidism. Reported studies in these two conditions on reproductive physiology in women and in experimental female animals have shown that both hypo and hyperthyroidism are associated with delay in onset of puberty, anovulation, various menstrual irregularities, infertility and spontaneous abortions. The present study conducted on the levels of FSH, LH and Prolactin in 36 women subjects between the age group 18 – 35 years out of which 10 are control, 26 are with thyroid disorders. In this 26 thyroid disorder patients 16 are hypothyroid cases and 10 are hyperthyroid cases. The result of the present study indicates that there is significant (>0.001) increased basal levels of serum LH as compared to FSH. Thus the ratio of LH: FSH altered from 1:1 to 6:1, and also there is significant (>0.001) increase in serum prolactin levels in hypothyroidism, where as no change in hyperthyroidism seen. From the present study it is concluded that the alteration in menstrual cycle and decreased reproductive performance of women are similar to polycystic ovarian disease and can be explained on the basis of altered hormone profile of LH, FSH and prolactin. Here increased levels of prolactin and LH with normal FSH in hypothyroid cases seen, indicating their susceptibility for the development of polycystic ovarian syndrome. There are normal levels of prolactin and FSH along with increased LH levels in hyperthyroid cases. In both hypo and hyperthyroidism menstrual irregularities and altered gonadotropin pattern are observed. This indicates that thyroid hormones play an important role in reproductive physiology.

Index Terms- hypothyroidism, hyperthyroidism, polycystic ovarian syndrome.

I. INTRODUCTION

The function of thyroid hormones include modulation of carbohydrates, proteins and fat metabolism, gene expression and also sexual and reproductive function,^[1] thus when the thyroid hormone gets out of balance, many body functions are affected. This is why hypothyroidism can mimic many other diseases.

Hypothyroidism is caused by insufficient production of thyroid hormones by the thyroid gland. Hypothyroidism has many effects on reproductive system development and function. The reproductive tract appears to develop normally in cretins, thus hypothyroidism during fetal life does not appear to affect the

normal development of the reproductive tract^[2]. Hypothyroidism beginning before puberty causes a delay in onset of puberty followed by an ovulatory cycle in women. In some cases juvenile hypothyroidism, precocious puberty and galactorrhoea have been reported^[3].

In women hypothyroidism is associated with delay in the onset of puberty, anovulation, amenorrhoea, polymenorrhoea, menstrual irregularities, infertility and increased frequency of spontaneous abortions. It was suggested that these alterations may be caused by decrease in gonadotropin secretion, due to hyper prolactinemia (prolactin levels are directly correlated with TSH levels).

In hypothyroid women changes in menstrual cycle suggests that thyroid disorders are associated with ovarian hyperactivity like hyperestrogenemia, hyper prolactinemia, impaired fertility. The effects of thyroid hormones on the impaired function of reproductive and to great extent is thought to be due to changes in TSH level, whose secretion overlaps with FSH, LH and prolactin and thus it may have overlapping function^[4].

Hyperthyroidism is due to overproduction of thyroid hormones. The most common underlying cause of hyperthyroidism is Graves's disease. Children born with neonatal Graves disease have no defects in the reproductive system that can be related to this disease. Hyperthyroidism occurring prior to puberty has been reported to delay the onset of menses^[5].

Similar to hypothyroidism, hyperthyroidism may also result in menstrual abnormalities in adult women. The more common manifestations are hypo, poly and oligomenorrhoea; moreover hyperthyroidism in women has been linked to reduced fertility. Reported studies indicate that menstrual disturbances in hyperthyroidism are 2 times more frequent than in normal population.

II. MATERIALS AND METHODS

The present study is carried out in the department of Biochemistry, S.V.S Medical College, Mahabubnagar. The relevant data is gathered from the Department of medicine, S.V.S medical college and Hospital during the year 2014-2015

The present studies include 36 women patients between the age group 18-35 years out of which 10 are control, 26 are with thyroid disorders. In this 26 thyroid disorder patients 16 are hypothyroid cases and 10 are hyperthyroid cases.

The hypothyroid cases have shown the symptoms like

- Enlargement of thyroid,
- Hair loss,

- Menstrual irregularities,
- Weight gain,
- Dry skin,
- Cold intolerance etc..

The hyperthyroid cases have shown the symptoms like

- Weight loss,
- Weakness,
- Menstrual irregularities,
- Depression,
- Vomiting etc...

In all the cases following hormones are estimated and confirmed the thyroid abnormality.

- Tri iodothyronine (T3)
- Tetraiodothyronine (T4)
- Thyroid stimulating hormone (TSH)
- Follicle stimulating hormone(FSH)
- Luteinizing hormone (LH)
- Prolactin.

Sample collection: - sample was collected from women patients between the age group 18 – 35years, during 2nd or 3rd day of menstrual cycle for the estimation of FSH and LH. All investigations are done by Two-site immunoenzymatic assay (AIA) method. By using TOSOH automated immunoassay system.

III. RESULTS

The present study was done by taking blood samples from 36 women patients who attended to S.V.S Hospital for thyroid hormone estimation as per their physician’s advice. In all these

cases T3, T4 and TSH levels are estimated. All patients belonged to the Age group 18- 35 years. Careful history regarding their menstrual history, number of children, age of the lost child, signs and symptoms of Hypo/Hyperthyroidism if any, were also recorded. Depending up on their results of T3, T4 and TSH they are categorized into 3 groups.

Group I: - In this group subjects with normal T₃, T₄ and TSH levels are included, and served as control group. Number of subjects 10.

Group II: - In this group subjects with decreased T3, T4 and increased TSH levels are included. Number of subjects 16.

Group III: - In this group subjects with increased T3, T4 and decreased TSH levels are included. Number of subjects 10.

Again in these 3 groups FSH, LH and Prolactin levels are also estimated.

In Group I patients the values of FSH, LH and Prolactin of thyroid hormones profile are with in the reported normal levels.

Group II patients have shown hypothyroid profile. The prolactin and LH levels are increase significantly (<0.001) with normal FSH levels. All 16 patients have shown hypothyroid symptoms and menstrual irregularities. Out of 16 patients 7 patients had oligomenorrhoea, 3 patients had amenorrhoea, 3 patients had polymenorrhoea, 2 patients had menorrhagia, and one patient had normal menstrual cycle.

Group III patients have shown hyperthyroid profile. FSH levels though normal, it is significantly lowered, as compared to group II and have very high LH values with normal Prolactin levels. All the 10 patients have shown hyperthyroid symptoms and menstrual irregularities. Out of 10 patients, 2 patients had oligomenorrhoea, 1 patient had amenorrhoea, 2patients had polymenorrhoea, 3 patients had hypomenorrhoea and 2 patients had normal menstrual cycle.

IV. SUMMARY OF RESULTS

Biochemical parameters	Values of	Group I	Group II	Group III
FSH <u>Normal values</u> NonmiDcycle -<20 mIU/ml, Midcycle - <40 mIU/ml,	<i>Mean</i>	4.86	6.2	2.15
	<i>SD ±</i>	1.86	2.7	0.92
	<i>SED</i>		0.9	0.65
	<i>t' value</i>		1.4	4.16
	<i>P' value</i>		NS	<0.01
LH <u>Normal values</u> BaselineLevel:-5- 20 mIU/ml, Serum Level :- 40 - 200 mIU/ml,	<i>Mean</i>	6.9	40.0	55.95
	<i>SD ±</i>	1.12	8.11	8.64
	<i>SED</i>		2.6	2.76
	<i>t' value</i>		12.7	17.77
	<i>P' value</i>		<0.001	<0.001

PROLACTIN <u>Normal values</u> Females :- 8.39 – 20.15 ng/ml	<i>Mean</i>	10.46	23.5	11.79
	<i>SD ±</i>	1.88	2.93	2.52
	<i>SED</i>		1.04	0.99
	<i>'t' value</i>		12.5	1.34
	<i>'P' value</i>		<0.001	NS
TSH <u>Normal values</u> :- 0.3 – 6.0 µIU/ml	<i>Mean</i>	2.22	25.3	0.14
	<i>SD ±</i>	1.28	3.25	0.084
	<i>SED</i>		1.08	0.40
	<i>'t' value</i>		21.3	5.2
	<i>'P' value</i>		<0.001	<0.001
T3 <u>Normal values</u> :- 0.9 – 1.9 ηg/ml	<i>Mean</i>	1.44	0.58	2.21
	<i>SD ±</i>	0.21	0.23	0.33
	<i>SED</i>		0.09	0.12
	<i>'t' value</i>		9.5	6.41
	<i>'P' value</i>		<0.001	<0.001
T4 <u>Normal values</u> :- 52 – 156 µ/ml	<i>Mean</i>	144.8	49.25	167.1
	<i>SD ±</i>	17.03	26.54	15.05
	<i>SED</i>		4.37	22.7
	<i>'t' value</i>		21.8	0.9
	<i>'P' value</i>		<0.001	NS

V. DISCUSSION

Review of literature and clinical evidence show that thyroid disorders in women are associated with frequent menstrual disturbances, impaired fertility and unsuccessful pregnancy [6, 7, and 8]. Animal studies have shown that hypothyroidism may lead to serious disturbances not only in development of the ovarian follicles but also their activity [9, 10, and 11].

According to the result obtained in the present study, in hypothyroid women, enhanced basal levels of prolactin and LH, normal levels of FSH are obtained. It results in alteration of LH: FSH ratio from 1: 1 to 6: 1.

This study confirms the published observations on elevated LH and prolactin levels on hypothyroid women, experimental studies on rats that suggest that formation of poly cystic ovaries in hypothyroid rats is associated with high levels of prolactin and LH. The present study also indicates that altered hormonal status of gonadotropins may be responsible for the irregular menstrual cycle, and also may predispose to development of polycystic ovarian syndrome in hypothyroid women.

According to Zahringers et al [12], LH secretion was increased in all hyperthyroid patients, while FSH secretion was increased in hyperthyroid men only. No changes in prolactin secretion were shown.

In the present study, the mean LH levels in hyper thyroid women are significantly higher than in euthyroid women, where as prolactin levels are normal. FSH levels though normal (<20mIU/ml), is significantly lower than in hypothyroid women. The mechanism of increase in serum LH and fall in FSH in

hyperthyroid women and the causes of menstrual irregularities in hyperthyroid women are not very clear.

VI. CONCLUSION

From the present study it is concluded that there is increased levels of prolactin and LH with normal FSH in hypothyroid cases, indicating their susceptibility for the development of polycystic ovarian syndrome. There is a normal level of prolactin and FSH along with increase LH levels in hyperthyroid cases. In both hypo and hyperthyroidism menstrual irregularities and altered gonadotropin patterns are observed, indicating that the thyroid hormones play an important role in reproductive physiology.

ACKNOWLEDGEMENT

We are highly grateful to the Institute and Management for providing facilities to carryout the work.

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Cytological Screening for early Diagnosis of Cervical Intraepithelial Neoplasia (CIN) and early Carcinoma of Cervix.

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Abstract- This study was an prospective study conducted on 500 women attending OPD of D. Y. Patil Hospital, Kadamwadi, Kolhapur.

Aim of D. Y. Patil study was to know the efficacy of Pap Smear cytology in screening for early diagnosis CIN & ca Cx & co-relation of cytological finding with histological findings.

It was found that, elderly age group women are at incensed risk of precancerous & cancerous lesions of Cx. Women who were of < 16 years at the time of there marriage are at increased risk of precancerous & cancerous lesion of cx. In this, women who were married >40 years are at increased risk of precancerous lesions & ca cx women with parity 3 – 4 are at increased risk of precancerous lesion CIN & ca cx in this study out of 500, 316 women having c/o White discharge per vaginum (WDPV) 86 women have precancerous lesion of cx & in this out of 195 women having absence of White discharge per vaginum (WDPV) 16 women's have precancerous lesion. In this women's having c/o PCB 62% has precancerous lesion & women not having c/o post cotal bleeding 16% has precancerous lesion. In this out of 60 women who had menstrual disturbans 30 women have precancerous lesions.

In this study out of women who had intermenstrual bleeding 40% women have precancerous lesions, & only 16% precancerous lesions are seen in women not having intermenstrual bleeding. In this study out of 310 women who are in lower socioeconomic class, 68 had precancerous lesion & 175 women who are in medal class, 35 had precancerous lesion. In this, women who were not using any contraception are at increased risk of precancerous lesion.

Index Terms- CIN) Cervical Intraepithelial Neoplasia, (Ca Cx) Carcinoma Cervix, PCB post coital bidding

I. INTRODUCTION

According to the World Health Organization, cervical cancer is the second most common type of cancer among women's, and was responsible for over 250,000 deaths in 2005. Approximately 80% of these deaths occurred in developing countries. Without urgent intervention, deaths due to cervical cancer are projected to rise by almost 25% over the next 10 years.

Cancer cervix has been considered preventable because it has a long preinvasive state and availability of screening

programs and treatment of preinvasive lesions is effective. It has been well established that well-organized screening by cytology has substantially reduced the incidence of morbidity and mortality from cervical cancer in developed countries.^{1,2,3}

Many developing countries do not have ample resources to implement cytology-based prevention programs, which necessitates well-organized laboratories to collect material and specialized personnel apt to render a diagnosis.⁴

The goal of screening of carcinoma of cervix is to diagnose and treat carcinoma cervix in early preinvasive states make the disease ideal for screening procedures. Here is the importance of a simple and relatively inexpensive procedure which could help to prevent a benign curable condition from developing into life threatening proportions. But the fact must be accepted that in the best of hands cervical smears are only an indicator. False negative are up to 15-30% in most cases.⁵ the final diagnosis must be made on pathological studies.

The success story in most developed countries can be attributed to a well executed screening programme, But in country like India where the revenue and resources are limited the results also have its limitations. For a programme like cervical screening to be successful in India it would require mass screening, A regular follow up with an accessible and affordable treatment and above all a good public awareness which at the present stage is a virtue of the elite who are at a lower risk.

II. METHODOLOGY

Study was carried out for a period of the year form May 2012 to Aug. 2014 in Dept. of OB/GY in D. Y. Patil Hospital, Kadamwadi, Kolhapur.

Aim was cytology screening for early diagnosis of CIN & early Ca Cx.

Objectives are to study efficacy of pap smear cytology for CIN & Ca Cx and to evaluate & interpret cases of epithelial lesion. According to Bethesda 2001 classification system & correlation of cytological finding with histological findings.

Informed consent was taken from each woman. Relevant obstetric & gynecology history was taken & recorded.

Inclusion criteria

Women of age (married) between 16-65 years presenting to the gynaec OPD with/without symptoms.

Women with symptoms like vaginal discharge, postcoital bleeding,

postmenopausal bleeding, intermenstrual bleeding and persistent leucorrhoea not responding to antibiotics.

- Women with normal looking cervix but symptomatic.
- Women with cervical lesions like polyps, erosion, hypertrophied cervix, cervix with nabothian cyst.

Women with clinical evidence of acute pelvic infection
Exclusion criteria

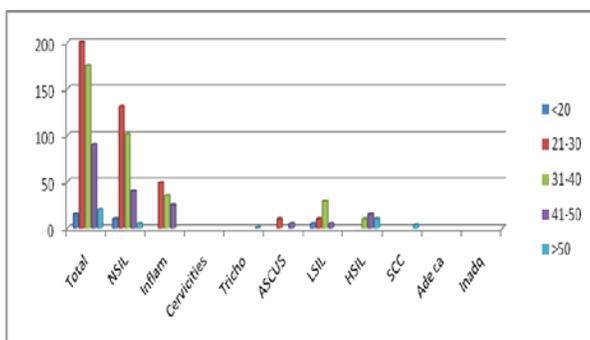
- Women with bleeding at the time of examination.
- Women who had been previously treated for carcinoma cervix
- Pregnant women.

- Women with frank lesions.
 - Women with previous cervical surgery
- Women's were subjected to pap smear & Cervical biopsy
Cervical smear reporting as per Bethesda 2001 clarification.
Biopsy was taken from abnormal area of categorized in to
normal / Inflammatory
Chr. Cervicitis
CIN – I. II. III
Sq. Cell Ca
Adeno Ca

III. RESULTS

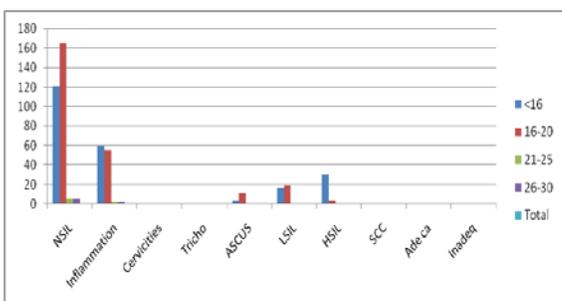
AGE DISTRIBUTION :-

Elderly age group women are at increased risk of precancerous & cancerous lesion of cervix.



1) AGE AT MARRIAGE :-

Women who were <16 years at the time of their marriage are at increased risk of precancerous & cancerous lesion of cervix.



1) YEARS OF MARRIAGE:-

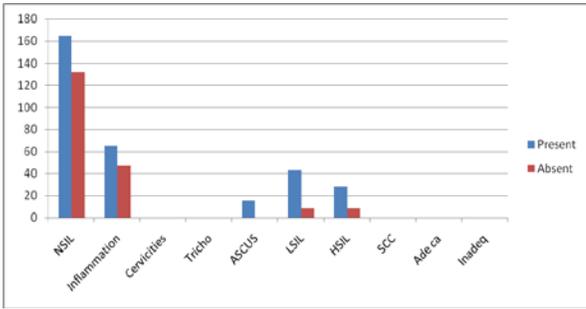
women who were married >40 years are at increased risk of precancerous & cancerous lesion of cervix.

2) PARITY:-

women with parity 3-4 are at increased risk of precancerous & cancerous lesion of cervix.

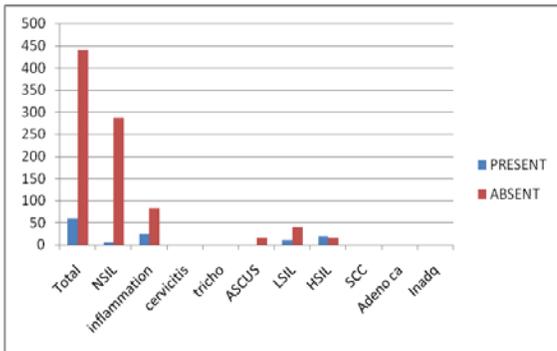
3) POSTCOITAL BLEEDING:-

women's having complaint of post coital bleeding 62% has precancerous lesion and women not having complaint of post coital bleeding 16% has precancerous lesion.



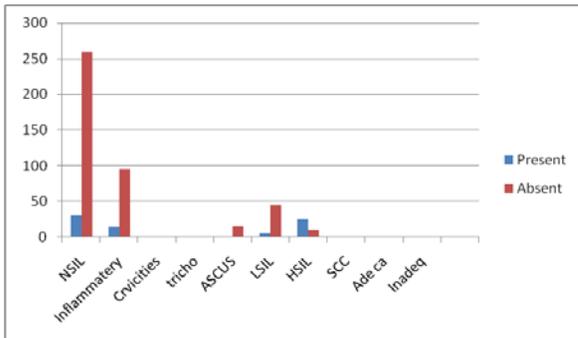
4) MENSTRUAL DISTURBANCES:-

In this study out of 60 women who had menstrual disturbances 30 women have precancerous lesion.



5) INTERMENSTRUAL BLEEDING:-

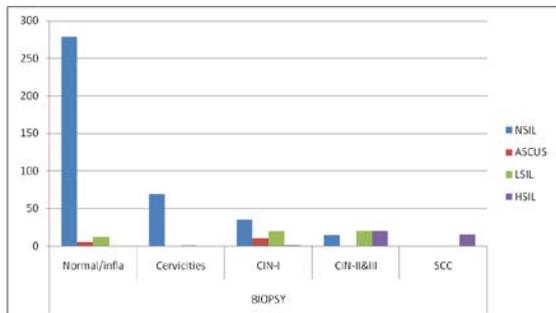
In this study out of women who had intermenstrual bleeding 40% women have precancerous lesion. And 16% precancerous lesion are seen in women’s not having complaint of precancerous lesion



6) SOCIOECONOMIC STATUS:-

In this study out of 310 women who are in lower socioeconomic class,68 had precancerous lesion & 175 women who are in middle class,35 had precancerous lesion.

7) CORRELATION OF CYTOLOGICAL FINDING WITH HISTOPATHOLOGICAL FINDING :-



- 397 NILM279 Normal/Inflam, 69 Cervicitis, 35 CIN-I, 14 CIN-II&III
- 16 ASCUS.....5 Cervicitis, 10 CIN-I
- 52LSIL.....12Normal/Inflam, 1 Cervicitis, 19 CIN-I, 20 CIN-II&III
- 36HSIL.....1CIN-I,20 CIN-II&III, 15SCC

SENSITIVITY=TP/TP+PN = 85/85+49= 85/134= 63%

SPECIFICITY= TN/TN+FP=348/348+18=348/366=95%

DIAGNOSTIC ACCURACY= TP+TN/TP+TN+FP+FN= 348+85/85+348+49+18= 433/500= 86%

IV. DISCUSSION

Cervical cytology-Sensitivity

Study	Sensitivity	Reference Standard
Goel et al (2001)	50.0	Colposcopy/Biopsy
Hendrik S Cronje et al	53.3	Colposcopy/Biopsy
R. Sankaranarayanan et al ¹⁴ (Multicentric- 2003) Kolkata Trivandrum Mumbai	36.6 72.3 70.0	Colposcopy/Biopsy
Present study	63	Biopsy

In a study conducted by Goel et al the sensitivity of Pap smear was found to be 50%. In a study by Cronje HS et al reported sensitivity was 53.3%.

A multicentric study by Sankaranarayanan et al showed sensitivity of Pap smear ranging from 36.6% to 72.3%. In the present study, the sensitivity of Pap smear was 63%e which is in correlation with Goel et al (2001) and R. Sankaranarayanan et al (Multicentric- 2003) at Kolkata.

Cervical cytology-Specificity

Study	Specificity	Reference Standard
Goel et al (2001)	97.0	Colposcopy/biopsy
Hendrik S Cronje et al	97.0	Colposcopy/biopsy
R. Sankaranarayanan et al ¹⁴ (Multicentric-	94.6 87.2 97.9	Colposcopy/biopsy

2003) Kolkata Trivandrum Mumbai	98.6	
Present study	95	Biopsy

In a study conducted by Goel et al the specificity of Pap smear was found to be 97% In a study by Cronje HS et al reported specificity was 97%

A multicentric study by Sankaranarayanan et al showed specificity of Pap smear ranging from 87.2% to 98.6% In the present study, the specificity of Pap smear was 95.0 which are in correlation with Goel et al, Cronje HS et al and by Sankaranarayanan et al at Trivandrum.

As a screening test, the Pap smear has been found to have a low sensitivity, between 50% and 80%, resulting in a high false-negative rate of 9-40%. However, the specificity of cytological evaluation is high. The sensitivity of the Pap smear has been found to be even lower in developing countries. The possible reason for this may be the large percentage of cervicitis and inflammatory smears, which mask mild dysplasia.

AGE

The mean age of our study population is 35.3 +10.2 years. Women with age group of 31- 50 years are likely to have more precancerous lesions

Hence from the above data, screening for cervical cancer before the age of 35 is necessary to detect premalignant lesions.

AGE AT MARRIAGE

The mean age at marriage of this study group is 16.8 + 2.29 years, which is an important risk factor. 40.7% of the participants are married at age less than 16 years. Women with age at marriage less than 16 years are likely to have more precancerous lesions Early marriage is still prevalent in India particularly in rural setup. Education and stringent laws are important to tackle this social problem.

DURATION OF MARRIED LIFE

Long duration of marital life and hence prolonged sexually active period has been implicated as a risk factor. Women married for more than 30 years likely to have more precancerous lesions

PARITY

High parity (para 3 or more) has also shown significant association with pre-cancerous and cancerous lesions. Women with parity of 3 and more are likely to have more precancerous lesions .

SOCIO ECONOMIC STATUS

61% of lesions were seen in patients belonging to the low socioeconomic status (as per the B. G Prasad classification). The reasons for this distribution may be early age at marriage, multiparity, malnutrition and early health seeking.

SYMPTOMS

Even though white discharge is present in 77.7% of the participants this complaint is not significantly associated with the risk of precancerous lesions compared to history of post coital bleeding which significantly associated with precancerous lesions and invasive cancer . Hence these patients should be promptly evaluated for presence of malignancy.

Limitations of this study

In this study, sample is selected from the population attending OPD. This population is not representative of general population. Hence when these tests are used for screening in general population the estimated sensitivity and specificity may not be achievable.

V. CONCLUSION

1. The regular screening of population by Pap smear is a cost-effective method for early detection of premalignant and malignant cervical lesions and down staging of carcinoma cervix. The procedure is simple, inexpensive and can be performed in the outpatient department. Hence, it should be recommended routinely as a method of improving reproductive health, & as a mans screening programme. It is cost effective & easy to perform can also be done by medico as well as trained medical co-workers.
2. Considering the high rate of cervical neoplasia in developing countries, there is a great need for an organised, well-targeted screening program. It should involve periodic gynaecological examinations along with education of women about danger signals. It will certainly bring down the high mortality due to carcinoma cervix and above all will alleviate the suffering caused by this disease.
3. As with all screening tests, cervical cytology is also limited by both false negative and false positives. To bring down false negative and false positive rates pathologists should have sufficient time to screen every slide completely and thoroughly with knowledge, concentration, skilled judgement and a relaxed mind.
4. For increasing sensitivity of pay smear it can be combined with other screening procedures like colposcopy, VIA, VILI.
5. In this study sensitivity of pap smear is 63% & Specificity is 95% with diagnostic accuracy of 86%.

ACKNOWLEDGEMENTS

We thank everyone who have helped us in the course of the study.

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Student Teachers' Knowledge of Biodiversity

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Abstract- Within this Decade on Biodiversity from 2011-2020, educational institutions are expected to play a critical role to educate their students for better understanding of biodiversity. According to the United Nations, the ultimate aim of the Decade on Biodiversity is to ensure the integration of biodiversity considerations into work related to the core issues of sustainable development. In the Decade on Biodiversity, knowledge about biodiversity is crucial because the outcomes of human activities nowadays are affecting the equilibrium of biodiversity in the world. Biodiversity education becomes necessary to educate people and promote awareness on biodiversity. Teachers are most influential in educating people to protect biodiversity and integrate it through biodiversity education. Teachers should be knowledgeable about biodiversity to ensure the successful integration of biodiversity education in teaching. This paper reports on various aspects of knowledge of biodiversity among student teachers, thus their readiness to integrate biodiversity education in teaching. The results suggest future study directed towards the need for more concerted effort in teacher education to prepare teachers with the necessary knowledge to integrate biodiversity education.

Index Terms- Biodiversity, Knowledge, Education, Student Teachers.

I. INTRODUCTION

Education is a key factor in developing public knowledge and awareness about issues that affect biodiversity across the world. Environmental problems that affect biodiversity have become issues of great concern to many people today. A concern for biodiversity loss has led the United Nations to declare 2011-2020 as the Decade on Biodiversity. The objective of the Decade on Biodiversity is to promote public awareness on biodiversity and mainstream biodiversity consideration into priorities [1]. Moreover, CBD [2] identified the need for a biodiversity awareness programme as a national responsibility. To achieve the aim of the decade, there is a need for the public to have knowledge about biodiversity.

Today's education system no longer emphasizes environmental problems per se, but is focused on fostering environmental literacy, attitudes and values. Biodiversity is declining rapidly due to human activities such as harvesting, pollution, overexploitation, habitat destruction and modification and the introduction of exotic species [3, 4]. A deep concern that the loss of biodiversity and deteriorating ecosystem contribute to imbalance of the nature is needed among the public. Therefore, specific knowledge on biodiversity is required from teachers and

student teachers who are involved in educating future generations. As educators, they should: (1) relate new scientific knowledge to everyday life and (2) critically judge and analyse information [5]. Student teachers should be aware that they would have to equip their students for living [6] and shaping a better future. Knowledge about biodiversity is crucial because the outcomes of human activities today are affecting the equilibrium of biodiversity in the world. Teachers' insufficient knowledge is reflected in students' knowledge [6]. Therefore, Biodiversity education has been proposed to encounter the lack of knowledge about biodiversity. Biodiversity education requires a teaching approach that can educate the public to understand biodiversity. This requires the construction and critical use of knowledge, the critical analysis of the role of natural sciences and an awareness of the scientific and non-scientific aspects [7].

This study is grounded in Lee Shulman and his colleagues' work related to teacher knowledge [8]. Shulman [9] proposed seven categories of teacher knowledge: content; pedagogy; curriculum; learners and learning; contexts of schooling; educational philosophies, goals and objectives; and pedagogical content knowledge. Teachers need to comply to current standards. Thus they must have in-depth understanding of content knowledge, be flexible, and are able to guide their students in learning as well as avoid them having misconceptions. It is important that teachers see the interconnectedness of ideas that come from different areas, and be able to relate these ideas to everyday life. As such, their understanding will form a sound foundation for their pedagogical content knowledge, with which they will be able to help their students learn better [9]. In Shulman's theoretical framework, teachers need to master two types of knowledge which is content knowledge and knowledge of curricular development. Content knowledge refers to extensive and in-depth knowledge of the subject matter.

There are limited studies to determine Malaysian biology student teachers' current position with respect to knowledge of biodiversity. Thus the main objective of this research is to explore student teachers' knowledge of biodiversity.

II. METHODOLOGY

This study is a survey method to explore the knowledge of biodiversity among student teachers from the field of science.

A. Sample

This study focuses on student teachers trained to teach biology for secondary school education. The sample involved in this

study consists of 60 student teachers from science education field. These student teachers are in their fourth year of an undergraduate science education degree program. They also enrol in courses from the pure sciences including biology as well as courses in the field of education. Thus, these student teachers are expected to have sound knowledge about biodiversity.

B. Instrument

The instrument is a questionnaire divided into two sections. The first section refers to demographic data of the respondents. The second section consisting of 20 items covering knowledge of biodiversity. 15 items are presented with a four point Likert scale choice and the remainder five items are open ended questions. This paper reports findings based on part of the questionnaire and the open ended questions.

III. RESULTS AND DISCUSSION

The data revealed that overall knowledge about biodiversity among student teachers is good because the mean score obtained is 75.58% of the maximum score. Knowledge about biodiversity is essential since human activities have affected the balance of biodiversity in the world. Thus Biodiversity Education is important to educate the public and promote awareness of biodiversity. According Nováček [10], the first step in the educational process is important, and in this case it is to assess student teachers' understanding of biodiversity [10]. Therefore, the ability to define biodiversity seems important to ensure proper understanding of the topic.

A. Definition of Biodiversity

When asked whether they can define the term biodiversity, 93.4% of the student teachers reported that they can. However, only 53.8% of them can define biodiversity as variability of living things. They are not able to explain in more detail about the term. Analysis of open ended questions provided more detail about student teachers' knowledge on biodiversity. Five aspects emerged from the definition of biodiversity given by the student teachers. These are diversity, living things, species diversity, genetic diversity and ecosystem diversity. 10% of the respondents were not sure that they can define biodiversity. Aspects of genetic diversity were also not directly stated in the definition of biodiversity. Fiebelkorn and Menzel [11] also found that the teacher ignores genetic diversity as part of biodiversity and are often unable to explain the difference between species diversity and genetic diversity. Another 90% of student teachers are able to define it even though not as specific as the definition provided by the Convention on Biological Diversity (CBD). The CBD defines biodiversity as "the variability among living organisms from all sources including, among other things, terrestrial, marine and other aquatic ecosystem and the ecological complexes which they are a part. This includes diversity within species, between species and of ecosystems". Biodiversity may be considered at three levels which is genetic diversity, species diversity and ecosystem diversity. Based on the definition given by student teachers, about 54% of them can define biodiversity very generally as the variability among living organisms. About 13% defined biodiversity as the variability among living things

and non-living things. Other studies that examine the term biodiversity also showed that respondents have less exposure to the biodiversity term. According to Lindemann-Matthies and Bose [1], 60% of school students who studied in Switzerland and adults were not familiar with this term. Nevertheless, the findings of this study showed that the respondents are familiar with this term but can define it very briefly. It is agreed by [13] in a survey of 125 students at the University of Stirling, United Kingdom that respondents frequently mention the terms species, biologists, vegetation and diversity in terms of biodiversity thus showing a lack of knowledge on biodiversity.

B. Aspects of Biodiversity Knowledge

Knowledge of biodiversity is divided into four themes: threats to biodiversity, issues related to biodiversity, importance of biodiversity and biodiversity strategy. The themes are chosen according to the scope of knowledge about biodiversity that should be possessed by the teacher to ensure that prospective teachers have good knowledge about biodiversity. The mean scores for the four themes are 56%, 33%, 77% and 90% of the total score respectively. 95% of the student teachers agreed that they can list the principal threats to biodiversity. From the open ended question, the student teachers in this study can only identify five aspects of threats on biodiversity. These are human activities (15% of student teachers), illegal logging (13%), pollution (13%), development (15%) and destruction of habitat (3%). From the responses provided and the percentage of student teachers who can identify the threats, student teachers show limited knowledge about threats to biodiversity. Nevertheless, they can relate certain human activities to threats. For example, illegal logging occurs because of human greed for money and this can lead to the extinction of species, pollution and food insecurity.

They were questioned about the relevance of biodiversity to real world issues and 91.6% agreed on this relevance. Most of the student teachers are aware of the underlying issues and perspectives regarding the controversy in conservation of biodiversity. For example they were able to explain the controversy between the opinions of environmentalists and economists. This includes difference in opinion with regard to allowing activities that harm biodiversity to take place, illegal logging and the emphasis on development. They are also able to explain the decline of biodiversity as a result of development activities, deforestation, pollution and so on [3]. Biodiversity loss can cause human disease, lack of food and environmental disaster [14]. Even though some of them claim that they understand the relevance of biodiversity to real world issues, yet they are unable to provide further explanation when asked to give examples. Their numbers make up 36.4% of the student teachers. Therefore, training in biodiversity education is necessary to enhance student teachers' content knowledge for successful integration of biodiversity education.

93.3% of the student teachers agreed that they can list specific examples of the importance of biodiversity to human societies. However when they were asked to list the examples, about 33.9% said they were not sure and were unable to provide the list. Student teachers who can list specific examples of the importance of biodiversity to human societies show that they

understand the importance of biodiversity. For example, they know that biodiversity is the source of food, both for humans and animals. They also stated that biodiversity functions as a source of other needs of living organisms, such as oxygen, habitat and medicine. They commented that biodiversity is necessary for the continuation of the energy cycle. They can even provide examples of the species that is used to provide medicine, such as the Bitangor tree. From the answers given, student teachers can relate biodiversity with economic development, social development and environment. It is also agreed by [15] and [7] that biodiversity education is related with social relationships and the environment.

Respondents in this study (85%) indicate that they knew the strategy to protect biodiversity and ways to promote the importance of biodiversity to society. Some of them also suggest that we need to explore biodiversity around us to enable others to understand the concept of biodiversity. Exploring the forest, different habitats and visit to gardens are also suggested as ways to provide experience about biodiversity. Campaigns through social and mass media are also recommended as alternative ways to promote biodiversity. The findings support the study by [16]. Respondents understand the concepts related to the biodiversity in nature, landscape management and have a clear concept about the functions of biodiversity. However, the case study conducted by [17] in Utah showed that the respondents have less knowledge on the concept of biodiversity. Nevertheless, the respondents remained concerned about the extinction issue of endangered species and habitats. Meanwhile in the [11] study, prospective science teachers were found to have basic knowledge about strategies related to biodiversity and strategy for conservation. The concept of biodiversity has been described as a difficult concept by [18] and other studies have shown understanding and knowledge about biodiversity is very limited [11, 13]. The difficulty of the concept resulted in respondents to have a relatively limited knowledge about environmental issues such as the greenhouse effect, ozone layer depletion and acid rain. In addition, according to [19], the majority of student teachers are not sure about the term biodiversity and this resulted in their incompetence to teach biodiversity issues in the classroom. It is also agreed by [11] that prospective science teachers were found to have limited knowledge about strategies related to biodiversity and conservation.

Student teachers should be knowledgeable about principal threats to biodiversity in order to integrate biodiversity education in their teaching.

IV. CONCLUSION

The findings from this study show that student teachers possess good knowledge about biodiversity. They will be able to give proper guidance to their pupils about biodiversity when they become teachers. However, some of them show limited knowledge about biodiversity and methods of addressing biodiversity. Thus, there is a need for future studies directed towards identifying the needs of student teachers in their training program to enhance their knowledge about biodiversity, thus enhancing their ability to integrate biodiversity education.

ACKNOWLEDGMENT

The authors wished to acknowledge the Short Term Grant provided by Universiti Sains Malaysia, Malaysia. We also thank the respondents involved in this study

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Cellular handover approach for better efficiency in 3G cellular system

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Abstract- With the advancement of technology, mobile devices nowadays incorporate multiple Radio Access Technologies (RAT). So, switching from one RAT to another becomes obvious. This procedure is called vertical handover. Universal Mobile Telecommunication System (UMTS) and Wireless Local Area Network (WLAN) are two such networks whose interoperability is being studied for years. WLAN covers relatively smaller area but provides a high data rate, on the other hand, UMTS covers a larger area but has comparatively lower data rates. We know heavy load on a particular cell can deteriorate its performance. Therefore, both the networks can co-ordinate to facilitate each other if loads of their neighboring cells are quite high. In this work we propose a dynamic load balancing heuristics using adaptive handover thresholds, which adapts as per the traffic load in a given cell. This can improve the service provided to the end users who are at the edge of the cell or closer. The metrics for performance considered in this work are outage probability and handover area.

Index Terms- Adaptive Hysteresis, Adaptive Threshold, Cell breathing, Load balancing, Vertical Handover Algorithm..

I. INTRODUCTION

Since the rollout of 3rd Generation (3G) cellular systems, the network providers have experienced an ever-growing subscriber base. In today's era where everyone wants to remain connected to the network seamlessly, the network operators find it difficult to manage the overall traffic load. Therefore, if heterogeneous networks co-ordinate to share load then better performance can be achieved. Two such networks considered here are Universal Mobile Telecommunication System (UMTS) and Wireless Local Area Network (WLAN). UMTS provides data rates of 384 kbps to 2 Mbps whereas WLAN provides data rates of up to 54 Mbps. Hence, co-ordination with WLAN can help UMTS users achieve higher data rates. On the other hand, UMTS provides wide-area coverage, so, coordinating with it, WLAN, which has comparatively smaller coverage area can provide seamless connectivity to its users on the move.

The concept seems feasible in today's era because there are cities in some countries where there are areas are intended to be completely Wi-Fi (or WLAN) enabled. Wirelessness seems to be the buzz word of the current generation. As such with the enhancement of wireless security the WLAN has also crossed the traditional walls of college campuses, airports, offices etc.

As the literature survey mentions, the concept of vertical handover is not novel and has been accepted and used since a decade or more. As we know, a well-known vertical handover is one that takes place between Global System for Mobile communication (GSM) and UMTS in majority of places because the rollout of UMTS or 3G spectrum was in phases, in most of the geographies. In this work vertical handover between UMTS and WLAN is being studied. The algorithm has been equipped to adapt the Received Signal Strength (RSS) threshold according to the load of the cell. The load of a cell causes major signal attenuation to the users who are there at the edge of the cell or in the vicinity.

Nowadays users not only want to remain connected to the network but also want to experience the best service. Always Best Connected (ABC) [3] is the basic idea behind most of the algorithms today. So, the users close to the border of the serving cell even need to be served as the ones closer to the centre of the cell. Keeping this in mind the handover algorithm measures the RSS and compares it against calculated hysteresis and threshold values to make the decision for handover. Any handover procedure can be divided into three phases [2]: a) Measurement, b) Decision and c) Execution.

a) Measurement Phase: In the measurement phase necessary parameters such as RSS, data rate, user preference etc., are taken into consideration for measurement to make the handover decision.

b) Decision Phase: In the decision phase measurement results are compared against the predefined or pre-calculated thresholds and then it is decided whether to initiate the handover or not. Different handover algorithms have different trigger conditions.

c) Execution Phase: In the execution phase, the handover process is completed and the relative parameters, such as operating frequency etc. (if required) are changed according to the different types of handover.

When a cell has low traffic then it can serve a larger area. On the other hand, with the increase in traffic the cell tends to serve a relatively smaller area. This is called cell breathing [6]. Also, with the increase in traffic load in a particular cell the performance of that cell or in other words, the RSS for each Mobile Station (MS) deteriorates. Therefore, the adjacent cells, which have lower load can co-ordinate to share the load. The threshold at which handover is to take place can be set according to the load of that particular cell.

II. MATERIALS AND METHODS

There are several factors responsible for handover initiation to take place [5]. RSS and hysteresis are some of the parameters which serve to decide for the handover to take place. Several algorithms mentioned in the literature have used these parameters. Nevertheless, when heterogeneous networks are taken into consideration then signals of two different networks cannot be compared [1]. Therefore, normalized power from the two networks is taken into consideration for comparison.

System Model:

The Third Generation Partnership Project (3GPP) mentions the UMTS network as UMTS Terrestrial Radio Access Network (UTRAN) [20]. UTRAN consists of NodeB, also referred to as base station in case of GSM. NodeB provides the services of the UMTS network to the MS. Similarly, the WLAN network has an Access Point (AP), which provides services to the devices under that network. The MS here is considered to move with constant speed from NodeB towards the AP in linear motion. Meanwhile, the RSS is calculated for the MS, which it receives from NodeB as well as AP. The service point for a MS should be single (i.e. either NodeB or AP) but it can listen to both simultaneously. The signal transmitted from NodeB (or AP) faces several attenuations. The attenuation is modeled as follows [8]:

$$\alpha(d, \zeta) = d^\eta 10^{\zeta/10} \tag{1}$$

Here, d is the distance in meters of the MS from its service point, η (eta) is the path loss exponent and ζ is the attenuation component due to shadowing [21]. If the losses are to be written in dB, then (1) can be modified as follows [8]:

$$\alpha(d, \zeta)[dB] = 10\eta \log d + \zeta \tag{2}$$

The transmitted signal from NodeB or AP faces the above mentioned attenuation therefore the signal strength received (or RSS) can be expressed as follows [1]:

$$S(d) = P_t - \alpha(d, \zeta) \tag{3}$$

Where, P_t is the transmitted signal strength in dBm from the NodeB or AP, $\alpha(d, \zeta)$ is the total attenuation and S(d) is the RSS.

The RSS is compared against a threshold value, which in turn is computed via a uniform quantizer. The quantizer takes the load of the cell and signal attenuation threshold (sat) for that load level as inputs and computes the threshold value for a given load level. This is the adaptive threshold, which varies according to the load level.

$$T_{adt} = Q(\text{sat}, l) \tag{4}$$

Here T_{adt} is the adaptive threshold in dBm for a given load level l and a predefined signal attenuation threshold (sat) in dBm, for that given load level. T_{adt} is the instantaneous threshold for a given cell, a given load level at a given time. The mobile stations refresh the value of T_{adt} stored with them repeatedly at an interval of 1 sec in anticipation of mobile stations entering or

exiting a given cell. T_{adt} is separately calculated for UMTS and WLAN cells by NodeB and AP respectively. The uniform quantizer Q is a function that accepts two inputs as described above and uses floor and ceil functions to find the quantization step. On the basis of the outputs from the floor and ceil functions the final quantized value i.e. T_{adt} is produced.

Many algorithms mentioned in literature use the uniform quantizer to build dynamic load levels [4]. The concept of dynamic load level sounds great but dynamicity has its own costs. It's so because constructing the load levels dynamic can cause further deterioration of services to the NodeB (or AP) which is already struggling with heavy traffic load. Hence, predefined load ranges can combat the problem of heavy traffic load better. Further, looking into the patterns of traffic load the load levels can be changed by the network administrator as per the usage.

In order to lessen the attenuation due to shadow fading in the RSS a rectangular window is used as follows [1]:

$$S(k) = \frac{1}{N_w} \sum_{n=0}^{N-1} S(k-n) W_n \tag{5}$$

Here the LHS of the equation (5) represents the averaged signal strength and S(k - n) in the RHS represents signal strength before the averaging process. W_n (n=0, 1, 2...) is the weight assigned for each signal strength value. N is the number of samples taken into consideration for the process of averaging. N_w can be given by the following equation [1]:

$$N_w = \sum_{n=0}^{N-1} W_n \tag{6}$$

As a common practice, if we consider rectangular window then $W_n = 1$ for n=0, 1, 2...

Further, Gauss-Markov assumption can be used to approximate the shadowing process [7]:

$$x[i] = ax[i-1] + \sqrt{1-a^2} n[i] \tag{7}$$

Here, x[i] represents the shadowing, a is the coefficient of correlation and n[i] is the Additive White Gaussian Noise (AWGN) with N(0, 1). Shadowing is always described with a random variable whose logarithm is normally distributed [7]. So, N(0, 1) represents the same.

The data rate is important for a network to outperform other networks. Shannon's theorem serves the best when it comes to calculate the data rate as a function of bandwidth (B) and signal-to-noise ratio (SNR) [1]:

$$DR = B * \log_2(1 + S/N) \tag{8}$$

Here DR is data rate in bps and S/N is the average signal power to average noise power.

Algorithm:

Each cell (NodeB or AP) updates its handover threshold based on its load as mobile stations enter or exit the cell. When the load of a certain cell is high, a high threshold value gets computed; otherwise, a low threshold value gets computed.

Different load levels such as L_1 to L_{i-1} , L_i to L_{k-1} ... L_j to L_n are constructed such that the load of each cell belongs to one or other load level. Corresponding to each load level a predefined sat (signal attenuation threshold) is set. This sat_j and load l_i is offered as input to the uniform quantizer.

1) The uniform quantizer uses two functions, namely floor and ceil to compute the high and low values for a particular sat_j .

$$\text{high} = \text{ceil}(sat_j) \quad (9)$$

$$\text{low} = \text{floor}(sat_j)$$

2) These two values serve to calculate the quantization step for the quantization process.

$$qstep = (\text{high} - \text{low}) / l_i \quad (10)$$

After further calculation the output of the quantization process comes out as T_i .

$$T_i = Q(sat_j, l_i), i=1, 2, \dots \quad (11)$$

3) T_i is the instantaneous value of T_{adt} in dBm which becomes the adaptive threshold for that cell at that particular load. T_i and as a consequence T_{adt} are updated by in or out movement of mobile stations.

4) When the normalized power of the MS received from the WLAN cell, RSS_{WLAN} (in dBm) exceeds the normalized power received from the UMTS cell, RSS_{UMTS} (in dBm) the MS enters the Handover Ready state:

$$RSS_{WLAN} > RSS_{UMTS} \quad (12)$$

Data rate plays an important role in selecting the network in case of Wireless Heterogeneous Networks (WHN).

5) If data rate in WLAN (DR_{WLAN}) in bps, becomes higher than data rate in UMTS (DR_{UMTS}) in bps, and RSS_{UMTS} falls further below T_{adt} then the MS is handed over to WLAN.

$$RSS_{UMTS} < T_{adt} \text{ AND } DR_{WLAN} > DR_{UMTS} \quad (13)$$

6) An MS in WLAN enters Handover Ready state when the following condition occurs [1]:

$$RSS_{UMTS} > RSS_{WLAN} + hys\ margin \quad (14)$$

where,

$$hys\ margin = \max\{20[1 - (X/R)^4], 0\} \quad (15)$$

X is the distance of MS in meters from WLAN Access Point.

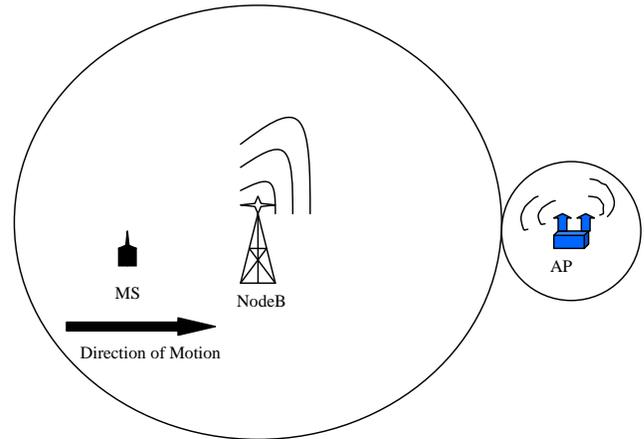
R is the radius of the WLAN cell in meters.

$hys\ margin$ is in dBm.

7) The mobile station is handed over to UMTS if the following condition occurs:

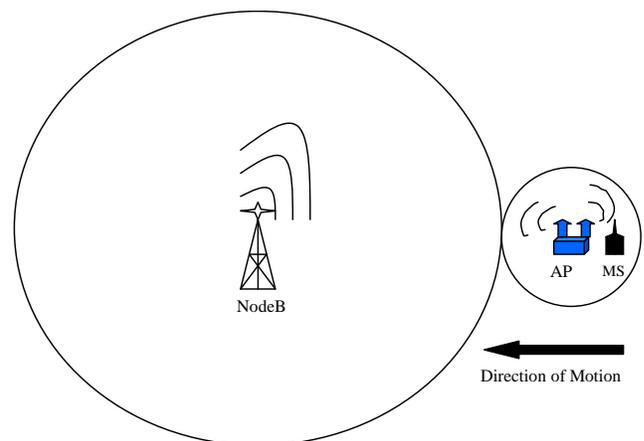
$$RSS_{WLAN} < T_{adt} \text{ AND } DR_{UMTS} > DR_{WLAN} \quad (16)$$

Methodolgy: Fig.1 shows a scenario that has been considered initially to begin with. Here a single MS is **Scenario 1 comprising of single MS in UMTS network**



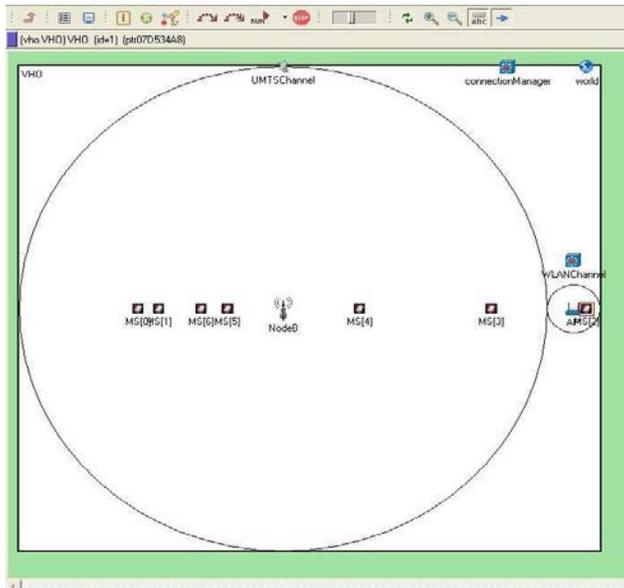
shown to move from UMTS network to the WLAN network. As shown NodeB covers a larger area and AP covers a smaller one. The direction of the motion considered here is from left to right of the observer. The MS while moving keeps operating with RSS_{UMTS} and simultaneously measures RSS_{WLAN} . In this way the MS would be in a position to know which value of RSS exceeds which. Also the respective datarates are taken into consideration. Both these factors would be used to make the handover decision. One other parameter that needs to be calculated is the value of adaptive threshold, T_{adt} . The calculation of T_{adt} is done by NodeB and AP separately, for their respective cells. All the mobile stations fetch this value at an interval to 1 sec.

Similarly, there can be a scenario just reverse to the previous one where the MS travels from the WLAN network to the UMTS network. This is shown in Fig 2.



Scenario 2 comprising of a single MS in WLAN network. Similar considerations can be made for this scenario as well where the MS utilizes the RSS_{WLAN} and keeps sensing the RSS_{UMTS} . The above scenarios seem hypothetical since the work is all about the load of the networks. But this understanding can

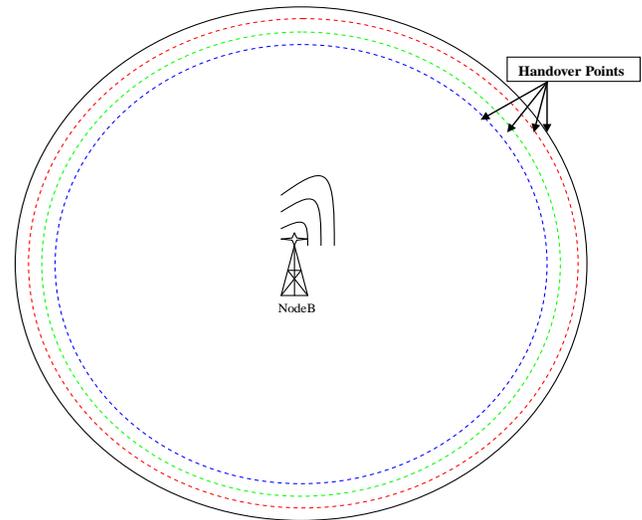
be ruled out by the fact that whatever the load of the network be it would definitely fall in some or the other load level and would definitely have some or the other T_{adt} . In this fashion multiple scenarios have been built, increasing the number of mobile stations and setting different directions of motion for them. Fig. 3 shows a scenario which is an exact snapshot from the simulator itself.



A scenario with seven MS in different networks.

Fig. 3 shows seven mobile stations, from which some are moving from UMTS to WLAN network while others are moving in opposite direction. The larger circle represents the UMTS coverage whereas the smaller one shows the WLAN coverage. At the center of the WLAN cell is the AP and the center of the UMTS cell is held by NodeB. The scenario above is shown to illustrate a fact that with the increase of the load in a cell there is chase for resources such as frequency, data rate, RSS etc. This chase becomes higher as we move towards the edges of the cell because RSS fades exponentially as we move away from the NodeB/AP. Hence, we in our current work propose a dynamic load balancing heuristics which adapts in accordance to the load of the cell. At low load levels the value of T_{adt} remains low so the mobile stations are served till the edge of the cell or closer. On the other hand this value is kept high at high load levels so that mobile stations are handed over much before the edge of the cell, to serve them better (The value of T_{adt} is negative so the concept of low and high value should not be misunderstood ref. Fig. 7). This fact is quite aligned to the concept of cell breathing.

The concept of cell breathing states that the cell area is larger if its traffic is low on the other hand the cell area is smaller if the traffic is high [6]. We presently in our work propose a model which tends to handover mobile stations earlier to adjacent cells if the traffic load of the cell is high. Conversely, the mobile stations are served till the border of the cell or closer when the traffic load is low. So the methodology we tend to propose is explained by the following figure.



Different serving regions for different traffic loads.

Fig. 4 clearly shows what we were describing till now. In order to keep it simple only few cases are considered here and only NodeB is shown to serve the mobile stations. At low load level the NodeB tends to serve till the red dotted line sometimes may be even till the edge of the cell marked black. At a higher level than this, the model hands over the mobile stations to the adjacent cells at the green dotted circle. At yet another higher level of load the mobile stations are handed over at the blue dotted circle. The points on the differently colored circles can rightly be called handover points, as these are the places where the mobile stations are handed over to adjacent cells. The dimension of these circles is not fixed. It can vary in accordance to the load levels set. At a particular load level only one circle operates actively. This is achieved by varying the value of T_{adt} which causes the mobile stations to handover at the point till where they can be served best.

The model proposed is made to run 100 times for each scenario. Around 85 scenarios have been simulated and the results have been recorded for the same. Each run takes different time period to complete depending on the number of mobile stations. For instance scenario one and two shown in Fig.1 and Fig. 2 take less time to complete than the scenario in Fig.3. During each run each MS has a starting co-ordinate. The run is said to complete when each MS completes one full round from its starting point to the right (or left) of the observer back to its starting point then to the left (or right) of the observer and finally back to its starting point. The direction of each MS (i.e. moving left or right) can be set in the initialization file.

Performance Metrics: The following metrics for performance are taken into consideration:

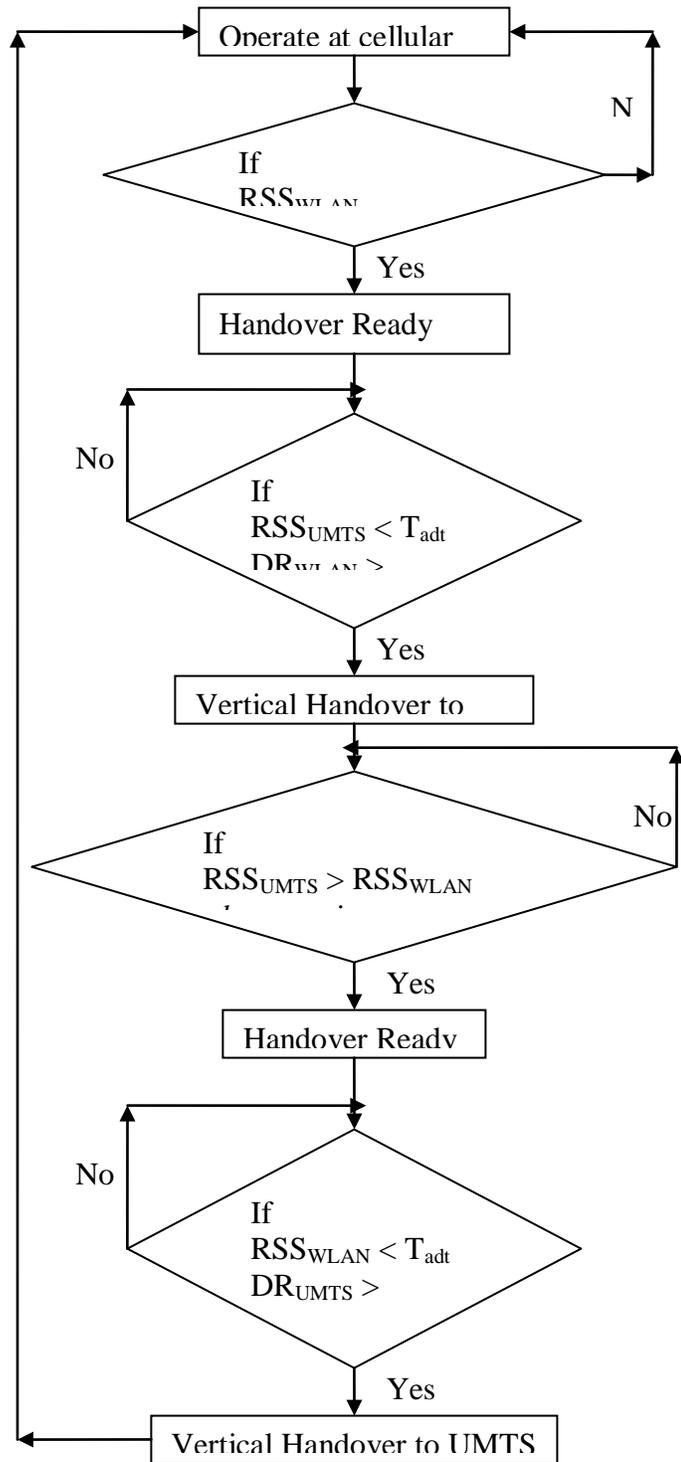
Outage Probability: Outage refers to the period of time when the MS receives insufficient signal strength or fades. The outage probability calculates such occurrences during a period of time. Outages should be less or none in context to ABC.

HandoverArea: The region covered by the MS from handover initiation phase to final handover execution phase. This area should be optimal such that neither it allows a quick handover nor it causes unnecessary delay in handover.

III. RESULTS AND DISCUSSION

A. Flowchart:

Fig. 5 illustrates the flowchart, which gives the overview of the algorithm that is used for vertical handover.



Flowchart for adaptive vertical handover algorithm

B. Tables and figures:

In order to obtain the various numerical results OMNet++ 4.2.2 is used as a network simulator. Various system parameters

are kept as close as to the ones used by the actual network providers. Table I. displays the UMTS network parameters set in the simulator. The radius of the UMTS cell, power transmitted by the NodeB and the bandwidth provided by the UMTS network are tabulated.

[UMTS Parameters

S.No.	Various UMTS Parameters	
	Parameter Name	Value
1.	Radius of Cell.	1000 m
2.	Power Transmitted from NodeB	30 dBm
3.	Bandwidth	5 MHz

Table II. displays the WLAN network parameters set in the simulator. Similarly, in this table the radius of the WLAN cell, power transmitted by the access point and the bandwidth provided by the WLAN network are displayed.

WLAN Parameters

S.No.	Various WLAN Parameters	
	Parameter Name	Value
1.	Radius of Cell.	100 m
2.	Power Transmitted from NodeB	0 dBm
3.	Bandwidth	20 MHz

Table III. displays the parameters set in the simulator which are common to both the networks. The correlation coefficient rho (□) and eta (□) used for shadowing calculation are shown. Also the distance between NodeB and AP and the sampling distance are mentioned.

Common Parameters

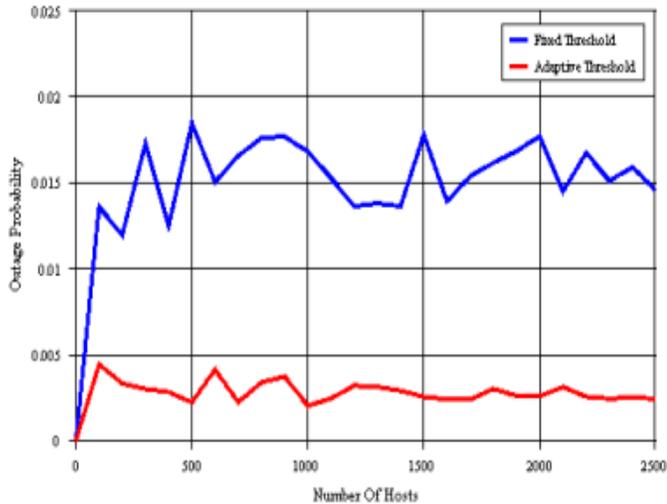
S.No.	Common Parameters	
	Parameter Name	Value
1.	Correlation coefficient (□)	0.5
2.	Eta (□)	3.6
3.	Distance between NodeB and Access Point.	1100 m
4.	Sampling distance	10 m

Fig. 6 displays the outage probability against the number of hosts for fixed and adaptive thresholds, respectively in the network. It can be easily discerned that the outage probability is low for adaptive threshold whereas comparatively high for fixed threshold.

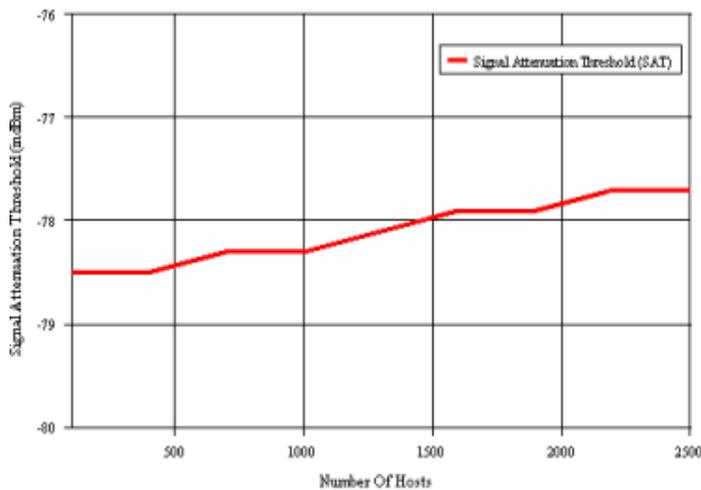
Fig. 7 shows the plot of variation of Signal Attenuation Threshold (SAT) vs. number of hosts. The graph shows that with the increase in the number of hosts in the network the SAT is quantized to a level, which is more easily achievable, by the hosts of the network to switch to the adjacent cell with higher

RSS. This graph illustrates the concept of cell breathing discussed earlier. The concept of high and low (negative) values for RSS threshold or SAT stated earlier can be understood clearly looking at Fig. 7.

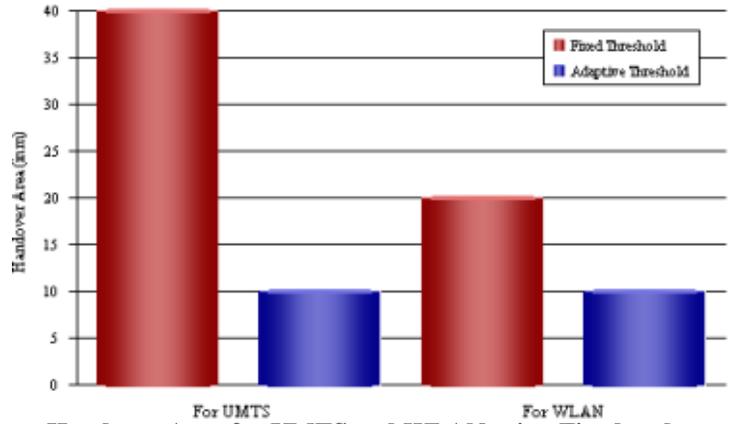
Fig. 8 shows the handover area for fixed and adaptive threshold for both the networks respectively. Clearly, the mobile stations cover more area to handover to adjacent cell in case of fixed threshold than adaptive threshold in case of both the networks. A large handover area can cause a high ping pong effect. In case of UMTS network, the adaptive threshold algorithm takes around one-fourth the area of the fixed threshold algorithm whereas in case of WLAN it takes half the area.



Outage Probability Vs Number Of Hosts



Adaptive Threshold Vs Number Of Hosts



Handover Area for UMTS and WLAN using Fixed and Adaptive threshold algorithms

Looking at the above results, we can easily infer that the adaptive threshold algorithm works much better than the fixed threshold algorithm. The algorithm also includes load balancing which is a problem faced by most of the network providers nowadays. The algorithm enables a cell to adapt its coverage area according to its load. Heavy load causes the cell to shrink whereas the cell serves normally during low load conditions. The work here lays road for the future generation networks to coordinate with each other to share their load.

IV. ACKNOWLEDGMENT

I would like to place on record my gratefulness towards my guide Ms. Megha Pandeya and moderator Mr. Saroj Kumar without the active involvement, useful suggestions and appreciative support provided by them my work would have never reached its completion. I would also like to thank the Almighty and my parents for showering their blessings and supporting me.

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Adapting to Climate Change – Building Capacities for Flood Risk Management in Bayelsa State, Nigeria

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Abstract- Flooding is a phenomenon that sometimes has devastating effects on human livelihoods. Impact of floods is more pronounced in low-lying areas due to rapid growth in population, poor governance, decaying infrastructure and lack of proper environmental planning and management. Flooding is also exacerbated by climate change and inadequate preparedness. However, flooding in most Nigerian cities is a major environmental challenge that has continued to defy solution as more people are rendered vulnerable to hazards involved. The implications of recent flooding in Nigerian cities include among others; loss of life and properties, spread of diseases, deformed livelihoods, assets and infrastructure. This paper therefore provides an overview of how Nigerian cities have been affected by flood incidences. The paper contends that prevailing effects of climate change, particularly flooding affecting almost everything in cities demands urgent attention in form of environmental and infrastructure planning, effective policy, improved and effective management of ecological fund, enhanced environmental disaster insurance, effective professional practice, enhanced public enlightenment programmes, integration of environmental planning and education to curriculum of schools at all levels, capacity building towards adaptation and mitigation of climate change impact. It also argued for the need to reinvent Nigerian cities through good governance towards creating sustainable cities in the country.

Index Terms- Adapting, climate change, Capacities, flood, Risk, management

I. INTRODUCTION

Climate change is one of the greatest threats facing the world today. It has impacted on all ecosystems and human societies in different ways and to varying degrees. Nigeria, like many other developing countries, faces enormous social, economic and environmental challenges that are likely to be exacerbated by the impacts of climate change. At both the individual and the national levels, climate change is of serious concern because of the nation's overdependence on climate-sensitive sectors, such as hydro-power generation, agriculture, fisheries and wildlife resources. Estimations indicate that temperature will continue to rise, and the survival of coastal communities will be threatened by rising sea level. Reduction in rainfall is already impacting on rain-fed agriculture and hydro-power outages, causing significant decreases in industrial production. Climate change will bring new flood threats, especially in developing countries such as Nigeria. It may

increase the magnitude, frequency, and intensity of flood risks, and have a critical impact on national economic activities. Developing countries tend to face larger flood risks because of insufficient funds, inadequate infrastructure, lack of legislation and enforcement programs, ignorance or lack of attention to the likely dangers from flooding, and other flood management issues. Additional risk factors, such as lack of preparedness and response by authorities, add to the existing vulnerabilities and will exacerbate the consequences of flooding. Delay of implementing measures against climate change may lead to serious problems including economic stagnation and persistence of poverty, which amplify the current glaring disparity between developed and developing countries.

These negative impacts of floods are related to and made worse by inadequate institutional, social, organizational, and individual capacities required for flood management in the state. In contrast, the risks might be alleviated if appropriate measures are taken based on enhanced capacity. The physical safety and the confidence in security generated by the sufficient measures may contribute toward further economic development.

In addition, the contexts surrounding water resources management including flood management have been shifting following diversification of people's sense of values, more emphasis on environmental conservation, and other increasing complexities. This paradigm shift requires more comprehensive and integrated approaches in flood management. In any process of flood management, the infrastructure and procedures are important to achieve goals. However, the capacity, which influences performance of organizations responsible for flood management, is paramount for making all elements of flood management function adequately. Especially in developing countries and of course in Bayelsa State, gaps between available capacity and the urgency to cope with the flood risks remain high. Under these circumstances, it is required to formulate new capacity building methodologies for effective flood management. Following the 2012 flooding in the country and the awareness it raised, integration of disaster risk management in Nigeria's overall development strategies has remained a key element in the country's improving capacity to deal with sudden onset as well as long-term disasters. It is against this backdrop that this study has become necessary.

This study aims to improve the life of vulnerable communities in Bayelsa State through strengthened capacities of community-based services for the preparation and mitigation of flood-related impacts. The study will promote collaboration between communities and local governments to tackle disaster risk reduction, welfare and health issues, and to develop an

integrated plan on these issues. The study involves two key components:

Community assessment and planning: This encompasses identifying community needs in strengthening capacities to cope with climate disasters, and development of an action plan. Local communities will provide information on disaster preparedness, and community-based management including waste management, neighborhood watch, basic services revolving fund systems, and land use management.

Knowledge capacity building on climate implications and flood related risks, preparedness and adaptation within the selected communities.

11 CAUSES/SOURCES AND STYLES OF FLOODS

Causes of flood tend to vary from one locality to the other depending on the available protection and management processes. Urbanization and or the concentration of settlements continue to encroach on flood prone areas. Human actions cause floods. There is the tendency to use additional lands that are flood plains, which attract development due to their flatness, soil fertility and proximity to water. (Ivbijaro,

M.F.A. et al, 2006). Hence, Patrick, L. Abbott, (2006) stated that, „streams build floodplains by erosion and deposition, and streams reserves the right to reoccupy their floodplains whenever they see fit. And that, humans who decide to build on floodplains are gamblers; they may win their gamble for many years, but the stream still rules the floodplain, and every so often it comes back to collect all bets“.

Other causes of increasing flood risk are increase in the proportion of impervious area, deforestation and channel interference, (Ivbijaro, M.F.A. et al, 2006).

Gill (2004) provides some important comments on the likely impacts of climate change on urban areas, and within, that considers the impacts from increased flooding. The publication suggests that the increase in flooding will be the most serious direct impact of climate change... „Factors of concern for flooding include: sea level rise (combined with severe storms and wave heights); more frequent, severe or prolonged rainfall events; the large size of urban catchments; an increasingly built-up environment which increases surface water run-off and, in particular, the rate of development on floodplains; the age, condition and lack of capacity of existing

drainage and infrastructure; the impact of rising groundwater in conjunction with surface flooding“ (Gill 2004, p. 34).

In addition to climate change, there are urban design features that can exacerbate the risk of flooding (e.g. reduction in urban green space, increase in hard surfacing, increased density of development and, potentially, increased barriers to flood flows such as road embankments). Because of the density of population, flooding problems in urban areas are characterized as „low probability/high consequence“ (i.e. there is a low probability of flooding, but if there is a flood it could have catastrophic consequences). Not surprisingly, there tends to

be a low awareness of flood risk in these areas and there are communities who do not know they are at risk of flooding and that any flood would have serious consequences because of the sheer density of homes in urban areas. Flooding can be from a number of sources: rivers (fluvial), coastal, tidal, sewers, groundwater and drainage. In the urban environment increased density adds pressure, especially on urban drainage systems and sewers. As a result flooding from sewers and drainage systems is an important part of the urban flooding equation and has implications for the type of social impacts experienced. In terms of urban flooding the focus in Making Space for Water is on joining up the approach to drainage. According to Patrick, L. Abbott, (2006:380), killer floods are unleashed by several phenomenon.

- A local thunder cloud can form and unleash a flash flood (upstream floods) in just a few hours.
- Abundant rainfall lasting for days can cause regional floods that last for weeks. This is also known as „downstream floods“.
- The storm surges of tropical cyclones floods the coasts.
- The breakup of winter ice on rivers can pile up and temporarily block the water flow, and then fail in an ice-jam flood.
- Short-lived natural dams made by landslides, log jams and levees fail, causing voluminous floods.

In Bayelsa State, most of the floods are from rivers (fluvial), coastal, tidal, groundwater, drainage, heavy rainfalls etc.

111 OBJECTIVES OF THE STUDY

This study explores how to alleviate flood damage, hazards and threats under climate change, and achieve sound economic development in Bayelsa State with a focus on capacity building. Hence the following objectives are set to be achieved.

To identify the level of damages resulting from flooding in Bayelsa State.

To ascertain the need for capacity building for flood management.

To identify the capacity building for flood management applicable in the State; to reveal the required strategies for minimizing the negative consequences of flooding in Bayelsa state and to identify required capacitybuilding to cope with the increased flood risks under climate change.

To reveal the activities in the state that link climatic change which results in flooding.

To ascertain the level of preparedness of the people of the state towards eminent threats of flooding

II. HYPOTHESES

The following research hypotheses are therefore put forward to be subjected to empirical test and verifications.

There is a relationship between Capacity building and the coping capacity of flood victims under climate change in developing countries

The higher the level of preparedness the lesser the damage encountered during floods in Bayelsa State.

III. STUDY AREA

This study was undertaken in Bayelsa state. Bayelsa State was created on October 1, 1996 out of the old Rivers State by the then regime of General Sani Abacha. The name, Bayelsa, is an acronym of three former Local Government areas - Brass, Yenagoa and Sagbama - in the then Rivers State, which had earlier comprised the entire area now constituting Bayelsa State. In the tradition in the old Rivers State, which Bayelsa State was created from; acronyms are used for local government areas. Brass Local Government Area was referred to as BALGA, for short; Yenagoa was simply YELGA, while Sagbama was SALGA. So in naming the new state, BALGA, YELGA, and SALGA was compounded to form BAYELSA.

Bayelsa State is Located in the Southern part of Nigeria. It's covers 21,100 Square Kilometres with capital at Yenagoa. The State is geographically located within Latitude 04° 15'' North, 05° 23'' South and longitude 05° 22'' West and 06 ° 45'' East. It shares boundaries with Delta State on the North, Rivers State on the East and the Atlantic Ocean on the West and South. Bayelsa State is a tropical rain forest, with more than three quarters of this area covered by water, with a moderately low land stretching from Ekeremor to Nembe. The area lies almost entirely below sea level with a maze of meandering creeks and mangrove swamps. The network of several creeks and rivers in the South, all flow into the Atlantic Ocean via the major rivers such as San Bartholomew, Brass, Nun, Ramos, Santa Barbara, St. Nicholas, Sangana, Fishtown, Ikebiri Creek, Middleton, Digatoro Creek, Pennington and Dobo. The vegetation here is characterized by the mangrove forest. In the North, it has a thick forest with arable lands for cultivation of various food and cash crops.

There are four main languages in Bayelsa State, which are Izon, Nembe, Ogbia and Epie-Atissa. It is important to note that the Ijaws (izon) constitute the majority in the area. The predominant religions in the State are Christianity and Traditional worship. The major occupations in the State are fishing, farming, palm oil milling, lumbering, palm wine tapping and local gin making, trading, carving and weaving. Bayelsa State is a major oil and gas producing area and it contributes over 30% of Nigeria's oil production. Bayelsa State is home to Oloibiri in Ogbia Local Government Area, where oil was first struck in Nigeria in commercial quantities in 1956. Gas production activities are currently being intensified in the State as feedstock to the LNG Gas Supply Plants in Bonny which is located in Oluasiri local government area of the state. Also the gas feed will feed into the proposed national associated gas gathering networks that will feed other LNG plants, power plants and end users in the manufacturing sector. The major oil exploration and production companies operating in the State are Shell, Agip and Chevron Texaco. The Kolo Creek Gas Turbine Project owned by the Bayelsa State Government supplies electricity to Yenagoa, the State Capital, and surrounding towns and villages. Bayelsa State is, presently, the only State in Nigeria that provides electricity for itself without any supply from the National Electricity Grid. Bayelsa State has large reserves of clay, sand and gravel. Bayelsa State has a wide variety of festivals, music, arts, crafts, folklore, artifacts, museums and monuments. The White Graveyard at Twon-Brass in Brass LGA, the Slave Tunnel at

Akassa in Brass LGA, Olodi Museum at Ogbolomabiri, Mangrove Museum at Nembe, Ogidigan Deity at Bassambiri and King Ockiya's Mausoleum at Ogbolomabiri all in Nembe LGA, Late Chief Christopher Iwowari's Monument at Bassambiri in Nembe LGA. Bronze Heads at Opume in Ogbia LGA, Isaac Boro Memorial Monument at Kaiama in Kolokuma/Opokuma LGA. These museums are stocked with artifacts dating back to hundreds of years. A proposed Museum at Oloibiri will chronicle the history of oil exploration in Nigeria and serve as a center of excellence in petroleum history, entertainment and learning. At Twon-Brass in Brass Local Government Area, there are the Commonwealth Graves of British soldiers who died in the Nembe-British War of 1895 (otherwise known as the Akassa war). In nearby Akassa, there is the Slaves Transit Camp. There is a War Boat in Aleibiri. The Atlantic Ocean beache stretches across Twon-Brass, Okpoama, Olodiama, Koluama, Sangana.

This study is necessary because of the importance of the region to the economic development of the country. Conflict in the area will mean serious problem to the country.

IV. PROCEDURE AND METHODOLOGY

The research population for this study was drawn from Bayelsa state, one of the south-south geo-political zone of Nigeria. This study is part of a comparative study that examined the degree of capacity building preparedness for flood risk management in the state. A survey research design was used in this study. The research uses description as well as analysis. The study is based on both primary and secondary sources. It adopt both the quantitative and qualitative research method. To arrive at the intended investigation, the study utilizes both the simple percentages and chi-square statistical analysis to test the relationship between variables.

V. DATA ANALYSES AND PRESENTATION

Introduction:

In this study, appropriate, tools and procedures has been adopted to present and analyze the data so far collected from the field work. 115 questionnaires (100%) printed and distributed, while 105 retrieved from the subjects are therefore analyzed and interpreted using tables, simple percentage, and Chi-Square () non-parametric statistical analysis test.

TABLE 1. SOCIO-DEMOGRAPHIC DATA OF RESPONDENTS

ITEM	FREQUENCY	PERCENTAGE (%)
1. Sex		
Male	60	57.14%
Female	45	42.86%
TOTAL	105	100%
2. Religion		

	Christianity	98	93.33%
	Islamic	3	2.86%
	Traditional	2	1.90%
	Others	2	1.90%
	TOTAL	105	100%
3.	Age		
	15-30	38	36.19%
	31-45	50	47.62%
	46-60	15	14.29%
	≥61	2	1.90%
	TOTAL	105	100%
4.	State of Origin		
	Akwa-Ibom	2	1.90%
	Bayelsa	78	74.29%
	Cross - River	1	0.95
	Delta	5	4.76%
	Ebony	1	0.95%
	Edo	2	1.90%
	Imo	2	1.90%
	Lagos	5	4.76%
	Rivers	8	7.62%
	Undecided	1	0.95%
	TOTAL	105	100%

5.	Family Type		
	Monogamy	35	33.33%
	Polygamy	45	42.86%
	Married but Divorced/Separated	15	14.29%
	Single	9	8.57%
	Others	1	0.95%
	TOTAL	105	100%
6.	Occupation		
	Farmer	15	14.29%
	Trader	20	19.05%
	Civil servant	62	59.05%
	Others	8	7.62%
	TOTAL	105	100%

Table 2. Showing the impact of flooding on the people

ITEM	FREQUENCY				ΣF
	YES		NO		
	FREQ	%	FREQ	%	

Q. 7.

105

100

0

0%

Q. 8.	101	96.19	4	3.81	
Q. 9.					
I	103	98.10	2	1.90	
Ii	95	90.48	10	9.52	
Iii	98	93.33	7	6.67	
Iv	101	96.19	4	3.81	
V	104	99.05	1	0.95	
Vi	80	76.19	25	23.81	

Table 2 above reveals that the people of the state has in one way or the other, suffered some level of negative impacts and damages from flooding, as all the respondents 105, representing 100% agreed.

It also revealed that 101, (96.19%) said they have been a victim of flood damages, and 4 (3.81%) did not suffer such damages.

It shows that, loss of lives and properties, 98.10% (103) said yes, while 2 (1.90%) said no. loss of biodiversity, 95 representing 90.48% said yes, 10 (9.52%) said no. Also, most of the respondents, 98 i.e, 93.33 revealed that flooding has caused dangerous diseases and sicknesses, while 7 (6.67%) said no. And 96.19% (101) disclosed that flooding has disrupted life-sustaining activities in the state, but 4 (3.8%) disagreed. Most of the respondents, 104 representing 99.05 answered that flooding contaminates the water body, 1 (0.5%) said no. Finally, it was shown that 80 (76.19%) of the subjects revealed that flooding has caused emotional and psychological problems, though, 25 (23.81%) disagreed.

Table 3. Showing the readiness of the people to flood occurrence

ITEM	FREQUENCY				ΣF
	YES		NO		
	FREQ	%	FREQ	%	
Q. 10.	28	26.26	77	73.33	
Q. 11.	25	23.81	80	76.19	
Q. 12.	101	96.19	4	3.81	

This table discloses that most people, 77 representing 73.33% of the subjects do not keep memories of the impacts of previous flooding while 28 ((26.67%) do. It further reveals that most of the respondents, 80 (76.19%) as against 25 i.e 23.81% (that said yes) do not always get prepared for eminent floods in order to avert its detrimental dangers. As such majority of the respondents 101 (96.19%) agreed that the more prepared people are, the less likely the impact of flooding will have on them, however, minority, 4 (3.81%) disagreed.

Table 4. Showing Causes of damages suffered during floods

ITEM	FREQUENCY				ΣF
	YES		NO		
	FREQ	%	FREQ	%	
Q. 13.					

I	98	93.33	7	6.67	
Ii	98	93.33	7	6.67	
Iii	80	76.19	25	23.81	

Table 4 unfolds firstly, that people suffer serious damages during floods as a result of laziness - of which 98 (93.33%) said yes as against 7 (6.67%) that said no. also, lack of preparedness, 98 (93.33%) said yes, while 7 (6.67%) said no. furthermore, lack of government's assistance records 80 (76.19%) as yes and 25 (23.81%) as no, indicating reason for serious damages in times of floods in the state.

Table 5. Showing activities that induce climate change

ITEM	FREQUENCY				ΣF
	YES		NO		
	FREQ	%	FREQ	%	
Q. 14.					
I	103	98.10	2	1.90	
Ii	101	96.19	4	3.81	
Iii	105	100	0	0	
Iv	80	76.19	25	23.81	
V	101	96.19	4	3.81	

This table discloses climate change inducing activities. It uncovers that burning of fossil fuels records 103 (98.10%) yes, as against 2 (1.90%) no. also, 101 representing

96.19% agreed that people build on flood plains while 4 (3.81%) did not. Another of such activities is oil spillage which all the respondents, 105 (100%) said yes. In addition, majority 80 (76.19%) said yes to indiscriminate dumping of wastes as against 25 (23.81%) that said no. finally, the table revealed that people engage blocking of drainages and water ways, as most of the respondents 96.19% (101) agreed while 4 (3.81%) said no.

Table 6. Showing the efforts of the governments

ITEM	FREQUENCY				ΣF
	YES		NO		
	FREQ	%	FREQ	%	
Q. 15.	80	76.19	25	23.81	
Q. 16.	10	9.52	95	90.48	
Q. 17	104	99.05	1	0.95	

Table 6 unmask the role played by government before, during and after flood incidents in the state. Majority of the subjects represented by 80 (76.19%) as against 25 (23.81%) (that said no) said yes, that government has done something about flood hazards in the state. The subjects, most of the, 90.48% i.e, 95 said there are no effective capacity development programs by the government, though 10 (9.52%) said there is. Finally, almost all the subjects 99.05% (104) agreed that the impact of flood can be reduced through effective capacity development programs, while 0.95% i.e 1 of the respondents disagreed

VI. TESTING OF HYPOTHESES

The hypotheses will be tested with Chi-Square () non-parametric statistical analysis test.

The rule here is, where Chi-Square () obtained (calculated) value is less than Chi-Square () critical (table) value, the null hypothesis (Ho) be accepted and the alternative hypothesis (HR) be rejected. But if the reverse is the case (i.e. If (obtained) > (critical) value), then the null hypothesis be rejected and the alternative hypothesis (HR) be upheld.

The above statement (rule) is applicable to the two hypotheses of this research.

Hypothesis 1

Null hypothesis Ho: „There is no relationship between Capacity building and the coping capacity of flood victims under climate change in developing countries“

HR: „There is a relationship between Capacity building and the coping capacity of flood victims under climate change in developing countries“

This hypothesis is tested with items, 16 and 17 from the questionnaire.

CONTINGENCY TABLE 1

ITEM	FREQUENCY		Total
	Yes	No	
Capacity development	10	95	105
No capacity development	104	1	105
Total	114	96	210

Chi-Square (χ^2) = $\sum (f_o - f_e)^2 / f_e$

Where: χ^2 = Chi-Square

f_o = frequency observed

f_e = frequency expected

The frequency expected (f_e) = $ct \times rt / \sum n$

Where: ct = column total

rt = row total

$\sum n$ = total of all scores in the table.

Frequency expected (f_e) for YES = $114 \times 105 / 210$

$$= 11970 / 210$$

$$f_e (\text{yes}) = 57$$

Frequency expected (fe) for NO = $96 \times 105 / 210$

$$=10080/210 \text{ fe (NO)}$$

$$=48$$

Chi-Square () Obtained 1.

	fo	fe	fo - fe	(fo - fe) ²	∑(fo - fe) ² /fe
a - yes	10	57	-47	2209	38.75
b - no	95	48	47	2209	46.02
c - yes	104	57	47	2209	38.75
d - no	1	48	47	2209	46.02
Chi-Square () Obtained =169.54					

This value for the test statistic can now be tested for its significance. Sampling Distribution = Chi-Square ()

distribution 

Critical Region: Alpha = 0.05

Degree of freedom (DF) = (r-1) (c-1)

Where, r = number of row

c = number of column

$$DF = (2-1) (2-1)$$

$$=1 \times 1$$

$$DF = 1$$

Chi-Square () (critical) = 3.841

Computed-Chi-Square (χ^2) = $\sum (f_o - f_e)^2 / f_e$

$$\chi^2 = 169.54$$

VIII RESEARCH DECISION

At 0.05 Level, (the critical region), with the Degree of Freedom (DF) = 1,

would begin at χ^2 (critical) = 3.841. With the obtained (calculated) χ^2 of

169.54, we reject the null hypothesis which says, „There is no relationship between Capacity building and the coping capacity of flood victims under climate change in developing countries“.

For this sample, we here by state that there is a statistically significant relationship between Capacity building and the coping capacity of flood victims under climate change in developing countries“.

Hypothesis 2

Null hypothesis H₀₂: The higher the level of preparedness the higher the damage encountered during floods in Bayelsa State.

HR2: The higher the level of preparedness the lesser the damage encountered during floods in Bayelsa State.

This hypothesis is tested with items, 8 and 11 from the questionnaire.

CONTINGENCY TABLE 1

ITEM	FREQUENCY		Total
	Yes	No	
Unprepared	101	4	105
Prepared	25	80	105
Total	126	84	210

Chi-Square (χ^2) = $\sum (fo - fe)^2 / fe$

Where: χ^2 = Chi-Square

fo = frequency observed

fe = frequency expected

The frequency expected (fe) = $ct \times rt / \sum n$

Where: ct = column total

rt = row total

$\sum n$ = total of all scores in the table.

Frequency expected (fe) for YES = $126 \times 105 / 210$

$$= 13230 / 210$$

$$fe (yes) = 63$$

Frequency expected (fe) for NO = $84 \times 105 / 210$

=8820/210

$$fe(NO) = 42$$

Chi-Square () Obtained 2.

	fo	fe	fo - fe	(fo - fe) ²	$\sum(fo - fe)^2/fe$
a - yes	101	63	38	1444	22.92
b - no	4	42	-38	1444	34.38
c - yes	104	63	38	1444	22.92
d - no	1	42	-38	1444	34.38
Chi-Square () Obtained =114.6					

This value for the test statistic can now be tested for its significance. Sampling Distribution = Chi-Square ()

distribution 

Critical Region: Alpha = 0.05

Degree of freedom (DF) = (r-1) (c-1)

Where, r = number of row

c = number of column

$$DF = (2-1) (2-1)$$

$$= 1 \times 1$$

$$DF = 1$$

Chi-Square () (critical) = 3.841



$$\text{Computed-Chi-Square (} \chi^2 \text{)} = \sum (f_o - f_e)^2 / f_e$$

$$= 114.6$$

The test statistic, χ^2 (obtained or computed) = 114.6, fall above the critical region,

of which Alpha = 0.05, with 1 Degree of Freedom, begins at $\chi^2_{critical}$ (critical) of 3.841.

Therefore we reject the null hypothesis (Ho2) that says, The higher the level of preparedness the higher the damage encountered during floods in Bayelsa State. Hence the alternative hypothesis upheld.

VII. CONCLUSION

From the findings of this research work, the following conclusions have been made:

There are serious negative impacts of flooding rife in the state, and many people, if not all, are victims as a result of climate change. Also, the most prevalent of such detrimental impacts (damages) include: loss of lives and properties (both private and public), loss of species such as fishes, snails, crops (and other useful plants), animals (gone on extinction), insects etc, causing dangerous diseases and sicknesses, interruption of almost all human activities for survival, contamination of the water body, and causing emotional and psychological problems.

Moreover, Lack of concern and lack of preparedness towards eminent flooding is one of the major reasons for excruciating damages and negative effects encountered. Also, though the government attempted certain flood management, prevention and coping strategies and programs, but such programs seems epileptic and ineffective as serious attentions are not given to them.

Furthermore, Flooding is majorly caused by human activities. As people engage in activities that induce climate change which is the harbinger for global warming, resulting into several environmental problems such as flooding, and others. Other causes found include; building flood plains, indiscriminate disposal of wastes resulting in blockage of drainages and other water ways.

VIII. RECOMMENDATION

Awareness should be emphatically created on the dangers of eminent flooding, and individuals, groups, families, communities, local governments, state governments should take it upon themselves to try as much as possible to work towards preventing the likely threats and dangers of flooding, everyone should show

concern, not easily forgetting the previous damages and get prepared and adjust accordingly.

In addition, enlightenment programs should and other capacity development strategies to adapt and cope during flooding should be put in place and the government and all well meaning citizens should its continual effectiveness and functionality.

Furthermore, laws should be passed to regulate such activities like burning of fossil fuels, indiscriminate dumping of refuse, sanitation of the environment, (especially gutters), building /developing on flood plains (to ensure that the water ways are clear and free), and oil spillage etc.

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Assessment of Market Linkages for Smallholder Farmers of Coffee Producers in Gihmbi Zone, Ethiopia

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Abstract- As countries develop, their labor force shifts from agriculture to industry and services rendering, and in this process the well-being of the people improves. However, for agriculture to become a credential tool for economic growth an improvement in smallholder productivity is necessary through improving resources, farmers can access with new markets and engage in value-adding activities. For that reason, this articles aims to investigate how smallholders can be supported in their efforts to create new market linkage opportunities and develop their resources. The Ethiopian coffee producers particularly Gihmbi have been served as a case study for this investigation because it can be characterized by its large number of smallholder farmers. In this case chain integrators can play a vital role for smallholder farmers in order to access them to the market. Because these chain integrators represent different types of value chain actors, they each take a different approach to their development intervention. This article concludes that each approach to develop market linkages for smallholders has its own challenges and weaknesses. Having this in mind there are three different types of chain integrators were identified, i.e. buyer-driven, intermediary-driven and producer-driven. As well as, the instruments of chain integrators aim to contribute to three fundamental purposes that improve the development of market linkages for smallholder's farmers those are: reducing transaction costs, creating production networks and developing the resources of the firm. A Sample size of 60 is taken, the collected data has been analyzed using both qualitative and quantitative methods and the data analysis has been supported by SPSS 16.0 software. As result shows integrators consequently configure the instruments that contribute to these purposes determines the success of the intervention and the sustainability of the market linkage for the smallholders.

Index Terms- chain instruments, buyer-driven, intermediary-driven and producer-driven.

I. INTRODUCTION

As countries develop, their labor force shifts from agriculture to industry and services, and in the process, the well-being of the people and society has been improves. This article gets rid of some light on the economic logic that drives the process and on the important role that agricultural productivity plays in it. It argues that agricultural productivity growth is the key to poverty alleviation.

In development thinking there are many shifts over the past decades ranging from an emphasis on technical solutions to basic needs and from integrated development programs to structural

adjustment (Schulpen & Gibbon, 2002). In order to reduce poverty, agriculture should therefore be one of the focal sectors of development interventions. Not only agricultural sector contribute to poverty reduction, at the same time it would help reduce food insecurity in many developing countries. Using agriculture as the fundamental basis for economic development in the agriculture-based countries like Ethiopia requires a productivity revolution in smallholder farming (World Bank, 2007). Smallholder farmers in developing countries like Ethiopia need to raise production efficiency and quality standards to become as distinctive competitive tools in agricultural markets. However, due to urbanization, rising incomes and globalization there are new opportunities to diversify particularly into cash markets. A major challenge is that a large part of the agricultural activities in developing countries currently occur in the informal economy (Henson & Cranfield, 2009). To increase efficiency in agriculture and to develop agribusinesses that are able to look at new markets by diversification, formalization in agriculture is necessary. By linking up to domestic and international markets, farmers have the opportunity to develop and modernize production processes that will increase their competitiveness in these markets. In order to become active players in the global agricultural industry, farmers from developing countries like Ethiopia has been need to hold close a stronger business perspective and reconsider their current set of farming activities.

1.1. Statement of the Problem

Because of their limited capacity and capabilities, smallholders often have problems to explore new market opportunities. Therefore, they need support that aims to organize and coordinate smallholder production and establishes new market linkages. There are abundant institutions and companies that are actively engaging in such activities. Particularly donors and non-government organizations have traditionally set up development projects that aimed to improve the position of smallholders (Shepherd, 2007). However, these non-government organizations have now become alarming for the development interventions that need to be motivated by market demand, because development interventions are more sustainable if they are commercially viable. That is why production activities need to be assessed in relation to the entire value chain. This supports the notion that there is a need for better market linkages between small producers and the market in developing countries (Shepherd, 2007).

This study contributes to the discussion regarding the development of market linkages for smallholders. particularly, these market linkages need to focus on establishing a long-term relationship between small farmers on one hand and downstream agribusiness (processors, exporters and retailers) on the other hand (Vorley, Lundy & Macgregor, 2008). Furthermore the

condition of extension services such as finance, training, inputs, etc. enhance the development of smallholders' capabilities which can stimulate the development of sustainable market linkages. However, there are high costs and risks associated with linking smallholder farmers to formal markets. Troubles with regard to production costs and volumes, poor access to information, etc. raise the transaction costs of working with a large number of small farmers. In addition, the low production capability of smallholders is the challenges to achieve economies of scale. Close coordination of production is therefore a necessity to lower the transaction costs, raise efficiency and make the linkage sustainable. Despite of this private companies usually prefer to work with organized farmers over individual farmers (Vorley et al., 2008). That the production of smallholders needs to be coordinated is recognized in many commodity chains. There are numerous drivers that can provide the harmonization and integration of smallholder production such drivers are non-government organizations, lead firms or farmer cooperatives. As there exists no universal term for the drivers in linkage literature, they has been referred to as „chain integrators“ for the rest of this study. This term has been chosen because the chain integrators attempt to facilitate the integration of smallholders into formalized production chains. On the other hand, terms such as chain facilitator driver for market linkages or market linkage developer, could also have been chosen. All the different chain integrators have their own initiatives and therefore different approaches to develop market linkages. As it is uncertain whether one of these approaches is typically better than another, it is attractive to investigate the features of the interventions by different chain integrators. This would lead to valuable insights of the functioning of several chain integrators and can possibly lead to more effective and balanced interventions by chain integrators in the future.

The coffee production will provide as a case to investigate the role of the chain integrator in creating market linkages for smallholders. Particularly, the focus is on the formalized market, referring to the trade between producers and (small scale) coffee producers. Due to a lack of large-scale coffee producers in Ethiopia, coffee producers are forced to turn to smallholder farmers for the procurement of coffee. However, there is a large informal coffee market in which most of the coffee is traded. This informal market offers stiff competition to the coffee producers in both the procurement and sales of coffee. In general, the linkages between smallholders and the formal market are weak.

The interventions of chain integrators in the Ethiopian coffee industry are focused on establishing and developing new market opportunities for smallholder farmers and at the same time securing a stable coffee supply to the professional coffee producers. Several different types of chain integrators offer a good case for comparison of approaches to create market linkages. The case has been illustrated how chain integrators approach the creation of market linkages in a developmental context.

1.2. Specific objectives of the study

1. To investigate the role of chain integrator in creating market linkages for smallholders of Coffee producer Gihmbi Zone Ethiopian.

2. To assess the aim of chain integrators in developing market linkages for smallholder farmers of Coffee producer particularly Gihmbi Zone Ethiopian.

1.3. Analytical framework

In order to develop a comprehensive analytical framework, it is necessary to define the chain integrators and their instruments that are used to analyze the Ethiopian coffee industry. Consequently, this framework has been providing the basis for analysis of the data that was collected during the field research. As such, the chain integrators have been framed in terms of producer-driven models, buyer-driven models and intermediary driven models.

Producer-driven models – These chain integrators include initiatives such as cooperatives and farmer-owned businesses. The models have had a mixed record of providing members with economic benefits in terms of access to dynamic markets (Vorley et al., 2008, p.197). These producer organizations engage in a wide variety of supporting activities, but rarely focus on providing an effective marketing channel. Even in this case where the organizations operated as marketing channel they were avoided by agribusiness because of problems in cooperation (Vorley et al, 2008). Yet, these kinds of farmer organizations are an important tool to increase competitiveness. In comparison to welfare organizations they are more focused on building competitiveness capacities and are better able to build on informal linkages in the market.

Buyer-driven models –This stand for a more forward relationship between the buyer and the producer that is frequently managed and maintained by a retailer or processor in an industry. There are various cases in which buyers had to include smallholders in their business model, because these were the only sources of raw materials available. In these instances the inclusion of small-scale producers has led to a sustainable relationship, such as in certain coffee industries (Vorley et al., 2008). Traditionally, buyers or processors integrate backwards and try to coordinate the production. This is also stimulated by a lack of initiative from the side of the farmers. The buyer usually attempts to cut out the middleman to create a direct relation with the producers and promotes this as a win-win situation for the producer, the customer and the buyer himself. Prices are supposed to be fair for the producer and the buyer has a better control over production.

Intermediary-driven models –these models create an alternative to producer and buyer-driven models through integrating forward for producers or backwards for retailers or processors is time demanding and expensive (Vorley et al., 2008). In essence these are attempts to cut out the middlemen to save costs, but in reality they often deemed result in high transaction costs and mixed outcomes. For that reason, working with middlemen might not be such a bad alternative as it is often perceived. This shows the opportunity to current as well as new intermediaries to engage in a certain value chain (Vorley et al., 2008). Mainly the transaction costs of working with many smallholder farmers are overwhelming. Additionally, the coordination efforts required to organize these farmers are discouraging retailers to directly source from smallholders (Vorley et al., 2008). In some cases industries have been intermediaries that have developed into an important facilitator in

the chain. They have introduced new standards and technologies in the sector that have supported smallholder farmers in improving their production quality and quantity. These intermediaries often have a strong focus on service provision but with a commercial attitude. Their focus on increasing the competitiveness of the chain and their market orientation can make them effective and efficient facilitators.

1.3.1. Importance of chain integrators

As far as previously mentioned, the instruments that chain integrators use to develop market linkages for smallholders serve three major purposes those are: - reducing transaction costs, creating production networks and developing firm level capabilities. Based on the results of the review of literature, these instruments have been briefly discussed below. Nevertheless, it is important to remember that the instruments are very context specific. Therefore, these instruments simply served as an inspiration for the field research. The analytical framework would accordingly be framed in terms of the purposes of the interventions, in order to give it a stronger conceptual value.

To reduce transaction costs- in this case chain integrators have tried to ensure price stability for certain commodities. Particularly for smallholder farmers price stability is essential. For subsistence farmers with low incomes, fluctuating prices can have demoralizing effects and may lead them to abandon a business agreement. Important with regard to pricing is also the

negotiation process in which the prices are determined. Chain integrators have been active in price negotiations to support the weaker party in order to get fair price agreement. Another instrument that is used to reduce transaction costs is the introduction of production and quality standards. These standards are useful for buyers as they guarantee quality inputs. For producers they increase sales opportunities and sometimes a premium price can be earned. A final important field of intervention for chain integrators in the light of transaction costs has to do with the logistics of the products. This is a broad topic, concerning not only transportation, but in the light of smallholder production, also the collection of agricultural products and the use of informal channels such as middlemen.

According to network theory, chain integrators have mainly focused on developing and improving production networks such as farmer cooperatives and business associations. Cooperation of value chain actors at the same level has many advantages, among which increased bargaining power, learning opportunities and collective investment opportunities. However, production networks also encounter many obstacles, such as a lack of resources, weak capabilities and fraud by its members. Therefore, chain integrators with relevant expertise have been able to play an important role in strengthening the capabilities of such networks.

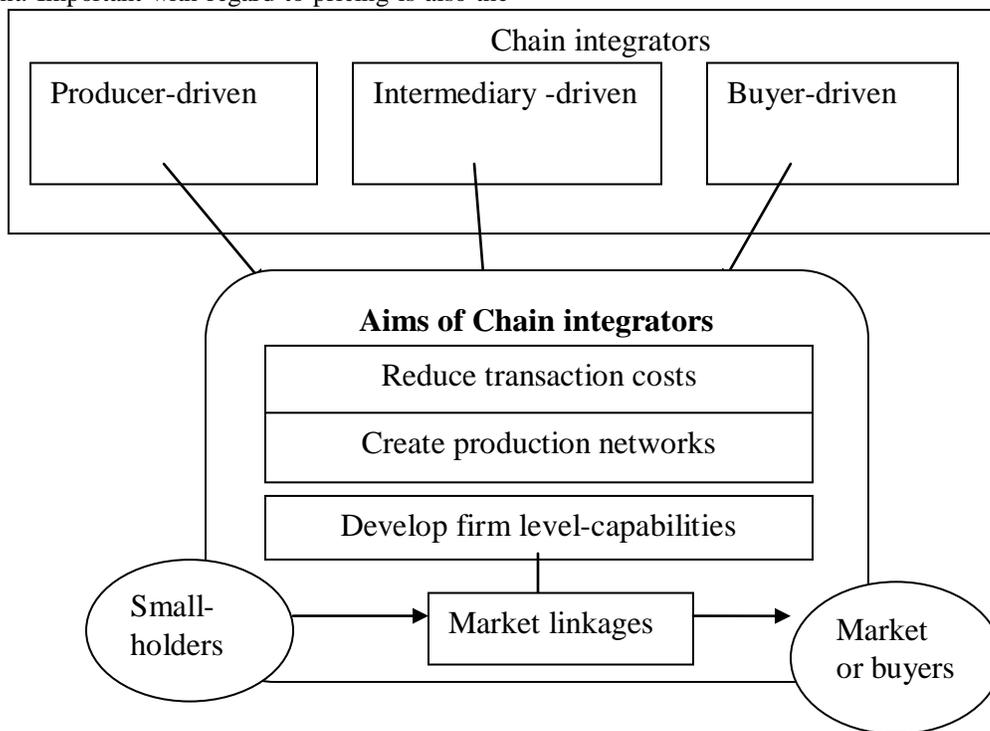


Figure 2.1: Analytical framework

1.4. Methodology of the study

The data that was used in this research is both primary and secondary data sources, with an emphasis on primary data. The data were collected by means of in-depth interviews, field visits and observations. The in-depth interviews were conducted with important stakeholder in the Ethiopian coffee producers. The interviewees were selected based on their membership of Ethiopian coffee Processers Association and their activities in the coffee industry. A wide range of topics were discussed during

the interviews to construct a complete picture of the coffee value chain. Initially, several interviews were held to develop a better understanding of the industry. Already in the early stages of the primary data collection, the different types of chain integrators that drive the development of market linkages for smallholder farmers were identified. The field visits and observations were a combined effort and sometimes took place after the interviews with the stakeholders. Also stallholder’s farms were visited sometimes, to get an impression of how the farmers were kept

and their attitude towards working with chain integrators. During the field visits we spoke with employees of the coffee producers. Thus, the field visits offered a clearer picture of the concrete activities in the chain. As far as secondary data a couple of reports were used that provided an overview of the Ethiopian coffee producers and also presented relevant quantitative data about the industry that was useful later on. In addition, other research reports about the industry were used to determine its structure and a few annual reports of the coffee firms provided more quantitative data and a sample of 60 smallholder farmers are taken and the collected data has been analyzed with the help of SPSS version 16 software.

1.5. Analysis and Discussions

This chapter has been discussing the findings of the preceding analysis by comparing the different types of chain integrators on each instrument. This approach provides a good indication of how each chain integrator treats its instruments that aim to develop market linkages for smallholders.

1.5.1. Role of chain integrators

Smallholders in Ethiopia often face several different problems that hinder their ability to develop new market opportunities independently. An obvious lack of education limits their ability to recognize or develop business opportunities. Financially, producers are in a weak position as well. Low incomes lead to low savings, and their lack of collateral or education reduces their creditworthiness. It is very difficult to enter new markets without capital to invest. Yet another problem is the small scale of production. As the result has been shown farmers usually own traditional coffee that is very well able to survive the local weather conditions in Ethiopia but they produce little coffee. In addition, most farmers live in remote, rural areas that are hard to reach, their position on the market is particularly weak.

In this case chain integrators attempt to address these weaknesses of the farmers and help them to create new opportunities. Their attention goes to education and training, organization and improving production facilities. Generally, as the result shown their efforts aim to serve three purposes:-

1. Reducing transaction costs, creating production networks, and developing the resources of the firm. On a microeconomic level this means that they have to pay attention to many details. Among central importance in the Ethiopian coffee industry is the coffee collection center. This is the place where the buyers and sellers meet to engage in market transactions, and is therefore the logical place to start building a sustainable relationship aiming to trade cash coffee. As the result has been shown that there are many things that need to be taken into consideration when developing a sustainable system for coffee collection. The set up of factors such as transportation, additional services, and etc all influence the decisions of smallholders and thus leads to have the ability to contribute to a durable cooperation arrangement. It is sometimes a challenge for the chain integrators to align their interests with those of the farmers. This article showed that farmers generally take a short term perspective, meaning that they are focused on direct gains and invest little in the development of their

production capacity and market access. In general, chain integrators take a long-term perspective, meaning that they prefer build durable market relations with smallholders and would prefer that farmers develop their production capacity and quality and commit to the coffee business.

2. Creating Production networks are a useful tool to strengthen the position of farmer's via the market. The aim of these groups is to create a shared responsibility among farmers and to have them stimulate each other to perform and deliver. These groups are seen as a starting point for a system in which the farmers take a higher level of responsibility or even manage their own coffee production activities. Particularly producer-driven initiatives have a strong track record in this area, as they often focus on the empowerment of smallholders.
3. Furthermore, as the result has been shown chain integrators put their attention on the development of the productive resources of the farmers. With poor quality resources it is very challenging to develop new market linkages. Farmers therefore need to upgrade their resources, in terms of better quality of seeds and the opportunity to attract capital to invest. For the traditional smallholders this requires a change of mindset, from considering their product activities as a side-activity, to approaching it with a more professional attitude.

1.5.2. Aims of Chain integrators with compared to roles of chain integrators

As the result of the study has been shown when comparing the three types of chain integrators, it is clear that each type has its own strengths and weaknesses. This section compares the different approaches of the chain integrators to develop market linkages for smallholders.

- Transaction costs have been discussed in terms of four factors that were also touched upon in the analysis particular. These includes: commitment or trust; ownership of equipment; remuneration of coffee collection center staff and use of middlemen. Trust is an important factor when trying to build a long lasting business relationship with smallholder farmers. On the informal coffee market in Ethiopia, there exist many uncertainties. Farmers are never certain whether they can sell all the coffee that they produce on the informal market. If they are too late or if there is too much competition, they are not sure to sell all their products. Many farmers have experienced that these are very unreliable, especially regarding their payments. Thus, in order to compete with the informal market, chain integrators can focus on earning the trust from the farmers. This result shown that the trust of the farmers is higher in the intermediary-driven and producer-driven models, than in the buyer-driven models.
- In the buyer-driven model the coffee processors (buyers) mainly try to create commitment through stable prices, timely payments. Even though many farmers appreciate those aspects, they are not a binding factor for the farmers. Sometimes, the coffee processors cannot live up to their promises, damaging the faith of the farmers in the model.
- In the intermediary-driven and producer-driven models, farmers have a much stronger belief in the functioning of the model. This is probably because they feel much more

involved due to the membership of a farmer group. Membership enables them to contribute to the decision-making process. Farmer groups thus have a much better ability to communicate with the farmers in case of unforeseen events. Farmers that are member of the groups also have a special interest in the performance of the coffee collection, because they pay membership fees or receive special benefits.

- Working with middlemen is a weak issue in the Ethiopian coffee industry particularly Gihmbi zone. The ones that are delivering to the informal market are generally considered unreliable and arbitrary. They pay a different price to each farmer. Despite of these claims, many farmers and coffee processors have worked with these on a regular basis. The negative attitude towards middlemen is also expressed in the models for chain integration. The buyer-driven model is the only model that actively uses middlemen to supply their coffee collection centers.
- Generally, the transaction costs are addressed differently by each of the models, although the intermediary-driven and producer-driven models take a similar approach. Their aim is to increase the trust and sense of responsibility of the farmers so that their actions reflect their commitment to the models. This reduces the need to create micro-economic incentives, such as motivating coffee collection center manager by performance payments, but at the same time it puts strong faith on the integrity of the farmers. On the other there is the buyer-driven model that places a stronger emphasis on economic incentives to develop trust and commitment.

1.6. Conclusions

- Smallholder farmers often have a lack of resources and capabilities that prevent them from entering and competing in formal markets. Consequently, they usually operate in the informal track, making little effort to upgrade their production facilities. In this case chain integrators can play an essential role in linking smallholders to the market.
- There is the buyer-driven model, in which the coffee processors act as an initiator for the development of continuous market transactions for coffee that they use as an input in their factories.
- There is the producer-driven model, through which the producers try to cooperate and achieve economies of scale that allow them to engage in processing activities and serve new markets. The focus of this type of chain integrator is on

the cooperation with fellow producers by building networks, share knowledge and build new capabilities.

- There is the intermediary-driven model, in which an external agent assists in the development of market linkages for smallholders with the aim to increase their incomes and improve their livelihoods. This type of chain integrator aims to develop the capabilities of the farmers through the development of networks, basic processing facilities and education.

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Impact of E-Governance on Employees Performance

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Abstract- Very important element in the entire process of Governance is the performance of employees, which leads to achievement of goals. Nowadays lot of changes are taking place around the world due to ICT enabled governance. As these changes are occurring very rapidly, organisations tend to adopt ICT at the same pace and speed to remain in the competitive market. Many studies and research has undertaken to evaluate the impact assessment in relation to cost, quality, revenue generation, and perceived value delivered to the customers, but very little research has undertaken to assess the impact in relation to the employees, who are the first caretakers in the whole process, hence it is felt that there is need for development of a Frame work for assessing impact of E-Governance on Employees. After extensive research survey, authors has concluded that creativity, Personal efficacy and Effectiveness leads to efficient delivery of services by the employees in E-Governance scenario.

Index Terms- Employees, E-Governance, Frame Work, Creativity, Personal Efficacy, Effectiveness:

I. INTRODUCTION

In early 1990's two changes swept across the world-the focus on good governance with increasing non-government participation in delivery of public services and information communication technologies(ICT) and internet- technologies that potentially could connect any and every one in real time. The concept of e-Government or e-Governance was born through the amalgamation of these two. E-Governance marked a paradigm shift in the philosophy of governance- citizen centricity instead of process centricity and large scale public participation through ICT's enablement.

In this context, union government of India approved National e-Governance plan (NeGP) during May-2006 with a vision to "make all government services accessible to the common man in his locality, through common service delivery outlets and ensure efficiency, transparency and reliability of such services at affordable costs to realize the basic needs of the common man."

The important attributes of the NeGP vision, efficiency, transparency and reliability of services are entirely depend on how employees perceive and adopt change by moving away from the old concept of manual systems.

²E-Governance Strategy for Karnataka "has stipulated that, government is more concerned about the changes in mind set at all levels of hierarchy, administrative dedication, by overcoming resistance from the traditionalist and those whose vested interests are threatened by the change.

³Research studies published in European Academic Research journal, has stipulated that "very important in the entire processing of E-Governance project is the Performance of Civil servants who are the first caretakers in this whole process.

Roche (1999) defined impact assessment as, the "systematic analysis of the lasting or significant changes-positive or negative intended or not – in people's lives brought about by a given action or services of actions.

¹Frame work for Citizen Engagement in E-Governance, Dept. of Electronic & Information Technology, Government of India, April-2012.

²E-Governance Strategy for Government of Karnataka, Department of IT & BT, Government of Karnataka, 2001.

³Lulzum Shabani, University of Pjeter Budi, Pristina, Vol-ii issue April-2014, European Academic Journal.

II. LITERATURE REVIEW

1. **Amabile, 1996:** Argues that creativity relevant skills include both domain relevant skills and creative thinking skills. Domain relevant skills refers to abilities regarding a specific content domain relevant to solve problems and complete tasks. Creative thinking skills refers to the ability to take new perspectives on problems and apply persistence to the exploration of new pathways to solve the problems.

2. **Bhatnagar.C & Nurpur Singh, 2010:** Has felt that Academic research on evaluation of E-Governance projects is clustered around two aspects.

(1) The first group studies assessed a number of projects post implementation with a great deal of variations in terms of "what was measured" and methodologies used or "how the measures were carried out".

Some studies examined the implementation process within the agency to evaluate whether the systems were functioning as they were designed to, or the degree to which the intended outcomes were achieved (Madon, 2000). Some studies looked at long term sustainability and scope for replication of a project (Kumar & Best 2006). While some measured the benefits that were delivered to the clients.

(2) The second group of studies focussed on developing a frame work for measurement of value delivered to different stakeholder. Different components of value are identified, and a methodology of measuring the performance of each element proposed. Frame works are expected to be applied to individual projects, either ex ante to determine whether the project needs to be implemented at all, or ex-post to make a judgement on its success.

3. **Bounds at all, 2005 ; Robbins, 2000:** has felt that Common measures of organisational performance are effectiveness and efficiency.

4. **Competency Dictionary for the Civil services: GoI-UNDP Project**-Strengthening HRM of Civil Services, stipulates Efficiency comprises Result orientation, Conceptual thinking, Initiative and drive, Seeking information, Planning and coordination, Desire for knowledge, Innovative thinking, Problem solving, Developing others, Self-awareness and self-control, Communication skills, and team working.

5. **Electronic Administration Development Agency(ADAE) & Bearing Point,2005:MAREVA methodology guide:** Provides a detailed method of computing costs and gains for an agency to calculate the expected return on investment(ROI) before a project is taken up. However, it suggests four other parameters on which a project should be assessed-Necissty of the project, Level of risk, Benefits employees and society, and concrete benefits to clients. Each of the five parameters is rated on five pppoint scale and presented as a radial diagram for all projects being compared. The key benefits for the clients are identified as gain of time, savings of money and simplification of accessibility.

6. **European Commission,2006: eGovernment Economics project(eGEP); Measurement framework final version:** stipulates that the measurement is build around the three value drivers of Efficiency(Organisational Value), Democracy(Political Value), and Effectiveness(User Value), and it is elaborated in such a way as to produce a multidimensional assessment of the public value potentially generated by eGovernment, not limited to just the strictly quantitative financial impact, but also fully including more qualitative impacts

7. **Federal Ministry of the Interior, Germany, 2004 WiBe 4.0: Recommendations on economic efficiency assesments in the German federal administration:** reports that WiBe is an approach that has been used for a decade for assesment of IT projects in Germany. It provides very detailed templates for calculating costs and revenues, templates for assessing investments, operating costs, and revenue impacts for the agency.

8. **Grimsley & Meehan, 2007 :** Explained that, E-Government systems frequently encompass strategic goals that go beyond efficiency, effectiveness, and economy to include political and social objectives, such as trust in government, social inclusion, community regeneration, community well being and sustainability.

9. **Martin Hoegl, 2007** “Creativity in Innovative projects”, Journal of Engineering and Technology Management : Argue that team work quality moderates the relationships of domain relevant skills and creative thinking skills with team performance.

10. **Pandey, 2009:** Organisational Factors for Exploration and Exploitation, 2009: carried out a study about effective organisational factors of employee creativity and finally concluded that creativity is greatly under the influence of organisational structure, leadership style and reward system in organisation.

11. **Rahnama ,2011:** Faculty of M & A Islamic Azad University, Iran Australian Journal of Business and Management Research Vol-1 : The survey of Relationship between Creativity and Organisational Effectiveness: Has concluded that there is a statistically significant relationship between employee creativity and organisational effectiveness in educational department of east Azerbaijan and Ardabil provinces. Creativity will contribute

to organisation effectiveness through improving employee performance.

12. **Rahul De, IIMB, 2006:** Journal Regional Development Dialogue, Vol 27: Felt that Most of the E-Government systems that are implemented in developing countries around the world fail, with the failure rate at over 80%(50% are partial failure and the rest are total failure). Many reasons are attributed to such failure rates, most of which have to do with a lack of direction and continued support by the responsible government departments.

13. **Sakalyte, 2013,;** Organisational Assessment, in STICS online Journal: Explained the fundamental difference between organisational assessment, that effectiveness is much broader perspective, which takes into consideration account quality, creation of value added, employee satisfaction, output interaction with the social and economic environment.

Variable/s	Effective	Ineffective
Efficient	Succeeds at minimum cost. The company thrives	Cost under control but fails to succeed. The company is bankrupting slowly
Inefficient	Succeeds at a high cost. The company exists.	An expensive failure. The company is bankrupting fast.

14. **Stefanos Mouzas, 2006:** University of Bath, UK, :Efficiency Vs Effectiveness: Concluded that Efficiency and effectiveness are central terms in assessing and measuring the performance of organisations as well as inter organisational arrangements such as strategic alliances, joint ventures, sourcing as well as outsourcing agreements.

15. **Shelly and Gilson, 2004:** What Leaders Needs to Know,; carried out study about effective group, individual and organisational factors of creativity and came to conclusion that time resource, group communication system, and organisational structure has an impact over individual creativity.

16. **Thomson, 2000:** Effects of Control on Choice reward and punishments, (2000): attributes break of hierarchy structures to the open and free communication that this in itself leads to more intra organisational risks and at last creativity increase and this factor makes organisations more effective and leads to creativity.

17. **Venkata Rao, 2008, Professor, C & IS, IIM Ahmedabad:** VIKALPA, Vol 33 : Impact Assessment of E-Governance Projects: Felt that the, impact that an e-Governance initiative can make depends very much on not only the relevance of the initiative, but also the capabilities of the officers who are involved with the initiative during the various phases of its life cycle.

18. **Woodman et al., 1993, Ford 1996, Taggar 2002,;** Explained that the Creativity has been typically conceptualized as an outcome, such as the novelty or inventiveness of a problem solution achieved, often referred to as the creative product.

III. OPERATIONAL DEFINITIONS

Impact of change entirely depends on human behaviour in an organization, which is influenced by various physical, social and psychological factors.

The key concepts which integrate an individual with an organization is the personal efficacy, effectiveness and creativity.

Personal Efficacy

The self is at the centre of a person's competence. The term "efficacy" has been used in the sense of potential effectiveness. ⁴Self-Efficacy is one of the indicator of Civil servants Performance.

Self-esteem is a "trait reflecting an individual's characteristics effective evaluation of the self (for ex feeling of self-worth or self-liking)- Gist & Mitchell 1992.

Self-efficacy "refers to beliefs in ones capacities to mobilize the motivation, cognitive resources and courses of action to meet given situational demands (wood & Bandura 1989).

Bandura (1982) proposed the concept of self-efficacy and a lot of research has been done on this concept. Three aspects are important in self efficacy.

First: - Judgment of ones perceived capability to perform specific task.

Second: - This judgment is not static and can change with new information.

Third: - It involves a mobilization component i.e., differential performance.

Gist & Mitchell (1992) have proposed a three dimensional model of efficacy determinants. Locus of causality (external-internal), variability (overtime and occasions), and controllability of the causal influence.

The concept of sense of efficacy has been proposed by pizer(McClelland and winter, 1969) in relation to goal(being-vs-doing), locus of resources(internal-vs-external resources or lack of resources), state(global-vs-specific), action(initiative-vs-compliance) and approach to problem (approach-vs-avoidance).

Personal efficacy is the general sense of adequacy which is likely to contribute to a person's effectiveness in working for a task related group. It may be useful to consider what contribute to personal efficacy as this may help to devise ways of measuring and analysing the variable. It is proposed here that *Four sets of factors contribute to personal efficacy:-Motivation, Self-awareness, Proactivity, and Action orientation.*

(a) Motivation:

It is an important aspect of personal efficacy. An individual with high personal efficacy is a highly motivated individual. Three motives or needs are fairly high in such person.

*The need for efficiency or excellence (achievement motive)

*The need for influence others (power motive|)

* The need to pursue goals that are likely to help a large number of persons (extension motive).

Achievement motivation is reflected in the concern a person shows for competition, either with others or with his own standards of performance, unique accomplishment or long term involvement.

Power motivation is reflected in the urge to influence others or to change things etc,

Extension motivation is reflected in the super ordinate goal of an individual and the concern he shows for others. Concern

for others would include concern for ones family, for others persons and for society at large.

(b) Self-awareness:

A person with high personal efficacy has higher awareness both of his strengths and his weakness. Such awareness helps him to use his strengths effectively and to manage his weaknesses by taking steps to remove them.

(c) Proactivity:

Personal efficacy is related to an individual's ability to take initiative. A person can either wait or react to situations or he can take the initiative. The latter is called proactive behavior. Proactivity includes at least three aspects.

First:- a proactive person feels that he can change things, or in general determine a course of action. Such a person is said to have an internal locus of control. A person who believes that events depend on outside forces (Fate, God, the Government, Parent, and Boss) is said to have external locus.

Second:- Proactivity is reflected in the attitude towards a problem, a proactive person solves a problem instead of waiting for a solution from outside or avoiding it altogether. This can be called proactive orientation.

Third:- A proactive person looks for available resources and utilizes them. The resources a person sees around him, the more proactive he is.

(d) Action Orientation:

Personal efficacy results in action. It is a part of efficacy. Action orientation may be shown in three ways:

First: An action orientation person shows some amount of self-discipline, for ex he works hard, denies himself opportunities for immediate gratification of some of his desires, sticks to schedules, spend long hours on the job and so on.

Second:- Planning orientation is the second aspect of action orientation. The person plans detailed activity schedules to reach a goal. Not satisfied only with formulating a goal, he prepares functional linkages between the goal and his present state. Finally such a person is also future oriented. Instead of living in the past or only confining himself to present he is obsessed by the future. What he wants to achieve, how he will act and so.

Personal Effectiveness

One precondition for personal effectiveness is better self-awareness. But only understanding one's self does not make a person effective. One simple model for self-awareness, which is widely used, is the Johari Window, developed by Luft and Ingham (1973). In this model, there are two main dimensions for understanding the self, those aspects of a person's behaviour and style that are known to him(self) and those aspects of his behaviour that are known to those with whom he interacts(others). A combination of these two dimensions reveals four areas of knowledge about the self (Exhibit-1)

	Known to self	Not known to self
Known to others	Arena or Public(A)	Blind(B)
Not Known to others	Closed(.C)	Dark(D)

Exhibit-1

In the Johari window model the size of the arena or open space is critical for personal effectiveness. Arena increases in proportion to the decrease in the blind and the closed area.

⁵Efficiency and effectiveness are central terms in assessing and measuring the performance of organisations as well as inter organisational arrangements such as strategic alliances, joint ventures, sourcing as well as outsourcing agreements.

⁶Common measures of organisational performance are effectiveness and efficiency.

(a)Openness:-

Openness is critical for effectiveness. Openness has two aspects- self disclosure and use of feedback. In addition perceptiveness or sensitivity to others feelings and non verbal cues, is also important.

The extent to which one share ideas, feelings, experiences, impressions, perceptions and various other personal data with others shows the degree of openness which is an important quality and contributes a great deal to persons effectiveness.

(b)Receiving Feedback:

Feedback on those aspects of a person about which others are aware but the person himself does not know about may be positive or negative. General there is no problem in positive feedback. Negative feedback however creates dissonance with self-image, and may be threatening to the ego. When one receives negative feedback, one tends to be defensive and generally uses defensive behaviour to deal with the feedback.

(c)Perceptiveness:

The ability to pick up verbal and nonverbal cues from others indicates perceptiveness. However like openness, this dimension must be combined with the other two dimensions for effectiveness. A person who is not open may receive many cues and much feedback from others at first, but soon he may be seen as being manipulative and generally unavailable. Perceptiveness and openness reinforce each other and if used effectively are likely to increase personal effectiveness.

Creativity:

Creativity and innovation are sometimes seen as synonymous. At a minimum, creativity can be defined as problem identification and idea generation, whilst innovation can be defined as idea selection, development and commercialization. Innovation often means that outside decision-makers have to get involved, as complete development and commercialization commonly require the competencies and knowledge of a team. Different competencies, structures, processes, resources and time scales are required.

The relationship between creativity and intelligence has always been a central concern of psychology (Guilford 1950). Parenthetically, it is interesting to note that a major impetus for

Guilford’s theory was his interest in creativity. The divergent production operation identifies a number of different types of creative abilities.

⁴Competency Dictionary for the Civil services: GoI-UNDP Project-Strengthening HRM of Civil Service

⁵Stefanos Mouzas, University of Bath, UK, 2006.

⁶Bounds at all, 2005 ; Robbins, 2000.

⁷The survey of Relationship between Creativity and Organisational Effectiveness, has concluded that there is a statistically significant relationship between employee creativity and organisational effectiveness. in educational department of east Azerbaijan and Ardabil provinces. Creativity will contribute to organisation effectiveness through improving employee performance.

Much effort has been devoted towards the measurement of creative potential. A common framework for creative thinking processes is described by Torrance(1979). Each aspect is defined further, along with ways to facilitate the respective aspects by using key words and application activities.

Fluency:-refers to the production of a great number of ideas or alternate solutions to a problem. Fluency implies understanding, not just remembering information that is learned.

Flexibility:- refers to the production of ideas that shows a variety of possibilities or realms of thought. It involves the ability to see things from different points of view, to use many different approaches or strategies.

Elaboration: is the process of enhancing ideas by providing more detail. Additional detail and clarity improves interest in, and understanding of the topic.

Originality: involves the production of ideas that are unique or unusual. It involves synthesis or putting information about a topic back together in a new way.

Certain cognitive skills seem to underlie creative behaviour such as

1. Fluency
2. Flexibility
3. Visualization
4. Imagination
5. Expressiveness and
6. Openness

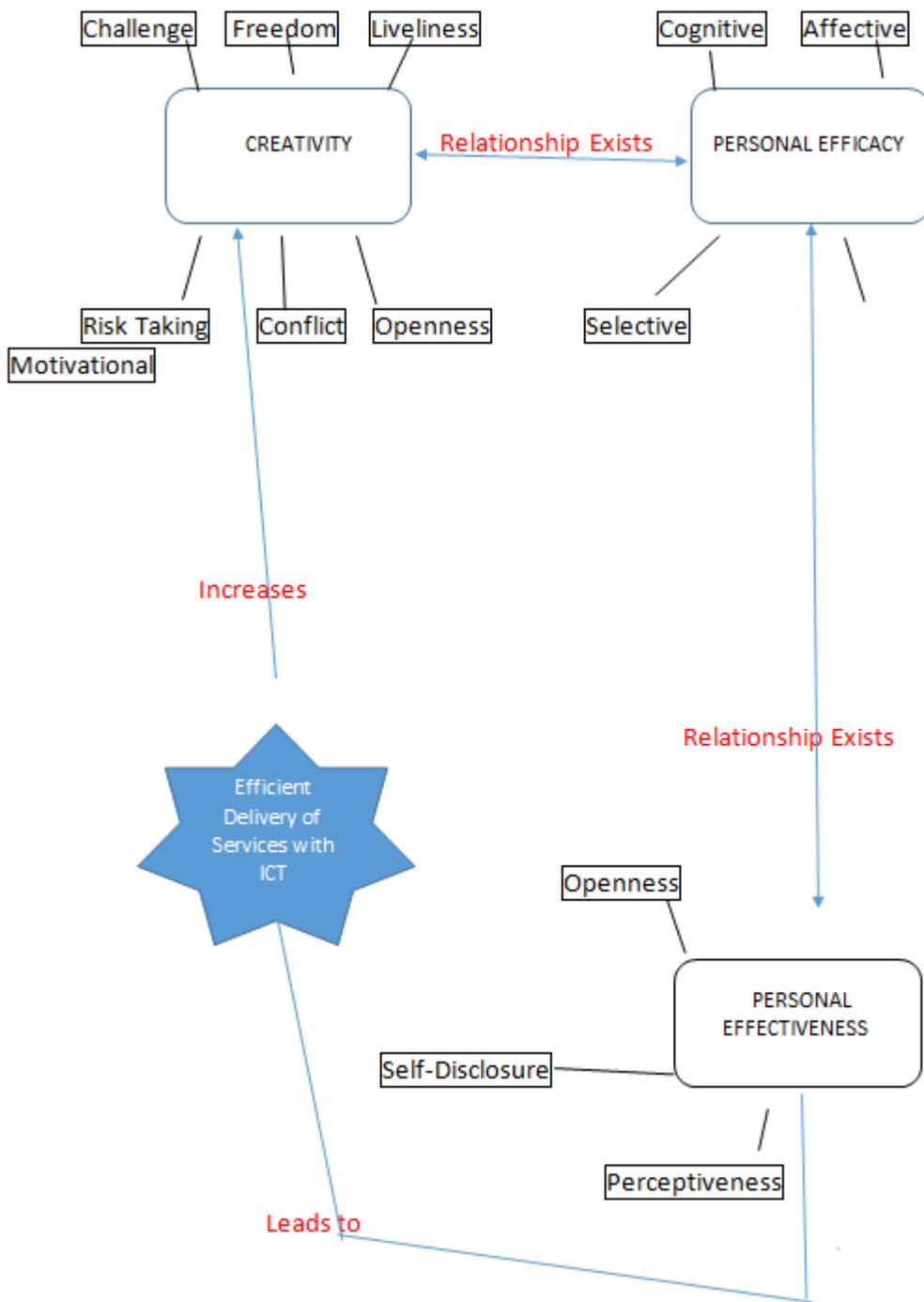
⁷Rahnama,(2011). Relationship between Creativity and Organisational Effectiveness. *Australian Journal of Business and Management Research*.Vol-1.Sep-2011.

These skills may be personality characteristics, which may be learned, or may be situational. There is also general acknowledgement that social processes play a major role in the recognition of creativity.

The following dimensions of creativity can be measured with the help of creativity assessment Inventory (CAI), developed by Rachita Sinha & Surabhi Purohit.

1. Challenge: A creative person approaches challenges and difficulties energetically and with enjoyment.
2. Freedom; A creative person prefers to be independent and happy to take initiatives and give voice to his/her ideas.
3. Liveliness: A creative person is busy most of the time. He mostly remains excited and happy.
4. Openness: A creative person tends to be trusting and considers mistakes a soothing to learn from.
5. Conflicts; A creative person looks for a help win win compromises, which needs willingness to communicate with understanding and empathy.
6. Risk Taking: A creative person takes responsibilities readily and doesn't hesitate to act on new ideas.

Conceptual Frame work of the Study



3. Objectives:

3.1 To find out the different factors that influence the performance of employees in Government of Karnataka.

3.2 To find out the relationship between Creativity, Personal Efficacy & Effectiveness of employees in Government of Karnataka.

3.3 To find out the overall impact of E-governance Scenario on the performance of Employees of Government of Karnataka.

4. Hypothesis of the Study:

The following are the Hypothesis statements to fulfil the objectives mentioned at 4.2

- 4.1 The relationship between creativity of employees and their personal efficacy is positively correlated.
- 4.2 The relationship between creativity of employees and their effectiveness is positively correlated.
- 4.3 The relationship between Personal efficacy and Effectiveness is positively correlated.

5. Formulation of Questions:

The Survey used the following questionnaires, to find out the results of the research study.

- 1. Personal Efficacy Scale (PES), developed by Udai pareek
- 2. Personal Effectiveness Scale (PE), developed by Udai pareek.
- 3. Creativity Assessment Inventory (CAI), developed by Rachita & Purohit.

Data Collection & Analysis

Psychological Data has been collected from 125 officers of Government of Karnataka who are working in E-Governance scenario, by administering the above questionnaires. Pearson’s correlation co-efficient and Sig.(2-tailed), is adopted for Data Analysis.

Correlation

		Personal Efficacy	Personal Effectiveness	Creativity
Personal Efficacy	Pearson Correlation	1	.050	.386
	Sig. (2-tailed)		.469	.000
	N	90	90	90
Personal Effectiveness	Pearson Correlation	.050	1	.257
	Sig. (2-tailed)	.469		.022
	N	90	90	90
Creativity	Pearson Correlation	.386	.257	1
	Sig. (2-tailed)	.000	.022	
	N	90	90	90

IV. CONCLUSION

Pearson Correlation coefficient shows, positive correlation between the creativity & personal Efficacy (0.386), and Creativity & Personal Effectiveness (0.257), among employees of GOK in E-Governance scenario. The critical value of ‘r’ at the 5% significance level is 0.2050, which is less than calculated value, which indicates acceptance of the Research Hypothesis. As per the results obtained through Pearson correlation coefficients we may accept research hypothesis, but due to little significance in α values, it is suggested that research may be continued with larger sample and with independent variables to authenticate the relationship.

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Mall Management: An analysis of customer footfall patterns in Shopping Malls in India

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Abstract- Mall management is a multifaceted and more complex business proposition. Mall culture is viewed as a significant change in the lifestyle of Indians. Malls have completely redefined the shopping experience. These malls have hoped to capitalize on teeming crowd, but it did not materialize, as per (Malls in India report, 2014) about 90% of the Malls are struggling to sustain. Today the deserted mall buildings e.g. Star City Mall, DLF Promenade are leased out to corporate offices and banquet halls owners.

The purpose of this study is to analyse the behaviour of mall shoppers that will drive footfalls in the malls. Like any other business thorough understanding of consumer is must, it is important to understand the consumer and shoppers profile in the catchment area, before leasing out space to anchor tenants in Malls.

Shopping Malls, as an industry is driven by real estate, not by retailing. Mall management has been identified as a critical factor for the success of mall. The study investigates the concept of mall management and indicates that success model of a mall does not depend on a single variable (retail brands) but a combination of multiple variables (real estate planning, zoning, anchor tenants, accessibility, connectivity).

Index Terms- Mall management, Shopper behaviour, yield management

I. INTRODUCTION

The purpose of this study is to understand the Indian mall shoppers by identifying their core characteristics including psychographics, demographics and shopping attitudes and its impact on shopping malls in India.

1. Introduction:

Mall development is taking place at a rapid pace in both Tier I and Tier II cities in India, driven by the organized retail sector. For the discerning Indian consumer, the malls are proving to be a panacea to all their shopping woes.

The packed parking areas, crowded food courts, brimming anchor stores and kids' zones are a testimony to the above. Increasing disposable incomes and paucity of quality time are creating a need for malls in the lives of affluent, urban Indian consumer. But, malls are shocked to learn that while people are spending a lot of time at these malls, they are not spending a lot of money. The objectives of this research study are therefore to classify mall shoppers by volume into heavy, medium and low rupee spenders and analyse difference between three groups in

(a) Demographics (b) Shopping orientations (c) Values and Lifestyle (d) Mall shopping attitude and behaviour.

II. REVIEW OF LITERATURE

MALL PATRONAGE:

Early researchers on mall patronage created gravitational models to determine patronage for shopping areas using multiple objective measures, such as distance, population density and mass(square footage of retail space)(Brunner and Mason, 1968; Huff,1963;Bucklin, 1967). Huff (1964) and Huff and Rust (1984) retail gravity model, provides a method for determining mall patronage based on the principle of cost (accessibility) versus utility (size). According to Moore and Mason (1969) who looked at the concept of retail centre patronage, the validity of these models and other approaches to trading area analysis using the concepts of mass and distance are debatable, since they presume similar retail centre patronage decisions from shoppers with similar incomes, educational levels and occupational classification. At this point, studies started having a rising customer focus. Later, studies focussed on subjective factors such as image attributes and consumers' shopping motives (Bellenger et al.,1977; Gentry and Burns, 1977-8; Nevin and Houston, 1980; Finn and Louviere, 1996; Stoltman, 1991). Wakefield and Baker (1998) examined the association between three factors- tenant variety, mall environment and shopping involvement, on shoppers' excitement and desire to stay at the mall to understand antecedents and consequences of excitement at the mall. LeHew al. (2002) enhanced the loyalty concept and studied mall attributes that influenced loyal patronage of malls while Zhuang al. (2006) studied the effect of situational variables on buying decisions. Hunter (2006) also determined the process by which image influenced patronage.

DECLINE IN MALL PATRONAGE

During the 1980s in the US, the mall was a fashionable destination for shopping and recreation (Kowinski, 1985). In the early 1990s Fienberg and Meoli (1991) reported that half of all retail sales were through malls. However, recent trends indicate that mall patronage is declining. According to the international Council of Shopping Centers, the mall industry has suffered through several years in which sales growth has not even matched the rate of inflation (Pacelle, 1997). Moreover, while malls sales are declining, the amount of retail mall space is increasing. Industry experts suggest three reasons. First, there are too many malls that look exactly same, with too many stores offering too much of the same merchandise (Ashley, 1997;

Templin, 1997). Due to paucity of time, consumers seek to maximize their shopping time (Ashley, 1997). Third, fewer consumers are expressing they go to the mall because they relish the experience (Berry, 1996; Chandler, 1995). Despite the seemingly bleak outlook for malls, there are some notable success stories. Even though people's lives are reportedly more time-pressed, they will find time to engage in activities they enjoy (Ashley, 1997). Mall developers are attempting to attract customers by creating an exciting shopping experience designed to attract and keep them at the mall (Cockerham, 1995). Academic research has also proved that consumer's attitude influences their decision to shop, from mall or catchment of stores, shopping centres environment (Finn and Louviere, 1990, 1996; Gentry and Bums, 1977). Customers seeking to maximize their shopping time will often drive past weaker malls to reach destination malls that have the finest variety of stores and merchandise (Ashley, 1997).

CONSUMER BEHAVIOUR

According to Tauber (1972), consumer behaviour consists of three distinct actions: shopping, buying and consuming. More progress has been achieved in identifying behavioural dimensions of buying and a number of theories on buying behaviour have been postulated in past research. However, fewer number has researched about the determining factors of consuming and shopping behaviour. Tauber (1972) also argued that shopping is more than simply purchase but also a leisure activity. In his study, Assael (1987) had discussed shopping behaviour as a typical form of consumer behaviour. Consumer behaviour can be defined as the behaviour that consumers demonstrate in search for, purchasing, using, evaluating and disposing of products and services that they expect will gratify their needs, Schiffman & Kanuk (2010).

Generally, there are many discussions about consumer shopping. Shopping has been described as an activity that refers to the procuring of consumer goods. It is also considered as an expressive activity such as shopping for consumer goods, dreaming about outfits and objects (Ramli, 2010). Lately, the study on shopping behaviour seems to imply that the main factors to attract customers and retain them are accessibility or location, new design, the assortment of retailers, leisure attraction, the communication mix, cost of access, customer services provided and the interaction between center, store and customer participants (Kirkup and Rafi (1999); Yusniza and Lee (2010)).

LOYALTY

Loyalty is stated by Dick and Basu (in Molina et al., 2008) as the blend of recurring patronage and encouraging attitude. However, behaviour shown through continuous purchases is actually defined as loyalty (Molina et al., 2008; Manana, 2009). Strongly held dedication to further repurchase a preferred or favoured product or service irrespective of situational control and marketing strategies that have potential to cause consumer switching activities, is defined as loyalty (Kotler and Keller, 2007; Manana, 2009). Brunner et al., (2010) described, repurchase likelihood, probability of long term choice, or switching manners are the measures of behavioural loyalty. Whereas in attitudinal aspect, brand inclination or emotional

commitment that is evaluated through repurchase intention, not considering other better choices, price acceptance and plan to communicate product or service to others is loyalty (Szczepanska & Gawron, 2011).

CONSUMER LOYALTY

Dick and Basu (1994), regarded the power of association between relative attitude of individual and their continuous purchasing behaviour as the consumer loyalty (Rittippant, Supradit, Virivasirimongkol & Skulareemit, 2009). If it is evaluated, it is taken as component of firm's wealth. Gremler & Brown (1996) defined consumer loyalty as the degree of consumer's repeat procuring or buying behaviour from a service supplier, having positive attitudinal nature towards the supplier and prefer this provider when require this service (Kheng, Mahamad & Ramayah, 2010). Consumer loyalty is considered as a positive perception about any object. (Szczepanska & Gawron, 2011).

MALL ATMOSPHERICS

Previous mall research (e.g., Bellenger, Greenberg and Robertson, 1977; Brown, 1991; Finn, McQuitty and Rigby, 1994; McGoldrick and Thompson, 1992) has reported the impact of mall atmospherics on behavioural responses, but has not examined the role of emotion in determining these behavioural responses. Because there are limited empirical studies on malls, marketing scholars have suggested a need for more research on consumer response to malls (e.g., Bloch, Ridgway and Dawson, 1994; McGoldrick and Thompson, 1992). Several store level studies have examined the effect of a single environmental element, such as music (Yalch and Spangenberg, 1990), color (Bellizi and Hite, 1992) and scent Spangenberg, Crowley and Henderson, 1996) on consumer emotion, but there are few studies that examine the effects of multiple environmental elements (cf. Baker, et al., 1992). Everett, Pieters and Titus (1994) aver that relatively little is known about the effects of the global configurations of aspects of the environment

CONSUMER INVOLVEMENT

Past theoretical and empirical work (Mano and Oliver, 1993; Richins and Bloch, 1986; Wakefield and Blodgett, 1994) work has shown that long term involvement is likely to influence emotional responses. Continuous and long-term involvement with shopping may increase a consumer's excitement with the shopping experience (Mano and Oliver, 1993). Thus, accounting for consumers' internal inclinations to enjoy shopping allows us to better understand the magnitude of any effects of the mall environment and tenant mix.

MALL PROMOTIONS

Mall promotions these days are as common a sight in shopping centres as the tenants themselves. Malls sometimes hold themed events especially during festivals, food festivals, handicraft exhibitions and celebrity visits which attract footfall and boost retailers' sales, but also provide a platform for opportunities in commercialisation (which means increased visibility and mileage, in the context of a mall). These events attract consumer durable companies, automobile companies, bringing in a lot of non core revenue because it helps them

promote the product among the relevant customers and built up a database of prospective customers. The brands are attracted to malls with high footfall and their target demographic. Retail Merchandising Units or kiosks are also a more permanent revenue stream. The promotional events include fashion shows, display of important cricket matches, football finals or the F1 grand prix. Often, these events are sponsored by the tenants of the mall who want to increase footfall. (Mall development and operations: An Indian perspective by Shelja Jose Kuruvilla and J Ganguli).

PROMOTIONS AND MARKETING IN A MALL

Promotional activities and events in a mall form an integral part of mall management. Organising cultural events has time and again proved vital in attracting consumers to a mall. Such activities may also act as a differentiator for a mall. Developers can formulate strategies for each mall according to the needs of the local consumers and meet the challenges posed by local/regional competitors. Ansal Plaza, the first mall in Delhi, is an example of a successful mall led by good promotions and marketing mall management practices. (Mall Management – A growing phenomenon in Indian Retail Industry June’2007).

ONLINE SHOPPING:

There have been intensive studies of online shopping attitudes and behaviour in the recent past. Most of these studies have tried to identify factors influencing or contributing to online shopping attitude and behaviour. The researchers seem to take different perspectives and focus on different factors in different ways. For example, Case et al. (2001) suggested that internet knowledge, income and educational level are dominant predictors of Internet purchases among university students. Bellman and colleagues (1999) reported that the online population is relatively younger, more educated, wealthier, although the gaps are gradually closing. They argued that demographics appear to play an important role in determining whether people use the internet, however, they also concluded that once people are online, demographics do not seem to be the key factors affecting purchase decision or shopping behaviour. Mishra S. (2009) also suggested that age and income show a strong relationship with purchasing behaviour. Banerjee et al. (2010) revealed that online shopping is significantly related with family income and frequency of internet usage and internet users with high disposable monthly incomes are more likely to engage in online shopping. This is one of the reasons that younger consumers are more open to online shopping (Dholakia and Uusitalo, 2002). They search for more products online and are more likely to agree that online shopping is more convenient (Sorce et al., 2005). Convenience along with other factors like price and wider selection influence the consumers’ attitude towards online shopping (Delafrrozn et al., 2009). Researchers

like Alam S. et al., (2008) explored additional factors like website design, reliability, customer service and security/ privacy significantly influencing young consumer perception of online shopping.

Perceived Risk was a major factor impacting consumer behaviour (Vijayarathy and Jones, 2000). Liebermann and Stashevsky (2002) and Forsythe and Shi (2003) provided evidence to support a relationship between perceived risk and frequency of use. Perceived risk is likely to have the greatest impact on sporadic internet shoppers, which precludes the conversion of Internet browsers into Internet shoppers (Forsythe and Shi, 2003; Cunningham et al., 2005). Risk perceptions and lack of trust were recognized as two major obstacles to the adoption of online shopping (Mukherji& Thomson, 2007). The model included several indicators belonging to four major categories: the value of the product, the shopping experience, the quality of service offered by the website and the risk perceptions of the Internet retail shopping. In a research conducted by Vellido et al. (2000), nine factors associated with users’ perception of online shopping were extracted. Among those factors, the risk perception of users was established (demonstrated) to be the main discriminator between people buying online and people not buying online. This evidenced that consumers’ attitude towards online shopping is a prominent factor affecting actual buying behaviour. Other discriminating factors were: control over and convenience of the shopping process, affordability of merchandise, customer service and ease of use of the shopping site.

In the Indian context, factors affecting online shopping are similar to global factors, but there may be some specific factors and an important point that needs to be considered is that the penetration of IT and its adoption in India has been slow. Convenience, Accessibility, Scope, Attraction, Reliability, Experience and Clarity are the important factors affecting online shopping in India (RRishi J.B., 2008). Amin and Amin (2010) found that gender plays an important role in online shopping. Females appear to be more concerned about personal privacy, trust, security and confidentiality while shopping online. A wide variety / range of product models are available with no need for a large physical space to store them.

1. Ease of shopping, sitting in comfortable confines of one’s home, no need to venture out when one is pressed for time.
2. Exchange policy.
3. Cash on delivery-Variou payment options like cash on delivery, net banking, and credit card to make payments.
4. Attractive deals on online shopping throughout the year.

The average footfall in a Delhi mall on weekdays is 35,000-40,000 and is 50,000-60,000 on weekends. Also, the following table summarizes the sizes of the most popular malls in Delhi-NCR:

	NAME	LOCATION	YEAR (OPENED)	SIZE
1	Ansal Plaza	Khel Gaon Marg	1999	1,75,000

2	Great India Place	Noida	2007	15,00,000
3	Select Citywalk	Saket	2007	13,00,000
4	Ambience	Gurgaon	2007	8,67,000
5	D Mall	Pitampura	2010	3,50,000
6	DLF Emporio	Vasant Kunj	2008	3,20,000
7	DLF Promenade	Vasant Kunj	2009	9,20,000
8	Living Style Mall	South Delhi	2010	-
9	Metro Walk	Delhi	2007	2,20,000
10	Square one Mall	Saket	2005	85,000
11	TDI Paragaon Mall	South Delhi	2010	-

Delhi's Select Citywalk one of the most popular mall in the country – is designed keeping in mind the affluent females accustomed to shopping in posh South Delhi markets like Defence Colony, Khan Market and Greater Kailash I. The product mix was designed to offer quintessential Indian brands such as Good Earth, Fab India alongside international labels such as Zara, Mango, Tommy Hillfiger. Speaking of design, the layout of Select Citywalk is such that all brands have high visibility.

III. METHODOLOGY

Testing of Hypotheses:

H1: There is a significant difference in the **demographic profiles** of Type I, II, III (High, Medium and Low) spenders.

H2: There is a significant difference in the **shopping behaviour** of Type I, II, III (High, Medium and Low) spenders.

H3: There is a significant difference in the **mall attitude** of Type I, II, III (High, Medium and Low) spenders.

Sampling: Sample collected was of 200 mall shoppers. Quotas were established for gender and age so as to ensure adequate representation of both genders and different age groups. Survey process was conducted in major metros across India. These cities were picked up owing to a high degree of mall penetration in these cities. Popular malls in these cities were chosen to ensure homogeneity in tenant mix and size.

Data Collection: A mall intercept data collection was used as it is quicker and simpler to administer to respondents for mall related questions. Data was collected through self-administered questionnaires. Every 3rd customer leaving the mall was requested to participate in the survey.

IV. MEASUREMENT

- Demographic Variables: The demographic data collected included gender, age, marital status, income, profession, education. These 6 variables were framed on appropriate category scales.
- Mall Attitude: Twelve shopping mall attributes were chosen to evaluate the importance mall patrons place on these. These correspond to the most common attributes studied in past patronage research viz., Location, parking facilities, variety of stores, mall employee behaviour, price, quality, customer service, promotional activities, ambience, mall amenities, food courts and

safety provisions. Degree of importance of these shopping mall attributes were measured through Likert-type responses.

- Mall Activities: A multi-item inventory of mall activities was devised using the design of the current Indian malls, review of literature on malls and the type of outlets found in malls. The items for mall activities namely, shopping, dining out, watching movies, meeting friends, window shopping, kid's zone and enjoying the ambience.
- Purchases: Purchases made at the malls were collected on a five point scale (1-Never and 5-Very frequently). Items chosen were selected on the basis of types of outlets found in Indian malls. These included: movies, dining out, apparel, footwear, jewellery, knick knacks and home needs.
- Frequency of visits, time and money spent

V. FINDINGS - DISCUSSION, SUMMARY AND IMPLICATIONS

The demographic profile of the sample studied indicates that majority of the consumers are young (with approx. 60% of the Sample between 18-35 years of age), with an income of over a lac per month (almost 50% earn over 12 lacs p.a.) and 36% respondents are at least a graduate. This indicates that the malls attract the middle as well as the upper classes in the catchment, highly educated and young crowd.

Married couples who visited the malls are twice of the unmarried people who visited the malls. Also, the number of females visiting the malls is twice as many as males visiting mall.

Almost 22% of the samples were students. This means that their visit may not necessarily be converting into sales/ revenues as it is a well known fact that students often visit mall only for window shopping and sometimes also for entertainment like movies, dining out, bowling alleys, gaming zones etc.

Also, 48% of the respondents visited the mall only once a month and 74% of the respondents spend 2-3 hours on an average per mall visit. It also emerged that almost 64% of the respondents spend 3000-12000 rupees per month in malls.

frequency of visiting the mall; **low degree of positive correlation** between time and money spent at the mall. However, there is a **high degree of positive correlation** between incomes of the respondent and money spent at the mall.

There is a **moderate degree of positive correlation** between age of the respondent and money spent; age of the respondent and

VI. HYPOTHESES TESTING

	INC	EDU	MARITAL	GENDER	PROFESSION	AGE
Chi-Square	72.640 ^a	111.680 ^a	15.680 ^b	25.920 ^b	37.600 ^c	25.920 ^a
df	3	3	1	1	4	3
Asymp. Sig.	.000	.000	.000	.000	.000	.000

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 50.0.

b. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 100.0.

c. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 40.0.

Differences in mall behaviour of different professions, age groups, genders, marital status, educational and income levels. Heavier spenders are often better qualified and with a higher disposable income.

	VISITFREQ	TIMESPENT
Chi-Square	72.640 ^a	260.160 ^a
df	3	3
Asymp. Sig.	.000	.000

a. 0 cells (.0%) have expected frequencies less than 5. The minimum expected cell frequency is 50.0.

There is a significant difference in the behavioural variables of the low, medium and heavy spenders in terms of the frequency of mall visit and time spent.

Hypothesis Testing of Behavioral Variables – mall activities (using ANOVA)

		Sum of Squares	df	Mean Square	F	Sig.
Movies	Between Groups	107.520	3	35.840	19.548	.000
	Within Groups	359.360	196	1.833		
	Total	466.880	199			
Dining out	Between Groups	26.899	3	8.966	3.928	.009
	Within Groups	447.421	196	2.283		
	Total	474.320	199			
Apparel	Between Groups	139.006	3	46.335	26.017	.000
	Within Groups	349.074	196	1.781		
	Total	488.080	199			
Footwear	Between Groups	81.832	3	27.277	14.831	.000
	Within Groups	360.488	196	1.839		
	Total	442.320	199			
Jewellery	Between Groups	16.091	3	5.364	5.104	.002
	Within Groups	205.989	196	1.051		
	Total	222.080	199			

Knick knacks	Between Groups	22.918	3	7.639	3.828	.011
	Within Groups	391.162	196	1.996		
	Total	414.080	199			
Homme needs	Between Groups	31.730	3	10.577	5.241	.002
	Within Groups	395.550	196	2.018		
	Total	427.280	199			

There is a significant difference in the behaviour of high, medium and low spenders across all product categories.

VII. RECOMMENDATIONS

The first Indian malls came into existence almost 15 years ago, and path-breaking developments have started taking place in last few years. As a decade and a half is not a very long time to see significant changes in marketplace or shopping behaviour, malls should concentrate on the development of Retail brands rather than eyeing a higher return on investment. The focus should be on consumer delight and driving higher footfalls, which if properly catered to will convert into higher sales / revenues.

i. THOROUGH CATCHMENT ANALYSIS:

The catchment should support the development in terms of consumer footfall and spending. There should be a connect between the catchment area and the tenant mix of the malls. There should not be too many malls in the same catchment area, as they may cannibalize into each other's target segment. A case in point is the malls in Noida (The Great India Place, Sabmall, Centrestage Mall and Atta Market in Sector 18).

ii. OPTIMUM TENANT MIX:

Mall occupants should have relevance for the target consumers. A synergistic relationship between them, where presence of one retail brand drives sales for the other will result in mall profitability in the long run.

iii. ACCESSIBILITY AND CONNECTIVITY:

It is very important that the mall is accessible and well connected through public transport, along with adequate parking spaces.

iv. SIZE:

An average mall should be 80,000 sq ft or more to have the right number of retail brands for various categories viz. Apparel, footwear, jewellery, multiplexes, dining out, electronics etc. To make the adage – All shopping needs under one roof.

v. ZONING:

Ensuring at least one anchor on each floor and tenants like multiplexes, food courts etc. On higher floors will guide the shoppers to higher levels, which they would have normally avoided in absence of these temptations. Locating anchor stores at specific spots and clustering vanilla stores around them is a smart zoning technique to feed off the footfall generated by anchor.

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APPENDIX

(I) INCOME

	Frequency	Percent	Valid Percent	Cumulative Percent
<3 lacs	16	8.0	8.0	8.0
3 to 6 lacs	32	16.0	16.0	24.0
Valid 6 to 12 lacs	56	28.0	28.0	52.0
>12 lacs	96	48.0	48.0	100.0
Total	200	100.0	100.0	

(II) EDUCATION

	Frequency	Percent	Valid Percent	Cumulative Percent
graduate	72	36.0	36.0	36.0
post graduate	100	50.0	50.0	86.0
Valid doctoral degree	16	8.0	8.0	94.0
professional degree	12	6.0	6.0	100.0
Total	200	100.0	100.0	

(III) MARITAL STATUS

	Frequency	Percent	Valid Percent	Cumulative Percent
married	128	64.0	64.0	64.0
Valid Unmarried	72	36.0	36.0	100.0
Total	200	100.0	100.0	

(IV) GENDER

	Frequency	Percent	Valid Percent	Cumulative Percent
male	64	32.0	32.0	32.0
Valid female	136	68.0	68.0	100.0
Total	200	100.0	100.0	

(V) PROFESSION

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid salaried	24	12.0	12.0	12.0
self employed professional	56	28.0	28.0	40.0

businessman	16	8.0	8.0	48.0
housewife	60	30.0	30.0	78.0
student	44	22.0	22.0	100.0
Total	200	100.0	100.0	

(VI) AGE

	Frequency	Percent	Valid Percent	Cumulative Percent
18 to 25 yrs	52	26.0	26.0	26.0
26 to 35 yrs	64	32.0	32.0	58.0
Valid 36 to 50 yrs	64	32.0	32.0	90.0
more than 50 yrs	20	10.0	10.0	100.0
Total	200	100.0	100.0	

(VII) TIMESPENT

	Frequency	Percent	Valid Percent	Cumulative Percent
<1 hr	8	4.0	4.0	4.0
1 to 2 hrs	16	8.0	8.0	12.0
Valid 2 to 3 hrs	148	74.0	74.0	86.0
>3 hrs	28	14.0	14.0	100.0
Total	200	100.0	100.0	

(VIII) MONEYSPENT

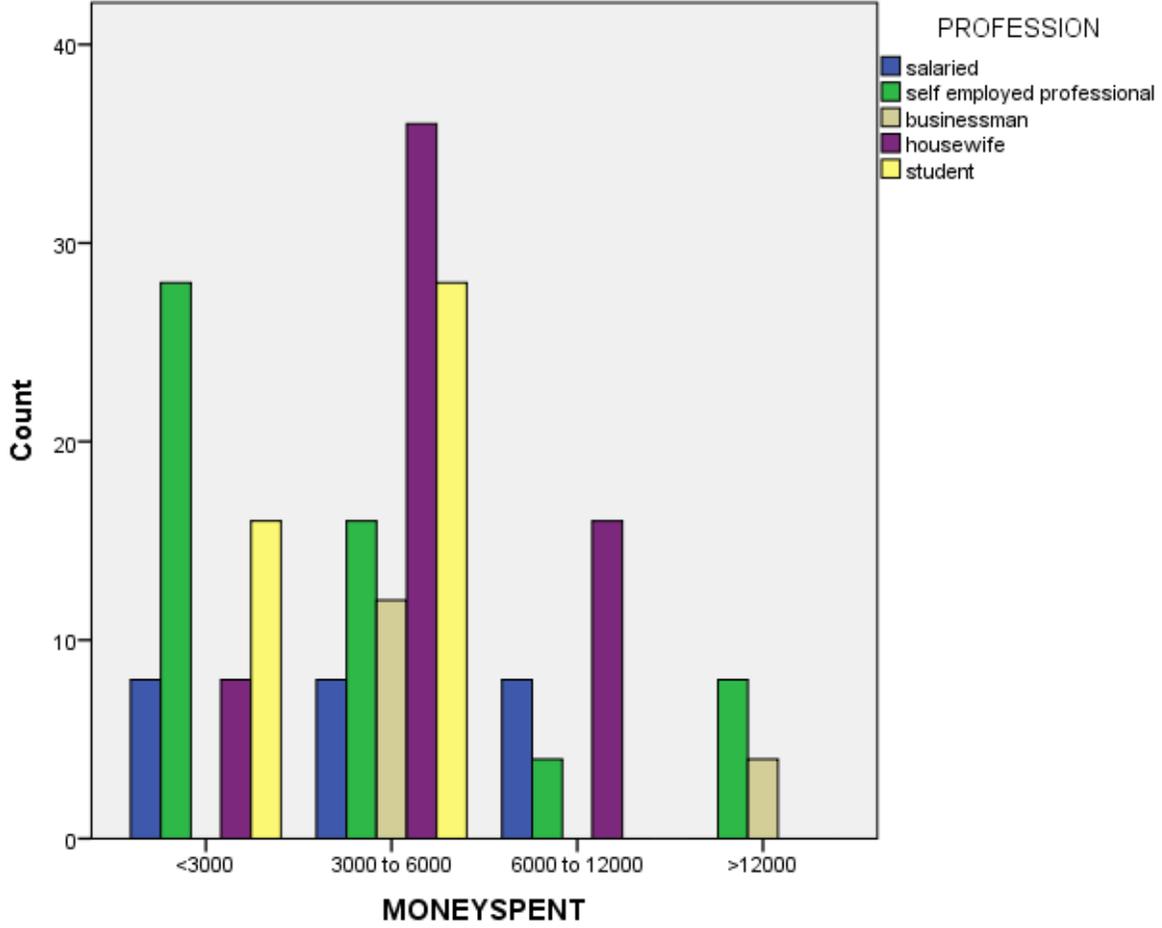
	Frequency	Percent	Valid Percent	Cumulative Percent
<3000	60	30.0	30.0	30.0
3000 to 6000	100	50.0	50.0	80.0
Valid 6000 to 12000	28	14.0	14.0	94.0
>12000	12	6.0	6.0	100.0
Total	200	100.0	100.0	

(IX) VISIT FREQUENCY

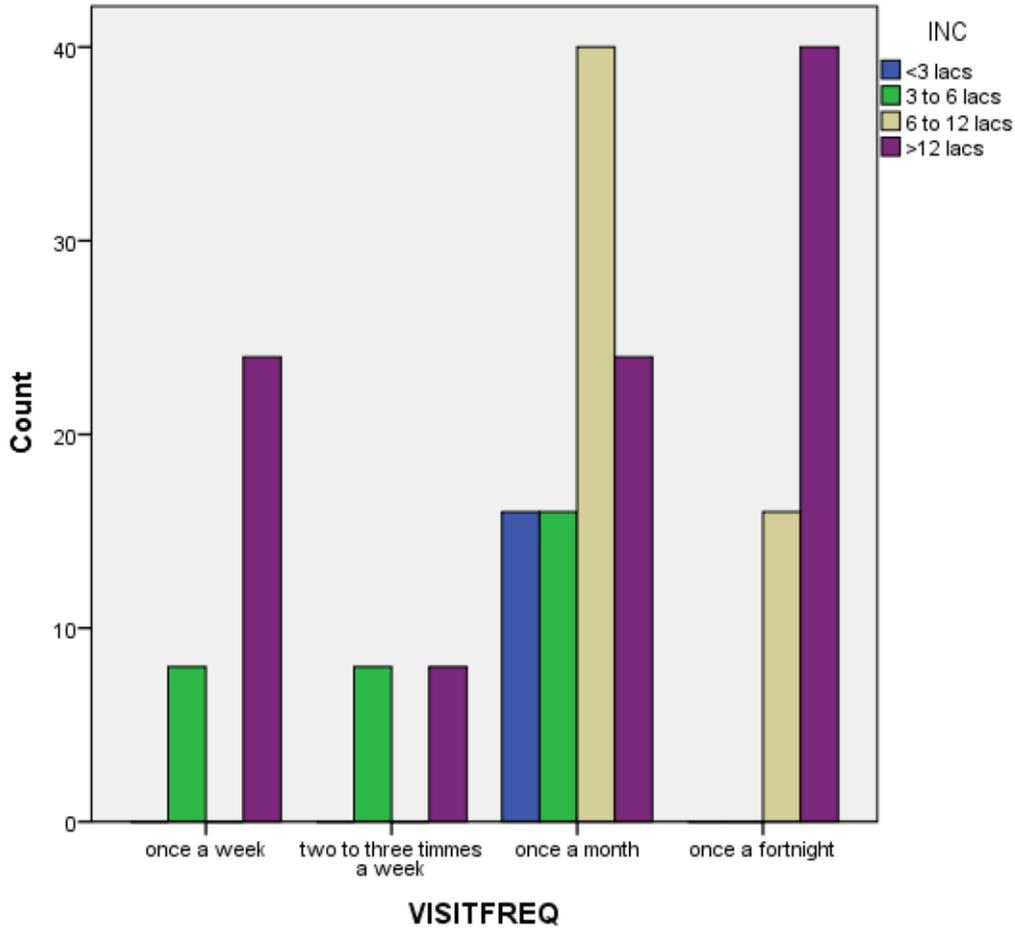
	Frequency	Percent	Valid Percent	Cumulative Percent
once a week	32	16.0	16.0	16.0
two to three times a week	16	8.0	8.0	24.0
Valid once a month	96	48.0	48.0	72.0
once a fortnight	56	28.0	28.0	100.0
Total	200	100.0	100.0	

GRAPHS:

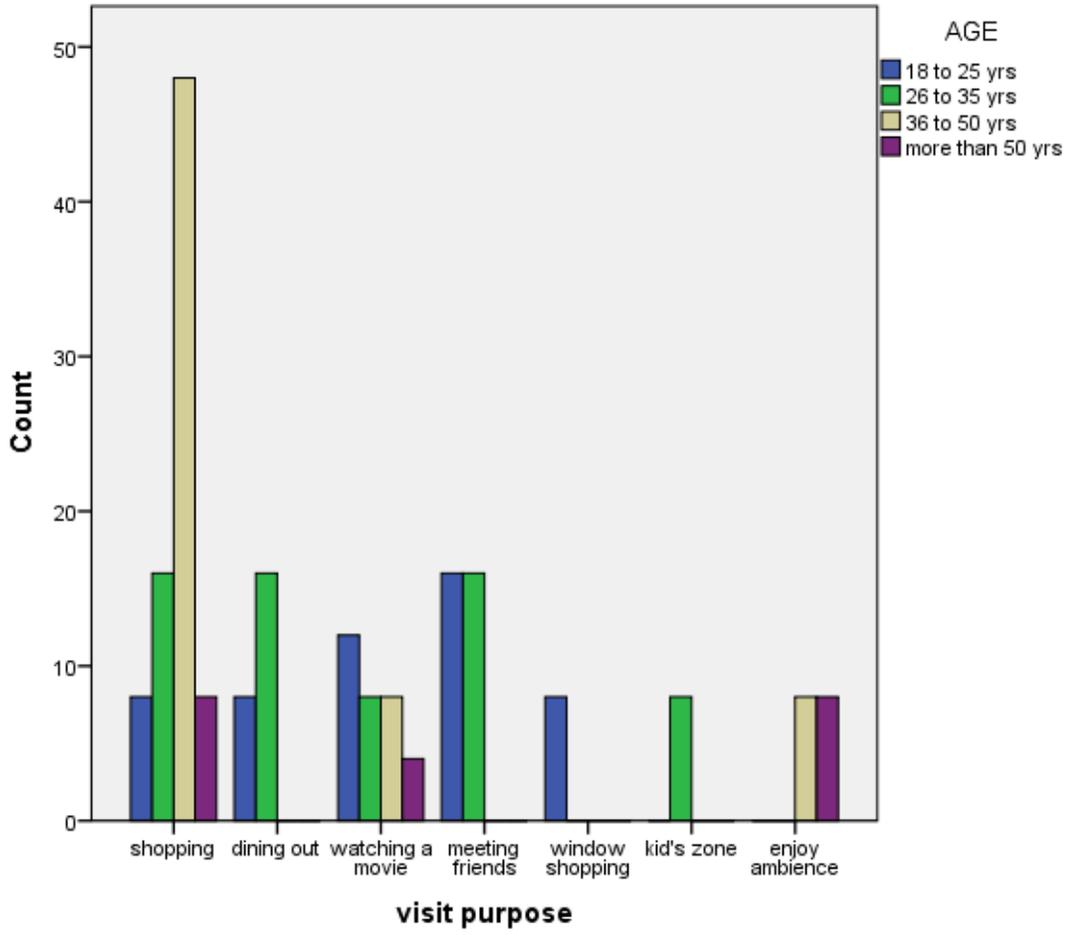
(I) Money spent by profession



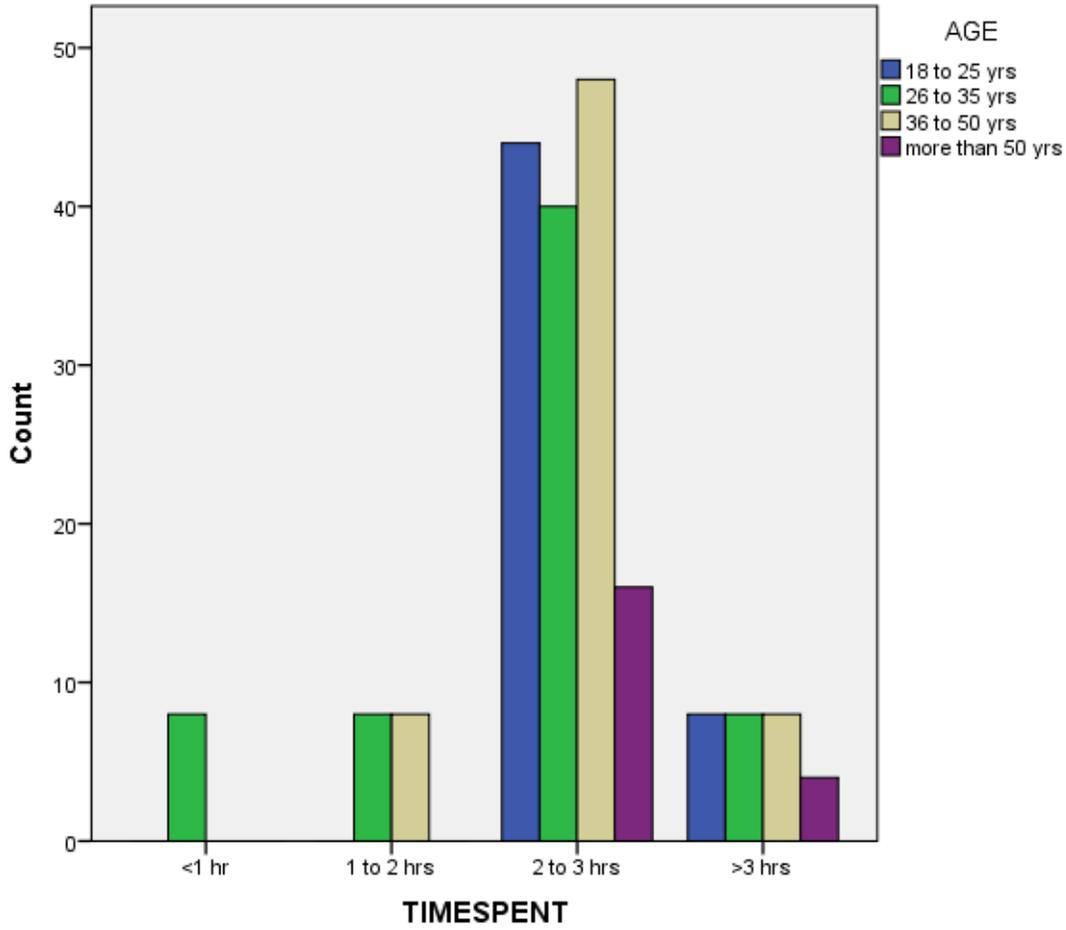
(II) Visit Frequency by Income



(III) Visit Purpose by Age



(IV) Time spent by Age



CORRELATIONS:

(i) Age and Money spent

		AGE	MONEYSPENT
AGE	Pearson Correlation	1	.293**
	Sig. (2-tailed)		.000
	N	200	200
MONEYSPENT	Pearson Correlation	.293**	1
	Sig. (2-tailed)	.000	
	N	200	200

** . Correlation is significant at the 0.01 level (2-tailed).

(ii) Age and Visit Frequency

		AGE	VISITFREQ
AGE	Pearson Correlation	1	.349**
	Sig. (2-tailed)		.000
	N	200	200
VISITFREQ	Pearson Correlation	.349**	1
	Sig. (2-tailed)	.000	
	N	200	200

** . Correlation is significant at the 0.01 level (2-tailed).

(iii) Income and Money spent

		INC	MONEYSPENT
INC	Pearson Correlation	1	.561**
	Sig. (2-tailed)		.000
	N	200	200
MONEYSPENT	Pearson Correlation	.561**	1
	Sig. (2-tailed)	.000	
	N	200	200

** . Correlation is significant at the 0.01 level (2-tailed).

(iv) Money spent and Time spent

Correlations

		MONEYSPENT	TIMESPENT
MONEYSPENT	Pearson Correlation	1	.077
	Sig. (2-tailed)		.277
	N	200	200
TIMESPENT	Pearson Correlation	.077	1
	Sig. (2-tailed)	.277	



A Case Report of Creutzfeldt-Jacob Disease

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Abstract- Creutzfeldt-Jacob Disease is the most frequently seen type of prion diseases. Its clinical findings consist of predominantly progressive dementia with a rapid onset, myoclonus, and also cerebellar, pyramidal, extrapyramidal and visual signs. Occurrence of periodical spikes in EEG, observation of cortical signal alterations during diffusion weighted (DW) MRI studies, and detection of protein 14-3-3 in cerebrospinal fluid (CSF) substantiate the diagnosis. Definitive diagnosis is established with histological examination of brain biopsy or autopsy materials.

Index Terms- Creutzfeldt -Jakob Disease (CJD), prion (PrPC), Infective prion (PrPSc), periodic sharp-wave complexes (PSWCs).

I. INTRODUCTION

Creutzfeldt -Jakob Disease (CJD) is a rarely seen neurodegenerative disease. It has four subtypes as sporadic, familial, iatrogenic and variant forms thought to be transmitted with ingestion of infected meat products¹. Mean age at the onset is 60 years with a yearly incidence of approximately 1/1.000.000. Firstly in 1982, Prusiner hypothetically proposed prions as causative infectious agents of CJD¹. In fact, normally a prion (PrPC) is a glycoprotein found in normal cells of humans and animals. In humans prion protein gene is localized on the short arm of the chromosome 20. Infective prion (PrPSc) is a posttranslational product resulting from defective folding of the normal prion. These abnormal prions accumulate in cells leading to the formation of vacuolar degeneration and some fibrillar structures; subsequently brain takes the form of a sponge resulting in death.²

Here we presenting a case with a probable sporadic CJD, in which diagnosis was established based on medical history, clinical presentation, findings of diffusion weighted (DW) MRI, EEG and CSF in accordance with clinical diagnostic criteria of World Health Organization (WHO).

II. CASE HISTORY

50yr old male presented with rapidly progressive dementia, rigidity, akinetic mutism, myoclonus of 3 months duration with loss of memory and behavioural abnormalities, in the form of formed visual and auditory hallucinations of 3 months duration. This was followed by slowness of all activities and stiffness of whole body, predominantly axial. There was exaggerated startle myoclonus.

Neurological examination revealed expressionless face with loss of speech and difficulty in swallowing, loss of all movements with stiffness of whole body. Not following commands but maintaining eye-to-eye contact with preserved reflexive eye movements. Normal pupillary responses to light. He was having diffuse myoclonus emerging spontaneously and response to auditory or tactile stimuli were observed. Deep tendon reflexes were normal, and planter reflexes were bilateral flexors. Sensory system examination is normal. Past medical history and family history was unremarkable. No abnormality in laboratory test was detected. **Complete blood picture** Hb 11.0gms, WBC count 6500 cells/cm³, Differential count: N-65,L-30,M-03,E-02,Platelets – adequate,ESR-10MM, SERUM UREA-26mg/dl, SERUM CREATININE-0.8mg/dl,sodium-150 meq/l.

Potassium-4.0meq/l,RBS-74mg/dl, Thyroid profile, LIPID PROFILE-NORMAL, Serum B12 and folic acid: normal, LFT – normal, CUE-normal, Chest x ray –normal, HIV AND HBSAG: negative, 2DECHO: NORMAL, Carotid Doppler: normal, CSF ANALYSIS: Normal, ADA 4U/ L,Cell count <5 cells with lymphocytes Sugar (54mg/dl) and protein(35mg/dl) levels normal, Gram staining and cultures negative, CT SCAN Brain: normal study.

EEG showed diffuse slowing; with periodic sharp-wave complexes (PSWCs), most often triphasic or biphasic, occurring approximately every second. The discharges are diffuse and symmetrical. MRI brain showed altered signal intensities in bilateral basal ganglion which were hyperintense on T2 and Flair images with restriction on DW images. Gyri appear bulky with subtle T2 hyper intensities and showed restriction of DW images.



MRI brain axial images T2 (1), Flair (2), DWI (3) showing T2 and flair hyperintensities of bilateral basal ganglion with bulky gyri showing diffusion restriction of bilateral basal ganglion and gyri.



EEG showing periodic sharp-wave complexes (PSWCs), most often triphasic or biphasic, occurring approximately every second.

III. DISCUSSION

CJD is a fatally progressive prion disease characterized with rapidly deteriorating dementia. Four different forms of the disease are recognized:

1. Sporadic – which accounts for 87% of all cases;
2. Genetically transmitted (familial) – accounts for another 10% of reported cases; inherited secondary to the mutation of prion protein gene localized on chromosome 20.
3. Iatrogenic – which can either be transmitted by contaminated surgical instruments or human tissues (dura-mater grafts; growth hormone preparations, cornea grafts and intracranial cortical electrodes)³

4. Variant form – which is the clinical form related to the bovine spongiform encephalopathy epidemic (the so-called "Mad Cow Disease")⁴.

Symptoms of sporadic CJD can appear at 50–70 years of age. Personality changes accompany cerebellar and visual symptoms. Ataxia is more marked in advanced cases and most patients have myoclonus manifesting as a response to auditory and tactile stimuli. In late stages patient develops akinetic mutism and myoclonus can disappear. 80% of the patients die from infection, cardiac and respiratory failure within the first year. CSF protein levels rarely rise in CJD. Detection of a proteinase inhibitor, 14-3-3 protein released from damaged neurons into CSF fortifies the diagnosis. Zerr et. al. found that 14-3-3 protein is 94% sensitive and 84% specific for the disease⁵

This protein can be detected in many other neurological disorders. Besides 14-3-3 protein, markers such as neuron specific enolase, amyloid beta, tau protein, astrocytic protein S 100 and neopterin are being investigated. EEG with Periodic biphasic or triphasic, synchronized sharp wave complexes occurring during middle or late stages of disease are typical and found 90% of the patients.

In sporadic CJD cerebral atrophy, increase in signal intensity in putamen, caudate nucleus and cerebral cortex can be detected in imaging studies. Increased signal intensity in the cortex is called ribboning. Shiga et al. revealed 92.3% sensitivity and 93% specificity for DW MRI in their patients with definitive and probable diagnoses of CJD⁶.

Recent studies demonstrated that even in very early stages of the disease pathological findings can be detected with DW MR. Definitive diagnosis of CJD requires neuropathological examinations. Detection of PrPSc reactivity with immunohistochemical staining and demonstration of protease resistant PrPSc have diagnostic value⁶.

Infective prion (PrPSc) is resistant to boiling, treatment with formalin, alcohol and UV rays but it can be inactivated by autoclaving at 132⁰ C and 15 lb per Sq inch for 1 hr or by immersion for 1 hr in 5% sodium hypochlorite (House hold bleach)⁷.

Table 53D.3 Several Diagnostic Criteria for Probable Sporadic Creutzfeldt-Jakob Disease

WHO 1998 Revised Criteria (WHO, 1998)	UCSF 2007 Criteria (Geschwind et al., 2007)	European Criteria 2009 ⁷ (Zerr et al., 2009)
1. Progressive dementia <i>and/or</i> 2. At least two of the following four features: a. Myoclonus b. Visual or cerebellar disturbance c. Pyramidal/extrapyramidal signs d. Akinetic mutism <i>and</i> 3. PSWCs on the EEG and/or a positive 14-3-3 CSF assay and a clinical duration to death <2 years 4. No alternative diagnosis on routine investigations	1. Rapidly progressive dementia <i>and</i> 2. At least two of the following: a. Myoclonus b. Pyramidal/extrapyramidal signs c. Dysfunction d. Visual disturbance e. Cerebellar signs f. Akinetic mutism g. Other higher focal cortical sign* <i>and</i> 3. A typical EEG or MRI <i>and</i> 4. Routine investigations should not suggest an alternative diagnosis	1. Progressive dementia 2. At least two of the following four features: a. Myoclonus b. Visual or cerebellar disturbance c. Pyramidal/extrapyramidal signs d. Akinetic mutism <i>and</i> 3. One of more of the following: a. Periodic discharges on the EEG b. A positive 14-3-3 CSF assay and a clinical duration to death <2 years c. High signal abnormalities in caudate nuclear and putamen or at least two cortical regions (temporal-parietal-occipital but not frontal, cingulate, insular, or hippocampal) either in DWI or FLAIR MRI 4. No alternative diagnosis on routine investigations

CSF, Cerebrospinal fluid; DWI, diffusion-weighted imaging; EEG, electroencephalogram; FLAIR, fluid-attenuated inversion recovery; MRI, magnetic resonance imaging; PSWCs, periodic sharp wave complexes; WHO, World Health Organization.
 *Higher focal cortical signs include such findings or symptoms as apraxia, neglect, acalculia, aphasia, etc.
⁷N.B. There were errors in the table summarizing the criteria in the paper; criteria shown here are derived from the text of the paper.

In our case, patient is having progressive dementia akinetic mutism, myoclonus, visual Hallucination, both pyramidal and extrapyramidal symptoms and on EEG – PSWC most often triphasic occurring every second and MRI brain showing hyper intensities on bilateral basal ganglia. All these findings are fulfilling the criteria for the diagnosis of sporadic Creutzfeldt-Jacob Disease as per WHO guidelines.

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Investigation of the Determinants to Augment Investment in the Indian Stock Market

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Abstract- The purpose of this study is to access the factors which resist common man in India from investing in stock market and ways to overcome such hesitations with the sole motive to induce investment in Indian Stock Market. India is one of the fastest developing countries in the world. As country's growth is mainly dependent upon its financial markets, India is also concentrating towards its share market sector. Indian stock markets are the engines that drive the vehicle of our economy by pumping in much needed capital. The study compares investment in Indian Stock Market with United State, London and Japanese Stock Market. This research is based upon a survey conducted on both investors and non-investors. This paper tends to find out why in a population of over one billion; barely 3% invest in equity markets in India, whereas in developed countries like US, UK and Japan more than 50% invest in equity markets.

Index Terms- Indian Stock Market, Foreign Stock Markets, Capital Market, BSE, NSE, Stock market integration, Global stock markets

I. INTRODUCTION

Capital market is a channel through which small and scattered savings of investors are utilized into productive corporate activities. It also provides the essential attributes of liquidity, marketability and safety of investments to the investors. A well organized and well regulated capital market facilitates sustainable development of the economy. Every government tries to develop their capital market through various measures. Capital market operations are of two type's i.e. primary market operations and secondary market operations or stock market.

The Indian stock market is the engines that drive the vehicle of Indian economy by generating much capital needed. The Indian stock market is one of the most developed markets in the world. The origin of Indian stock market can be traced to the later part of the eighteenth century. It is one of the oldest and fastest growing in the world. There are two main stock exchanges in India:

Bombay Stock Exchange (BSE): BSE was established in 1875 as "the native share and stock broker association". It is Asia's first stock exchange. It is one of India's leading exchange groups. With more than 5000 companies listed on it makes it world's number one stock exchange in terms of listed companies.. It is also one of the world's leading exchanges for Index options trading. BSE's popular equity index - the SENSEX - is India's most widely tracked stock market benchmark index. It is traded internationally on the EUREX as well as leading

exchanges of the BRCS nations (Brazil, Russia, China and South Africa).

National Stock Exchange (NSE): NSE was incorporated in November 1992 as a tax paying company. It was recognized as a stock exchange in April 1993. In October 1995 it became largest stock exchange in the country. It is 11th largest stock exchange in the world by market capitalization of around US\$1 trillion. The NSE's key index is CNX Nifty. The Exchange has brought about unparalleled transparency, speed & efficiency, safety and market integrity. It has set up facilities that serve as a model for the securities industry in terms of systems, practices and procedures.

The Indian Stock Market is mainly affected by two E's-

- I. Earnings/Price Ratio- price-earnings ratio is company's current share price compared to its earning per-share. It is the most popular method of stock analysis.
- II. Emotions/Sentiments- stock market are driven by emotions and sentiments. They play an important part in investing. The rise and fall of Sensex is hugely dependent of emotions.

U.S. Stock Market

A market for stocks in the United States has existed in one form or another for more than 200 years. Originating with a few brokers meeting outside the NY Street, today the stock market has become one of the most essential financial institutions in the U.S. economy. Today there are three major stock exchanges. To fit the vast story of the stock exchange into this research we focus on only on New York Stock Exchange and NASDAQ.

New York Stock Exchange:

NYSE is the largest equities-based exchange in the world. It is based in New York City, U.S. The origin of NYSE can be traced back to 200 years. NYSE remains the world's foremost securities marketplace after centuries of growth and innovation. NYSE was formerly run as a private organization and became a public entity in 2005. In 2007 NYSE merged with European Exchange and formed NYSE Euronext. It is also known as the "Big Board". More than half of all NYSE trades are conducted electronically. Over the years its commitment to investors has been immovable. Its persistent innovation and application of technology has made it to provide unparalleled quality of services.

NASDAQ

NASDAQ stands for National Association of Securities Dealers Automated Quotations. It is a computerized trading system for trading in securities. It was the world's first electronic

market. Today NASDAQ is the largest electronic stock market with over 3,000 companies listed. In 2007 NASDAQ merged with Scandinavian exchange group OMX and became THE NASDAQ OMX GROUP, further enhancing its commitment to technology and innovation across global markets. Today, the NASDAQ OMX Group owns and operates 24 markets, 3 clearing houses, and 5 central securities depositories, spanning six continents--making it the world's largest exchange company.

II. WHY PEOPLE INVEST MORE IN U.S.

- U.S. Markets are Better Capitalized: The U.S. stock markets represent the biggest single concentration of wealth in history. In terms of market capitalization, no other financial market comes close to the combined U.S. stock markets. As of the end of 2011, the market capitalization of the NYSE was valued at US\$11.8 trillion.
- U.S. Stock Markets are More Liquid: Just looking at the NYSE alone; the value of share trading for the whole year of 2011 was 6 times that of London, 4.5 times that of Tokyo, and 13 times that of Hong Kong. U.S. markets are still the biggest in terms of turnover as well as value. That means there's a very high chance of finding a buyer or seller of any particular stock at any given time.
- U.S. Stock Markets Offer Greater Diversification: U.S. markets offer access to a huge variety of U.S. companies seeking to raise capital. With almost 5,000 companies to select from, you can invest in major companies and brands from all over the world who list their shares on U.S. financial markets.
- US equities are the core of almost every major global equity: The US gross domestic product (GDP), which measures production of goods and services, is \$15 trillion (compared to India's \$1.5 trillion). This is 21.67 per cent of the world GDP. Listed companies in the US account for more than 33 per cent world market capitalization. Between 1980 and 2010, the US markets generated 14 per cent annual compounded growth in rupee terms. A global presence helps US companies not only mitigate country-specific risks but also take advantage of growth in emerging and other economies. On an average, US equities represent close to 50 per cent of global equity indices. The US is also one of the most diversified equity markets in the world with the top two sectors, financials and technology, accounting for only 34 per cent market capitalization.

London Stock Exchange

London Stock Exchange is the primary stock exchange in United Kingdom. It is largest stock exchange in Europe. It is the most international stock exchange with 350 companies from more than 50 countries. With partnerships to various international exchanges in Asia and Africa, it aims to remove cost and regulatory barriers of capital markets worldwide. From conducting its business in the coffee houses of 17th century London, the Exchange is one of the world's oldest stock exchanges and can trace its history back more than 300 years.

III. WHY PEOPLE INVEST IN LONDON STOCK EXCHANGE

- British shares generally pay higher dividends, mostly because British government doesn't tax dividends twice.
- British shares are generally cheap. British companies generally pay larger dividends than American companies, with the current yield on the FTSE 100 being 3.8% compared to 2.4% on the S&P 500. This is because British tax law favors dividends, while American tax law encourages companies to distribute money to their shareholders via buybacks.
- Many British companies do business in the fastest-growing economies of the world -- emerging markets such as Brazil, China, India, Indonesia, and South Africa -- and buying their shares is an easy way to invest in their growth.
- London is the center of the global mining industry, so a disproportionately large number of foreign mining companies are listed there. Many are members of the FTSE 100, such as Africa-based Anglo-American, Chilean copper miner Antofagasta, and India's Vedanta Resources.

Tokyo Stock Exchange

Tokyo stock exchange is the largest stock exchange in Japan with its headquarters in Tokyo. It was established on May 15, 1878. It is third largest stock exchange in the world by market capitalization. In July 2012 Tokyo stock exchange merged with the Osaka securities exchange and formed Japan Exchange Group. Japan Exchange Group was launched on January 2013. Atsushi Saito will be the group CEO of this exchange. This exchange is home to the best known Japanese MNC's including Toyota, Honda and Mitsubishi.

WHY INVEST IN JAPAN

- Japan is Cheap: The stock market is cheap. Possibly very cheap -- at a time when nearly everything else looks pricey. The Nikkei 225, Japan's major stock market index, trades at just 10 times forecast earnings. The dividend yield is up to 2.3 percent -- a hefty amount in a country with zero inflation. Japanese equities today trade for half of annual revenues, according to FactSet. And they trade for less than book value, while U.S. stocks trade for twice book.
- World's third-biggest economy: Japan is still the world's third-biggest economy, and it is far more successful than most people realize. Japan is still a great exporter. It is running a current account surplus equal to 3 percent of gross domestic product (compared with America's current account deficit of 3 percent of GDP). Over the past 20 years, real output per worker in Japan has grown nearly as fast as that in the U.S.
- Decisive Central Bank: The Bank of Japan has moved swiftly to pump extra liquidity into the Japanese market -- nearly \$700 billion to date, to be exact. This sends the global markets a clear message -- that the bank will take aggressive measures to offset any true financial panic.

IV. LITERATURE REVIEW

Balasubramanian Bala N and Ramaswamy Anand, (2014)

The research studied concentrated ownership and control is the predominant shareholding pattern in India. Over the 11-year study period from December 2001–December 2011, controlling shareholders further entrenched themselves by substantially increasing their holdings. Foreign companies in this study strengthened their entrenchment, with median holdings running over 50% right through. The changes in the Government policy opened up several business sectors for majority foreign direct investment could have been a contributing factor for the decline in the number of listed companies. Government-owned companies in this sample witnessed a decline in non-institutional share holdings over the study period, with institutional holdings showing corresponding increases.

Pratapsinh Daksha Chauhan, Dec (2013)

The researcher has studied the financial performance of NSE and BSE over the last decade. The study aims to find out the stock exchange which is performing financially better on various bases. This study is limited for only financial performance covering averages of profits, listing income, brokerage income, operating expenses, Return on Capital Employed, total revenue income, etc. The tool for appraisal of financial performance is mean, standard deviation, co-efficient of variance and trend analysis.

They have looked at the price returns of individual stocks, with data from the National Stock Exchange (NSE) and daily closing price data from both NSE and the Bombay Stock Exchange (BSE), the two largest exchanges in India.

Bala Anju, (2013)

The research studied the Indian stock market in depth. The study was conducted to find out the past, present and future trend or the prospect of Indian stock market. This study provided guidelines to investors to maximize their profit by minimizing risk. High degree of volatility in the present in Indian stock market will lead to development of future. The risk can be mitigated in stock market by spreading of investment across various options.

Venkateswara K.S. Kumar & Prof. Devi V.Rama Devi

Conducted by Professors of KLU Business School, KL University, Andhra Pradesh, the above mentioned research emphasizes the contribution of Foreign Direct Investment (FDI) & Foreign Institutional Investors (FII) on the Stock Market. It is also an analysis on the trend & pattern of FDI & FII flow in the Indian economy, with its influencing aspects on the country.

Gupta Nupur (2011)

In this study a comparison had been made between stock markets of Asia such as Indonesia, Korea, Japan, Malaysia and Hong Kong. These countries are becoming a hot spot for foreign capital as low capital and this is leading to advancement of technology. The research had been conducted to show whether BSE AND NSE provide better diversification in long run and short run to both institutional investors and international investors. The study provides the information to the investors related to investment risk and return. This paper finds the non-normality feature in the stock distribution of the above mentioned economies. The negative skewness in the long run and

short run indicates that there will be more returns and higher opportunity for investment.

Ranpura Darshan, Patel Bhavesh K. (2011)

In this research paper the author tries to show Indian stock market is interdependent on foreign stock market. For this purpose the study examines the linkages between different markets.

The aim of the study was to identify the extent the events happening in one stock market affects the other stock market and to study the co movement of stock market of India with other developed and developing countries.

The data from July 1997 to Dec 2009 of all the selected stock exchange in term of their Local currencies have been taken under consideration. The outcome was that BSE provided better risk adjusted return for the particular period.

Patidar Sohan(2010) studied investor behavior towards share market. The findings of the study indicated that as per the age-wise classification, the investors in the age group of below 35 years are actively participating in the speculation trade and the age group above 55 hesitate to take risk and are not at all interested in the share market.

Mukherjee and Bose (2008)

They investigated the integration of India with the developed countries such as US, Japan, and five other Asia Pacific market for period in between 1999 to 2005. It founded that stock returns in India were led by major stock exchange return in US, Japan, Singapore, South Korea. They also founded Indian market exerted considerable influence in stock return in Japan and South Korea along with Malaysia and Taiwan.

Wood [Ryan](#) & Zaichkowsky (2004) [Judith Lynne](#) studied on Attitudes and Trading Behavior of Stock Market Investors. This study identifies and characterizes segments of individual investors based on their shared investing attitudes and behavior. A behavioral finance literature review reveals five main constructs that drive investor behaviour: investment horizon, confidence, control, risk attitude, and personalization of loss.

Shrivastav Anubha (2003) Since Indian stock market is vast and attract investors as a hotspot of investment .The Indian market is steadily growing and had allured domestic investors community and foreign investors group in the past ,the major part of investment in Indian market is attributed to institutional investors among whom foreign investors are of primary importance . one eminent concern in the matter is whether these foreign investors (FII) direct the Indian stock market .This paper examines whether market movement can be explained by these investors and their impact on the stock markets. FII, because of its short-term nature, can have bidirectional causation with the returns of other domestic financial markets such as money markets, stock markets, and foreign exchange markets. Hence, understanding the determinants of FII is very important for any emerging economy as FII exerts a larger impact on the domestic financial markets in the short run and a real impact in the long run. The present paper is an attempt to find out determinants of foreign institutional investment in India, a country that opened its economy to foreign capital following a foreign exchange crisis. The objective of the study is to find out whether there exist relationship between FII and Indian stock market.

Mr. Rai Janakand Dai Sarat

The researcher investigated the nature of financial integration of Indian stock market with global and major regional markets. It provided various applied finance perspectives on integration among stock market, checking the sensitivity of result of sample period in an environment of structural shift.

(1991) Venkateshwar explores the relationships of the Indian stock markets as reflected by the Bombay Stock Exchange Index, vis-a-vis other prominent international stock markets. 23 international Stock indices are used over the period 1983-87. He concludes that there is practically no meaningful relationship between the BSE index and other international stock market indices, though the British and South Korean indices are inversely related to BSE.

J. Harrison Michael and Kreps David M. (1978) studied Speculative Investor Behavior in a Stock Market with Heterogeneous Expectations. According to them Ownership of the stock implies not only ownership of a dividend stream but also the right to sell that dividend stream at a future date. Investors may be unable initially to achieve positions with which they will be forever content, and thus the current stock price may be affected by whether or not markets will reopen in the future. If they do reopen, a speculative phenomenon may appear. An investor may buy the stock now so as to sell it later for more than he thinks it is actually worth, thereby reaping capital gains.

V. RESEARCH METHODOLOGY

Research Problem: The need for the research was to analyze why out of population of over one billion only 18 million invest in Indian Stock Market.

VI. OBJECTIVE OF THE RESEARCH STUDY

Primary Objective

- To study survey on perspective of investors and non-investor's participation in Indian stock market
- To find out what steps government should take to motivate people to invest in stock market.
- To find out what steps government should take to enhance financial literacy.

Secondary Objective

- To compares investment in Indian Stock Market with United State, London and Japan Stock Market. .
- To compare financial literacy programs and taxation aspects of India with US, UK and Japan.

VII. RESEARCH DESIGN

- The research design is exploratory and descriptive.

Profile of Respondents:

Characteristics	Number	Percentage
Gender		
Male	285	57%

- The type of research undertaken is exploratory as it would include in depth surveys as well as qualitative and quantitative analysis.
- It is descriptive research and analytical research as the state of affairs that exist in capital market are explained by using the facts and information already collected.

Hypothesis Testing: Using Chi-Square and phi Cramer v statistics

Null Hypothesis

- H1: There is no relationship between annual income and investment in stock market.
- H2: There is no relationship between gender and investment in stock market.
- H3: There is no relationship between financial literacy and investment in stock market.
- H4: There is no relationship between age and investment in stock market.
- H5: There is no relationship between occupation and investment in stock market.

VIII. DATA COLLECTION METHODS

The data collected is Primary data and Secondary data which is both quantitative and qualitative data, which was further analyzed in order to draw conclusions and suggestions.

- **PRIMARY DATA:** Primary data was collected by a survey on perspective of investors and non-investor's participation in Indian stock market. A questionnaire was prepared for the survey and random sampling was done.
- **SECONDARY DATA:** Secondary data collection was done through internet.
- **TOOL USED:** SPSS 20

SAMPLE SIZE	500
TARGET SEGMENT	INVESTOR NON INVESTOR
SAMPLING	RANDOM SAMPLING
NUMBER OF QUESTIONS INVOLVED	15
TYPE OF QUESTION	Open Ended Multiple Choice Questions

Female	215	43%
Age		
18-25	275	55%
25-35	135	27%
35-45	55	11%
45-60	25	5%
60 above	10	2%
Occupation		
Private Service	180	36%
Professional	95	19%
Govt. Service	35	7%
Business	95	19%
Other	95	19%
Income		
Below 3,00,000	150	30%
3,00,000-5,00,000	195	39%
5,00,000-7,00,000	65	13%
7,00,000 above	90	18%
Annual Savings		
Less than 20,000	60	12%
20,000-30,000	130	26%
30,000-40,000	125	25%
40,000 above	185	37%

Financial Literacy

Financial Literacy is the possession of knowledge and understanding of financial matters. It is mainly used in relation with personal finance. Financial literacy often entails the knowledge of properly making decisions pertaining to certain

personal finance areas. It also involves deep understanding of financial concepts like compound interest, time value of money, etc.

The financial literacy rate of India as compared to United States, United Kingdom and Japan are given below:

Country	Compound Interest	Inflation	Risk Diversification
United States	65%	64%	52%
United Kingdom	82%	78%	62%
Japan	71%	59%	40%
India	59%	25%	31%

(Source: Lisa Xu, Bilal Zia the World Bank Development Research Group Finance and Private Sector Development Team June 2012)

Internet Users

With the advent of technology share trading is now done online. To increase investment in stock market government

should also focus on internet literacy and accessibility. Given below is the comparison of percentage of internet users in India with that of other countries

List of Countries by Internet Usage (2014)

Rank	Country	Internet Users	Penetration (% of with Internet)	Pop.
<hr/>				

Rank	Country	Internet Users	Penetration (% of with Internet)	Pop.
1	China	641,601,070	46.03%	
2	United States	279,834,232	86.75%	
3	India	243,198,922	19.19%	
4	Japan	109,252,912	86.03%	
5	Brazil	107,822,831	53.37%	
6	Russia	84,437,793	59.27%	
7	Germany	71,727,551	86.78%	
8	Nigeria	67,101,452	37.59%	
9	United Kingdom	57,075,826	89.90%	
10	France	55,429,382	85.75%	

(Source: <http://www.internetlivestats.com/internet-users/>)

As compared to United States, United Kingdom and Japan, India has the lowest number of internet users. As share trading is now done online therefore to boost investment in stock market internet accessibility and internet literacy should be increased.

Per Capita Income

India

[South Asia](#)

Income level: **Lower middle income**

[GDP \(current US\\$\)](#)

\$1.877 trillion 2013

[Population, total](#)

1.267 billion 2014

<http://data.worldbank.org/country/india>

United States

Income level **High income: OECD**

[GDP \(current US\\$\)](#)

\$16.77 trillion 2013

[Population, total](#)

319.0 million 2014

Per capita income, also known as income per person, is the mean income of the people in an economic unit such as a country or city. It is calculated by taking a measure of all sources of income in the aggregate (such as GDP or Gross national income) and dividing it by the total population. It is observed that per capita income in India is lesser as compared to other countries, so lesser amount left for saving and investment.

United Kingdom

Income level **High income: OECD**

[GDP \(current US\\$\)](#)

\$2.678 trillion 2013

[Population, total](#)

64.07 million 2014

Japan

Income level **High income: OECD**

[GDP \(current US\\$\)](#)

\$4.920 trillion 2013

[Population, total](#)

126.1 million 2014

Hypothesis Testing

Following Null hypotheses was made for the study:

- H1: There is no relationship between annual income and investment in stock market.
- H2: There is no relationship between gender and investment in stock market.
- H3: There is no relationship between financial literacy and investment in stock market.
- H4: There is no relationship between age and investment in stock market.
- H5: There is no relationship between occupation and investment in stock market.

IX. RESULTS

To test the null hypotheses stated above, Chi-Square test was applied, the results of the Chi-square test shows that:

<u>Null Hypothesis</u>	<u>Chi- Square</u>	<u>Accept/Reject</u>	<u>phi and Cramer's v Value</u>	<u>Relationship Strength</u>
H1: There is no relationship between annual income and investment in stock market.	0.006	Reject	0.261	Weak
H2: There is no relationship between gender and investment in stock market.	0.005	Reject	0.192	Very Weak
H3: There is no relationship between financial literacy and investment in stock market.	0.000	Reject	0.849	Strong
H4: There is no relationship between age and investment in stock market.	0.005	Reject	0.263	Weak

H5: There is no relationship between occupation and investment in stock market.	0.859	Accept	N/A	N/A
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X. FINDINGS

- ✓ Out of 500 respondents 369 answered that they do not invest in stocks. If investment pattern of males is compared with females then only 16.4% of females said they invest in stocks whereas 33.6% of males said they invest in stock market.
- ✓ Respondents with annual saving above 40,000 invest more in stock as compared to respondents with less than 20,000 annual savings.
- ✓ Most of the respondents said they do not invest because of risk loss of money and lack of technical knowledge.
- ✓ Out of 369 respondents who do not invest in stock markets 55.4% said if their annual savings are increased then they will invest in stock market.
- ✓ Out of 369 respondents who do not invest in stock markets 64.9% said if they are provided complete knowledge then they will invest in stock market.
- ✓ Most of the respondents said they would like to invest in real estate because of high returns. Only 9.38% respondents said that they prefer to invest in stock market.
- ✓ 37.6% of the respondents feel that financial literacy can be enhanced by spreading awareness about stock market through advertisement.
- ✓ Out of 131 respondents who invest in stock market only 3.57% said they invest more than 75% in stocks.
- ✓ 72.77% respondents feel the introduction of Rajiv Gandhi equity scheme will boost investment in stock market.
- ✓ 37.6% of the respondents feel that financial literacy can be enhanced by spreading awareness about stock market through advertisement.

XI. CONCLUSION

This report analyzed the perception of investors and non-investors towards Indian Stock Market. People generally do not invest in stock market because of lack of knowledge and risk of loss of money. Many respondents feel that advertisement is the best way to enhance financial literacy and motivate people to invest more in Indian Stock Market. Launch of investor friendly equity schemes will also help boost investment in stock market.

XII. SUGGESTIONS AND RECOMMENDATIONS

- ✓ Government should start part time courses to stock market knowledge.
- ✓ Government should introduce short term investments scheme with high return.

- ✓ - Government should spread awareness among potential investors.
- Assurance of lesser loss for investors.
- Government should launch short term courses for potential investors.
- ✓ Government should organize periodical investment campaign in tier II & III cities
- ✓ Government should bring awareness among people. People had a perception that they need lot of time if they want to invest in markets and they don't have it. They must be given clarity between trading and investment. There should be simple process to buy and sell share as far as India is concerned. Government should start some special centers for stock buy and sell and to bring awareness.
- ✓ Government should take measures to remove myths against stock markets.
- ✓ It should start celebrity advertisement as it affects the urban and rural population. Introduce more schemes which are less complex. It should open a separate stock market if possible for the rural population to encourage them
- ✓ People in India are generally unaware of stock market as a whole. Also, shares are an age old taboo in India. Also, the general distrust about financial dealings among the people is a big reason. The govt. must induce transparency and awareness for this sector to flourish.
- ✓ Government should remove capital gain tax.

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Fabrication of Monocrystalline Silicon Solar Cell using Phosphorous Diffusion Technique

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Abstract- This paper gives an overview of the materials and methods used for fabricating a monocrystalline silicon solar cell. The aim of this research is to study the solar cell fabrication technology and fabrication of monocrystalline silicon solar using phosphorous diffusion technique locally. For solar cell fabrication we have used several number of processing steps to get the final solar cell output. At first we took a p-type monocrystalline silicon wafer with square shape $150 \times 150 \text{ mm}^2$ in size, $200 \mu\text{m}$ in thickness and which is a (100) oriented Czochralski Si wafer. Then Cleaning and texturing of the wafer was done using different chemical solutions and edge isolation of wafer was done using edge isolation paste. Phosphorous diffusion was done by diffusion furnace to form p-n junction using liquid Phosphorus Oxychloride (POCl_3). Front and back side metallization was done by screen printers using silver paste and aluminum paste respectively. Then Rapid Thermal Annealing of the wafer was done at high zone temperature for curing the contact. Finally, fabricated solar cell was characterized by LIV tester. LIV data shows that maximum power is 10.3369W, voltage at maximum power is 0.27504V, current at maximum power is 37.5833mA, open circuit voltage is 0.555462V, short circuit current is 56.5867mA, fill factor is 32.8868 and the efficiency of the cell is about 7%. The efficiency of our fabricated solar cell is quite low since fabrication of monocrystalline solar cell is for the first time in Bangladesh. Bangladesh Atomic Energy Commission (BAEC) has established a laboratory to fabricate solar cell locally. Optimization of processing techniques, equipment temperatures as well as the air quality, water quality and other chemicals are needed to increase the efficiency of solar cell.

Index Terms- LIV tester, phosphorus oxychloride, rapid thermal annealing, screen printing, Texturing.

I. INTRODUCTION

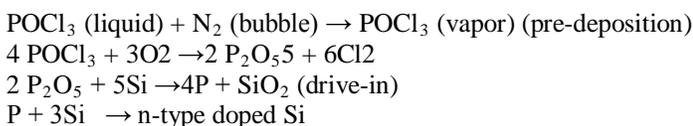
Electricity is a prerequisite for economic growth and social development. But Bangladesh is one of the most electricity deprived nations in the world [1], [2]. Bangladesh has been facing a power crisis for about a decade, mainly because of inadequate power generation capacity compared with demand and the aged infrastructure of many existing power generation facilities [3]. Despite the large potential for renewable energy sources in Bangladesh, currently their contribution to the electricity supply remains insignificant. Renewable energy sources in Bangladesh, particularly solar energy, can play a

significant role to meet the electricity demands in the rural and remote areas of the country since around 70% of people having lack accesses to electricity and most of them are living in the village. The location of Bangladesh is ideal for tapping solar energy effectively. Sunlight is dropped in Bangladesh about seventy percent [4]. Daily solar irradiation intensity varies from 3 to 6.5 kW/m^2 , with a maximum during March-April and a minimum in December-January [5], [6], [7]. Crystalline silicon solar cells are used in the largest quantity of all types of solar cells on the market, representing about 90% of the world total solar cell production in 2008 [8]. Monocrystalline silicon technique is used as a promising method for solar cell fabrication [9]. For monocrystalline silicon solar cell fabrication, phosphorous diffusion technique is the most widely used technique for photovoltaic industry [10]. For the first time Bangladesh Atomic Energy Commission (BAEC) has established a monocrystalline silicon solar cell fabrication laboratory as partial fulfillment of national electricity demand. We have done our experiment in this solar cell fabrication laboratory. The current study will focus on the fabrication of monocrystalline silicon solar cell using phosphorous diffusion technique and characterization of this solar cell locally. It is expected that the development of solar cell locally will play an important role in renewable energy sector in Bangladesh.

II. THEORY OF PHOSPHORUS DIFFUSION

Phosphorus (P) diffusion is currently the primary method for emitter fabrication in silicon (Si) solar cell processing [11]. The thermal diffusion of phosphorus is necessary to create an n-type emitter to the p-type wafer [12]. The diffusion depends on various factors of which temperature and gaseous environment is most important [13]. P-type silicon wafers are widely used in solar industries and therefore diffusion technologies have been developed to deposit n-type doping elements to create the p-n junction. Along with nitrogen (N_2) and oxygen (O_2) gases, phosphorus oxychloride (POCl_3), a liquid source of phosphorus is also widely used in the standard diffusion process of solar cells [14], [15]. Due to its low boiling temperature (105.8°C) [16], at temperatures between $850\text{-}900^\circ\text{C}$ in the diffusion chamber, POCl_3 is decomposed into simple phosphorus compounds like P_4 , P_8 , P_2O_5 , etc. In oxygen environment and at 850°C temperature, the diffusion coefficient (D) can be approximated as $D \sim 0.0013 \mu\text{m}^2/\text{hr}$. The phosphorus diffusion

fabrication of crystalline silicon solar cell with emitter diffusion, surface passivation and screen printing of electrode leads to formation of n+ type emitter at the top surface of the wafer. Phosphorus oxychloride (POCl₃) is a liquid source which vaporizes at room temperature itself hence it should be kept in cool place. For the diffusion process, the vapors are carried out by the carrier nitrogen and oxygen is passed through another valve. The reaction takes place, the phosphorus oxychloride reacts with oxygen forms phosphorus pentoxide and then the phosphorus pentoxide reacts with the silicon to give the silicon dioxide and the phosphorus. Generally, phosphorous diffusion process is performed in two steps. The first step is called pre-deposition that involves the formation of phosphorous-rich oxide films on the silicon substrate. Second step is called drive-in [17], [18], [19] which the phosphorous-rich oxide film acts as an infinite source for phosphorous diffusion into the Si substrate. During pre-deposition, phosphorus pentoxide (P₂O₅) forms on the surface of the wafers by the reaction of phosphorous with oxygen. The P₂O₅ immediately reacts with the silicon, by resulting in diffusion of phosphorus and formation of the phosphosilicate glass (PSG) [SiO₂: (P₂O₅)_x] layer on the Si surface [20]. The phosphorus atoms formed at the PSG-Si interface penetrate through the silicon wafer [21] and can be simplified with the following reaction equations:



III. FABRICATION OF MONOCRYSTALLINE SILICON SOLAR CELL

Monocrystalline type silicon solar cell fabrication deals with a set of basic material, chemical components and equipment and machinery. The specifications of the basic materials are stated in Table 1. The basic material [22] used for solar cell fabrication is mono crystalline type silicon wafers that are p type doped initially. Fabrication of our c-Si solar cell starts with square shape wafer of 150×150 mm² in size and 200µm in thickness, (100) oriented Czochralski Si (or Cz-Si) wafer.

Table 1: Basic Materials Involved in Solar Cell Fabrication

Raw Wafer	Cell type	Doping	Shape and size	Thickness
Silicon wafer	Monocrystalline	p-type	150×150 mm ²	200µm

Fabrication of monocrystalline silicon solar cell from p-type silicon wafer requires several number of process steps to get the final solar cell output. Figure 1 shows the sequence of the solar cell fabrication processing steps.

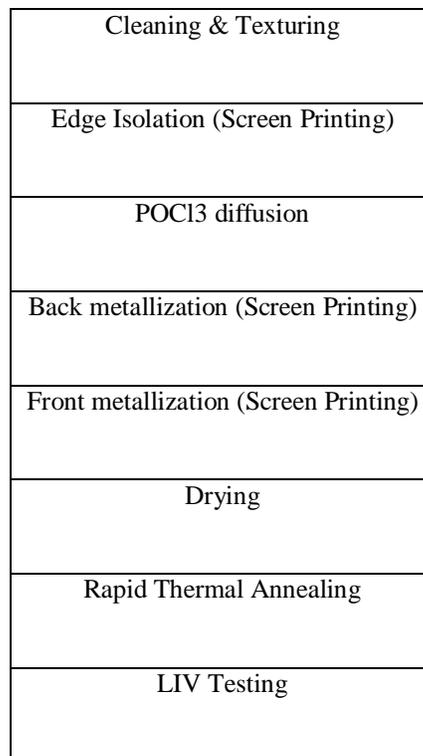


Figure 1: Sequence of the solar cell

fabrication process steps.

The starting p-type monocrystalline silicon wafer for solar cell fabrication in our experiment is shown in Figure 2. Solar cell fabrication process description in our experiments is given below.



Figure 2: Starting p-type monocrystalline silicon wafer

A. Cleaning and Texturing

Solar cell fabrication requires cleaning and texturing of wafers. Cleaning is done for the removal of the organic contaminants, thin oxide layer, and metal particles and texturing is done to create random, sub-wavelength pyramid features on wafer surface to reduce reflection and enhance light absorption [12], [23]. This kind of processing requires wet-chemical processing benches, exhaust system and water treatment prior to discharge to the waste stream. Cleaning and texturing of wafer is done by three processes which are described below.

A.1 Saw damage removal process

At first a tray on which the wafers are kept is washed using DI water (De-ionized). A beaker is taken and it is cleaned properly using detergent and DI water. Then 4 liters of DI water is transferred to that clean beaker and the beaker is placed on a heating system and the water is heated to 70°C. Then 400 grams of sodium hydroxide pellet (NaOH) is weighted on an electronic balance and then transferred to the beaker containing DI water. The above preparation is done to make 10% NaOH solution. This has to be prepared according to the ratio, NaOH (Sodium Hydroxide): H₂O (DI-water) = 1 gram: 10 ml. Once the temperature of the NaOH solution reaches 70°C which is measured using a thermometer, the tray containing the wafers is transferred to that beaker and it is dipped in that solution for 10 minutes. After 10 minutes the tray containing the wafer is removed from the beaker and then it is dipped in DI water for few times and then the wafers is ready for the next step.

A.2 Hydrophobic process

Hydrophobic process requires the preparation of a solution according to the ratio of, HF (Hydrofluoric Acid): H₂O (DI-water) = 1 ml: 50 ml. The two liquids are mixed according to the ratio mentioned above. Once the solution is prepared the wafers which went through the saw damage removal process is dipped into this HF solution for 3 minutes and then they are removed from the HF solution and dipped few times in DI-water. After that the wafers are dried using compressed air so that they are prepared for the next step.

A.3 Texturing Process

Texturing process requires preparation of a solution using the ratio of, KOH (Potassium Hydroxide): IPA (Isopropyl Alcohol): H₂O (DI-water) = 1 gram: 5 ml: 125 ml. Initially we wash the beaker with DI-water and then 4 liters of DI-water is added and the beaker is placed on an electronic heater. Then 32 gram of potassium hydroxide pellet is measured on an electronic balance and then transferred to the beaker containing DI-water. When the temperature of the beaker reached 70 °C the boat containing the wafers after the HF process is placed into the beaker and then 160 ml of Iso-2-Propanol solution is added to the beaker and the wafers are kept in that solution for 10 minutes. After that the tray containing the wafers are removed from the beaker and then dipped few times in DI-water. Then the hydrophobic process is repeated and finally the wafers are dried using the compressed air and that concludes the texturing process. Then the wafer can be viewed under Scanning Electron Microscope (SEM) to see the change of wafer orientation after texturing is done. Figure 3 shows the textured silicon wafers and Figure 4 shows the Scanning Electron Microscope (SEM) pictures of textured surface of p-type silicon wafer.

B. Edge Isolation

A critical step in solar cell fabrication is electrical isolation of n and p type regions. Edge isolation is done to separate front side and back side. In the next step after wafer cleaning and texturing, back side of the wafer edge is masked using a screen printing machine and a diffusion barrier paste is used to isolate the edge. After the screen printing is done the wafers are dried for 10 minutes in a preheated oven at 200 °C. Figure 5 shows the

picture of screen printer used for edge isolation and Figure 6 shows the designed screen used in our experiment.



Figure 3: Textured silicon wafer

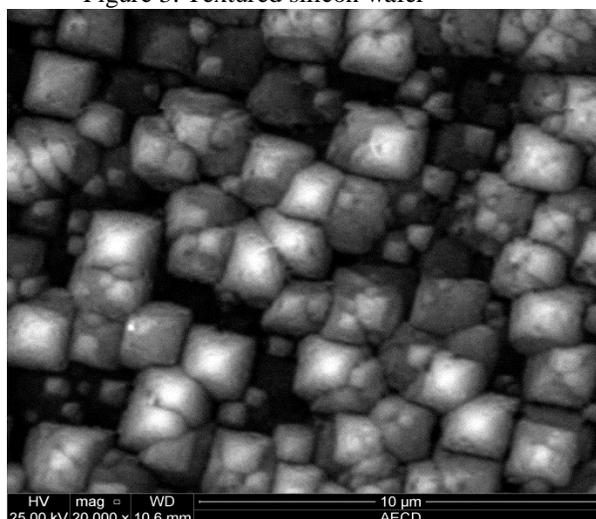


Figure 4: SEM pictures of textured silicon wafer.



Figure 5: Screen printer for edge isolation

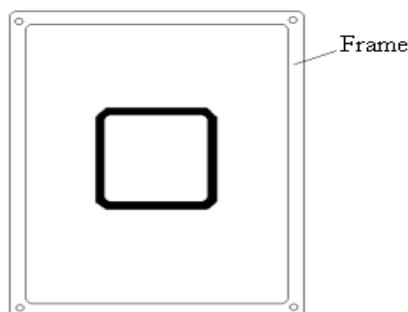


Figure 6: Designed screen used for edge isolation

C. $POCl_3$ Diffusion

Solar cells following texturing and cleaning are subjected to phosphorous diffusion to form n-p junctions. After edge isolation, the wafers are kept on a tray made of glass for the diffusion process. The tray was cleaned with the Isopropyl Alcohol (IPA) solution before use. At first the diffusion machine is turned on and the centre zone temperature is set to 600 °C. Once the temperature reached 600°C the tray containing the wafers were transferred to the diffusion chamber. It is necessary to make sure that special care is taken while transferring so that the wafers don't break. After the wafers are kept inside the container mouth is closed properly and care also has to be taken to check whether the gas is properly going out through the exhaust system. Then nitrogen gas is turned on and we have to wait for 10 minutes and then increase the temperature to 875 °C keeping the nitrogen gas on. After 875 °C is reached nitrogen gas is turned off and oxygen and $POCl_3$ (Phosphorus oxychloride) were turned on simultaneously. Then we have to wait for 10 minutes in this condition and after 10 minutes of diffusion time oxygen and $POCl_3$ gas are turned off simultaneously and nitrogen gas is turned on and we have to allow the nitrogen gas to flow for 10 minutes. After 10 minutes nitrogen gas is turned off and only oxygen gas is turned on for the next 10 minutes. After that oxygen gas is turned off and nitrogen gas is allowed to flow for 10 minutes. Finally after 10 minutes the temperature of the chamber is reduced to 600 °C from 875 °C and during this stage nitrogen gas is kept turned on. Once the temperature of the chamber dropped to 600 °C, the nitrogen gas is turned off and the wafers are ready to take out. Special heat protective gloves should be used because all these things are done at very high temperature so safety has to be ensured. Once the wafers are cooled naturally, it is processed for the next stage. Figure 7 shows the phosphorous doped silicon wafer.



Figure 7: Phosphorous doped on P type Si wafer from diffusion chamber.

D. Back and front surface metallization (Screen Printing)

Screen printing process is most commonly used to form metal contacts on back and front surfaces of solar cells. Following diffusion, screen printed metallic contacts are formed to form electrical contacts to n and p doped regions. A thick, viscous metal solution or paste is forced through stainless screen grid onto the wafer in selected lithographically defined open regions in the screen. The metal lines on the front surface (n-type) are made of silver and on the back surface (p-type) are made of aluminum. Aluminum contact on the wafer backside also serves to form a heavily diffused p++ layer that reduces contact resistance and enhances back surface reflectance. Appropriately-designed screens are used for this process, and screen printers are used to form Ag and Al contacts to front and back solar cell surfaces. The printing process begins as a silicon wafer is placed onto the printing table. A very fine-mesh print screen mount within a frame, is placed over the wafer; the screen blocks off certain areas and leaves other areas open, where the paste can go through. The distance between wafer and screen is carefully controlled (called the 'snap-off' distance). Screens used for front side printing typically have a much finer mesh size than do backside screens, due to the finer metal lines required on the front side. After a measured amount of paste is dispensed onto the screen, a squeegee distributes the paste over the screen to uniformly fill the screen openings. As the squeegee moves across the screen, it pushes the paste through the screen openings and onto the wafer surface. Back side screen printing done by using aluminum paste. This process must be tightly controlled for temperature, pressure, speed, and many other variables. After each printing step the wafer goes to a drying furnace to solidify the paste. The wafer is then transferred to another printer for printing additional lines on either the front or back side of the wafer. Each solar cell has conductive lines on both front and back sides that are printed using screen masks and which have different functions. The complete screen printed solar cell is shown in Figure 8. The silver lines on front side are much more narrow and delicate than those on the backside; some manufacturers perform the backside print steps first, and then flip the wafers over to print front side contact, minimizing the potential for damage during handling.



Figure 8: Complete screen printed solar cell

E. Drying

After screen printing, the silicon wafers are required to go through drying at relatively low temperature (around 120°C) for certain period. In our experiment, we placed the wafers after each

time edge isolation, back and front side printing in a preheated oven at 120°C for 10 minutes so that the paste gets attached well to the wafer surface.

F. Rapid Thermal Annealing (RTA)

Following screen printing, high temperature process is used to cure contacts in order to form ohmic contacts. The rapid thermal annealing furnace is used to cure or fire screen printed contacts on silicon solar cells. In order to establish an ohmic contact (low resistive contacts), contact firing is recommended in silicon solar cell processing. Conventionally, any RTA process is capable to do the process. In this case, a belt conveyer system integrated RTA processing unit is used for a continuous processing of contact firing. A conveyor belt furnace capable of reaching 1000 °C temperature is used for this step. In our experiment, RTA of screen printed cells is done at a temperature of 500, 600 and 800 °C respectively. The wafers are passed through a moving belt which goes inside the RTA machine. Rapid Thermal Annealing is important because it provides proper contact between the conductor and the semiconductor. Figure 9 shows the contact firing process of screen printed Si solar cell.



Figure 9: Contact firing at RTC furnace

G. Light Current Voltage (liv) Testing

After finishing a complete solar cell, LIV (Light-Current-Voltage) testing is done to evaluate the performance of the cell and mainly to calculate the efficiency of the solar cell. Initially the wafer is kept on the gold plated tray and then the bus bar of the cell is aligned with the pogo pins. Then the vacuum is turned on. Then the power supply and the control box is connected to the Laptop. LIV measurements using inexpensive, flash, xenon light source for illumination. LIV data acquisition is based on a custom-designed electronic interface integrated with high resolution, programmable voltage supply. Voltage across the solar cell is applied to measure the light generated photo-current. A user-friendly LabVIEW interface capable of writing data in ASCII format forms the basis of data acquisition. Spectral distribution of xenon high intensity plasma discharge lamp is light is closest to the solar spectra, and is industry standard. The flash LIV system is capable of measuring small (~ 10 cm²) and large (up to ~15x15 cm²) solar cells. The intensity variation is controllable in ~ 10 mW/ cm² to 100 mW/ cm² through simple absorptive metallic filters. Figure 10 shows the LIV measurement system.



Figure 10: LIV measurement system

IV. RESULTS AND DISCUSSION

Solar cells are characterized by their ability to convert sunlight into electricity. The light intensity (L)-current (I)-voltage (V) test is a series of measurements performed on complete solar cells to measure their operating characteristics. The LIV test identifies characteristics such as short circuit current (Isc), open circuit voltage (Voc), fill factor (FF) and power maximum (Pmax). These results can be used to determine the efficiency of solar cell. Solar cells are tested under one-sun conditions using Xenon-arc lamps; a xenon spectrum is closest to sunlight. Data acquisition based on programmable current-voltage source power supplies capable of handling current up to ~ 8 A is used in conjunction with a proprietary data acquisition system. Calibration of this LIV measurements system is based on independently measured c-Si solar cells at Sandia National Laboratories. The measured LIV data are shown in Figure 11.

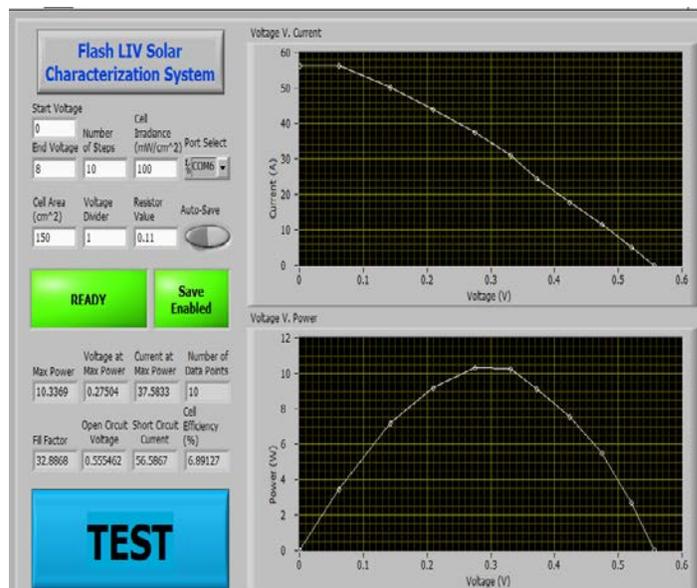


Figure 11: Measured LIV data

It gives the V-I curve of our fabricated solar cell. From LIV data, we have found the following results of our fabricated

monocrystalline silicon solar cell which are, Maximum power is 10.3369W, Voltage at maximum power is 0.27504V, Current at maximum power is 37.5833mA, Open circuit voltage is 0.555462V, Short circuit current is 56.5867mA, Fill factor is 32.8868 and Efficiency is 6.89%. The efficiency of our fabricated solar cell is quite low because it is the first locally fabricated solar cell in Bangladesh. Optimization of processing techniques as well as the air quality, water quality and other chemicals are needed to increase the efficiency of solar cell.

V. CONCLUSION

For the first time, a laboratory has been set up by BAEC to fabricate the monocrystalline silicon solar cell locally. We have fabricated our solar cell in this Laboratory. The efficiency of our fabricated solar cell is about 7% which is quite low as compared to the commercially available solar cell in the market. Our main objective was study of solar cell fabrication technology and fabrication of a monocrystalline silicon solar cell locally. There are lots of challenges to increase the solar cell efficiency. The main challenges are to find out the right recipe and technique which needs iterative methods. Completion of a particular recipe and technique takes 3-4 days and usages lots of consumables (raw materials, chemicals, gases etc). In summary, significant progress has been made in understanding and fabricating a wide range of silicon solar cells with the highest device conversion efficiency of 7%. For instance, cleaning and texturing process, optimum flow rate for POCl_3 and fixing the different temperature zones of RTA process is achieved which can significantly enhance the solar cell efficiency. Moreover, doping concentrations have to be further optimized and carefully characterized to get more improvement. In the near future, optimizing all the challenges the laboratory will play a pioneer role to developing as well as promoting solar cell fabrication technology in the country.

ACKNOWLEDGMENT

The author acknowledges the support of Solar Cell Fabrication Laboratory, Bangladesh Atomic Energy Commission during the fabrication and testing of solar cell.

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Predicting Crash-Time of Rational Speculative Bubbles of Malaysian Stock Market during the Year 2008

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Abstract- Rational speculative bubble can be defined as transient upward movements of stock prices above fundamental value due to speculative investors. The Generalised Johansen-Ledoit-Sornette (GJLS) model have been developed as a flexible tool to identify the size of rational speculative bubble. This model is combines the economic theory of rational expectation bubbles with finite-time singular crash hazard rates, behavioral finance on imitation and herding of investors and traders as well as mathematical statistical physics of bifurcations and phase transitions. It has been employed successfully to a large variety of stock bubbles in many different markets. The purpose of this study is to predict crash-time, intrinsic value and size of rational speculative bubble of Malaysian stock market during global economic crisis 2008. The predicted crash-time by employing GJLS model is exactly same as empirical date of crash during 2008.

Index Terms- bubbles, intrinsic value, GJLS, economic crises

I. INTRODUCTION

A positive acceleration of prices above intrinsic value is said to be a rational speculative bubbles (J. Galbraith, 1997 & D. Sornette, 2003). An unexpected rise in the price of a continuous process also can be named as rational speculative bubble. Rational speculative bubbles are one of the severe issue that give negative consequences to the growth of country's economy. This is because of economic bubble development and dramatic bursts in financial markets (Statman, 1998). Many recent concepts describes that economic bubbles can be produced because of positive feedback trading by noise traders, heterogeneous beliefs of investors together with a limitation on arbitrage and synchronization failures among rational traders. Researches done by Linter & John, 1969, E.Miller, 1977, M.Harisson & D.Kreps, 1978 proved that the combined effects of heterogeneous beliefs and short-sales constrained may lead large movements in asset. In this kind of models which assume heterogeneous beliefs and short-sales, the asset prices are determined at equilibrium to the extent that they reflect the heterogeneous beliefs about payoffs, but short sales boundaries force the pessimistic investors disappear from the market, leaving only optimistic investors and thus magnified asset price levels. However, when short sales limitations no longer tie investors, then prices fall back downwards.

In another class of models, the role of "noise traders" in fostering positive feedback trading has been highlighted. The term "noise trader" was proposed first by Kyle & Albert, 1985 and Black & Fischer, 1986 to show irrational investors. These noise positive feedback traders purchase securities when prices increases and sell when prices drop. Due to this positive feedback mechanism, the deviation between the market price and the intrinsic value has been bloated (Shleifer et al., 1990). The empirical evidences on this theory are mainly from the studies on momentum trading strategies. Stocks which performed poorly in the past will perform better in a long-term perspective (over the next three to five years) than stocks which performed well in the past. In contrast, at intermediate horizon (three to twelve months), the stocks which performed well previously will still perform better (N. Jegadeesh & S. Titman, 2001)

However, predicting the burst of economic bubbles remains an unsolved problem in standard econometric and financial economic methods (Brunnermeier et al., 2004). This is due to the fact that the fundamental value is in general poorly constrained and it is impossible to differentiate between exponentially growing bubble prices. Detecting the bubble ex-ante could help to take some actions to stop from bubble bursting. But none of the theories mentioned above can diagnose bubble ex-ante. This may be due to the fact that all these theories cannot differentiate between intrinsic and bubble price and cannot give a price dynamics which leads to a crash. The Standard Johansen-Ledoit-Sornette (SJLS) model or Johansen-Ledoit-Sornette Model was developed by Sornette and his colleagues. It also has the ability to predict the most probable crash time after a bubble ex-ante. Generalized Johansen-Ledoit-Sornette (GJLS) Models have been developed as flexible tools to predict bursting of rational speculative bubble (W. Yan, 2011). This study specially conducted to predict probable crash time of speculative rational bubble Malaysian stock market for the year 2008.

II. GENERALISED JOHANSEN LEDOIT SORNETTE MODEL

The GJLS model of economic bubbles and crashes is an extension of the rational expectation bubble model proposed by N. Barberis et al., 1998. A financial bubble is modelled as a regime of accelerating or super-exponential power law growth punctuated by short-lived corrections organized according the symmetry of discrete scale invariance (K. Daniel et al., 1998). The super-exponential power law is argued to result from positive feedback resulting from noise trader decisions that tend

to enhance deviations from fundamental valuation in an accelerating spiral.

We firstly consider the purely speculative asset that pays no dividends, so that we do not take into account the interest rate, information asymmetry, risk aversion, and the market clearing condition. The rational expectations are simply corresponding to the familiar martingale hypothesis in (1).

$$E_t[p(t')] = p(t) \quad \forall t' > t \quad (1)$$

where $p(t)$ denotes the price of the asset at time t and $E_t[\cdot]$ indicates the expectation conditional on information revealed up to time t .

Then lets the cumulative distribution function (cdf) of the time of crash is called $Q(t)$, the probability density function (pdf)

is $q(t) = \frac{dQ}{dt}$ and the hazard rate is $h(t) = \frac{q(t)}{1-Q(t)}$. The hazard rate is the probability per unit of time that the crash will happen in the next instant if it has not happened yet.

In the JLS model, the stock market dynamics is described as (2).

$$\frac{dp}{p} = \mu(t)dt - \kappa dj \quad (2)$$

where p is the stock market price and the term dj indicates a discontinuous jump such that $dj = 0$ before the crash and $dj = 1$ after the crash happens. The parameter κ determined the loss amplitude associated with the occurrence of a crash. The time-dependent drift $\mu(t)$ is chosen so that the price process satisfies the martingale condition given as (3) and (4), respectively.

$$E_t[dp] = \mu(t)p(t)dt - \kappa p(t)h(t)dt = 0 \quad (3)$$

$$\mu(t) = \kappa h(t) \quad (4)$$

And (5) is corresponding to the price.

$$\log \left[\frac{p(t)}{p(t_0)} \right] = \kappa \int_{t_0}^t h(t') dt' \quad (5)$$

This gives the logarithm of the price as the relevant observable. The higher the probability of a crash, the faster the price grow (conditional on having no crash) in order to obey the martingale condition. Intuitively, investors must be remunerated by a higher return in order to be induced to hold an asset that might crash. The sensitivity of the market reaction to news or external influences accelerate on the approach to this transition in a specific way characterized by a power law divergence at the

critical time t_c of the form $F(t) = (t_c - t)^{-z}$, where z is called a critical exponent. This form amounts to the following property of (6).

$$\frac{d \ln f}{d \ln(t_c - t)} = -z \quad (6)$$

(6) is a constant, namely that the behaviors of the observable F become self-similar close to t_c . The symmetry of self-similarity in the present context refers to the fact that the

relative variations $\frac{d \ln F}{F}$ of the observable with respect to

relative variations $\frac{d \ln(t_c - t)}{(t_c - t)}$ of the time-to-crash are independent of time t , as expressed by the constancy of the exponent z .

The crash hazard rate follow the same dependence as (7).

$$h(t) = B'(t_c - t)^{m-1} \quad (7)$$

where B' is a positive constant and t_c is the critical point or theoretical date of the bubble end. The term m must in the range of $0 < m < 1$ for an important economic reason's otherwise; the price would go infinity when approaching t_c (if the bubble has not crashed yet).

The first order expansion for (7) (the hazard rate) is given by (8).

$$h(t) \approx B'(t_c - t)^{m-1} + c'(t_c - t)^{m-1} \cos[\omega \ln(t_c - t) + \phi'] \quad (8)$$

The crash hazard rate now displays log-periodic oscillations. This can easily see by taking the exponent z to be complex with a non-zero imaginary part, since the real part of $(t_c - t)^{-z+i\omega}$ is $(t_c - t)^{m-1} \cos[\omega \ln(t_c - t)]$. The evolution of the price before the crash and critical date is then given by (9).

$$\ln E[p(t)] \approx A + B(t_c - t)^m + C(t_c - t)^m \cos(\omega \ln(t_c - t) + \phi) \quad (9)$$

The generalised Johansen Leodit Sornette Model is formed by inferring fundamental value of stock in eq.(9). Extension of (9) is said to be GJLS Model that proposed by (W.Yan et al., 2011).

The price dynamics of an asset as

$$dp = \mu(t)pdt + \sigma(t)p dW - \kappa(p - p_1)^\gamma dj \quad (10)$$

where the $\mu(t)pdt + \sigma(t)p dW$ describes the statistical geometrical Brownian motion and the third term is the jump.

When the crash occurs at some time t^* $\int_{t^*}^{t^*+} dj = 1$ (indicate t^*), the price drops abruptly by

$$\text{amplitude } \kappa \left(p(t^*) - p_1 \right)^\gamma$$

where $\kappa = \gamma = 1$, the price drops from $p(t^{*-})$ to $p(t^{*+}) = p_1$. The price changes from its value just before crash to a fixed well-defined valuation p_1 .

Inferring no-arbitrage condition $E_t[dp] = 0$ to (10) leads to
$$\mu(t)p = k(p - p_1)^\gamma h(t) \tag{12}$$

Conditional on the absence of a crash, the dynamics of the expected price obeys the equation

$$dp = \mu(t)p dt = k(p - p_1)^\gamma h(t) dt \tag{13}$$

and the fundamental price must obey the condition $p_1 < \min p(t)$. For $\gamma = 1$, the solution is

$$\ln[p(t) - p_1] = F_{LPPL}(t) \tag{14}$$

where $F_{LPPL}(t)$ is given by the (9); For $\gamma \in (1, 0)$, the solution is

$$(p - p_1)^{1-\gamma} = F_{LPPL}(t) \tag{15}$$

do not consider the case $\gamma > 1$ which would give an economically non-sensible behaviour, namely the price diverges in finite time before the crash hazard rate itself diverges.

In summary, [26] considered a model as shown below.
$$p_1 + \exp(F_{LPPL}(t)), \gamma = 1 \tag{16}$$

The final model (16) was applied to the Kuala Lumpur Composite Index (KLCI) to identify the the most probable crash-time of rational speculative bubble that appeared during the year 2008. Besides that, this study also to obtain fundamental value of stock price and followed by identification of bubble size as well.

III. RESULTS AND DISCUSSION

As a first step, we test few time intervals to predict the index value at market stopping time in order to choose a most appropriate time window to predict crash-time of rational speculative bubble of KLCI. Table 1 shows the results obtained for index value at market stopping time.

Table 1: Predicted index value at market stopping time

Time interval	Index value at market stopping time	Predicted index value	Differences, %	MSE
01/09/1998-18/02/2008	1516.22	1506.88	0.60	3.16E-07
29/03/1999-18/02/2008	1516.22	1493.87	1.50	2.01E-08
31/05/1999-18/02/2008	1516.22	1477.81	2.50	1.26E-09
27/09/1999-18/02/2008	1516.22	1477.02	2.60	3.56E-08
08/05/2001-18/02/2008	1516.22	1437.27	5.20	3.13E-08
19/12/2002-18/02/2008	1516.22	1400.17	7.70	1.38E-08
10/03/2003-18/02/2008	1516.22	1402.75	7.43	2.36E-08
24/05/2004-18/02/2008	1516.22	1401.70	7.60	9.06E-09
06/03/2007-18/02/2008	1516.22	1430.91	5.63	1.44E-09

There are nine different time intervals selected to predict index value at market stopping time. The most nearest index value obtained is for the time interval 01/09/1998-18/02/2008. This time interval was used to forecast the crash-time of KLCI

during year 2008. The crash-time predicted using selected time interval by the model is exactly same as the empirical date that is 18/02/2008. The fitted KLCI index with the GJLS model is shown in figure 1.



Figure 1: Fitted curve of KLCI, 2008

Table 2: Predicted intrinsic value of KLCI, 2008

Time interval	Index value at market stopping time	Intrinsic value	Bubble size
01/09/1998 - 18/02/2008	1516.22	861.98	654.24, 43.2%

The intrinsic value predicted by using the selected time interval is shown in Table 2. The obtained value is 861.98 which shows that the market value is deviated about 43.2% from its fundamental value. This deviation is called as size of the speculative rational bubble that formed during global economic crisis 2008. By using the predicted intrinsic value, we found that

the rational speculative bubble start to form and grow in Malaysian stock market from 12/01/2000 to 18/02/2008. There are eight bubble phases found in the period of selected time interval. The summary of the phases are shown in the Table 3 and illustrated in figure 2.

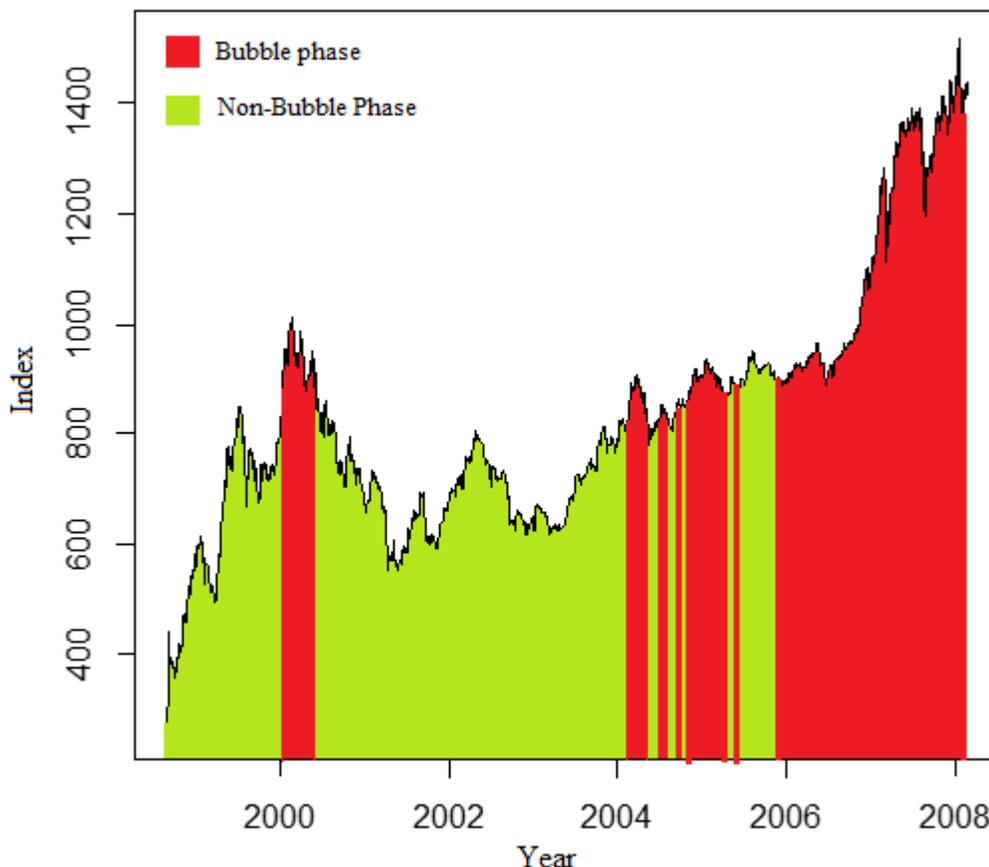


Figure 2: Bubble Phase of Malaysian Stock Market, 2008

Table 3: Bubble Phase and Size of the Bubble Formed in Malaysian Stock Market, 2008

Bubble Phase					Size of the Bubble Formed	
Starts		Ends		Duration		
Date	Market Index Value	Date	Market Index Value		Min %	Max %
12/01/2000	869.62	14/06/2000	862.12	155	0.9	17.55
24/02/2004	874.82	14/04/2004	866.29	51	1.5	5.45
20/04/2004	864.02	27/04/2004	868.32	8	0.2	1.57
20/09/2004	865.34	21/09/2004	865.31	2	0.4	0.93
04/10/2004	865.07	07/10/2004	864.16	4	0.4	0.36
01/11/2004	864.04	05/04/2005	869.81	156	0.2	8.77
08/04/2005	864.02	30/05/2005	869.96	53	0.2	4.88
02/06/2005	862.40	18/02/2008	855.39	992	0.1	75.87

The maximum size of rational speculative bubble formed in Malaysian stock market is 75.87% and appeared about 992 days before crash. According to the Table 3, we can summarize that the longer the duration the bigger the size of the bubble formed.

data to achieve our goal of study. It is essential needs for researcher to study on financial bubbles. It is because the economic bubbles are one of the serious issue that give negative implications to the development of economy which is the factor leads to an economy crisis.

IV. CONCLUSION

In a conclusion, this paper examines the possible crash-time of rational speculative bubble of KLCI stock market during the year 2008. The GJLS model was successfully employed to the

ACKNOWLEDGMENT

We would like to acknowledge Universiti Malaysia Terengganu for providing facilities and fund.

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A Stage-Based Model Development Study on Tourism Social Impact Assessment

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Abstract- The study of tourism impacts has been the topic of studies by several researchers since many years ago. Social impact, as one of the fundamental pillars of tourism impacts, has been consequently investigated from different perspectives. This study aims at demonstrating the developmental stages of tourism social impacts assessment including model development, instrument design, and instrument testing. Therefore, a comprehensive literature review on social impact studies has been conducted to acknowledge the major theories. The attitudinal surveys have been found to be the common method of addressing a range of social-cultural impacts, especially with the focus on communities' attitude towards social impacts of tourism in touristic destinations.

Index Terms- Assessment, model development, social impact, tourism

I. INTRODUCTION

Tourism as one of the world's fastest growing industries is affecting different features of human's life such as economy, culture, and environment. The more tourism develops in an area, the more its impacts can be detected. Due to the positive or negative impacts, tourism can be praised or criticized in any destination.

Study of social impacts and issues regarding its measurement has been the subject of studies since many years ago (Milman and Pizam, 1988; Ap and Crompton, 1993; Deery et al., 2012). However, Hall and Richards (2000) claimed that measuring the social and cultural impacts of tourism is often a difficult task because firstly, they are mostly indirect and secondly, the lack of accepted methodology prevents exact measurement. On the other hand, Deery and Jago (2010) claimed that the methods to collect and analyze data regarding social impacts are often similar. Haley et al. (2005) noted that in addition to the lack of underpinning theory, the choice of different methodologies in examining perceptions has resulted in a fragmented rather than coherent view. However, there is something in common in most of the studies that is monitoring both positive and negative indicators when measuring social impacts. In order to contribute to better understanding of the social impacts of tourism and their measurement models, this study reviewed the related literature comprehensively and has provided evidences for each stage of development in tourism social impact assessment.

II. BACKGROUND OF THE RESEARCH

There are different studies on tourism social impact which affected its measurement. The concept of "Social Impact Assessment (SIA)" opened a new gate in social impact studies.

This concept provides an integrated approach to the measurement of social impacts (Finsterbusch, 1995). Burdge and Vanclay (1995) defined social impact assessment as the process of assessing or estimating the social consequences which are likely to follow from specific policy actions or project development, especially in the context of appropriate national, state, or provincial environmental policy legislation. Finsterbusch et al. (1983) asserted that Social impact assessment is an anticipatory research that gathers data on the likely impacts of a number of alternative development options and uses the results to decide on the best alternative to implement. One of the methods of social impact assessment is the Interactive Community Forum that seeks community members' judgments of social impacts resulting from project alternatives in an environmental impact assessment (Becker et al., 2003). While social impact assessment studies focus on individuals' perception of, or attitudes toward a proposed project, the Interactive Community Forum seeks to empower individuals by using their knowledge and local expertise to identify community-level impacts (Becker et al., 2003). The process of Interactive Community Forum involves "community selection", "citizen sampling", "small group structure and facilitation", and "data collection".

According to Deery et al. (2012), social impact research has reached the stage where much of the works have focused on single issues which do not meet the needs of providing a holistic perspective. For example, Tassiopoulos and Johnson (2009) discussed about social impacts of events and Goodwin (2006) worked on the impact of tourism on poverty. The socio-cultural impacts have been frequently explained by Tourism Area Life Cycle (Butler, 1980), Doxey Irritation Index (Doxey, 1975) and Social Exchange Theory (Ap, 1992) (Zamani-Farahani and Musa, 2012). Mathieson and Wall (1982) suggested that only two frameworks have emerged which appear to be widely applicable to social impact research related to tourism. These frameworks belong to Bjorklund and Philbrick (1972) and Doxey (1975). Wearing and Laresn (1996) affirmed that these two were the initiators of development of a conceptual basis for the assessment of social impacts. These theories are going to be explained in the next section.

In a recent study about social impacts of tourism, Deery et al. (2012) investigated on a literature about social impacts of tourism and the process of models' development in this area. The researchers followed the stage-based model of Deery et al (2012) and added other studies to their examples by the aim of describing and extending each stage (Table 1). Since stage one in Deery et al's (2012) study is related to definition and concept of social impacts, this stage was removed from the study in order to concentrate only on the stages directed to the social impact assessment.

Table 1: Stages of development in social impact assessment

Stage One: Model Development	Doxey, 1975; Butler, 1980; Mathieson and Wall, 1982; Perdue, Long and Allen, 1990; Ap (1992)
Stage Two: Instrument Design & Development	Ap and Crompton, 1993, 1998; Choi and Sirakaya, 2006
Stage Three: Instrument Testing	Fredline and Faulkner, 2000; Choi and Sirakaya, 2005; Fredline et al, 2006

III. FINDINGS OF THE STUDY

A. Stage One: Model Development

The initial model development for tourism social impact refers to the work of Bjorklund and Philbrick (1972) who presented a matrix for residents' attitudes. In their proposed model, the hosts may be active or passive in terms of their behavior towards tourism and negative or positive in terms of their attitudes (Ryan, 1991). Actually, Bjorklund and Philbrick (1972) claimed that attitudes and behaviors of different groups can be positive or negative and active or passive and it depends on the level of their involvement in tourism industry. This makes their model different from Doxey's and Butler's model which represent the general tone of opinion (Ryan, 1991). Doxey (1975) proposed model of irritation which led to further contribution in evaluating social impacts of tourism. Doxey (1975) believed that when numbers of tourists are increased and a more developed tourism industry is attained at the destination, it results in irritation in the host community. In fact, this model indicates the changes in locals' attitude toward tourism according to its impacts. His proposed model for residents' attitudes toward tourism impacts involved four stages which are called "euphoria", "apathy", "annoyance", and "antagonism". At the primary stage of tourism development, residents feel happy and comfortable (euphoria). Then, they start losing interest in tourism (apathy). At next stage, the negative impacts of tourism are increased when the number of tourists grows and residents feel annoyed (annoyance). Finally, in antagonism stage hostile reaction against tourism take place. Doxey claimed that the reciprocating impacts between tourists and community members may be converted into different degrees of community members' irritation which were influenced by the number of tourists and the threats they pose to the way of life of community members (Wearing and Larsen, 1996).

Although Doxey's model is a useful approach towards identifying the four stages of tourism evolution at a destination, it has been criticized for its limitations by Wall and Mathieson (2006) who believed that it is a unidirectional model intended to represent the entire nature of the host community. Zamani-Farahani and Musa (2012) confirmed that the model assumes that it is the whole community that becomes hostile to tourism, but often communities are heterogeneous and different sections of the community have different reactions. Besides, Allen et al. (1993) noted that residents' attitudes are affected by the level of economic activity and not the level of tourism development as what Doxey mentioned. For example, the more the residents are employed in tourism industry, the more they show good reactions to tourism.

Following Doxy, Butler (1980) proposed a very famous model which is called Butler lifecycle model. He suggested that every

tourist destination experiences similar stages of development. Exploration is the first stage of Butler's model which is the presentation of a new place for tourists. In this stage tourists use local amenities and cause the least impacts to local residents. In the next stage which is involvement, services begin to be established to serve the needs of the travelling public and during the third stage (development), prominent physical development in area products and services, together with considerable advertising and promotional efforts will occur (Zamani-Farahani and Musa, 2012). It is the time when the concerns about impacts of tourism start and lead to the last stage which is called "decline". It reflects the host community's inability to cope with identified tourism impacts. If right policies which sustain the balance between resources and demands are adopted, the decline is less likely to happen (Upchurch and Teivane, 2000).

Therefore, the residents' perception of tourism impacts may differ from time to time or from situation to situation according to the either stage of tourism development or decline. Understanding these stages and the impact of underlying changes can help tourism researchers to evaluate local people's positive or negative attitudes toward tourism impacts.

Like Doxey's model, Butler's tourism lifecycle model was also criticized by some researcher. Dyer et al. (2007) stated that Butler's cycle of evolution conceptualizes diminished resident support for tourism development in tourist locations as related negative impacts become evident while Mason and Cheyne (2000) and Zamani-Farahani and Musa (2012) criticized it for its assumption of a degree of homogeneity of community reactions.

Mathieson and Wall (1982) later on discussed about the social and cultural impacts of tourism and considered particular dimensions to be influenced by tourism based on the relationships between tourists and host community. According to them, this relationship has some characteristics which are important to be discussed when the impacts are investigated. First of all, the relationship between tourists and host community is a temporary relationship which cannot be deep and therefore the impacts of this relationship will depend on the return of visitors to the same accommodation. Second, residents may exploit the time pressures under which tourists operate because tourists are forced to enjoy a wide variety of experiences in a short time and therefore delays cause irritation. Third, since tourists spend most of their time in touristic areas with other tourists, they are separated from local people unless the local people are involved in tourism industry and make contact with tourists. Fourth, the relationship between local people and tourists is not instinctive rather it is preplanned. The fifth point is that their relationship is often unbalanced in terms of material inequality and power because residents are seen as servers by tourists and can impose their will on host community (Ramchander, 2004). Later on, Perdue et al. (1990) proposed a model for the residents' support and attitudes toward tourism development. In their model, they considered personal benefits which host community receives from tourism development as a drive factor influencing their perception and attitude.

The next significant stage in tourism development model to be discussed in terms of social impacts of tourism is Ap's (1992) model which involves four stages. In the embracement stage, local people accept tourism and feel positively about its impacts. At the tolerance stage, they start feeling more about the impacts

of tourism. At adjustment stage, they adjust based on their involvement in tourism industry and finally at withdrawal stage, they no longer cope with the impacts of tourism. Similar to Doxey's and Butler's models, it describes the way in which tourism development affects local people's attitudes towards tourism (Alhasanat, 2008). Ap (1992) proposed the model in which local residents evaluate tourism in terms of the costs and benefits they expect to occur in exchange for their involvement in it (Zamani-Farahani and Musa, 2012). Ap (1992) claimed that the higher benefits than costs, the more residents have positive attitudes towards development. In this sense, Ap's model is in congruent with Perdue et al's model which refers to host community's advantages of tourism development as the key factor controlling their attitudes toward tourism development. Like previous theories, this model has some limitations. Alhasanat (2008) believed that even though this theory is a valid indicator to explain both positive and negative attitudes of a host population towards tourism, it presupposes that people always act in a rational way, that is they process the information they receive systematically and make decisions based on this (Alhasanat, 2008).

B. Stage Two: Instrument Design and Development

Ap and Crompton (1993) developed and tested a tourism impact scale comprising of 147 items which were reduced to 35 final items after testing the instrument. This scale included seven domains namely, social and cultural, economic, crowding and congestion, environmental, services, taxes, and community attitudes. Their tested and final scale for measuring socio-cultural impact is shown in table 2.

Table 2: Social and cultural impacts of tourism

Indicators reviewed	Final scales
<p>Positive social impacts</p> <ul style="list-style-type: none"> ▪ Improves the quality of life ▪ Increases availability of recreation facilities/opportunities ▪ Improves quality of fire protection ▪ Improves quality of police protection ▪ Improves understanding and image of different communities or cultures ▪ Promotes cultural exchange ▪ Facilitates meeting visitors ▪ Preserves cultural identity of host population ▪ Increases demands for historical and cultural exhibits <p>Negative social impacts</p> <ul style="list-style-type: none"> ▪ Increased prostitution ▪ Increased alcoholism ▪ Increased smuggling ▪ Heightened tension ▪ Increasingly hectic community and personal life ▪ Creation of a phony folk culture 	<ul style="list-style-type: none"> ▪ Demand for historical activities and programs ▪ Demand for cultural activities and programs ▪ Variety of cultural facilities and activities in the community ▪ Opportunities to learn about other people and cultures ▪ Awareness/recognition of the local culture and heritage ▪ Variety of entertainment in the area ▪ Opportunities to restore and protect historical structures ▪ Opportunities to meet interesting people ▪ Understanding of different people and cultures by residents ▪ Life and validity of the community

Source: Ap and Crompton (1993)

Choi and Sirakaya (2006) in another study developed indicators to measure community tourism development within a sustainable

framework. As far as related to this research, social indicators of community tourism should be investigated in order to measure social impacts of tourism. In order to develop these indicators the first step is finding the best secondary sources. The required information can be obtained from community stakeholders, tourism experts and scholars who have previously investigated on the same area. The indicators for social dimension in Choi and Sirakaya's model are shown in Table 3.

Table 3: Indicators for the social dimension of tourism impacts

Key Themes	Indicators
Host community/ residents and stakeholders	<ul style="list-style-type: none"> ▪ Host community satisfaction toward tourism development ▪ Host community attitude toward tourism development ▪ Continuance of traditional activities by local residents ▪ Stress in visitors/host relationship ▪ Resident/non-resident ownership of homes (2nd homes/part time residents) ▪ Level of congruency among stakeholders ▪ Resident involvement in tourism industry
Social cohesion	<ul style="list-style-type: none"> ▪ Change in social cohesion ▪ Change in community structure evident of a community breakdown and alienation ▪ Change in family cohesion
Sex tourism	<ul style="list-style-type: none"> ▪ Sex tourism ▪ Percent employed in sex tourism ▪ Prostitution number and rate in local sex tourism industry ▪ Community attitude toward sex tourism
Tourist satisfaction	<ul style="list-style-type: none"> ▪ Tourist satisfaction/attitude toward tourism development
Community resource	<ul style="list-style-type: none"> ▪ Degradation/erosion of natural and cultural resource
Distribution of resources/power	<ul style="list-style-type: none"> ▪ Shift in social structure (e.g. power shift and its socio-economic implications) ▪ Percent of managerial employment from local residents
Community health and safety	<ul style="list-style-type: none"> ▪ Litter/pollution (air, water, etc.) ▪ Overcrowding ▪ Congestion (road) ▪ Crime rate ▪ Public awareness toward value of tourism ▪ Number of incidents of vandalism reported ▪ Community health (availability of health policy related to tourism) ▪ Loss of traditional lifestyle and knowledge via modernization
Quality of life in general	<ul style="list-style-type: none"> ▪ Levels of satisfaction with community life in general (QOL)

Source: Choi and Sirakaya (2006)

C. Stage Three: Instrument Testing

The last stage is the emergence of testing the instruments for measuring social impacts which starts with Fredline and Faulkner's study (2000). They applied the cluster analysis approach as a tool for investigating the underlying structure of community reactions to tourism and events and explored the profiles of the various clusters. In another study, Choi and Sirakaya (2005) developed and validated a scale assessing residents' attitudes toward sustainable tourism. Perceived social costs was revealed as one of the main domains in their study including eight items regarding overcrowding, overuse of recreation resources, fast growing rate, irritation of local

residents (two items), disruption of quality of life (two items), and environmental degradation.

Later on, Fredline et al. (2006) listed the social indicators suggested during the community consultations. Even though the research has been done for the two case studies in Australia (Coles Bay and Freycinet Surf Coast Shire), the result of the study can be generalized for the similar measurement of social impacts of tourism. Based on this, Fredline et al. (2006) started with collecting secondary data to identify impacts and indicators of social impacts. After selecting a set of indicators they applied these indicators to measure host community's perceptions of tourism impacts and testing them in case studies. Social indicators and potential sources of measurement found by Fredline et al. (2006) are shown in the table 4.

Table 4: Social indicators and potential sources of measurement

Indicator	Potential Measure, data source (s) scale and frequency
Visitors to the area	<ul style="list-style-type: none"> ▪ Annual visitors by reason and length of stay ▪ Tourist accommodation (by type, occupancy rate) ▪ Number of visitors to the VIC
Land Use	<ul style="list-style-type: none"> ▪ Rate of development ▪ Area of development ▪ Size of development
Access especially to parking	<ul style="list-style-type: none"> ▪ Parking space count ▪ Number of parking fines incurred ▪ Over flow car parking space available ▪ Public transport services to area ▪ Occupancy rates in relation to number of cars ▪ Price & timetables for local buses ▪ Traffic count
Business success	<ul style="list-style-type: none"> ▪ Occupancy rates ▪ Bookings ▪ Comparison of previous years performance ▪ Input of monies into local area
Safety in the community	<ul style="list-style-type: none"> ▪ The presence of neighborhood watch ▪ Number of reported safety issues in the area
Tourism Development	<ul style="list-style-type: none"> ▪ Comparison between business types and community demands over past years and present
Participation in community activities	<ul style="list-style-type: none"> ▪ Number and type of community groups/clubs/interest groups ▪ Number of local volunteers esp. at events
Change in character of local community (Positive and negative)	<ul style="list-style-type: none"> ▪ Letters to editor of local paper ▪ Number of locals moving from area ▪ Locals perceptions ▪ Change in demographics
Maintenance of heritage	<ul style="list-style-type: none"> ▪ Policies in place to protect heritage
Cultural development: events (number and type)	<ul style="list-style-type: none"> ▪ Number of events, annual and special events ▪ Reoccurrence rate of events (success)
Change in crime patterns	<ul style="list-style-type: none"> ▪ Increased/decreased amount of incidents reported.
Change in social problems e.g. Alcohol, drugs	<ul style="list-style-type: none"> ▪ Increased/decreased amount of services required for social problems
Business start-ups	<ul style="list-style-type: none"> ▪ Number of business openings minus business closures
Business diversity	<ul style="list-style-type: none"> ▪ Business classification system (which sector do businesses belong to & employment levels)
Labor force participation	<ul style="list-style-type: none"> ▪ Number of persons in employment or seeking employment
Job creation level	<ul style="list-style-type: none"> ▪ Change in unemployment levels ▪ Ratio of new business to new positions created in area

Source: Fredline et al. (2006)

Reviewing the mentioned models above, Deery et al. (2012) considered a new approach for social impacts of tourism. As explained by Deery et al. (2012), there are two groups of variables which can be discussed in social impacts researches and they can act as moderators to measure social impacts. One is the group that influences the residents' perception of tourism impacts and the other one is the impacts themselves. According to Deery et al. (2012), the following table can be a key to understand and measure social impacts in terms of residents' perception (Table 5).

Table 5: Variables which influence residents' perception of social impacts of tourism

Residents' personal profile	<ul style="list-style-type: none"> ▪ Age, gender, income, or on the residents' relationship to the area and to tourists
Residents' external variables	<ul style="list-style-type: none"> ▪ Economic dependence on tourism working in or owning a business in tourism or a related industry ▪ Distance of place of residence from areas of high tourist activity ▪ Level of contact with tourists --Use of facilities also used by tourists ▪ Tourist/resident ratio
Residents' values variables	<ul style="list-style-type: none"> ▪ Community attachment ▪ Social, political and environmental values

Source: Deery et al. (2012)

Deery et al. (2012) continued with presenting the most important social impacts of tourism which can be used in measuring the range and type of influence by tourism in a community. The list of impacts provided by Deery et al. (2012), according to previous studies, is shown in the following table (Table 6).

Table 6: Social impacts of tourism on communities

Impacts	Components
Economic benefits	<ul style="list-style-type: none"> ▪ Opportunities for local business ▪ Employment opportunities ▪ The strength of the local economy ▪ Revenue for local government ▪ Funding for public services (e.g. health, police, fire services)
Opportunity cost	<ul style="list-style-type: none"> ▪ Demand for public services (e.g. health, police, fire services)
Facility maintenance	<ul style="list-style-type: none"> ▪ The standard of maintenance of public facilities such as beaches, parks and roads ▪ Public transport
Interesting things to do	<ul style="list-style-type: none"> ▪ Shopping opportunities ▪ Entertainment and recreational opportunities ▪ Opportunities to socialize ▪ Intercultural interaction
Disruption	<ul style="list-style-type: none"> ▪ The number of people in public places (e.g. parks and beaches) ▪ The availability of parking spaces ▪ Noise levels ▪ The number of people in shops, restaurants, nightclubs etc ▪ Traffic congestion
Pride	<ul style="list-style-type: none"> ▪ Community pride
Delinquent behavior	<ul style="list-style-type: none"> ▪ Alcohol related behavioral problems ▪ Illegal drug use ▪ Rowdy behavior ▪ Gambling ▪ Prostitution
Environment	<ul style="list-style-type: none"> ▪ Litter ▪ The available habitat for local wildlife ▪ The natural environment
Showcase effect	<ul style="list-style-type: none"> ▪ The image of the city in the eyes of others (not residents)

Increased prices	<ul style="list-style-type: none"> ▪ The overall cost of living ▪ Property values ▪ Rents Rates
Access denied	<ul style="list-style-type: none"> ▪ The number of permanent residents in the region
Justice	<ul style="list-style-type: none"> ▪ Social and moral values ▪ Relationships between local residents
New infrastructure	<ul style="list-style-type: none"> ▪ The level of urban development ▪ New shops and restaurants
Town/region character	<ul style="list-style-type: none"> ▪ The physical appearance of the region ▪ The style of architecture on the region ▪ The character of the region

Source: Deery et al. (2012)

IV. CONCLUSION

The purpose of this paper was to investigate on the stages of development in tourism social impact assessment. In order to reach the aim of this study, a comprehensive review on the most important models and approaches about social impacts of tourism and their evaluation has been applied. Based on the literature, it was determined that much of the researches into social impacts focus on the host community perceptions and examine the negative and positive effects of tourism on the community as perceived by its members. Therefore, it is very important to adopt the planning policies which can reinforce positive impacts while reduce negative impacts by involvement of communities in tourism industry. This will result in further understanding of residents about tourism and their participation in tourism decision making which will consequently lead them to receive more benefits from the industry. These policies will let local people to be involved in the industry in a positive way and undertake both positive and negative impacts of tourism.

ACKNOWLEDGMENT

The authors would like to extend their appreciation to Universiti Sains Malaysia for granting the Research University Grant called Sustainable Tourism Cluster [Grant No. 1001/PTS/8660011] that made this study and paper possible.

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Investigation on Property Relationship in Various Austenitic Stainless Steel 304L Welds

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Abstract- In the present work an investigation was made on property relationship of SS 304L austenitic stainless steel welds. Shielded metal arc welding (SMAW), gas metal arc welding (GMAW) and gas tungsten arc welding (GTAW) methods were used to make welds. Tensile test was used to measure the yield strength and ultimate tensile strength of the welds. Impact test was used to measure the toughness of the welds. Experimental results clearly revealed that these properties of GTAW was superior compared to the other two welds. This was due to more weld penetration at lower heat input into the base metal. The disadvantage of SMAW and GMAW is that the slag must be chipped off of the weld after it cools and can sometimes infiltrate the weld causing weakness.

Index Terms- 304L austenitic stainless steel; shielded metal arc welding; gas metal arc welding; gas tungsten arc welding; material properties;

I. INTRODUCTION

Carbon steel on cooling transforms from austenite to a mixture of ferrite and cementite. With austenitic stainless steel, the high chrome and nickel content suppress this transformation keeping the material fully austenite on cooling. Austenitic stainless steels have high ductility, low yield stress and relatively high ultimate tensile strength, when compared to typical carbon steel. Austenitic stainless steels are commonly used in the fabrication of piping systems, automotive exhaust gas systems and in a variety of equipment associated with the chemical and nuclear power industries. The type 304L austenitic stainless steel is an extra low-carbon variation of type 304 with a 0.03% maximum carbon content that eliminates carbide precipitation due to welding. As a result, it can be used in severe corrosive conditions. It often eliminates the necessity of annealing weldments except for applications specifying stress relief. Since 304L stainless steel weldments are frequently subjected to dynamic loading conditions in their service environments, it is essential to optimize the welding process. The present study aims to investigate the effect of Shielded metal arc welding (SMAW), gas metal arc welding (GMAW) and gas tungsten arc welding (GTAW) on the mechanical properties of weldments, Specifically on the material behavior under forces and toughness properties.

II. WELDABILITY

The austenitic class of stainless steel is generally considered to be weldable by the common fusion and resistance techniques. Special consideration is required to avoid weld "hot cracking" by assuring formation of ferrite in the weld deposit. Type 304L is generally considered to be the most common alloys of this stainless class. When weld filler is need, AWS E/ER 308, 308L, 304L or 347 are most often specified.

Shielded metal arc welding

Shielded metal arc welding (SMAW) is also known as manual metal arc welding or flux shielded arc welding or informally as stick welding, is a manual arc welding process that uses a consumable electrode coated in flux to lay the weld. An electric current, in the form of either alternating current or direct current from a welding power supply is used to form an electric arc between the electrode and the metals to be joined.

Gas metal arc welding

Gas metal arc welding (GMAW), also called metal inert gas (MIG) welding, and extrudes a metal wire electrode from a gun held by the welder. Power is applied to the gun by a power supply that attempts to regulate voltage at a preset level set by the operator. The gun also carries a shielding gas to the nozzle of the gun. Current flows down the gun through the arc and back to the power supply via the ground clamp.

Gas tungsten arc welding

Gas tungsten arc welding (GTAW), also called tungsten inert gas (TIG) welding uses a non-consumable tungsten electrode which must be shielded with an inert gas. The arc is initiated between the tip of the electrode and work to melt the metal being welded, as well as the filler metal, when used. A gas shield protects the electrode and the molten weld pool.

Present work is aimed at comparisons of yield strength, ultimate tensile strength and toughness of SMAW, GMAW and GTAW of SS 304L austenitic stainless steel.

III. EXPERIMENTAL PROCEDURE

Material

The parent metal employed in this work is SS 304L austenitic stainless steel having 10mm thickness. The chemical composition is given in **Table 1**. The mechanical property of the steel is given in **Table 2**.

Table 1: Chemical composition of base metal

	C	Mn	Si	N	P	S	Cr	Ni
min	-	-	-	-	-	-	18.00	8.00
max	0.030	2.000	0.750	0.10	0.045	0.030	20.00	12.0

Table 2: Mechanical properties of base metal

STEEL GRAD E	0.2% Yield strength (MPa)	Ultimate tensile strength (MPa)	Hardness Rockwell (RB)	Elongation % 50.8 mm
SS-304L	170	485	201 (92)	40

Edge preparation of parent metal

The edge preparation is done for plate specimen as per ASME B16.25 standard as shown in **Fig.1**.

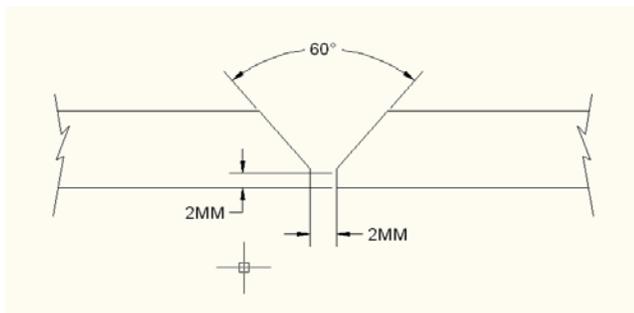


Fig.1: Dimension for Edge preparation process of plate specimen

Welding process

- Direct current Shielded metal arc welding (SMAW) process with electrode of AWS A5.4 E308L-16 of 3mm diameter was used to weld steel plates in square-butt joint configuration. SMAW welding parameters of current 80A, voltage 20V were used. The image of this weld metal is shown in **Fig. 2**.
- Direct current Gas metal arc welding (DC-GMAW) process with electrode of AWS A5.9 ER 308L of 1.2mm diameter and argon-carbon dioxide shielding gas at 20°C and 0.15 MPa was employed to weld steel plates in square-butt joint configuration. GMAW welding parameters of current 200A, voltage 20V were used. The image of this weld metal is shown in **Fig. 3**.
- Direct current Gas tungsten arc welding (DC-GTAW) process with throated tungsten electrode of 2.4mm diameter and argon shielding gas was employed to weld steel plates in square-butt joint configuration. GTAW parameters of current 120A, voltage 20V were used. The image of this weld metal is shown in **Fig. 4**.



Fig.2: Fabricated Shielded metal arc weld (SMAW) metal



Fig.3: Fabricated Gas metal arc weld (GMAW) metal



Fig.4: Fabricated Gas tungsten arc weld (GTAW) metal

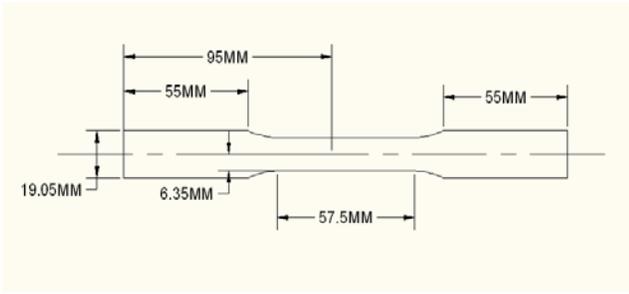


Fig.5: Dimension of Tensile test specimen

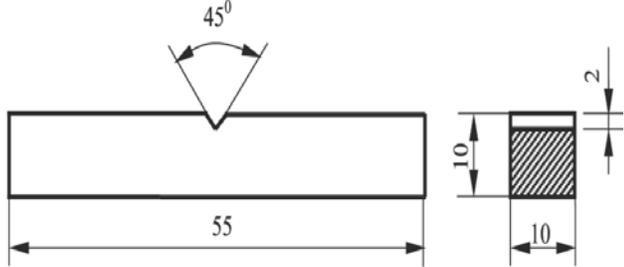


Fig.6: Dimension of Impact test specimen



Fig.8: Fracture specimens in tensile test



Fig.9: Fracture specimens in impact test

Tensile test

Longitudinal weld tensile test samples were machined for both plates and rods, as per the standard ASTM-E8 as shown in **Fig.5**. Tensile test was conducted on Instron 1185 Universal testing Machine at a cross head speed of 0.05 mm/min and values were noted.

Impact test

Charpy V-notch Impact test samples were machined for both plates and rods as per the standard ASTM-E23 as shown in **Fig.6**. The impact test was conducted on pendulum impact tester, Model IT-30 and values were noted.

Table 3: Material properties of welds

Type of Weld	Material Properties		
	Toughness (MPa)	0.2% Yield strength (MPa)	Ultimate tensile strength (MPa)
GTAW	32.9	9.80	460
GMAW	30.42	7.60	422
SMAW	26.86	6.60	406

IV. RESULTS AND DISCUSSION

Tensile and toughness properties

The **Fig.7a** and **Fig.7b** shows tensile test and impact test specimens. The results of tensile test and impact test are shown in **Table 3**. The fracture specimens in tensile test and impact test are shown in **Fig.8** and **Fig.9** respectively.

As mentioned earlier, these were determined from longitudinal all-weld specimens taken from weld zone. The tensile data and impact data for each condition are an average of measurement made from six specimens.

V. CONCLUSIONS

From the above experimental data, it is clear that gas tungsten arc welded (GTAW) joint SS-304L gives the better ultimate tensile strength, yield strength and toughness properties nearer to the base metal properties than Shielded metal arc welds (SMAW) and gas metal arc welds (GMAW).

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Fig.7a



Fig.7b

Fig.7: Fabricated specimens

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Virtual Lab Control Using Android Phone

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Abstract- Android based lab control is a system which allows you to access desktop of remote computers act as “Server” through the android phone act as “Client” using Wi-Fi network. This system is based on VNC architecture where user is able to see and access the desktop of remote computer of any platform like Linux, Mac, and Windows etc .For that, a VNC server must be installed on a computer connected using Wi-Fi network. The image of the desktop is compressed before it is transmitted to the phone. So to work on this, we must use a VNC protocol to access the graphical user interface of remote computer. The user can perform the operations like capturing the screen, mouse clicking, zooming, panning, opening documents and file transfer etc.

Index Terms- Android, Desktop, VNC, Wi-Fi, Server.

I. INTRODUCTION

The growing popularity and introduction of smart phone has brought a big change in technical field of cellular phone. Now a day, smart phones are spread worldwide and provide much more facility than the cellular phone. These phones provide features which were previously provided by the computer system architecture [4].

The proposed system should be able to communicate with the remote system and it should have the control on the device from the mobile phone. The system can perform the operation from a android phone like a normal desktop system does. Whether you have some query while implementing the program and your teacher is not available or she is not present in the college, this system gives you correct solution to keep you connected. The system is graphical desktop sharing system which uses protocol to remotely control another computer. Here the proposed system is trying to implement access to remote computers from a android phone. This system makes use of virtual network computing. VNC is platform independent.VNC is a desktop sharing system which provides remote control via network.

II. RELATED WORK

In the scope of remote control there are several projects and initiatives designed to allow remote desktop control via android phone [5].

For instance, we have software called “Team Viewer” which is a computer software package for remote control, desktop sharing, online meeting, web conferencing and file transfer between Computers .Versions are available for the Microsoft

windows, OSX, Linux, Android, WindowsRT, Windows phone operating system. While the main focus of this application is remote control of computers, collaboration and presentation features are included .Team viewer can be used without charge by non-commercial users and business premium. Other point to be considered is remote visualization mechanism that are useful for achieve remote display of other devices. The most popular system designed to perform a remote control of devices is Virtual Network Computing. This system was design to access the desktop in mobile devices.

This paper focuses on access of multiple computers using android phone. So whatever the existing system was there they were trying to access a single desktop. That means one to one relationship was there. Only one machine would be controlled by the android phone. But now this paper enlists the process how to access the multiple computers through networking or Wi-Fi. This paper presents a proposal that covers this area of interest. The proposed platform is providing openness [5].

The VNC system is compound by client and server where the client is remotely connected to the server and send request to server to retrieve the update of remote controlled devices. The server side tracks and encodes display updates and the client side decodes and renders the update received.

III. EXISTING SYSTEM

The existing systems are potentially good system which allows us to remotely connect to the machine and access their respective desktops. But they have some limitations. They are listed below [1].

1. One of the application is based on central server, where client and server are connected to the central server. Here the application area is executed on central server. Because of this, the speed of operation is low and the whole system is depends on central server.

2. Another application is controlling desktop from a android phone. But the system uses RFB protocol which is slow protocol. Because of this working of this application is slow.

So because of this drawback we are concentrating on proposed architecture.

III. PROPOSED SYSTEM

I. VNC ARCHITECTURE-

Proposed system based on VNC architecture i.e. Virtual Network computing. Virtual Network computing is a graphical desktop sharing system which provides remote control via network. It supports a controlling functionality by usage of a graphical screen update from a controlled device and capturing a mouse and keyboard [4]. The proposed system is based on HTTP protocol.

The Hypertext Transfer Protocol is an application protocol for distributed, collaborative information system. Using this protocol we can transmit all information between connected devices. VNC system required two type of application for proposed system i.e. One is sever side application and other is client side application. In this application client can send the request to the server after that server can accept request and send reply to the client.

This module deals with the authentication and connection between client and server. The IP address of the server and the password transmitted the first frame after the handshaking is done [4].

The server and client communicate using a protocol called as HTTP protocol. Basically this protocol is functions as request-response protocol in the client server computing model.

control, messaging etc. Server receives all the request from client and processes that request by generating response [1].

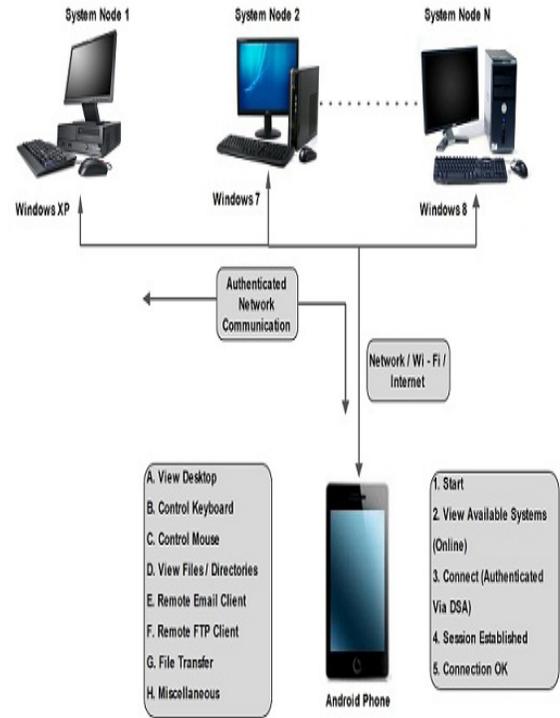


Fig 2 . Multiple desktop access using android phone

3. Design of proposed system

Proposed systems have four main modules. Those modules are listed as below and the functionality and design of each module is described further [2]:

A. Desktop sharing-

In this module, Remote desktop screen will be accessed. This will be done with the help of VNC protocol.

B. Pointing and clicking-

User can click on the remote display screen .Also he can perform the mouse clicking events such as single click, double click etc.

C. File transfer –

User can move the file from one folder to another folder.

D. Email –

We can send the email from phone to another user.

E. Control Keyboard-

We can use the shortcuts for file operations like cut, copy, paste etc.

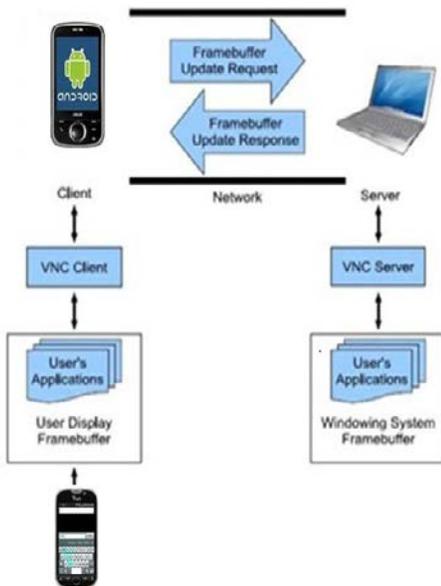


Fig.1. VNC architecture based mobile access computers

2 .VNC architecture based multiple desktop access

The proposed system is desktop sharing system which allows remote access to multiple computers via android phone. When the server and client starts, the client (Android phone) request for OTP by entering the IP address of server machine. The server sends the OTP via SMS to client. Entering that OTP, connection between client and server will be established. Once the connection is established, the client can request for various services like viewing screen shots, keyboard control, mouse

4. Algorithm to be used-

SHA1 (Secure Hash 1) Algorithm-

SHA1 algorithm is safe against the preimage attacks. SHA1 algorithm is a hashing algorithm which is used for converting the message to a unique representation of the message of fixed size i.e. multiple of 512 bits in length, without the loss of information about its exact original length in bits 1 [1]. We have provided security for this application while authentication for the user is done.

When the user is logged in, the attacker does not need to find out the exact password. It is enough to find a string that result in the same hash. When the user enters the password in the password field. Some hash value is created and it is stored in the database. This hash value is compared with the password that user has entered. If it matches then we said that the user is authenticated user.

Algorithm Steps-

1. Padding-

Pad the message with a single one followed by zeroes until the final block has 448 bits.

2. Append the size of the original message as an unsigned 64 bit integer-

Initialize the 5 hash blocks (h0, h1, h2, h3, h4) to the specific constants defined in the SHA1 standard.

3. Hash (for each 512bit Block)-

- A. Allocate an 80 word array for the message schedule
- B. Set the first 16 words to be the 512bit block split into 16 words.
- C. The rest of the words are generated using the following algorithm-

Word [i3] XOR word[i8] XOR word[i14] XOR word[i16] then rotated 1 bit to the left.

4. Loop 80 times doing the following. (Shown in fig)

5. Calculate SHAfunction() and the constant K (these are based on the current round number).

- e=d
- d=c
- c=b (rotated left 30)
- b=a
- a = a (rotated left 5) + SHAfunction() + e + k + word[i]

6. Add a, b, c, d and e to the hash output-

Output the concatenation (h0, h1, h2, h3, h4) which is the message digest.

SHA1 Message Digest-

The messages digest of the string:

“This is test for theory of computation”.

Message digest for the above string is-

4480afca4407400b035d9debeb88bfc402db514f.

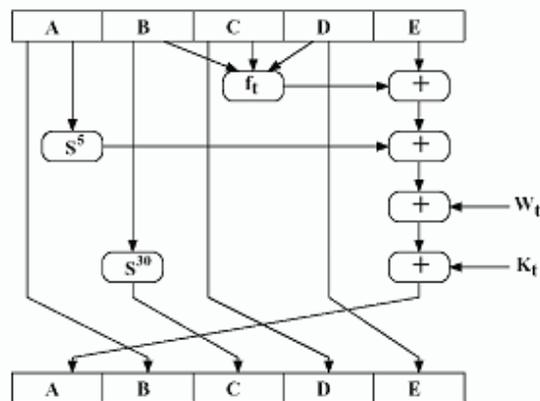


Fig 3. SHA1 algorithm block diagram

IV. APPLICATIONS

- Home appliances can be controlled using comphroid.
- Students in a distributed group can view the computer screen which is manipulated by the instructor.
- Remote Desktop System is very useful even in industries. Whenever there is new application or update, it is not required to be installed in all the - systems. Only the host computer can be updated & rest of the system & mobile devices can access it remotely.

V. EXPERIMENTAL RESULTS

Experimental result describe the process of desktop sharing in the form of input –output.



Fig.4. Login Page

Firstly user opens the application. He enters the IP address of the machine which he wants to access. After entering the IP address, user request for one time password (OTP) that will generate at the server side. User has ho entered this OTP. Then he accesses the desktop (shown in fig 5).



Fig.5. Actual view of desktop

VI. CONCLUSION

This application provides easy access to remote desktop via android phone and security using OTP. This will be implemented using Wi-Fi network. This application provides system administrator to control the files, monitoring the tasks. The VNC architecture is used to implement this system and HTTP protocol is used for exchange or transfer hypertext. Thus the extended scope of this system will prove to be helpful in controlling handheld devices.

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Captive breeding of thick-lipped Gourami, *Trichogaster labiosua* (Day) by gradual increasing aquarium water temperature and their early life stages

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Abstract- For the breeding of *Trichogaster labiosua* (Day), male and female individuals were kept in the ratio of 1:1 in clean and clear water containing the aquatic weeds, *Hydrilla sp.* *Trichogaster labiosua* easily bred in the aquarium conditions on gradually increasing temperature of aquarium water. Nesting behaviour of the fish was observed within the temperature range 24–28°C. Spawning rate ranged from 20,000–25,000. The developmental period was observed between 18–25 days.

Index Terms- *Trichogaster labiosua*, beautiful colouration, increasing temperature, easy to breed, aquarium fish.

I. INTRODUCTION

Thick-lipped Gourami, *Trichogaster labiosua* (Day) locally known as Pheteen in Manipuri is characterized by its greenish colouration, lighter ventrally. Body has 8–10 oblique vertical dark bars on the sides, blue horizontal stripes on the body. Fins are dark, with outer edge of anal fin yellowish red. The fish is widely distributed in rivers, ponds, swamps, lakes of India and Myanmar (Vishwanath, 2007). The fish generally breeds inside the bubble nest which is prepared by the bubbles secreted from the male fish, in the shallow water bodies such as paddy fields, ponds, swamps, ditches etc. during the pre-monsoon season. The fish is gaining its importance because of its food value and ornamental purposes. Presently, most of the aquacultural production of ornamental fishes is focused on freshwater species and when a species is discovered by the aquarium trade, the sudden interest, if any, often leads to the decline in wild populations of that particular species (Tlustý, 2002). This depletion is attributed to the commercial collection of the fishes for the purpose of ornamental fish trade. Perusal of related literature shows that prior record or study related to the embryonic development of this species in particular has not been published so far. Hence, this experiment was designed and performed to study the newly hatched eggs and embryonic development under the laboratory conditions. The newly hatched *T. labiosua* and its subsequent developmental stages are described here.

II. MATERIELS AND METHODS

1. Collection of brooders

Fishes were collected by netting from the pond inside the campus of Manipur University, Canchipur, Imphal. Live fishes were transported to the laboratory in polythene bags, partially

filled with oxygen by following the method of Esther & Verhallen, 2005.

2. Identification of fish

For the accurate taxonomic identification of the fish, measurements and counts were done following Vishwanath *et al.*, 2007. Measurements were taken point-to-point with a digital caliper on the left sides of the specimens to the nearest 0.01mm. Lica S8APO stereo zoom microscope under transmitted and reflected light was used to count the fin rays, scales and lateral line pores.

3. Culture of fish

Fish were cultured in Manipur University Aquarium of Fishes in the aquarium size of 90 × 45 × 30 cm³. Daily feed of the fish was provided; the optimum temperature for proper growth and development was checked and looked after well to ensure that all the fish remained healthy without any aberrant behavior. Lost leaves and excess plant debris were removed carefully; the dirt and excreta were also siphoned out from the bottom part of the aquarium water, at least, once in a week.

4. Identification of sex

Sexual dimorphism was assessed on the basis of genitalia, oozing milt, swollen vent and body colouration.

5. Breeding technique

The experiment was conducted on 2+ year old, 15–22g body weight *Trichogaster labiosua* of 20 gravid females and 20 males (n=40) in 20 aquarium with the size of 90 × 45 × 30 cm³ each. The brooders were randomly distributed into different aquaria at the male to female ratio of 1:1 (PLATE 1). After spawning, the fecundity of each female was determined by randomly taking samples of eggs in a 10 ml graded tube. For this, total number of eggs in 1ml was counted and was then multiplied by the total volume of eggs released. Fertilisation rates of eggs were determined by randomly taking a sample of approximately 100 eggs in a petri dish. Only fertilized eggs with intact nuclei were counted for the percentage of fertilization. The environmental conditions observed during the breeding period were: Room temperature (25 ± 9 °C), water temperature in the aquarium (23 ± 4°C), pH (6.8–7.2) and DO (5.5–6.3 ppm).

6. Larval rearing technique

Larvae were reared by feeding powder food sera-micron; Tubifex worm powder and some aquatic live foods collected by the use of plankton nets.

7. Study of early stages

Fertilized ova were placed in petri dishes containing fresh water. The water in the dishes was changed every 48 h. For the observation of the embryo, the embryo was kept on the cavity

side and observed by Lica microscope. The surface feature of the embryo was studied using Scanning Electron microscopy (Fig. 7 & 8 of PLATE 2). Description of post larval development was based on embryonic specimens obtained by plankton net from aquarium in June, July and August, 2014. Measurement of the total length of each of the specimens was taken after being immobilized in cooled water which made the photography of specimens possible without causing any shrinkage due to death, anesthetics and preservatives.

III. RESULTS

1. Sexual dimorphism

Males were colourful. The females had swollen vent, bulging in mature forms.

2. Effect of temperature on nesting and breeding

At temperature above 20°C, the male soon started producing bubbles from its mouth which float on the water surface forming the bubble nest (Fig. 2 of PLATE 2). Then, the male guided the female to a position below the nest which the male had prepared and then warped its body around the female's body in such a way that their vents were closed together. This "nuptial embrace" took place repeatedly till the female released the eggs which were immediately fertilized by the male at temperature, 22°C–28°C. As the eggs fell slowly to the bottom, the male left the female and caught the eggs in its mouth. Then he moved up and down the eggs into the nest and stood guarding over them.

3. Incubation of eggs

The incubation period was 20–30 hours and on hatching, the hatchling remained in the bubble nest. Within 2–3 days hatchling became free swimming.

4. *Trichogaster labiosa* at hatchling

At hatching (24°C), *T. labiosa* were 5.5–6.3mm in length, the body slender with a very long tail and the anus well forward (Fig. 2–5 of PLATE 2). Pectoral fin was well developed, although other fins remained indistinguishable from the primordial fin. Induction of eyes started, iris silver in colour; when viewed dorsally, black green and yellow. Pigmentation became prominent in the head region.

5. Post larval development

This was easily described in terms of appearance of melanophores and fin differentiation. A post larva 5.7 mm (Fig. 6 of PLATE 2) long showed a similar pigmentation pattern to the newly hatched post larva except for an increase in number of dorsal and ventral contour and mediolateral melanophores. The second dorsal and anal fins started differentiation from the promordial fin although no evidences of rays were seen. In a post larval 7.4 mm long, rays were evident in the second dorsal and anal fins and also in the caudal fin. Pigmentation got characteristically evident in this stage. A row of internal notochord melanophores could be seen. The peritoneal pigmentation expanded to surround the body cavity completely, giving silvery appearance. In 8.6 mm long embryo, the second dorsal, anal and caudal fins were discrete, the primordial fin being reduced. At this stage, the head and body cavity occupied a greater percentage of body length than earlier stage. This trend continued as the post larval stage developed further, as could be seen in the post larva 10.2mm long. By this stage, the larva had

assumed most of the adult characteristics except for the filiform rays.

IV. DISCUSSION

Bubble-nest building is the first step of the fish echogram defined by Hall (1968). In our study, 100% pairs of the fish built their bubble nest a day after the male and the female were placed together in the aquarium. Various environmental factors such as light, temperature, pH, DO, meteorological conditions etc. are known to play important role in stimulating the release of gonadotropic hormones from the anterior lobe of pituitary glands and thereby controlling the breeding behavior of the fish (Motilan *et al.*, 2013). With the gradual increase in temperature, reproductive organs of the fish are stimulated, their courtships behaviour starts. The males become stimulated first, and start the making of the bubble nest. Temperature stimulates the breeding behaviour of the fish because temperature profoundly affects, alters and determines the rate and type of biological reactions taking place inside the living systems (Hawkins, 1981). The pigmentation of the newly hatched postlarva closely resembles that of the 6.3mm post larva although the number of mediolateral, ventral and dorsal contours of melanophores differ. However, even in post larvae hatched from the same batch of eggs, the numbers of melanophores within the lines are rarely constant. The post larva 10.7mm long shows no evidence of fines rays. SEM examination reveals that pectoral fins are formed earlier than the other fins. In the complete maturation stage of 10.2mm long, filiform rays are not apparent. The study fulfills that successful spawning of *Trichogaster labiosa* also takes place in the aquarium system by gradual increase in aquarium temperature. The experiment also confirmed that *T. labiosa* has bubble nesting behaviour which is a high degree of parental care among the commercial proliferative breeders. Besides, the technique of breeding this species proved healthful for the maximum pure seed production of the species for the aquarium trade, species conservation and restoration. Breeding of this species can be easily managed in the aquarium conditions although the step of larval stage rearing is a critical step necessary for the maximal survival of the species.

ACKNOWLEDGEMENT

Authors are thankful to Department of Life Sciences, Manipur University, Canchipur, Imphal for providing laboratory and other infrastructure facilities during the work.

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PLATE 1. Breeding of *Trichogaster labiosa* by increasing temperature of aquarium water

PLATE 2

BUBBLE NEST AND EARLY DEVELOPMENTAL STAGES OF *Trichogaster labiosa*



Fig. 1. Bubble nest



Fig. 2. Hatchling



Fig. 3. Advanced hatchling



Fig. 4. Yolk sac - stage



Fig. 5. 3 - days stage

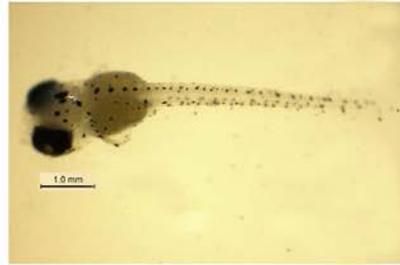


Fig. 6. 12 - days stage

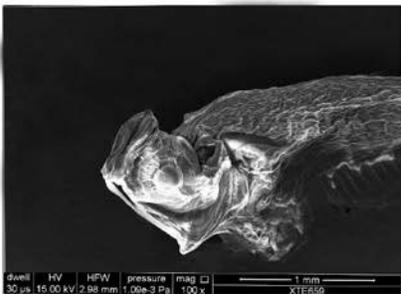


Fig. 7. SEM - Image of anterior portion of 22- days stage



Fig. 8. SEM - Image of 22- days stage

Screening of *Streptomyces Albus* CN-4 For Enzyme Production and Optimization of L-Asparaginase

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Abstract- A total of ten actinomycete strains were isolated from the soil sample. All the strains were sub cultured as pure on Yeast extract, Malt extract and Dextrose agar and screened for the biologically active enzymes, and optimization of L.aspariginase enzyme was carried out by various parameters including pH, temperature, and carbon, nitrogen sources by growing the strain CN-4 in modified ISP-5 broth for 96 h. Among the seven carbon sources tested, lactose proved to be the best carbon source by supporting high yields of L-aspariginase enzyme. Influence of six nitrogen sources on L-aspariginase production and growth of the strain was tested. Yeast extract was found to enhance both growth and production of L-aspariginase. Once the preferable carbon and nitrogen sources were determined as lactose and yeast extract, efforts were made to identify their suitable concentrations. Lactose @ 0.5% and yeast extract @ 0.5% with 1% L-asparagine as optimized nutrient broth adjusted to pH 7.0 inoculated with *Streptomyces albus* CN-4 incubated at 30°C for 96 h improved the production of L-aspariginase.

Index Terms- Bioactive enzymes, Yeast extract, Nutrient broth, Optimization

I. INTRODUCTION

Actinomycetes are also the producers of a wide array of commercially and biotechnologically important enzymes. Enzymes are macromolecular biological catalysts. They are responsible for thousands of metabolic processes that sustain life like amylases, cellulases, chitinases, L-aspariginases, pectinases, proteases etc. Microbial L-aspariginase has been widely used in the treatment of certain human cancers. The clinical accomplishment of this enzyme is attributed to the reduction of L-asparagine; tumor cells incapable of synthesizing this amino acid are selectively killed by L-asparagine scarcity. Though several L-aspariginases of bacterial origin have been developed and their prospective usage in clinical trials has been deliberated to prevent the advancement of L-asparagine dependent tumors, mainly lymphosarcomas, the success hitherto has been rather limited. Actinomycetes strains isolated from soils such as *Amycolatopsis* sp^[3], *Streptomyces gulbargensis*^[4] and *S. albidoflavus*^[5] have capabilities of producing detectable amounts of L-aspariginase.

Chitin as the second most copious insoluble natural source constitutes the structural component of fungal cell walls, crustacean cells and insect exoskeletons, its recycling is of considerable economic and environmental significance. Current techniques to transform chitin to functional carbohydrate products necessitate harsh chemical treatments that incur problems of undesirable byproducts^[6]. Chitinase producing microorganisms directly or indirectly chitinase enzyme in purified form could also be used as potential biocontrol agents^[7, 8]. Some chitooligosaccharides such as GlcNAc6 and GlcNAc7 have been reported to possess antitumor activity^[9, 10].

Amylase and proteases catalyze the release of simple sugars from starch and control the protein levels respectively. Amylase from actinomycetes and other microbial sources are used in the food processing industries for making syrups^[11], baking processes and Proteases used in the manufacturing of biscuits to reduce the protein level in the flour. Cellulases used in biologically fabric conditioners. Catalase used in the rubber industry for generate oxygen from peroxide to convert latex into foam rubber along with all these enzymes some other enzymes are also playing a lead role in different industries. So the present study was focused on the production of biologically useful enzymes by using actinomycetes strains because of their abundant presence in nature.

II. MATERIALS AND METHODS

Sample collection: Laterite soil sample collected from Kandukuru, Prakasam (Dist) a depth of 5 – 8 cm was pretreated with calcium carbonate (1:1 w/w) and dried at 45°C for 1 h in order to reduce the abundance of bacteria and fungi^[12].

Isolation of actinomycete strains:

The two different media used for isolation and maintaining pure cultures are Yeast extract malt extract dextrose agar (YMD) and starch casein salts agar media were prepared, sterilized at 15 lbs pressure (120°C) for 15 min and poured into Petri plates under aseptic conditions. Both streptomycin (50 µg/ml) and nystatin (50 µg/ml) were added to the media just before pouring into Petri plate. Soil dilution plate technique was employed for isolation of actinomycetes strains^[13]. The pretreated soil (1 g) sample was suspended in 100 ml of sterile distilled water. Serial dilutions were prepared and 0.1ml of 10⁻³ and 10⁻⁴ dilutions were plated on media with the help of a spreader. The inoculated

plates were incubated at 30°C for 7-14 days. After incubation, actinomycete colonies were isolated from soil. Streak plate method was used to purify the cultures of actinomycete strains. The colonies were picked with the loop according to the condition. The picked up specks of the colonies were streaked over YMD agar medium followed by incubation at 30°C for 7 days. Further, pure cultures were maintained on YMD agar slants and stored at 4°C for further studies^[13].

Enzymatic profile of the strain:

Amylase:

Starch agar medium was used to test the strain for the production of amylase. The culture was inoculated in the Petri plate containing solidified starch agar medium. The Petri dish was incubated at 28-30°C for 48 h. After incubation the plate was flooded with Gram's iodine solution (2:1 of potassium iodide and iodine in 300 ml of distilled water). A clear zone around the colony against the blue background was taken as positive (Holding and Collee, 1971).

Cellulase:

To detect the cellulolytic activity of the strains, modified ISP-4 medium with cellulose (1%) in place of starch was employed. Inoculated plates were incubated at 30°C for 7 days. Hydrolysis of cellulose was seen as clear yellow zone within a reddish brown background after flooding the plates with a mixture of hydrochloric acid and iodine solution, prepared by mixing 1 ml of 0.1 N HCl with 5ml of 2% KI^[14].

L-asparaginase:

To determine the ability of the strain to secrete Lasparaginase that catalyzes the hydrolysis of L-asparaginase to Laspartic acid and ammonium ion. Modified ISP-5 medium with Lasparagine (1%) and phenol red (0.03%) with initial pH 7.0 was prepared. Sterilized medium was poured into Petri plates and allowed to solidify. The plates were inoculated with the strain and incubated at 30°C for 48-72 h. Change of dye color around the actinomycete colony from yellow to pink indicates the positive reaction while no color change interprets the test as negative^[15].

Catalase:

Sterilized trypticase soy agar slants inoculated with the strain were incubated at 30°C for 48-72 h. After incubation, 3-4 drops of hydrogen peroxide was allowed to flow over the culture. The tubes were observed for the appearance or absence of air bubbles (Holding and Collee, 1971).

Chitinase:

Colloidal chitin was prepared according to the method of^[16]. Chitin powder (5 mg) was added slowly to 90 ml of concentrated HCl under vigorous stirring for 2 h, followed by the addition of 1L distilled water. Thus obtained fine white precipitate was collected at 4°C by centrifugation (6,000 rpm) for 10 min. It was then washed repeatedly with distilled water until the colloidal chitin became neutral (pH 7) followed by drying at 50°C and used for further studies. Colloidal chitin (0.5%) was added to the rest of the components of Chitin Yeast extract Salts (CYS) broth. The plates were inoculated with the strain and observed for a

zone of clearance around the actinomycetes colony after incubation at 30°C for 7 days.

Deoxyribonuclease (DNase):

Production of the enzyme capable of degrading deoxyribonucleic acid (DNA) was tested by inoculating the strain on DNA agar plates. After 3-5 days of incubation, plates were flooded with 1N HCl and the appearance of clear zone around the actinomycete colony infers the degradation of DNA in the medium^[17].

Nitrate reductase:

Sterilized trypticase nitrate broth inoculated with the strain was incubated at 30°C for 6 days. After incubation, 5 drops of reagent A (8 g of sulphanilic acid in 1000 ml of 5 N acetic acid) and 5 drops of solution B (10 g of α -naphthalamine in 1000 ml of 5 N acetic acid) were added to the culture tubes and observed for color change. Appearance of cherry red color indicates the ability of the strain to produce nitrate reductase (Holding and Collee, 1971).

Protease:

Proteolytic activity of the strain was determined in terms of caseinolysis. Starch casein agar medium were prepared, autoclaved and poured into sterilized Petri plates. After solidification, the strain was inoculated and incubated at 30°C. After 3 days of incubation, appearance of clear zone around the actinomycete colony indicates the test as positive (Holding and Collee, 1971).

Urease:

To detect the urease activity of the strain, Christensen agar medium was prepared, sterilized and poured into sterile Petri plates. The strain was inoculated at the center of the agar medium and the plates were incubated at 30°C for 48 h and observed for color change from yellow to pink around the colonies indicating positive reaction (Holding and Collee, 1971).

Arginine hydrolase:

To test the ability of the strain to produce Arginine hydrolase, agar tubes containing arginine agar medium were prepared (L-arginine 1%, K₂HPO₄ 0.03%, NaCl 5%, MgSO₄ .7H₂O 0.01%, phenol red 0.001%, agar 2%), sterilized and inoculated with the respective strains by the stab culture technique. After incubation at 37°C for five days, the tubes were observed for color change. Formation of a bright magenta color indicates the presence of arginine hydrolase (Holding and Collee, 1971).

L-asparaginase production by *Streptomyces albus* CN-4:

To screen the strain for the production of L-asparaginase, culture was inoculated into modified ISP-5 agar containing glycerol (1%), L-asparagine (1%), K₂HPO₄ (0.1%), trace salt solution (FeSO₄.7H₂O - 0.01%, MnCl₂.7H₂O - 0.01%, ZnSO₄.7H₂O - 0.01%) - 0.1% with initial pH 7.0. Phenol red (0.1%) was added to the Petri dish before inoculation. The inoculated Petri plates were incubated at 35°C for 4 days and observed for the formation of red color around the colony.

Asparaginase assay:

The enzyme assay was performed as described by^[18] with minor modifications. Biomass was separated by centrifuging the culture broth at 10,000 rpm for 15 min and was mixed with Tris - HCl buffer. It was again centrifuged and the cell free extract (0.2 ml) obtained was mixed with 0.8ml of 0.05M L-asparagine. After incubating the reaction mixture for 15 min at 37°C in a waterbath shaker, the reaction was terminated by the addition of 0.5 ml of trichloroacetic acid (15% w/v). Precipitated proteins were removed by centrifugation and the liberated ammonia was determined by U.V. spectrophotometre at 450nm by Nesslerization. Tubes kept at zero time incubation served as control. Enzyme production was determined on the basis of liberation of ammonia calculated with reference to a standard curve of ammonium sulfate. One L-asparaginase unit (U) equals to the amount of enzyme which releases 1µM of ammonia per minute at 37°C. Growth of the strain was also recorded by measuring the dry weight of the biomass obtained during centrifugation step.

Optimization of L-asparaginase production:

Influence of different cultural conditions such as initial pH, temperature, carbon, and nitrogen sources on the production of L-asparaginase by the strain CN-4 studied. Fermentation medium was initially adjusted to pH levels of 4-9 to determine the optimum pH for maximum L-asparaginase production. As the growth of the strain and production of L-asparaginase was maximum at pH 7.0. In the present study, the strain showed maximum L-asparaginase yields at 96 h with initial pH 7.0. Impact of temperature on the production of L-asparaginase by the strain was studied. As the production of L-asparaginase, as well as the growth of the strain was maximum at 30°C, it was recorded as the optimum temperature and used for further studies. Different carbon sources was employed to determine their influence on L-asparaginase production by strain CN-4 with modified ISP-5 media broth. The culture medium supplemented with lactose stimulated the production of L-asparaginase by *Streptomyces* sp. CN-4. Production of L-asparaginase was minimum when glucose was used as the carbon source. Influence of different concentrations of lactose on L-asparaginase production is recorded. Effect of six nitrogen sources on L-asparaginase production and growth of the strain CN-4 was tested. Yeast extract was found to be the best nitrogen source to enhance the growth and as well as the production of L-asparaginase. Once the preferable carbon and nitrogen sources were determined as lactose and yeast extract, efforts were made to identify their suitable concentrations.

Impact of pH on growth and L-asparaginase production by the strain:

Impact of pH on L-asparaginase production was examined by culturing the strain in modified ISP-5 broth adjusted to pH levels ranging from 4 to 9. Both the growth of the strain and enzyme activity was determined. The optimal pH was used for further study.

Influence of temperature on growth and enzyme production:

To determine the optimal temperature for growth and Lasparaginase production, the strain CN-4 inoculated in modified ISP-5 broth with optimal pH was incubated at different temperatures viz., 25°C to 45°C for 96 h.

Effect of carbon sources on growth and enzyme production:

To investigate the effect of carbon sources on L-asparaginase production by the strain, modified ISP-5 broth was amended with different carbon sources such as fructose, galactose, lactose, maltose, xylose, sucrose and starch each at a concentration of 0.5% (w/v). The carbon source which supports high yields of L- aparaginase production by the strain was chosen for further study. Impact of different concentrations of the best carbon source (0.1- 1.0%) among the other carbon sources tested on L-asparaginase production by the strain CN-4 was studied and the optimal level achieved was fixed for further studies.

Effect of nitrogen sources on growth and enzyme production:

The effect of nitrogen sources was determined by supplementing different inorganic and organic nitrogen sources viz. peptone, yeast extract, ammonium nitrate, sodium nitrate, L-proline and urea at the rate of 0.5% (w/v) to modified ISP-5 broth. The nitrogen source found to be good for optimal L-asparaginase productivity was selected for further study. Besides, the optimal concentration of nitrogen source (0.1-1.0% w/v) supporting good yields of L-asparaginase production by the strain was determined by maintaining all other conditions at optimal level.

Statistical Analysis: Data obtained on the bioactive metabolite production under different microbial culture conditions were statistically analyzed and expressed as mean ± standard error with one-way analysis of variance (ANOVA).

III. RESULTS

The enzymatic profile of the strain was interesting as it is a producer of a wide range of commercially important enzymes like amylase, cellulase, chitinase, L-asparaginase, protease, urease, lipase and DNase, but negative for pectinase, arginine hydrolase and nitrate reductase.

Table: 1 shows the production of enzymes by the strain *Streptomyces albus* CN-4

Enzymatic activity			
Amylase	P	Cellulase	P
Chitinase	P	Pectinase	N

Lipase	P	Protease	P
DNase	P	L- Asperginase	P
Urease	P	Nitrate reductase	N

P – Positive; N – Negative

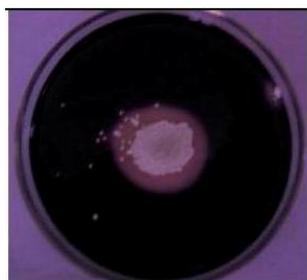


Fig: 1 Amylase



Fig: 2 Urease



Fig: 3 Dnase



Fig: 4 Cellulose



Fig: 5 L-asparaginase

Production of L-asparaginase by *Streptomyces albus* CN-4

The wide use of microbial L-asparaginase in the treatment of certain human cancers, the urgent need of L-asparaginase from various sources has been emerged. During screening of the strain for L-asparaginase production, pink color was formed around the colony inoculated in modified ISP-5 agar with 1% L-asparagine and 0.1% phenol red indicating positive result for the production of L-asparaginase. Hence attempts were made to study the effects of various conditions on L-asparaginase production by the strain by adopting one factor at a time method.

The strain was cultivated in modified ISP-5 broth and assayed for the production of L-asparaginase at every interval of 24 h up to 7 days to determine the optimum incubation period. Enzyme assay was based on ammonia liberated with reference to a standard curve of ammonium sulphate and expressed in terms of U/g of cell dry weight at 37°C for 1 min. Dry weight of the cell was determined by weighing the dried biomass obtained during centrifugation step.

The production of L-asparaginase by the strain commenced after 48 h of cell growth and maximum production was observed after 96 h of incubation. A positive correlation between cell

growth and L-asparaginase activity was reported in *S. karnatakensis*^[19] and *S. albidoflavus*

Optimization of L-asparaginase production

Influence of different nutritional and physiological conditions such as pH, temperature, carbon and nitrogen sources for the production of L-asparaginase by the strain.

Initial pH

Production medium was initially adjusted to pH levels of 5-9, used to determine the optimum pH for maximum L-asparaginase production. As the growth of the strain and production of L-asparaginase was maximum at pH 7.0, it was recorded as the optimal pH value. The results were parallel with the results of^[20] and *Streptomyces* sp. AQB VC67^{[21], [22]} also noted optimal L-asparaginase production by *S. aureofasciculus*, *S. chattanoogenesis*, *S. hawaiiensis*, *S. orientalis*, *S. canus* and *S. olivoviridis* at pH levels between 7 and 8. In the present study, the strain showed maximum L-asparaginase yields when cultured in modified ISP-5 broth for 96 h with initial pH 7.0.

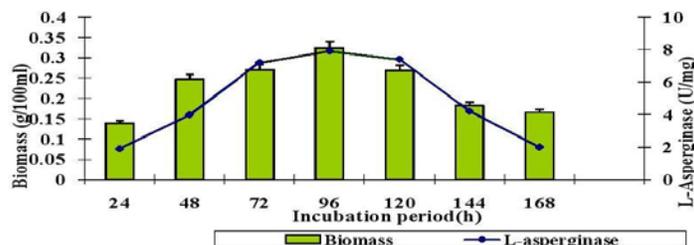


Fig: 6 Effect of incubation period on growth and L-asparaginase production by *Streptomyces albus* CN-4 (values are means of three replicates ±SD).

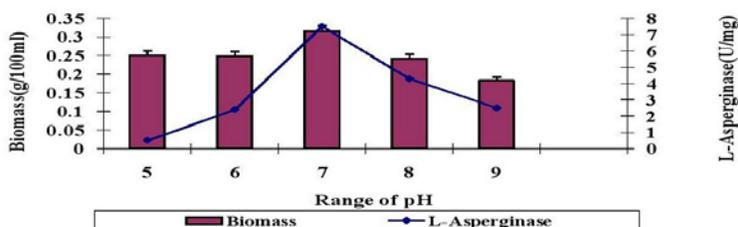


Fig: 7 Effect of pH on growth and L-asparaginase production by *Streptomyces albus* CN-4 (values are means of three replicates ±SD).

Temperature

Effect of temperature on the production of L-asparaginase by the strain is presented in figure 38. As the production of L-asparaginase as well as the growth of the strain was maximum at 30°C, it was recorded as the optimum temperature and thus used

for further studies. Production of L-asparaginase was high at 30°C in *S.collinus* (Mostafa and Salma, 1979) and *S. longsporoflavus* F-15^[23]. The optimum temperature for L-asparaginase production in *S. plicatus* was recorded as 29±2°C.

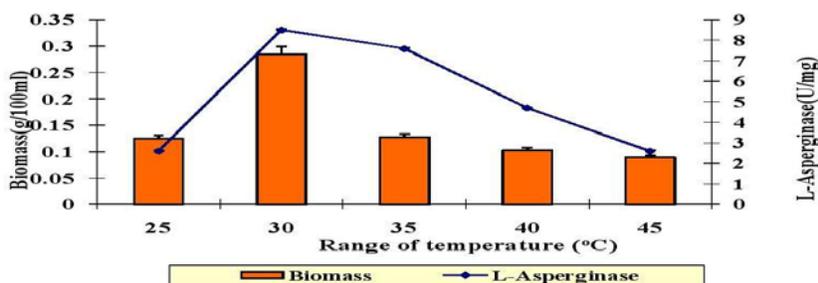


Fig: 9 Effect of temperature on growth and L-asparaginase production by *Streptomyces albus* CN-4 (values are means of three replicates ±SD).

Carbon Sources

Modified ISP-5 broth amended with different carbon sources was employed to determine their influence on L-asparaginase production by strain. The culture medium supplemented with lactose stimulated the production of L-asparaginase by *Streptomyces albus* CN-4. Production of L-asparaginase was minimum when glucose was used as the carbon source.^[17] also reported lactose as the best carbon source that

enhanced the production yields of L-asparaginase by *Erwinia carotovora* while sucrose was reported as the suitable carbon source for the improved production of L-asparaginase by *Streptomyces tendae*^[25] and *Streptomyces* sp.^[26] Influence of different concentrations of lactose on L-asparaginase production is recorded in optimal yield of L-asparaginase by the strain was achieved in the medium amended with 0.5% lactose.

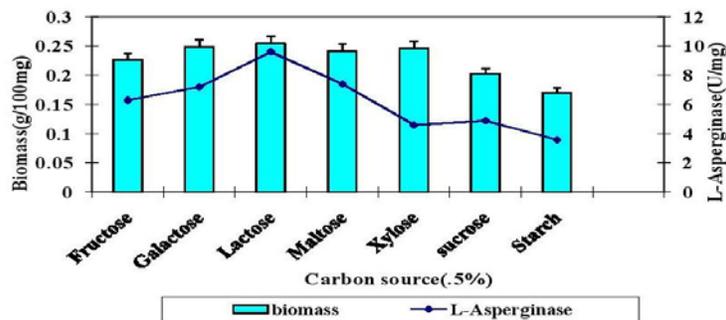


Fig: 10 Effect of Carbon sources on growth and L-asparaginase production by *Streptomyces albus* CN-4 (values are means of three replicates \pm SD).

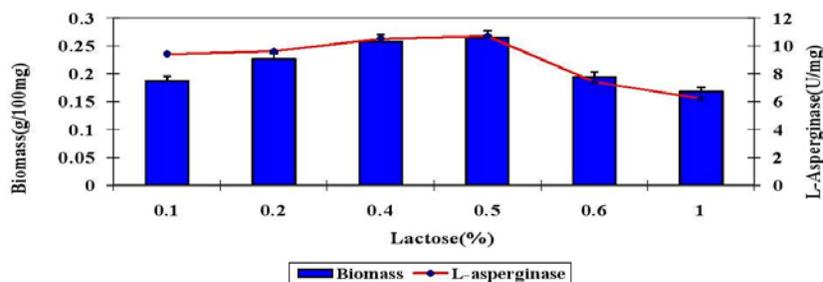


Fig: 11 Effect of concentration of optimized carbon source on growth and L-asparaginase production by *Streptomyces albus* CN-4 (values are means of three replicates \pm SD).

Nitrogen sources

The effect of different nitrogen sources on the production of L- asparaginase by the strains was studied by incorporating different organic and inorganic nitrogen sources to modified ISP-5 broth containing 0.5% lactose. L-asparaginase production by the strain varied with different nitrogen compounds tested. Among them, yeast extract supported maximal L-asparaginase production by the strain followed by potassium nitrate. Yeast extract was reported as an excellent nitrogen source for L-asparaginase production by *Erwinia aroideae* [27], while only L-asparagine favoured high yields of L-asparaginase in *S.collinus*, *S.karnatakensis* and *S. venezuelae*. Tryptone and yeast extract served as good nitrogen sources for *E. caratovora* EC – 113 [28]. Optimization studies of Abdel-All revealed that glycerol-L-

asparagine-yeast extract medium was suitable for the synthesis of L-asparaginase by *S. phaeochromogenes* FS-39. The optimal level of yeast extract was found to be 0.5% as it favored high yields of L-asparaginase by the strain. A gradual decline in L-asparaginase production was found with further rise in yeast extract levels. Yeast extract is essential for cell growth and L-asparaginase synthesis, but in high concentration it inhibits the production of L-asparaginase [29]. Narayana recorded 2% yeast extract as optimal concentration for L-asparaginase production by *S. albidoflavus*. In the present study, enhanced levels of L-asparaginase production by the strain was recorded in the modified ISP-5 broth containing 0.5% yeast extract and 0.5% lactose with initial pH 7.0 incubated at 30°C for 96 h.

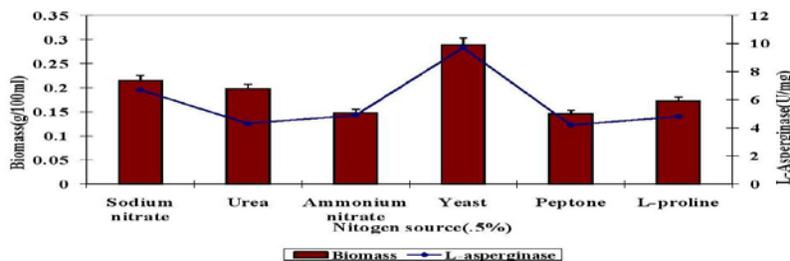


Fig: 12 Effect of nitrogen sources on growth and L-asparaginase production CN-4 . (values are means of three replicates \pm SD).

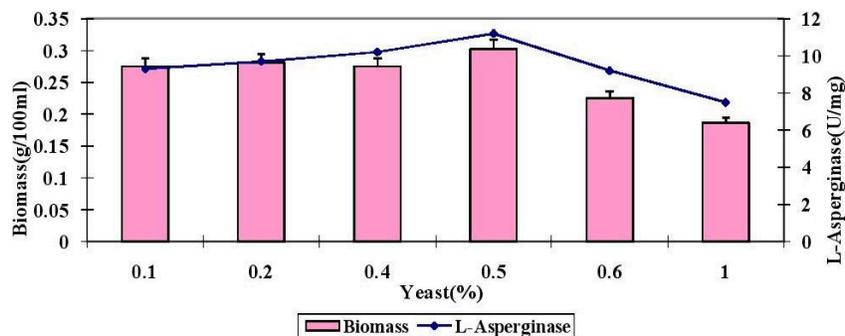


Fig: 13 Effect of nitrogen sources on growth and L-asparaginase production by the strain CN-4 . (values are means of three replicates \pm SD).

IV. DISCUSSION

The strain has ample capacity to produce detectable amounts of a wide array of enzymes including amylase, lipase caseinase, L-asparaginase, DNase cellulase, and urease. In addition to the bioactive metabolites, the strain also produced L-asparaginase enzyme in detectable amounts. The production of all the compounds had a marked increase after the optimization of cultural and physiological parameters.

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Biological thresholds of weeds to seedlingless growing of tomatoes

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Abstract- To establish the weed thresholds of injury to seedlingless growing of tomatoes a field trial was carried out in the conditions of artificial weed infestation, and variants of particular types of weeds with particular density were tested. The trial recorded weed infestation, growth, development and productivity of tomatoes, content of soil humidity and soil nutrients. It was established that at equal number of weeds per area unit, most nitrogen was consumed by *Chenopodium album* L. and *Solanum nigrum* L., phosphorus – *Datura stramonium* L., and potassium – *Solanum nigrum* L., *Chenopodium album* L. and *Echinochloa crus-galli* L. The strongest tomato competitor for water was *Solanum nigrum* L., and the weakest – *Setaria veridis* P.B. The highest injury levels were manifested by *Datura stramonium* L. and *Solanum nigrum* L. and the biological threshold of injury levels for these weeds was 1 per m². *Echinochloa crus-galli* L., *Amaranthus retroflexus* L. and *Chenopodium album* L. had lower injury levels, and the biological threshold of injury for them was 2 per m². *Setaria veridis* P.B. manifested the lowest injury level. Its biological threshold was 4 per m².

Index Terms- Tomatoes, Biological thresholds, Weeds, Injury levels

I. INTRODUCTION

To develop plant protection technologies for weed control it is not enough only to include chemical systems of highly effective herbicides and herbicide mixtures and the use of new ways and methods for their application. It is also necessary to establish accurately the weed density and the critical period of competition with the crop when it is appropriate to apply these herbicides. In a number of cases, a good knowledge of the injury thresholds of the individual types of weed to a certain crop makes it possible to avoid one or more sprayings, which is of great significance both economically and ecologically, as it protects the soil and environment from harmful residues.

The injury thresholds and critical periods in the competition between weeds and crops and subject of study for a number of authors. It was established that the biological threshold of injury of johnsongrass to maize is one plant per m², and the economical is two plants per m², and the weed is most harmful in the period between the third and sixth week after crop emergence [1,2]. The critical period for weed infestation of fat hen to wheat is between the 28th and 42nd day after its emergence [3]. With soya the

critical period of weed infestation is between the 15th and 60th day after sowing or the phase of 1st, 3rd triple leaf [4,5]. The competition between weeds and beans is strongest in the period between emergence and second triple leaf of the crop [6]. The weeds have the greatest impact on broad beans in the period 28-30 days after its emergence [7]. The black nightshade has the strongest effect on peas in the period from four to six weeks after sowing [8]. The critical period of competition between the weeds and tomatoes is about 12 days (from 24th to 36th day) after planting the tomatoes [9], and according other studies the critical period of weed infestation covers the period from 35th to 60th days after tomatoes sowing and its duration depends on the variety [10]. The economical threshold of injury to growing tomatoes for Redroot pigweed is over 1 per m², and for cocksbur grass it is over 5 per m² [11], whereas the biological threshold of injury of black nightshade according to other authors is 0.8 per m² of weed plants [12]. In garlic growing, the weeds which developed between the 28th and 49th day of crop emergence affect yield formation the greatest [13]. It was established that fertilization with higher rates of phosphorus fertilizers delays the beginning of the critical period of competition between weeds and lettuce [14]. It is typical for most of the research which cover the injury thresholds and the critical periods of competition between weeds and crops that they are too multidirectional, include various crops, cultivation methods and types of weeds, and some are bound to different phenophases of the crop development.

The goal of this investigation was to establish the biological injury thresholds of the main weeds to seedlingless growing of tomatoes, which will provide an opportunity to manage the technology by applying agrotechnically more expedient and ecologically safer weed control systems.

II. MATERIALS AND METHODS

To achieve this goal a field trial was conducted in the conditions of artificial weed infestation, and variants were made of particular types of weed at particular density.

The tomatoes were grewed on a high level bed after a design of 120 + 40/25 cm. The trial was set after the block method in 4 replications with the following variants:

1. Check – weeding with various types of weeds;
2. Check – weeded during vegetation;
3. Mixed weeding with 4 plants from the various types of weeds;

Variants from 4 to 7 were weeding with green bristle-grass (*Setaria viridis* P.B.) with density of 1, 2, 4 and 8 plants per m², respectively;

Variants from 8 to 11 were weeding with cocksbur grass (*Echinochloa crus-galli* L.) with density of 1, 2, 4 and 8 plants per m², respectively;

Variants from 12 to 15 were weeding with Redroot pigweed (*Amaranthus retroflexus* L.) with density of 1, 2, 4 and 8 plants per m²;

Variants from 16 to 19 were weeding with fat hen (*Chenopodium album* L.) with density of 1, 2, 4 and 8 plants per m²;

Variants from 20 to 23 were weeding with black nightshade (*Solanum nigrum* L.) with density of 1, 2, 4 and 8 plants per m²;

Variants from 24 to 27 were weeding with jimsonweed (*Datura stramonium* L.) with density of 1, 2, 4 and 8 plants per m².

The trial investigated the following indexes: weeding, growth, development and productivity of tomatoes, content of soil humidity and soil nutrients. The weeds were recorded by the quantity-weighting method by types at the end of vegetation. The tomatoes growth and development were recorded with development index, whereas the yield – with productivity index. The yield data was statistically processed by analysis of variance. The content of soil humidity was determined by stages in the 0-30 cm layer by the thermostatic method. The soil nutrients content was established by stage in the 0-30 cm layer. The mineral nitrogen was determined with the Parnas-Wagner distillation apparatus and the mobile forms of phosphorus were determined colorimetrically by Egner-Riem, and potassium – by flame photometry.

III. RESULTS AND DISCUSSION

The results which express the interdependency in surface biomass to the main weeds (Table 1) show that their air dry weight reduced but not regularly with the increase of weed number per area unit. With green bristle-grass the weight was

reduced from 62.3 g for 1 number per 1 m² to 49.3 g, i.e. with 19.9 % for 4 n. per m² and reached 38.8 g (with 37.7 %) for 8 n. per m². The interspecies competition was stronger at 8 weeds per m² where the air dry weight sharply decreased. With redroot pigweed the interspecies competition is almost the same. It was greatest for fat hen, where the weight from 593.3 g for 1 n. per 1 m² dropped down to 309.6, i.e. with 47.7 % for 4n per 1 m² and reached 193.1 g, i.e. decreased with 67.5% for 8 n. per 1 m². The values for black nightshade were close to these. The weakest interspecies competition was seen for jimsonweed, where with the increase of weed number from 1 to 8 n. per 1m², their weight decreased from 1056 g to 839 g, i.e. with 20.5 %. In the interspecies competition the most persistent weeds were cocksbur grass and Redroot pigweed, and the most sensitive were fat hen and black nightshade.

Table 2 and Table 3 show the competitive relations between the weeds and tomatoes about the soil macroelements. In the third leaf stage of the tomatoes, the content of mineral nitrogen varied from 13.5 to 27.1 mg per kg soil for all the variants. Phosphorus varied from 4.4 to 7.8 mg per 100 g soil and potassium – from 2 to 12 mg per 100 g soil. At this stage the weeds were very small or had just emerged and therefore did not impact the content of soil macroelements, regardless of their density. The values of absorbed nutrients were very different for the different weeds in the stage of tomato ripening (Table 3). The content of nitrogen, phosphorus and potassium in the noweeded check was lowest – 16.2 mg per kg soil, 4.6 and 9 mg/100 g soil, respectively. By increasing the weed density in all variants was also increased the amount of used soil macroelements. At an equal number of weeds per area unit, most nitrogen was used by fat hen and black nightshade - with 69.4 % and 57.3 % more compared to check weeded, phosphorus – by jimsonweed, and potassium almost to the same amount by black nightshade, fat hen, cocksbur grass and redroot pigweed.

Table I: Dependence of surface biomass of tomatoes of the weeding

Variant №	Type of weed	Number	Average weight of surface biomass, g	Variant №	Type of weed	Number	Average weight of surface biomass, g
1	<i>Setaria viridis</i> P.B.	23	38.1	12	<i>Amar. retroflexus</i> L.	1	525.8
	<i>Echinochloa crus-galli</i> L	3	39.5	13	<i>Amar. retroflexus</i> L.	2	400.2
	<i>Amaranthus retroflexus</i> L	13	171.3	14	<i>Amar. retroflexus</i> L.	4	367.2
	<i>Datura stramonium</i> L.	2	272.7	15	<i>Amar. retroflexus</i> L.	8	312.1
	<i>Chenopodium album</i> L	4	162.7				
	<i>Solanum nigrum</i> L.	16	147.8				
2	Check – weeded during vegetation			16	<i>Chenopod. album</i> L.	1	593.3
3	<i>Setaria viridis</i> P.B.	4	44.9	17	<i>Chenopod. album</i> L.	2	435.1
	<i>Echinochloa crus-galli</i> L	4	124.1	18	<i>Chenopod. album</i> L.	4	309.6
	<i>Amaranthus retroflexus</i> L	4	354.4	19	<i>Chenopod. album</i> L.	8	193.1
	<i>Datura stramonium</i> L.	4	629.9				
	<i>Chenopodium album</i> L	4	156.9				
	<i>Solanum nigrum</i> L.	4	170.3				

4	<i>Setaria viridis</i> P.B.	1	62.3	20	<i>Solanum nigrum</i> L.	1	435.3
5	<i>Setaria viridis</i> P.B.	2	52.7	21	<i>Solanum nigrum</i> L.	2	302.3
6	<i>Setaria viridis</i> P.B.	4	49.3	22	<i>Solanum nigrum</i> L.	4	318.7
7	<i>Setaria viridis</i> P.B.	8	38.8	23	<i>Solanum nigrum</i> L.	8	211.0
8	<i>Echinochloa crus-galli</i> L.	1	140.0	24	<i>Datura stramonium</i> L.	1	1056.2
9	<i>Echinochloa crus-galli</i> L.	2	146.7	25	<i>Datura stramonium</i> L.	2	1097.7
10	<i>Echinochloa crus-galli</i> L.	4	107.0	26	<i>Datura stramonium</i> L.	4	923.4
11	<i>Echinochloa crus-galli</i> L.	8	77.3	27	<i>Datura stramonium</i> L.	8	839.7

Table II: Agrochemical characteristic of the soil - third leaf stage of tomatoes

Var. No	mg /1000 g soil			mg /100 g soil		pH (H ₂ O)	Salts content ms/cm ⁻¹
	NH ₄ - N	NO ₃ - N	N _{min}	P ₂ O ₅	K ₂ O		
1.	5.4	16.2	21.6	5.0	6	7.3	40
2.	13.5	8.1	21.6	5.0	4	7.2	30
3.	8.1	5.4	13.5	4.8	11	7.2	80
4.	8.1	16.2	24.3	5.4	8	7.2	20
5.	10.8	13.5	24.3	6.1	9	7.1	50
6.	13.5	5.4	18.9	6.4	7	7.1	66
7.	8.1	19.0	27.1	7.3	10	7.1	30
8.	19.0	8.1	27.1	6.1	10	7.2	90
9.	16.2	8.1	24.3	7.5	7	7.2	80
10.	10.8	16.2	27.0	7.5	13	7.1	100
11.	13.5	18.0	31.5	5.1	12	7.1	80
12.	8.1	8.1	16.2	5.8	6	7.1	60
13.	10.8	10.8	21.6	6.4	8	7.0	90
14.	10.8	13.5	24.3	7.3	5	7.0	70
15.	8.1	16.2	24.3	5.9	10	6.9	90
16.	10.8	8.1	18.9	5.1	10	7.1	70
17.	13.5	10.8	24.3	6.2	3	7.0	90
18.	13.5	8.1	21.6	6.5	8	7.1	90
19.	10.8	8.1	18.9	5.8	8	7.2	60
20.	8.1	5.4	13.5	4.8	10	7.1	80
21.	5.4	10.8	16.2	5.2	9	7.1	100
22.	8.1	10.8	18.9	6.7	13	7.1	60
23.	13.5	8.1	21.6	7.8	10	7.1	90
24.	21.6	16.2	37.8	4.4	8	7.1	90
25.	10.8	8.1	18.9	5.1	10	7.0	100
26.	5.4	13.5	18.9	6.8	10	7.1	90
27.	10.8	13.5	24.3	7.0	2	7.1	100

Table III: Agrochemical characteristic of the soil - ripening stage of tomatoes

Var. No	mg/1000 g soil			mg/100 g soil		pH (H ₂ O)	Salts content ms/cm ⁻¹
	NH ₄ -N	NO ₃ -N	N _{min}	P ₂ O ₅	K ₂ O		
1.	5.4	10.8	16.2	4.6	9	6,9	100
2.	19.0	19.0	38.0	6.7	19	6,9	110
3.	8.1	8.1	16.2	4.8	9	7,1	110
4.	16.2	19.0	35.2	6.1	19	7,0	100
5.	13.5	13.5	27.0	6.1	17	7,1	120

6.	16.2	10.8	27.0	5.8	17	7,1	120
7.	13.5	13.5	27.0	5.5	14	7,0	100
8.	19.0	10.8	29.8	5.8	13	7,0	90
9.	16.2	13.5	29.7	5.8	14	7,1	100
10.	16.2	13.5	29.7	5.8	14	7,1	100
11.	16.2	8.1	24.3	5.5	13	7,0	120
12.	13.5	19.0	32.5	6.1	19	7,1	110
13.	10.8	16.2	27.0	5.8	15	6,9	100
14.	8.1	13.5	21.6	5.5	14	7,0	100
15.	8.1	19.0	27.1	5.5	13	7,1	120
16.	16.2	19.0	35.2	5.8	19	7,1	100
17.	13.5	16.2	29.7	5.8	17	7,1	110
18.	19.0	8.1	27.1	5.5	14	7,1	100
19.	8.1	13.5	11.6	5.5	13	7,0	100
20.	19.0	19.0	38.0	6.1	15	7,2	100
21.	13.5	16.2	29.7	6.4	15	7,1	100
22.	10.8	10.8	21.6	5.5	14	7,0	110
23.	8.1	8.1	16.2	5.5	13	7,1	90
24.	16.2	16.2	32.4	5.8	15	7,1	110
25.	19.0	10.8	29.8	5.5	14	7,0	100
26.	13.5	13.5	27.0	5.5	14	7,1	120
27.	13.5	13.5	27.0	5.1	14	7,1	90

The unproductive water consumption by the soil is one of the main factors in the weed competition. The results (Table 4) show that in the third leaf stage the humidity content in 0-30 cm layer at mixed weeding was 31.3 % less than the check (crops without weeds). At density of green bristle-grass 2 n. per m², the humidity content was almost the same with the clean crops. By increasing the weed density the unproductive water consumption was also increased. The highest humidity consumption in the third leaf stage was observed for black nightshade and

jimsonweed, and the least consumed amount – for green bristle-grass. In the budding and ripening stages of tomatoes, the humidity content in the soil for the variant of mixed weeding was even less than the clean crops (with 43.7 %). In this period even smaller weed density led to higher humidity consumption. At the end of vegetation again the mixed weeding and the weeding with black nightshade appeared as the greatest competitors for the tomatoes regarding the water. At 8 n. per m² for black nightshade the soil humidity content was 48.5 % less than the clean crops.

Table IV: Impact of weeding on the soil humidity in the 0-30 cm soil layer, % of FMC

Variant No	Humidity content, % of FMC*		
	Third leaf stage	Budding	Ripening
1.	41.1	43.5	34.3
2.	84.5	77.8	83.4
3.	58.0	43.8	33.6
4.	83.1	61.3	63.1
5.	83.2	60.5	62.5
6.	68.0	61.2	57.4
7.	66.8	58.6	52.9
8.	79.1	68.1	73.7
9.	76.8	64.7	60.8
10.	67.4	63.5	54.1
11.	66.3	58.6	50.4
12.	72.9	66.5	66.2
13.	72.6	63.0	60.1
14.	63.9	61.0	54.3
15.	63.9	54.9	48.5

16.	70.7	62.7	62.6
17.	71.0	61.1	52.1
18.	62.2	59.2	47.6
19.	62.8	57.5	46.2
20.	71.0	62.6	61.1
21.	68.0	62.7	54.2
22.	59.2	57.6	48.2
23.	58.7	55.9	42.9
24.	69.9	60.5	64.4
25.	68.0	57.5	56.0
26.	61.6	56.1	51.9
27.	61.0	53.4	47.7

* FMC – full moisture capacity

The competitive relations between tomatoes and weeds were manifested in the vegetative development of the crop. The data in Table 5 shows that the different weeds suppress the tomato development to a different degree. The green bristle-grass at density of 2 n. per m² did not affect the plant height. There was an insignificant negative effect from fat hen of the same density (the tomatoes were 2.7 % behind in their development compared to the clean crops). This may be due to the fact that the green bristle-grass plants were generally small, whereas fat hen emerged a little later and the tomatoes had certain advantage in their own development. By increasing the weed density, the difference in tomato plants height from these variants and from the clean crop plants also increased. The strongest negative impact on tomato growth was observed with black nightshade and jimsonweed. The same tendencies were observed for leaf number and flower number. With higher weed density, the plants had a delayed development and formed their reproductive organs relatively later. The lowest development index compared to the check was recorded at density of 8 n. per m² of jimsonweed (-33.4). The weakest negative effect on tomato growth at density of 8 n. per m² was by green bristle-grass. The development index

was -13.1 compared to the clean crops. At equal number per area unit the monocot weeds suppressed the crop more weakly than the dicotyledonous ones.

The dependency of yield on the different types of weeds and the degrees of weeding is shown in Table 6. The highest yield (47375 kg/ha) was obtained from the variant weeding with green bristle-grass at density of 2 n. per m², which exceeded the weeded check with 4 %, but the difference was not significant. By increasing the density of the different weeds (1, 2, 4 and 8 plants per m²) the tomato yield decreased which was clearly expressed at the higher density of 8 n. per m². The yield of cockspur grass, for example, decreased from 93 % to 70-50 %, for redroot pigweed it decreased from 92 % to 76-53 %.

As we compared the variants at equal level of weeding (8 n. per m²), it is seen with the different weeds that jimsonweed had the strongest negative impact. The yield was 65 % lower than the clean crops, and the differences were well proven. The result for black nightshade was similar. The yield was 62 % lower. Weeding with green bristle-grass had the weakest negative impact. The yield decreased with 40 % with well proven difference.

Table V: Morphological indexes and development of the tomato plants

Variant No	Type of weed	Number of m ²	Tomato height, cm	%	Number of leaves	%	Number of flowers	%	Development index
1.	Check - noweeded	61	21	56.7	4	57.1	2	50	- 45.4
2.	Check – weeded during vegetation	-	37	100.0	7	100.0	4	100	-
3.	Mixed weeding	24	24	64.8	4	57.1	2	50	- 42.7
4.	<i>Setaria veridis</i> P.B.	1	34	91.8	6	85.7	3	75	-15.8
5.	<i>Setaria veridis</i> P.B.	2	38	102.7	6	85.7	4	100	-3.8
6.	<i>Setaria veridis</i> P.B.	4	36	97.3	6	85.7	4	100	-5.6
7.	<i>Setaria veridis</i> P.B.	8	33	89.2	5	71.4	4	100	-13.1
8.	<i>Echinochloa crus-galli</i> L.	1	32	86.5	4	57.1	3	75	-27.1
9.	<i>Echinochloa crus-galli</i> L.	2	35	94.6	5	71.4	4	100	-11.3
10.	<i>Echinochloa crus-galli</i> L.	4	32	86.5	5	71.4	4	100	-14.0
11.	<i>Echinochloa crus-galli</i> L.	8	30	81.1	5	71.4	4	100	-15.8
12.	<i>Amaranthus retroflexus</i> L.	1	28	75.6	6	85.7	3	75	-21.2

13.	<i>Amaranthus retroflexus</i> L.	2	33	89.2	6	85.7	4	100	-8.3
14.	<i>Amaranthus retroflexus</i> L.	4	30	81.1	5	71.4	4	100	-15.8
15.	<i>Amaranthus retroflexus</i> L.	8	26	70.3	5	71.4	3	75	-27.7
16.	<i>Chenopodium album</i> L.	1	34	91.8	6	85.7	3	75	-15.8
17.	<i>Chenopodium album</i> L.	2	36	97.3	6	85.7	4	100	-5.6
18.	<i>Chenopodium album</i> L.	4	33	89.2	6	85.7	4	100	-8.3
19.	<i>Chenopodium album</i> L.	8	30	81.1	5	71.4	4	100	-15.8
20.	<i>Solanum nigrum</i> L.	1	34	91.8	6	85.7	3	75	-15.8
21.	<i>Solanum nigrum</i> L.	2	31	83.8	5	71.4	4	100	-14.9
22.	<i>Solanum nigrum</i> L.	4	28	75.6	5	71.4	3	75	-26.0
23.	<i>Solanum nigrum</i> L.	8	24	64.8	5	71.4	3	75	-29.6
24.	<i>Datura stramonium</i> L.	1	31	83.8	4	57.1	2	50	-36.3
25.	<i>Datura stramonium</i> L.	2	30	81.1	5	71.4	4	100	-15.8
26.	<i>Datura stramonium</i> L.	4	27	72.9	6	85.7	4	100	-13.8
27.	<i>Datura stramonium</i> L.	8	25	67.6	4	57.1	3	75	-33.4

Table VI: Influence of weed infestation on the productivity of tomatoes

Variant №	2011		2012		average kg/ha	relative yield %	
	X	± d	x	± d		k ₁₌₁₀₀	k ₂₌₁₀₀
1	14370	- 32890	11500	-32160	12935	-	28
2	47260	-	43660	-	45460	351	-
3	15120	- 32140	12330	-31330	13725	106	30
4	49340	+ 2080	43380	-280	46360	358	102
5	51090	+ 3830	43660	0	47375	366	104
6	34650	-12610	36660	-7000	35655	276	78
7	34140	-13120	20000	-23660	27070	209	60
8	41510	- 5750	42935	-725	42222	326	93
9	38830	- 8430	43000	-660	40915	316	90
10	31210	-16050	32660	-11000	31935	247	70
11	26640	- 20620	19330	-24330	22985	178	50
12	43040	- 4220	40630	-3030	41835	323	92
13	41840	- 5420	41660	-2000	41750	323	92
14	36010	- 11250	32660	-11000	34335	265	76
15	29920	-17340	18660	-25000	24290	188	53
16	41710	- 5550	41480	-2180	41595	322	91
17	41800	- 5460	41660	-2000	41730	323	92
18	37030	- 10230	34160	-9500	35595	275	78
19	26480	- 20780	18330	-25330	22405	173	49
20	34060	-13200	34835	-8825	34448	266	76
21	26760	-20500	32330	-11330	29545	228	65
22	23160	-24100	26000	-17660	24580	190	54
23	17580	-29680	16830	-26830	17205	133	38
24	25550	-21710	40149	-3511	32850	254	72
25	23070	-24190	40330	-3330	31700	245	70

26	23130	-24130	25660	-18000	24395	188	54
27	17190	-30070	14660	-29000	15925	123	35
GD 5%	8560		9240				
GD 1%	12930		11850				
GD 0.1%	15100		14340				

IV. CONCLUSIONS

The strongest weed interspecies competition was observed with fat hen and black nightshade, and the weakest was with jimsonweed. In the interspecies competition the most resilient weeds were cockspur grass and redroot pigweed, and the most sensitive were fat hen and black nightshade.

At an equal number of weeds per area unit, the greatest amount of nitrogen was consumed by fat hen and black nightshade, phosphorus - jimsonweed and potassium at almost the same extent - black nightshade, fat hen, cockspur grass and redroot pigweed.

The strongest competitor to tomatoes for water was black nightshade, and the weakest was green bristle-grass.

The negative weed effect on tomato growth and development varied depending on the degree of weed infestation and weed species composition. The strongest negative effect on tomato growth was by black nightshade and jimsonweed, and the weakest was by green bristle-grass.

The highest injury levels at intensive tomato production were manifested by jimsonweed and black nightshade and the biological thresholds of weeds was 1 plant per m². The cockspur grass, redroot pigweed and fat hen had lower injury levels. Their biological thresholds of weeds were 2 plants per m². The green bristle-grass manifested the lowest injury level. Its biological threshold was 4 plants per m².

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Evaluating Performance of Centrifugal Pump through CFD while Modifying the Suction Side for Easting Discharge

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Abstract- The conventional suction geometry is not efficient for higher capacity of pump and thus reduced discharge on the delivery side. Intake manifold is being designed for this work. The previous configuration would be studied using CFD techniques while pursuing the objective of arriving at the most efficient geometry for the given application. The marginal increment in the discharge for the Centrifugal Pump tends to depreciate with each marginal rise in capacity the pump; especially for the higher order pumps (25HP and above).

The prominence of vortices along with turbulent flow at the regions in the suction pipe affects the flow of water and consequently the discharge. The discharge the 'sump' is not favorably designed for aiding the intake through the suction pipe. This work would focus on Design alternatives for minimizing the vortices within the suction pipe and enhancing the discharge through possible use manifold at the suction end. Alternatively, efforts would be pursued for addressing the Design of the Sump (Tank) for facilitating the flow of water at the suction end while smoothing out the in pipe.

Index Terms- alternative geometry, pressure drop, suction side, performance of pump, flow analysis

I. INTRODUCTION

Suction or inlet condition is an important factor of pump hydraulic system design. Due to cavitations, vortices, and prime losses, no proper allowances may occur. Pressure which is created by pump is lowered at the suction nozzle which induces the fluid to enter through inlet piping. Less liquid being handled if any design that slow down the efficient transport of this liquid. In some cases Physical damage or crackers to the pump or any other part of pump is because of poor performance and bad designs of pump.

The study of pump suction system configuration is classified into two parts: (1) suction piping and (2) suction source. For properly design an efficient system, critical consideration should be given to suction piping and suction source. This study deals with pump suction system configuration and is applicable to all types of pumps, and successful operation and useful life of every pump can be so dependent on a properly designed and thought-out suction arrangement.

The main aim of sump is to provide water with uniform velocity during the pump operation, abnormal flow phenomena

such as cavitations, flow separation, pressure loss, vibration and noise occur often by flow unsteadiness and instability. Especially, free and subsurface vortices containing air occurred in sump pumps seriously damage to pump system. According to the HI standard of Hydraulic Institute or JSME criteria for a pump sump design, these vortices should be prevented and their disappearance must be verified by model test in the construction of pump station.

To reduce these vortices and for the advanced pump sump design with high performance, it is very important to know the detailed flow information in sump system. For this purpose, to date many researchers have made experimental and numerical studies on the flow in pump-sump. Now days it is common practice in India, that while engineering big lift Irrigation, Drinking water scheme or Boiler feed pump unit, Sump model study is conducted to confirm suitability of pump sump, also parallel CFD analysis is done to check suitability of sump. Initially while engineering pumping scheme general guidelines of appropriate standards HIS or BHRA are used to decide the sump dimensions and then sump model study is conducted in presence of manufacturer and customer representatives. The flow conditions at entry to a pump depend upon flow conditions in approach channel, sump geometry, location of pump intake with respect to the walls, velocity changes and obstructions such as piers, screens etc., and rotational tendencies in flow produced upstream of the pump bays. Analytical determination of the flow conditions in a sump is not an easy task due to the complex nature of the flow. Moreover the analytical solution may not completely predict the actual conditions in the sump due to the assumptions made for simplifying the analysis. Thus at present model studies are the only tool for developing a satisfactory design of a pump sump, yet numerical simulation is a very good facility for reducing the time and cost involved in the design process.

II. LITERATURE REVIEW

S. R. Shah, et al. [3] conducted various experiment in laboratory to validate a numerical model developed to simulate the three-dimensional turbulent flow in a water pump intake bay. The experiments were conducted on the basis of flow visualizations and measurements with particle image velocimetry.

A numerical model was developed by Constantinescu and Patel (1998 a,b) to simulate the flow in water intake bays. This paper describes comparisons between the experimental and numerical results as there was no experimental data that was complete and comprehensive enough to validate the numerical model. The location, number, and general structure of the subsurface and free-surface vortices prophesied by the numerical model were approximately correct with those observed in the experiment. The only blemish in the numerical model was that the exception of the strongest vortex, attached to the nearest sidewall, which was prophesied, was more dispersed and less intense than the vortices observed in the experiment. The result propound that the numerical model which could be executed to preliminary design to identify geometric configurations and flow parameters that may lead to strong vortices in the intake and swirl in the suction column.

P.S. Mahar, R.P. Singh [4] reported that the total cost of a pumped water supply system includes the capital costs, the replacement costs, and the energy costs concomitant to the system's operation and pumping units. The optimization model assists to minimize the total annual cost of the pumping main and pump, satisfying the pump characteristic curve equations. This model determines the optimal diameter of pumping main with pump efficiency for a required discharge for an available diameter.

III. METHODOLOGY

[A] Mathematical Model: In mathematical model, the empirical formulae in the Engineering domain can be applied to get the desired solution for the problem. There are two methods to calculate the pressure drop, namely; the Bisection method and the Modified Newton Raphson method. In our case we will use the Modified Newton Raphson Method.

[B] Analytical Model: This is nothing but the computational method. This method provides the simplicity and helps us to solve the problem with robustness. The software's used will be in FEA (Finite Element Analysis) domain. The analytical model is then further divided in three parts namely; Preprocessing, Solving, Post processing. The preprocessing can be done in modelling software such as Catia and then followed by solver GAMBIT/ANSYS and post processing will be in ANSYS FLUENT. Here the result of the mathematical model will be compared with the result obtained from the computer.

IV. CFD STUDIES

Definition of CFD

"The science of predicting fluid flow, heat transfer, mass transfer (as in perspiration or dissolution), phase change (as in freezing or boiling), chemical reaction (e.g. combustion), mechanical movement (e.g. fan rotation), stress or deformation of related solid structures (such as mast bending in the wind), and the related phenomena by solving mathematical equations that govern these processes using a numerical algorithm on a computer" (FLUENT, 2006)

Computational fluid dynamics (CFD) uses numerical methods to solve the fundamental nonlinear differential

equations that describe fluid flow (the Navier- Stokes and allied equations), for predefined geometries and boundary conditions. The result is a wealth of the predictions for flow velocity, temperature, density, and chemical concentrations for any region where flow occurs. CFD analysis begins with a mathematical model of a physical problem, conservation of matter, momentum, and energy must be satisfied throughout the region of interest. Fluid properties and modeled empirically. Simplifying assumptions are made in order to make the problem tractable (e.g., steady-state, incompressible, in viscid, two dimensional). Provide appropriate initial and boundary conditions for the problem. CFD applies numerical methods (called discretization) to develop approximations of the governing equations of fluid mechanical in the fluid region of interest. The solution is post processed to extract quantities of interest (e.g. lift, drag, torque, heat transfer, separation, pressure loss, etc.).

Basics of Computational Fluid Dynamics:

Computational Fluid Dynamics (CFD) is a computer-based tool for simulating the behavior of systems involving fluid flow, heat transfer and other related physical processes. It works by solving the equations of fluid flow over a region of interest, with specified (known) boundary conditions for that region. CFD is a sophisticated computationally-based design and analysis technique. CFD software gives you the power to simulate flows of gases and liquids, heat and mass transfer, moving bodies, multiphase physics, chemical reaction, fluid-structure interaction and acoustics through computer modeling. This software can also build a virtual prototype of the system or device before can be apply to real world physics and chemistry to the model and this software will provide with images and data which predict the performance of that design. Computational fluid dynamics (CFD) is useful in a wide variety of applications and used in industry. CFD is one of the branches of fluid mechanics that uses numerical methods and algorithm can be used to solve and analyze problems that involve fluid flows and also simulate the flow over a piping, vehicle or machinery. Computers are used to perform the millions of calculations required to simulate the interaction of fluids and gases with the complex surfaces used in engineering. More accurate codes that can accurately and quickly simulate even complex scenarios such as supersonic and turbulent flows are ongoing research. Onwards the aerospace industry has integrated CFD techniques into the design, R & D and manufacture of aircraft and jet engines. More recently the methods have been applied to the design of internal combustion engine, combustion chambers of gas turbine and furnaces also fluid flows and heat transfer in heat exchanger. Furthermore, motor vehicle manufactures now routinely predict drag forces, under bonnet air flows and surrounding car environment with CFD. Increasingly CFD is becoming a vital component in the design of industrial products and processes. This study deals with the study of water outlet temperature from helical coil system. Computational fluid analysis is carried out to determine the temperature profile. Computational fluid analysis is carried using software CATIA V5 which is used to build the model and mesh it in ICFM CFD and ANSYS FLUENT is used to carry out the temperature analysis. This total analysis is known as Computational fluid dynamics analysis. Today, well tested commercial CFD packages not only have made CFD analysis a

routine design tool in industry but also helping the research engineer in focusing on the physical system more effectively. Before doing the analysis it is important to have an overview of what fluent is and how does it work.

Experiments vs. Simulations

Experiments	Simulations
Quantitative description of flow phenomena using measurements <ul style="list-style-type: none"> • for one quantity at a time • at a limited number of points and time instants • for a laboratory-scale model • for a limited range of problems and operating conditions Error sources: measurement errors, flow disturbances by the probes	Quantitative prediction of flow phenomena using CFD software <ul style="list-style-type: none"> • for all desired quantities • with high resolution in space and time • for the actual flow domain • for virtually any problem and realistic operating conditions Error sources: modeling, discretization, iteration, implementation

V. RESULT OF CFD ANALYSIS

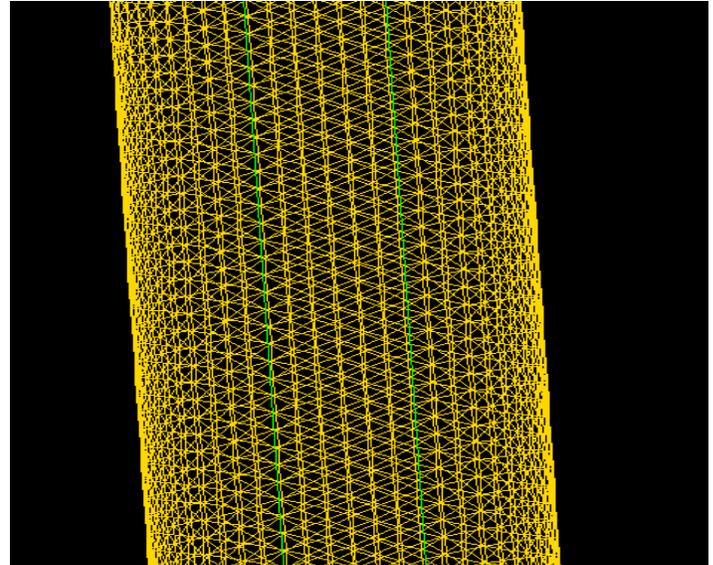
A number of computations by the CFD analysis were carried out for various conditions using a desktop personal computer. One case of computation took eight hours to get animation for flow visualization. In the following analysis, water is considered as working fluid. The CFD software provided animation video files for visual understanding of flow pattern.

The results of the computational simulation can be analyzed using number of variables. In this study it has been restricted to the comparison of results based on the pattern of streamlines of flow and the velocity profiles. The streamline pattern shows that a very large rotating mass of fluid is created in the forebay portion but it not affects the smooth entry of water in each pump due to the length of the forebay is more. Also there flow is maximum on the side where space for future expansion is kept blank, similarly in experimental we get the maximum flow on blank pump chamber side which is analyzed by using wool thread which is shown in figure 5. And there is no any surface or submerged vortices in the pump chamber.

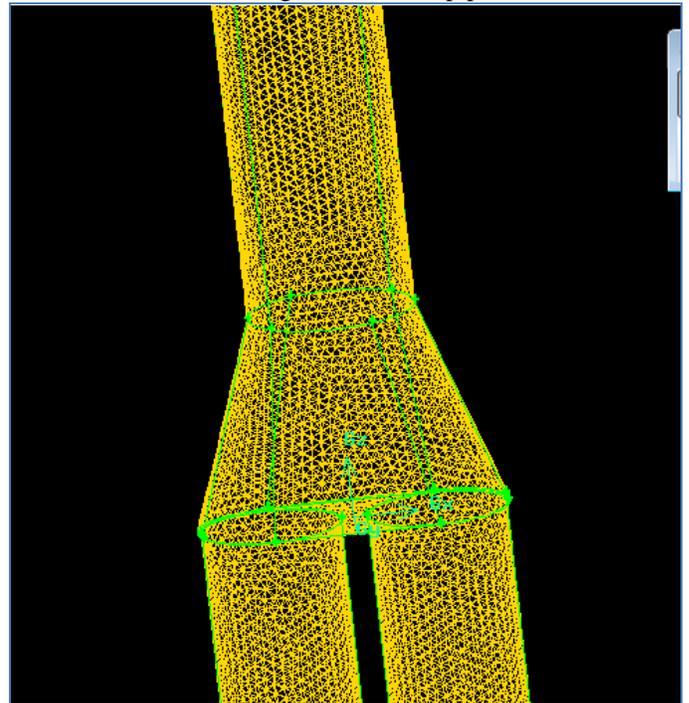
Meshing detail

Meshing type : tetrahedral
 Element size : 5

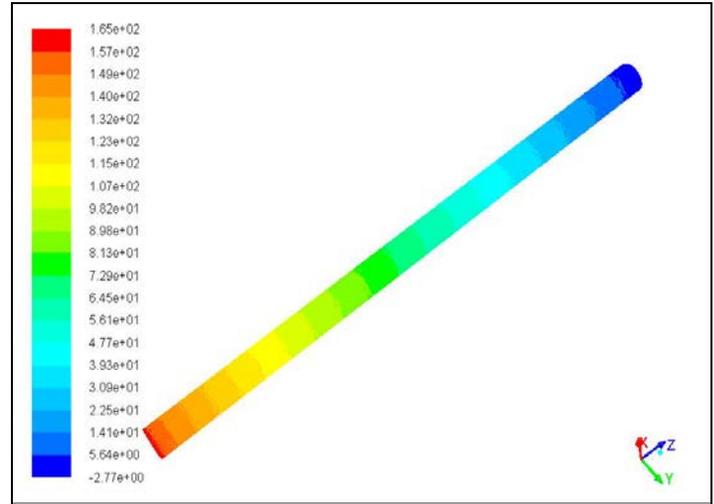
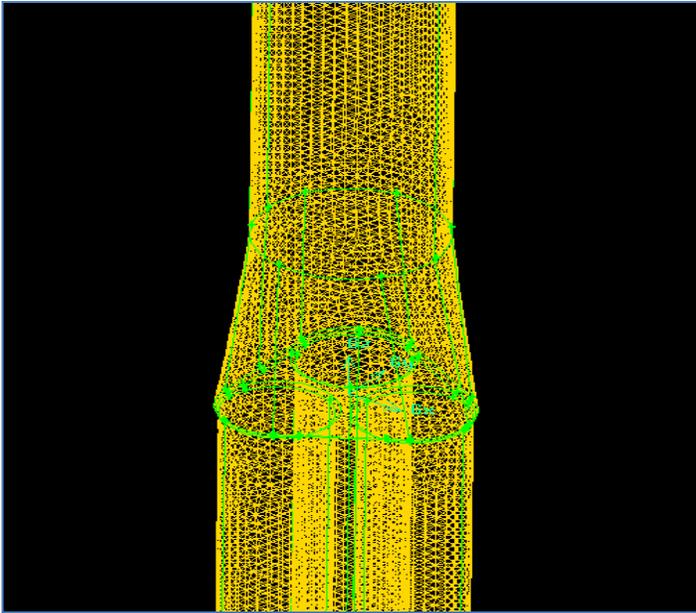
Meshing of single pipe



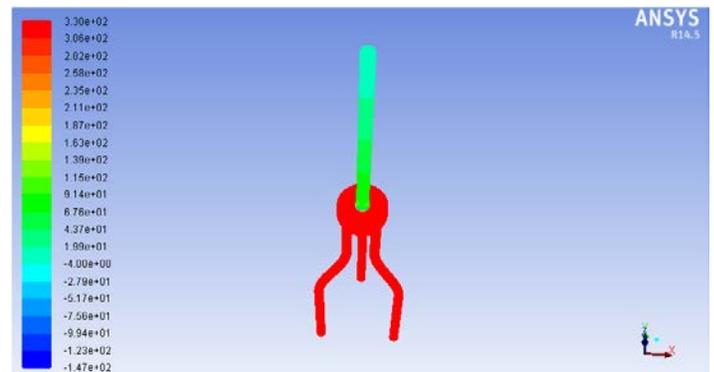
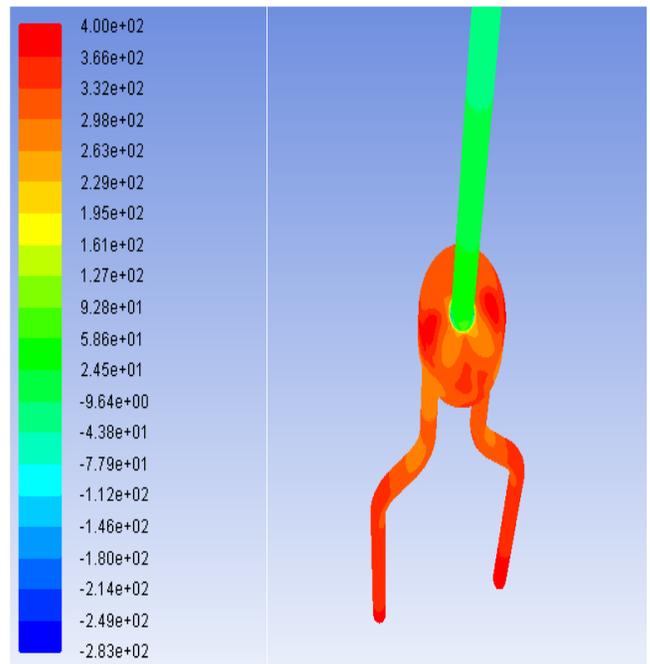
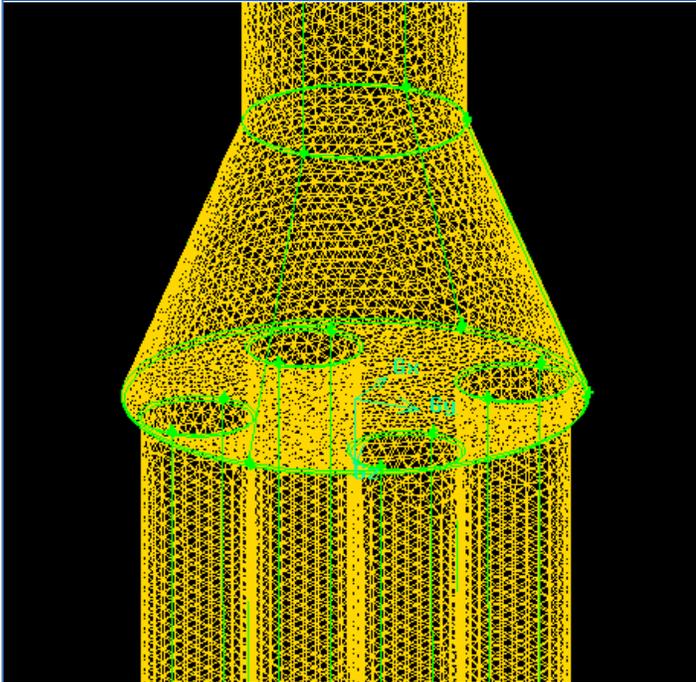
Meshing of two intake pipe



Meshing of three intake pipe



Meshing of four intake pipe



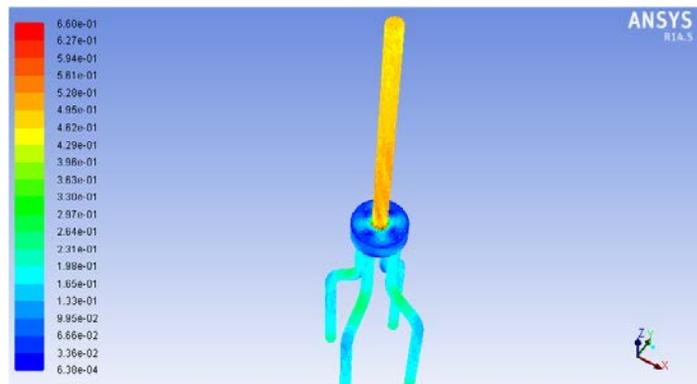
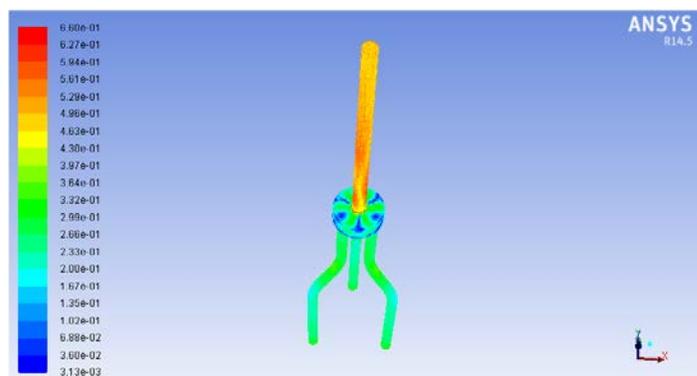
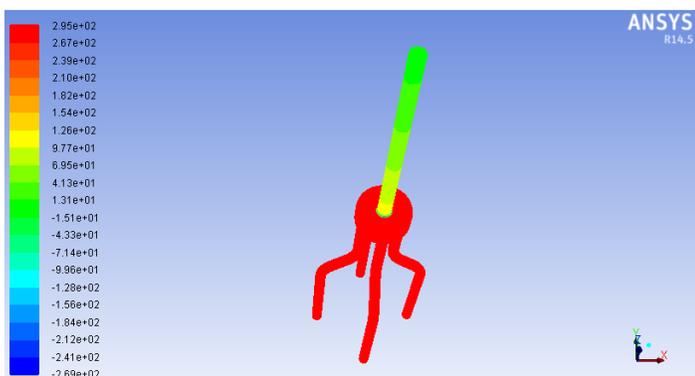
A. Pressure Distribution

Pressure distribution calculated by the CFD is shown in figures. Red colour indicates pressure level is maximum and blue is indicates pressure level is minimum. In the figure, For single pipe pressure is maximum at inlet and minimum at outlet.

For two intake pipe, pressure is a maximum at the inlet as shown in figure.

For three intake pipes pressure is maximum at the inlet.

For four intake pipes pressure is maximum at inlet.



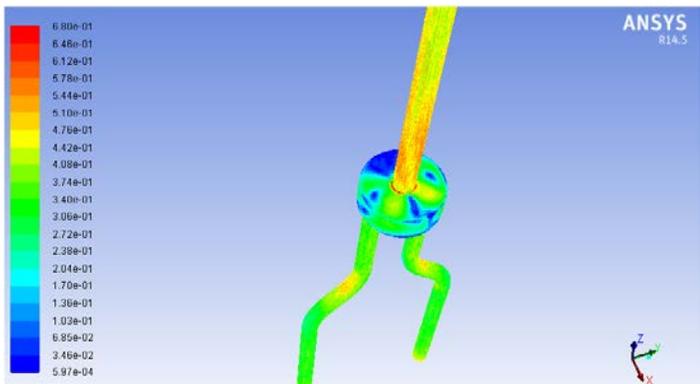
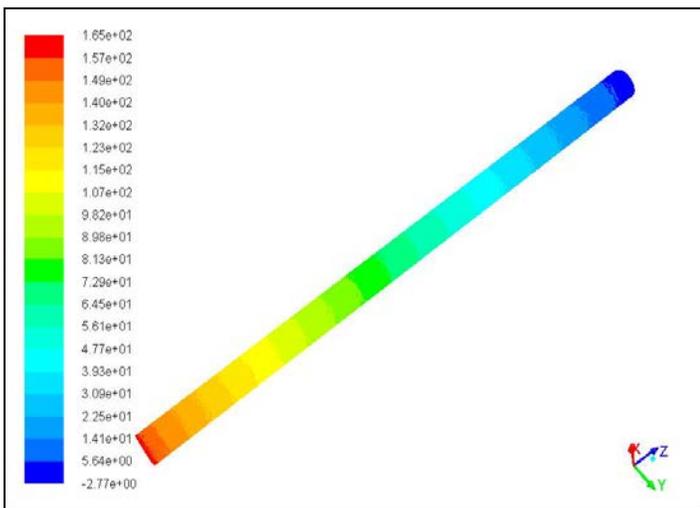
B. Velocity Distribution

Stream lines calculated by the CFD Analysis are shown in figure. Velocity distributions are shown in Figure. Velocity of the flow is classified by colors. For single pipe, velocity is maximum at centre of pipe and minimum at inner surface of the pipe as shown in fig.

For two intake pipe, a velocity is a maximum in single pipe connected to the two intake manifold while it's minimum in two intake manifold as shown in figure.

For 3 intake velocity is near about constant as shown in figure.

For 4 intake pipes velocity is minimum at inlet manifold and maximum at outlet single pipe as shown in fig.



VI. CONCLUSION

In the present work enhancement of performance of centrifugal pump through CFD while modifying the suction side for easting discharge has been carried out with boundary conditions such as mass inlet and pressure outlet. Mesh is created using Gambit 2.2.30. Discharge and pressure drop is calculated for three intake pipe.

This study focused on which geometry is best for performance of centrifugal pump through CFD while modifying the suction side for easting discharge. whether single pipe or two intake manifold or three intake manifold or four intake manifold is best geometry for enhancing the discharge by computationally. After selection of geometry we calculate discharge and pressure drop by experimentally.

- Discharge of three intake manifold is high as compared to other geometry.
- Power required for three intake system is less by analytically So, cost is less.
- Pressure drop is less for three intake system by analytically and software analysis.
- For three intake geometry weight is less.
- The best geometry is 3 intake pipe manifold.
- The study confirms that the flow within the pump sump is greatly affected by the geometry of the sump.
- CFD is very helpful in analyzing the effects of sump geometry on the flow pattern.
- Commercial software like ANSYS CFX reduce the time of analysis significantly.

The commercial CFD package ANSYS FLUENT V6 was used to predict the three dimensional flow and vortices in a pump sump model. The CFD model predicts the flow pattern in detail and the location, and nature of the vortices. However, considerable post-processing of the basic data is needed to fully comprehend the details of the flow. Thus CFD model can be used to study the effect of various parameters which reduces time as well as cost and hence can become an important tool for optimization of pump sump geometry.

ACKNOWLEDGMENT

I express my sense of gratitude towards my project guide **Prof. S.V.Channapatanna** for his valuable guidance at every step of study of this dissertation, also his contribution for the solution of every problem at each stage.

I am thankful to **Prof. A.A Bagade** Head of the department of Mechanical Engineering and all the staff members who extended the preparatory steps of this dissertation. I am very much thankful to respected Principal **Dr. A. M. Nagraj** for his support and providing all facilities to complete the project. Finally I want to thank to all of my friends for their support & suggestions. Last but not the least I want to express thanks to my family for giving me support and confidence at each and every stage of this project.

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Obtaining measurement patterns of partial discharges in power cables XLPE using Probabilistic Neural Networks

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**Office of Distribution Systems, Laboratory of Testing Equipment and Materials (LAPEM)

Abstract- This paper presents a computational implementation of a Probabilistic Neural Network for obtaining patterns of partial discharges in power cables XLPE. The experimental measurement data of the power cables are obtained in the Laboratory Testing Equipment and Materials (LAPEM), which is a certified laboratory property of the Comisión Federal de Electricidad (CFE) in México. These data implicitly contain the patterns of partial discharges and are used to carry out the training and testing of Probabilistic Neural Network. In order to illustrate the reliability and validity of the proposed computational implementation, the results obtained by this proposed implementation are compared with those calculated by the methodologies given in the standard IEC 60270.

Index Terms- Probabilistic Neural Networks, partial discharges, power cables XLPE, pattern recognition.

I. INTRODUCTION

One of the most sensitive techniques to detect problems in the power cable isolation is the measurement of Partial Discharges (PD). However, its application is limited due to electromagnetic interference problems that occur on site, further that the partial discharge data are difficult to interpret and only trained personnel with experience can provide an accurate conclusion about abrupt changes in the nature of the insulator, which are caused by vacuoles in a solid or gas space between the surfaces of an insulator to a conductor or another insulator. The Artificial Neural Networks (ANN) has been extensively applied for classifying complex stochastic partial discharge patterns because of its ability to learn from a few trained fault examples [1,2]. However, the fundamental issue in NN learning and classification is generalization, i.e. the potential of the NN to function reliably well for some unknown or unseen PD data. Many NN topology algorithms have been applied for partial discharge classification and these include: the back-propagation (BP) algorithm [1,3-4]; the Kohonen self-organizing map and learning vector quantization [1]; modular neural networks [5]; adaptive resonance theory [6]; the counter propagation NN [7]; hidden Markov models [8]; fuzzy logic controllers [9] and more recently the probabilistic neural network [10].

The Probabilistic Neural Networks is a type of Artificial Neural Networks, which together make a very useful technique for obtaining patterns of certain phenomena associated with the partial discharges and related cases. The above is because the PNN technique has many qualities such as speed training, simulation speed, precision, plus the ability to facilitate detection

of the intensities corresponding to each type of discharge, since when the measurements contain three types of partial discharges, makes it easier to understand such measurements [11].

The partial discharge activity generates both physical phenomena and chemical changes within the dielectric material, causing the transmission of acoustic, electrical and optical energy that can be detected and analysed using appropriate sensors. The acoustic technology for target detection has developed very rapidly in the past few years [12] and therefore strong tools such as signal processing and feature extraction for the detection of a partial discharge condition are required [13]. Several researchers have successfully used acoustic detection methods for studying the characteristics of electrical discharges on insulators [14]. Many signal analysis techniques have been used, such as Fourier transform [15], wavelet transform (WT) [16], as well as neural networks in order to characterize and classify the electrical discharge signals [17,18]. A partial discharge is an electrical breakdown phenomenon which is confined and located in the region of an insulating medium, emerging between two conductors which are at different potentials. Partial discharges have detrimental effects on the environment in which they occur [19]. In solid or liquid produce a slow but continuous degradation of the elements that surround them, which ends in the electrical breakdown of insulating material (internal and external PD). In gaseous medium such as air, partial discharges produce the corona effect [20]. However, the results obtained by these means led to questions regarding the effectiveness of pattern classification and recognition of partial discharges established until today, As well as questions to any treatment of this data to improve the interpretation of the phenomenon, but allowed evaluate the practical importance of deployments magnitude and phase of the pulses [21] and the analysis of waveform of partial discharge signals [22]. In [23] is presented the first study case concerning to the change of patterns of partial discharges in power cables due to the aging process, and thereby starts the diagnosis using pattern recognition.

According to the above, it is necessary to establish metrics statistics to define the type of partial discharge present in certain isolation (external, internal or surface discharge). For the development of these statistical metrics, ANN [24-28] have been of great interest to researchers because they can be used as a technology for data mining because it offers the means to model effectively and efficiently complex phenomena and large [29]. The ANN models are programmed from the data, that is, they are able to find relationships inductively (patterns) via learning algorithms based on existing data more than the fact require the help of a modeler to specify the expression of a function of their interactions [30-31].

This work presents the relevant data associated with $Q-\Phi$ y $N-Q-\Phi$ by partial discharge measurements on site and laboratory for power cables [27]. With these data patterns, the internal and external partial discharge, and corona effect in power cables XLPE are obtained, and they are used in a computational implementation to perform data processing using Probabilistic Neural Networks. The paper is structured as follows, in Section II is presented the design of the measurement system in the LAPEM, practical computational implementation of Probabilistic Neural Networks, the network configuration and testing, whilst the results and conclusions are presented in Section III and IV, respectively. Finally, the references and biography of the paper's authors are shown.

II. DESIGN OF THE MEASUREMENT SYSTEM

In the testing laboratory (LAPEM) a prototype developed for measurement in the power cables XLPE, as shown in Figure 2, by means of which could perform the different partial discharge measurements where data were free of noise, this in order to obtain "clean" standards, both corona discharges as partial internal and external. Also, this prototype was useful to also obtain combined data from these measurements, creating a database to characterize in a better way the artificial neural network. These data have four columns, the first of which determines the cycle, the second angle where partial discharge is presented, the third shows the electric field strength in pC and the last column indicates the current. However, in this study the second and third column to validate the proper training of the PNN was only necessary.



Figure 2. Measuring prototype built in the test lab (LAPEM).

In Figure 3, it is possible observe the magnitude internal partial discharge (pC) in the power cable XLPE, where most of the data are in the beginning of the positive and negative cycle.

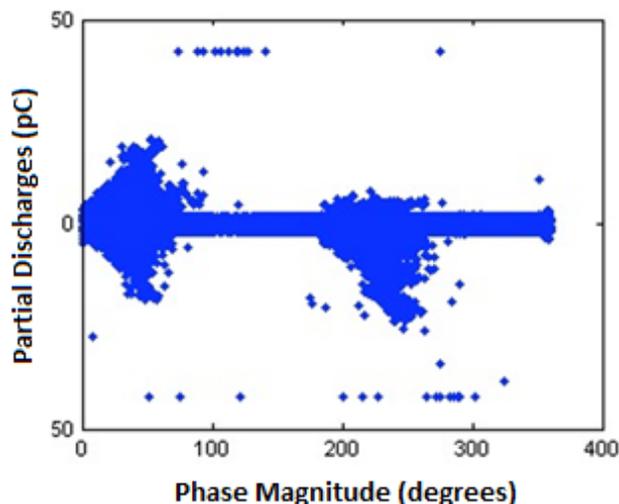


Figure 3. Internal partial discharge in power cable XLPE.

The surface partial discharges clearly are observed in Figure 4, which are created in the middle of both the positive and the negative cycle, and that have a value greater than pC internal discharges.

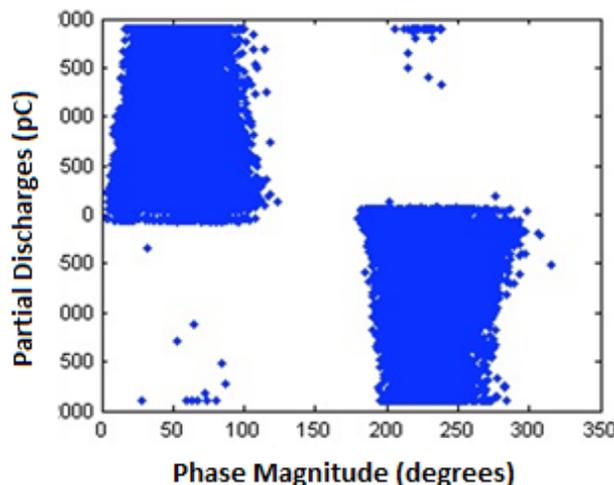


Figure 4. Surface partial discharge in cable XLPE.

Finally, the characteristics of corona measurements in power cable XLPE can be observed in Figure 5. This effect is produced in all that exists in the terminal end of the measurements.

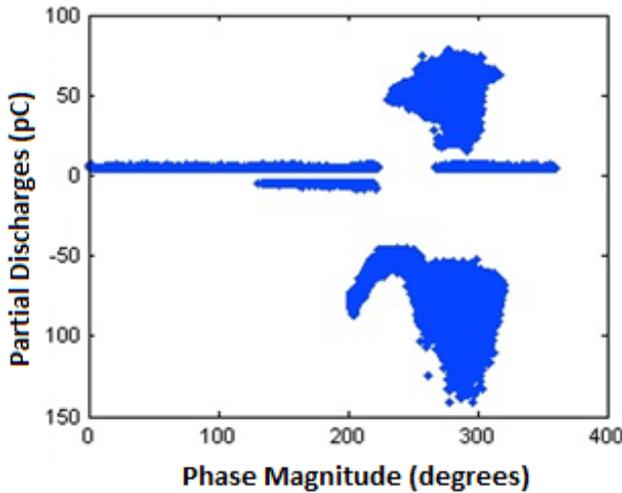


Figure 5. Corona PD measurements in power cable XLPE.

III. DEVELOPMENT AND PRACTICAL IMPLEMENTATION OF THE PROPOSED PROBABILISTIC NEURAL NETWORK

A. Practical implementation of Probabilistic Neural Network

The Probabilistic Neural Networks can be used in problems where it is necessary to carry out the data classification. Unlike the process used for regression problems, in which an adjustment is made of weights and bases according to the presented error; in the classification process the weights adjustment is not made and only output patterns are determined by comparing and calculating distances. Figure 6 shows the architecture of the configuration of a Probabilistic Neural Network, in which is based the RNN developed in this paper.

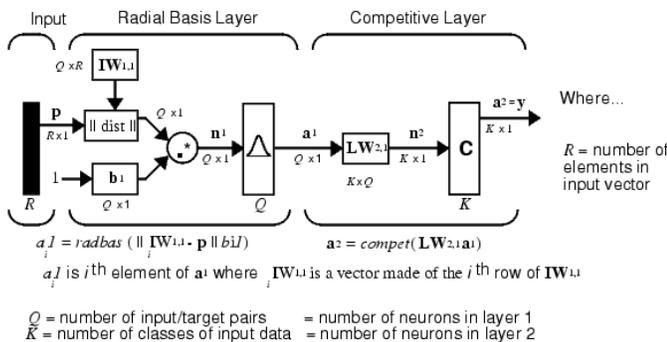


Figure 6. Architecture of the Probabilistic Neural Network.

The performance of the PNN can be explained as follows, when the network is presented with an input, the first layer computes distances from the input vector to the training vectors and produces a vector whose elements indicate how close the input is detected with that of training [10]. Then the second layer sums these contributions for each class of entries seeking to produce as output a vector of probabilities. Finally, a transfer function at the output of the second layer contains the maximum of these probabilities, and produces a 1 for that class and a 0 for the other classes.

B. Network configuration

The application of neural networks in fault diagnosis has two stages, stage one is for the training process, during which the training patterns are supplied to the network to perform calculations or adjustment of some of its parameters, while stage two is the process of testing, during which delivers a known data pattern in order to verify if the output delivered by the network corresponds to the expected output.

C. Network testing

Some simulations were performed to determine the patterns extraction of PNN, using a prototype with the three possible conditions of partial discharges, as shown in Figure 7.

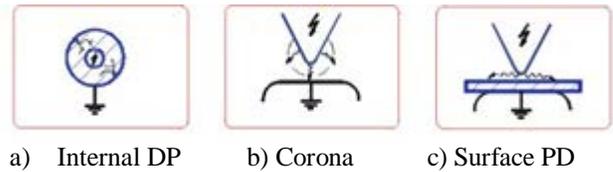


Figure 7. Characteristics of measurement patterns for proposal PNN.

In order to obtain a large amount of data for training of Probabilistic Neural Network, measurements were performed in the power cable XLPE considering seven replicates for each type of partial discharge. By separating the measurements for each partial discharge are obtained measurements with the following characteristics: noise-free and unmixed data. Once the data needed for the training of PNN were obtained, we proceeded to generate parameters for generating results.

IV. RESULTS

Once the neural network has been trained and tests have been performed, the data is processed and presented as a percentage for each internal and superficial partial discharge, and to the corona and electromagnetic noise. Figure 8 shows the percentage of partial discharge in which the concentration of the data is observed with greater clarity.

From these data, a simulation is performed with the data cluster of new patterns of partial discharges to obtain the results shown in Tables 1-6. Table 1 shows the results obtained by considering the internal partial discharge pattern in which there are a lot of data of this discharge with respect to other types of PD.

Table 1. Percentages of measurements, internal DP.

Partial discharges	Percentage of PD (%)
Internal	99.2226
Surface	0
Corona	0.6478
Noise	0.1296

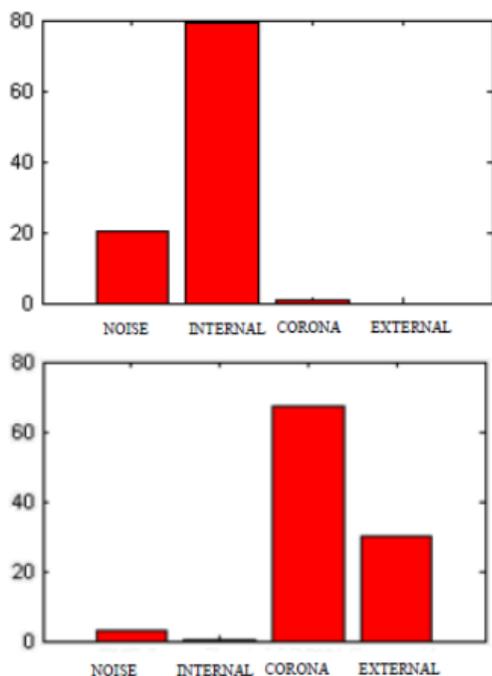


Figure 8. Percentage of each partial discharge in power cable XLPE.

Table 2 shows the results of the percentage of measurements obtained by simulation with the data pattern of the surface partial discharge. In the simulation, 93.5683% of measurements for this PD is obtained, making it possible to say that the neural network is trained properly for this pattern.

Table 2. Percentages of measurements, surface DP.

Partial discharges	Percentage of PD (%)
Internal	0
Surface	93.5683
Corona	6.35403
Noise	0.07767

Finally, we carried out the simulation for training the Probabilistic Neural Network with the corona. This training section of neural network is the most complicated of the whole process, since it is possible to determine that there mixtures in data patterns, however, in Table 3 it is shown that 89.89% of the measurements correspond to data of corona. In accordance to above mentioned, the proposed Probabilistic Neural Network is trained correctly for the case of the corona partial discharge.

Table 3. Percentages of measurements, corona DP.

Partial discharges	Percentage of PD (%)
Internal	5.90717
Surface	1.14474
Corona	89.8958
Noise	3.05229

As part of the innovation of this work, were also classified, in sections, the data packets of each type of partial discharge. From these data, it is possible to obtain the average of the magnitude of partial discharge to understand variability in the measurement. As shown in Table 4, the magnitude in concentration of internal partial discharge is 1.19 pC; with this data can be concluded that the magnitude of the charge of the partial discharge is very high and if the power cable XLPE continues energized with the nominal voltage, there may be a break in the insulation after 100 hours of operation, causing a failure of the power conductor. On the other hand, from the magnitude of the corona is determined that the cable XLPE already contains in somewhere an tip effect, which produces said measurement of corona, but is possible to determine that said magnitude is not sufficiently significant to affect the measurement, therefore the charge is not transcendental for the occurrence of an electrical fault.

Table 4. Values of the patterns of internal DP.

Partial discharges	Average of PD (pC)
Internal	1.19418
Surface	0
Corona	0.80966

Regarding the measurement of surface partial discharge, Table 5 shows that the average magnitude of the surface DP is 49.69 DP pC. This value is not very high compared to the conditions set by surface DP, thus it can be concluded that the insulation has a time of considerable lifetime. Compared with the measurement of corona, is observed that the surface partial discharge is much higher, which may affect the electrical losses in the cable. This may be an indication of the need to check the fittings and connections at terminals of the power cable.

Table 5. Values of the patterns of surface DP.

Partial discharges	Average of PD (pC)
Internal	0
Surface	49.6924
Corona	17.3337

Finally, the measurement of corona is presented in Table 6. In this table, the condition and value of the corona is very confusing due to the high values of surface discharge partial, whose magnitude could be harmful to cable insulation; whilst the value of corona and internal discharge is not harmful to the insulation, but as shown in Table 3, just 1.1% of the data correspond to surface PD. It must be pointed out that over time it is possible to have insulation breakdown in the power conductor.

Table 6. Values of the patterns of corona DP.

Partial discharges	Average of PD (pC)
Internal	2.2665
Surface	108.457
Corona	63.3199

V. CONCLUSIONS

A computational implementation based on Probabilistic Neural Networks for obtaining patterns of partial discharges in XLPE power cables has been presented. The reliability of the probabilistic neural network has been demonstrated by comparing the results obtained with the proposed neural network and those calculated with the methodologies given in IEC-60270. The reliability of the probabilistic neural network has been demonstrated by comparing the results obtained with the proposed neural network and those calculated with the methodologies given in IEC-60270. From the data, it can be concluded that the proper classification of partial discharge is not sufficient to determine the fault condition; because by the average of the partial discharge is possible to know the right characteristics to predict, by time, the parameters that will affect the safe operation of the power cable. Financial support given by Council of Science and technology of the State of Guanajuato (CONCYTEG) to develop this research is gratefully acknowledged.

ACKNOWLEDGMENT

Financial support given by Council of Science and Technology of the State of Guanajuato (CONCYTEG), under the agreement 14-IJ-DPP-Q182-07, to develop this research is gratefully acknowledged. The authors also are grateful to the Office of Distribution Systems of the Laboratory of Testing Equipment and Materials (LAPEM) of the Comisión Federal de Electricidad (CFE), in México, for the support with laboratory equipment and experimental material, as well as to the office manager by the support for the development of this study.

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Retroperitoneal Tumors a Ten Year Experience in University of Maiduguri Teaching Hospital North Eastern Nigeria

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Abstract- Background: Retroperitoneal tumours are fairly common though may present as a diagnostic puzzle as a result of non specific clinical features. This study reviewed our ten-year experience in the university of Maiduguri Teaching hospital (UMTH) and the State Specialist Hospital. **Patients and methods:** The study reviewed all patients with retroperitoneal tumors managed at the two centres between January, 2004 and December 2013. **Results:** A total of 130 patients were analyzed, age ranged from 3 months to 79 years with a mean 38.75years, comprising 77males and 53 females with a male to female ratio of 1.45:1. The peak age group was 30 – 39 years .Complications at presentation include severe anemia in 16.15%, impaired renal function in 14.62%, and urinary tract infection in 11.54%. Histology of tumours revealed fibrosarcoma in 18.46% and lymphoma 15.39%. The post- operative complications include surgical site wound infection in 13.08%, acute renal failure in 3.85%, and deep vein thrombosis in 2.31%. Mortality was 13.08%. **Conclusion:** Retroperitoneal tumours present late and become symptomatic and palpable only when they reach significant size, they are best evaluated with good quality cross – sectional imaging and preoperative histology by core needle biopsy. Complete surgical resection is the most potential curative treatment modality for retroperitoneal sarcomas and is best performed by a multidisciplinary sarcoma team.

Index Terms- Retroperitoneal Tumours, Our Experience, Management, Outcome

I. INTRODUCTION

The retroperitoneum can host a wide spectrum of pathologies including a variety of rare benign tumours and malignant neoplasm that can be either primaries or metastatic lesions. Retroperitoneal tumours can cause a diagnostic dilemma and present several therapeutic challenges because of their rarity, relative late presentation and anatomical location¹ often in close relationship with several vital structures in the retroperitoneal space². The retroperitoneum is the second most common site of origion of primary malignant soft tissue tumours(sarcomas) after the deep tissues of the lower extremities therefore retroperitoneal mesenchymal lesions are far more likely to be malignant³. As a group retroperitoneal sarcomas have poor prognosis the reason being the great difficulty in their complete surgical removal⁴.

Tumour debulking followed by radiation seems to be the treatment of choice⁵. Tumours of the sympathetic nervous system like neuroblastoma and ganglioneuroblastomas in the retroperitoneum are slow growing tumours, surgery followed by radiotherapy is useful in their management⁶. This study reviewed our ten year experience with management of retroperitoneal tumours.

II. PATIENTS AND METHODS

The study reviewed all patients with retroperitoneal tumours managed at UMTH and State Hospital between January, 2004 and December 2013. Permission for the study was granted by the Hospital Research and Ethics Committee. Informed written consent was obtained from all patients. Clinical and laboratory information was extracted from their records and data analyzed. The diagnosis was made based on clinical features and relevant investigations which includes packed cell volume, urinalysis, blood chemistry, full blood count, and ultrasound scan. Others were intravenous urography, magnetic resonance imaging, computerized tomography, ultrasound guided core needle biopsy among others. Those presented as emergency were resuscitated with intravenous fluids, antibiotics (ceftriaxone and metronidazole), and blood transfusion where indicated. All patients had open surgery under general anesthesia. Post-operatively patients were monitored and subsequently discharged and followed up on outpatient basis.

III. RESULTS

A total of 141 patients were reviewed, 11 were discarded due to incomplete data, and 130 analyzed. Age ranged from 3 months to 79 years with a mean 38.75years, comprising 77males and 53 females with a male to female ratio of 1.45:1. The peak age group was 30 – 39(20%) years **table1**. The clinical features were pain, abdominal/flank mass in all 130(100%) of patients **table2**. Complications at presentation include anemia that necessitated blood transfusion before surgery in 21(16.15%), impaired renal function in 19(14.62%), urinary tract infection in 15(11.54%), and intestinal obstruction in 17(13.08%). Resected tumours were sent for histology which revealed fibrosarcoma in 18.46% and lymphoma 15.39% **table3**. Complete tumor resection (resection margin free of tumor) was achieved in 67(51.54%), while the

63(48.46%) had either debulking or biopsy taken due to advanced disease. The post-operative complications includes surgical site wound infection in 17(13.08%), acute renal failure in 5(3.85%), deep vein thrombosis in 3(2.31%), keloid/hypertrophic scar in 7(5.38%). There were 17 mortalities (13.08%).

IV. DISCUSSION

Previous study showed that Primary tumours of the retroperitoneum are not common entities⁷ however this study found them to be fairly common in the tropics with 130 cases in ten years in contrast to their finding of 34 cases in 25 years. The mean age of 59years, and male to female ratio of 1.26:1⁸, however this study found the mean age of 38.75years and male to female ratio of 1.45:1. Our findings of non specific clinical presentation were similar to previous studies. The study found the commonest retroperitoneal tumours to be fibrosarcoma, lymphoma, teratoma, and metastatic deposits in that order. While a study by Pirayesh et al found liposarcoma, leiomyosarcoma, histiocytomas and rhabdomyosarcomas in that order as the commonest⁹. The complete tumour resection rate of 51.54% in this study is in keeping with resection rate of major cancer centres^{10,11}. Patient who had complete resection of their tumours had better outcome compared to those that had residual disease, therefore completeness of tumour resection correlated with patient survival as noted by multiple previous experiences^{12,13}. In our experience benign tumours, well differentiated teratomas, and lymphomas(due to good response to chemotherapy) had excellent outcome, however fibrosarcoma, liposarcoma, and secondary tumours tend to have poorer outcome especially high grade, incomplete resection and with or without distant metastases. The latter category tend to have tumour progression early in the course of their follow up, 57% within a year. Reoperation for progression of primary tumour does not add to long term survival though improved quality of life in the short term. The above findings are similar to other reports¹⁴⁻¹⁶. Our experience with chemotherapy either as adjuvant or neoadjuvant was limited to lymphomas and germ cell tumours with remarkable response, however the response of fibrosarcoma and liposarcoma to chemotherapy were dismal¹⁷. There is no facility for radiotherapy in our centre, those that required radiotherapy to the tumour bed or localized secondaries not amenable to excision were referred to centres with better facilities in keeping with global best practice. Several uncontrolled trials in retroperitoneal sarcoma patients have suggested survival benefits with adjuvant radiation therapy¹⁸⁻¹⁹.

V. CONCLUSION

Retroperitoneal tumours present late and become symptomatic and palpable only when they reach significant size. They are best evaluated with good quality cross-sectional imaging and preoperative histology by ultrasound-guided core needle biopsy is required when imaging is non-diagnostic. Complete surgical resection is the most potential curative treatment modality for retroperitoneal sarcomas and is best performed in high volume centres by a multidisciplinary sarcoma

team. Local recurrence occurs in a large proportion of patients. Complete surgical resection, and tumor grade are important predictors of recurrence and disease specific survival. Further research is required to define the role of radiotherapy, chemotherapy, and develop biological therapies to target the various molecular pathways.

Table 1: Age Distribution

Age group (yrs)	No	%
<10	14	10.77
10-19	15	11.54
20-29	17	13.08
30-39	26	20.00
40-49	16	12.31
50-59	14	10.77
60-69	20	15.39
70-79	08	06.15
Total	130	100.00

Table 2: Clinical Features

Features	No	%
Abdominal/flank mass	130	100.00
Pain	130	100.00
Anaemia	085	065.38
Upper Urinary tract obstructive symptoms	067	051.54
Weight loss/ anorexia	043	033.08
Fever	039	030.00
Intestinal obstructive symptoms	032	024.62
Pedal edema	021	016.15
Haematuria	018	013.85

Table 3: Histological diagnosis

Histology	No	%
Fibrosarcoma	24	18.46
Lymphoma	20	15.39
Teratoma	16	12.31
Metastatic tumours	16	12.31
Liposarcoma	12	09.23
Neurofibroma	10	07.69

Retroperitoneal cysts	07	05.39
Neuroblastoma	06	04.61
Rhabdomyosarcoma	04	03.08
Tuberculous adenitis	04	03.08
Mucinous carcinoma	03	02.31
Neurofibrosarcoma	02	01.54
Phaeochromocytoma	02	01.54
Endothelioma	02	01.54
Carcinoid tumour	02	01.54
TOTAL	130	100.00

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Injury occurrence among residents in a semi-urban area in Sri Lanka; A community survey

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Abstract- Injuries were the leading cause of hospital admissions in Sri Lanka for the past two decades. Common causes for injuries in Sri Lanka are road traffic crashes, falls, animal bites, occupational accidents, violence and humanitarian crisis. However, community based data on injuries in Sri Lanka is scarce. Therefore, the objective of this study was to describe the occurrence of injuries and the associated factors in a semi-urban community in Central Sri Lanka. A community-based descriptive cross-sectional study was conducted in Gangawatakorale administrative area among 696 households selected by cluster sampling which included 3110 household dwelling residents.

The incidence of injuries among all age groups was 17.7 per 1000 population per six months (n=55, 95% CI: 12.2-24.6). Age of the participants with injuries ranged from 2-83 years (Mean=33.8, SD=21.8). The majority were less than 30 years (49.1%, n=27) and were of low income families (56.4%, n=31). More males (63.6%, n=35) were injured than females (36.4%, n=20) (p<0.05). The mechanism of injury were fall from height (38.2%, n=21), road traffic crashes (29.1%, n=16), animal bites (9.1%, n=5), sports injuries (7.3%, n= 4), cut injuries (7.3 %, n=4), poisoning (5.4%, n=3) and burns (3.6%, n=2). Lower limbs were the commonest affected site by injury (41.8 %, n=23).

Considering the high prevalence of injuries related to falls from heights, road traffic crashes and animal bites across all age groups, interventions in the form of targeted injury prevention programs for different age and sex groups, based on local epidemiology are needed for this population.

Index Terms- injury prevalence, mechanisms of injuries, unintentional injuries, Sri Lanka

I. INTRODUCTION

Injuries have become a major public health problem worldwide. It is one of the leading causes of death around the world accounting 10% of deaths worldwide (1). Further, every five seconds one person in the world dies due to injury(1). Each year, nearly 5.8 million people around the world perish as a result of an injury(1). In the context of Sri Lanka, injuries were the leading cause of hospital admissions since 1995. In 2003, 16.7% of total admissions and 11% of deaths in government health institutions were due to injuries. Intriguingly, the injury burden is spread across all districts in Sri Lanka. Injury was ranked as the number one reason for hospital admissions in 18 of the 23 districts and in the other districts; it was among the top 5 reasons (2).

Injuries can be broadly divided into three categories, namely; intentional, unintentional and undetermined intent(3). According to WHO, the term “injury” was used to describe the physical damage that results when a human body is suddenly or briefly subjected to intolerable levels of energy. It could be a bodily lesion resulting from acute exposure to energy in amounts that exceed the threshold of physiological tolerance, or it can be an impairment of function resulting from a lack of one or more vital elements (i.e. water, air, warmth) as in drowning, strangulation or freezing (3).

Injuries contribute to the majority of adolescent and young adult deaths(1). Injuries include those from road traffic injuries, poisoning, drowning, fires/ burns, falls and etc. Although there are many studies on injuries in other countries, it is an area which is very less explored in Sri Lanka. In particular, there is only a very few community studies on injury statistics in Sri Lanka. In a study done in Southern Sri Lanka in 2009 has revealed that the age sex urban rural adjusted annual incidence of non-fatal injuries is 24.6 per 100 population for 30 days duration (4). Another study done in a rural community of Yatinuwara, in central Sri Lanka in 2008 has given a major physical injuries incidence of 82.6 per 1000 person years (5).

The present study was conducted in order to find out the incidence of injury occurrence in Sri Lanka as well as to explore the mechanisms or causes of injury and associated factors. In a rural community study done in Sri Lanka has revealed that animal bites(28.2%) was the main cause of injury followed by falls(18.8%) and objects fallen on the victim(17.6%). Further, the commonest place of injury according to that study was road (41.1%), home(34%) and factory(14%) and the highest injury occurrence was reported among the age group of 25-45 years(34%).⁵ Even within Sri Lanka, the causes for injury remains specific to geographical locations and demographic and socio-economic factors. A community survey done in Southern Sri Lanka in Galle district has shown that the falls (26.7%), mechanical injuries (25.6%), road traffic injuries (20.5%) and animal bites (16.9%) are the leading causes of non-fatal injuries (4). Another study based on secondary data on all deaths from injury in North Central Province of Sri Lanka has revealed that poisoning was the most common cause of death being 3.9 fold more common than road traffic accidents(6).

There are studies on specific injury types done in hospital settings using patient samples or patient records. According to a retrospective study performed by analyzing patient records of the Burns and Reconstructive Surgical Unit, National Hospital of Sri Lanka for a period of 18 months there were 46 acid burn patients

due to assaults, accounting for 4% of the total number of burn patients during the period. The age range of the cases was 12 to 60 years, and 63% of the patients were between 21 and 40 years. The male to female ratio was 2.8:1(7). Another study done using a convenient sample of 824 Army servicemen who were referred to the psychiatric ward in the military hospital of Colombo during August 2002 to March 2006 period, revealed that 29(3.52%) had undergone traumatic brain injuries during the civil unrest which lasted from 1983-2009 in Sri Lanka(8).

The difference in the causative mechanisms of injuries varies between countries as well. It is shown by the studies done in India, the neighboring country of Sri Lanka. A descriptive study done in rural areas of Puducherry, India among 1900 individuals with a 3months recall period has reported the common mechanisms of injury as fire(25.5%), falls(20.8%) and road traffic injuries(15.1%). This study further reported that majority of the injuries had occurred at home (44.7%) and that injuries were more among adults(71%) aged 15 to 59 years followed by children(21%)(9). A similar survey done in rural Pondicherry has revealed that the most common causes of injuries were fall on the ground from height or due to slip (7.4%), road traffic accidents (5.6%), agriculture related injuries (5%) and bites by scorpion/ insects/snakes/dogs (4.1%)(10).

Injuries impose a heavy health burden especially on the poor in low and middle income countries.¹ As Sri Lanka is undergoing a major socio-demographic, epidemiological, and technological transition, injuries have become an emerging public health problem. Today, injuries are no longer random or unavoidable but are considered being predictable and largely preventable (1). They could be prevented by adjusting individuals' lifestyle, health habits and risks. Early detection and prompt action is essential to keep the injuries as well as disabilities and fatalities caused by injuries to a minimum. In order to plan preventive strategies the community based epidemiological distribution of occurrence of injuries and associated factors are required. As community based studies on injuries are scarce in Sri Lanka, this study was conducted to collect data on the occurrence of injuries and their associated factors.

II. MATERIALS AND METHODS

The present study was conducted in Gangawatakorale administrative area in the Kandy district of the Central Sri Lanka. Gangawatakorale is located in the district of Kandy 6 kilometers from the Kandy city, the hill capital of Sri Lanka. It has a tropical climate and a multi-ethnic population where majority are Sinhala Buddhists. Gangawatakorale is a 29.4 square kilometers area and it consists of 25 Grama Niladari areas (smallest administrative unit in the country). It consists of a total population of 53,280 and 14928 households. There are 47315 females and 42139 males with a female to male ratio of 1.1(11).

Study population was all individuals residing in the Gangawatakorale area on the date of interview. Individuals residing in Gangawatakorale area irrespective of age having the ability to understand and speak Sinhala language and who consented participation in the study were included as study participants. Study unit was an individual in Gangawatakorale area who fulfills the inclusion criteria.

The survey sample was selected using a cluster sampling technique with probability proportionate to size. Sample size was calculated using an expected incidence of injury of 8%(5), Z value corresponding to the required level of confidence of 1.96 and with a required level of precision of 0.05 with a cluster effect of 2 and a non-response rate of 5% (12) Therefore, the final sample size was 3060 individuals. Considering the average household size is 4.4 members(13), a sample size of 696 households was estimated to achieve the sample size of 3060. A household was defined as a group of individuals living together and eating from the same kitchen(4). Clusters were selected from GN areas which is the smallest administrative unit in Gangawatakorale administrative area which is the primary sampling unit (PSU) in the present study. Clusters were identified according to their probability of selection being proportional to size. In each GN area there is an electoral register which is updated annually regarding names and addresses of the chief occupant of a household and it was used as the sampling frame to select 30 individuals from each of the PSU. The starting point of the cluster was identified randomly using a random digit number and the adjacent households to the right of the starting point were covered to complete 30 households. Government and private institutions, schools, religious places were excluded from the survey. All the individuals in a household who met the selection criteria were included into the survey. If there was no one in a house, second visit was done on the next day. If they cannot be contacted it was replaced by the house adjacent to the last selected household.

Study instrument was an interviewer administered questionnaire (IAQ) and it was designed following an extensive literature search on injury statistics and a series of panel discussions with the experts in the injury research in Sri Lanka. Validity of the questionnaire was ensured by assessing the face validity, content validity and consensual validity by a team of experts in the fields of public health and injury. Each question in the questionnaire was assessed for its relevance in assessing injury and associated factors, appropriateness of the wording used and acceptability in the local context. Necessary changes were made based on their recommendations. Questionnaires were pre-tested at a different setting to test the feasibility of the instrument. Therefore, the questionnaire was pre-tested among a group of Sinhala speaking people in Matale district which is an adjacent area of the study setting. Clarity, sequence of questions, average time required to complete the questionnaire, willingness to participate and overall feasibility of conducting the study were assessed in the pre-test. Following the pre-test necessary alterations were done.

Data was collected by 13 data collectors who are G.C.E. (Advanced Level)/ high school level qualified. A two day training session was given for all data collectors by the PI one week prior to the commencement of the field work. During that programme, the purpose of the study was carefully explained. The importance of taking informed written consent, ensuring confidentiality and minimizing non-response were emphasized. Training on how to administer the IAQ was also included. Necessary precautions that have to be taken in order to obtain reliable and accurate data were also highlighted.

In the data collection proper, data collectors explained the purpose of the study and the nature of the information collected

to the participants. Following the explanation regarding the study, an opportunity was given to the participants to decide whether they like to participate or not in the study. The trained data collectors paid home visits to 696 households during May-June 2013 covering 3110 residents. Interviews were done in the afternoon hours. Majority of the data was obtained from the research participants and whenever the participants were unavailable or having conditions like deaf and dumb, data was obtained from the housewife assuming that she is more aware of the injury history of all household members (3).

After obtaining informed written consent, information on the occurrence of injuries to each family member in past six months prior to the interview and related factors were collected from the relevant research participant or the housewife of the household using pre-designed and pre-tested questionnaire. For the purposes of the present study, the term “injury” was used to describe the physical damage that results when a human body is suddenly or briefly subjected to intolerable levels of energy. It can be a bodily lesion resulting from acute exposure to energy in amounts that exceed the threshold of physiological tolerance, or it can be an impairment of function resulting from a lack of one or more vital elements (i.e. water, air, warmth) as in drowning, strangulation or freezing(3). Disability was defined as a temporary loss of function for more than one week or permanent loss of function (partial or complete) of part of the body(5). The information on injury was collected and classified according to the ‘mechanism of injury’ such as falls from height/due to slip, road traffic accidents, animal bites, sports injuries, poisoning etc. A structured checklist of common injuries was used to facilitate recalling injuries of study participants. To enhance quality of the data, answers were cross checked with the medical records whenever possible and completed questionnaires were checked

for completeness on the same day of the interview. Five percent of the questionnaires were re-checked by the PI. We could obtain information for 707(97.2%) households, 12 (1.7%) houses were locked and no one of the households refused to participate in the study. Guidelines for conducting community surveys on injuries and violence given by World Health Organization were used for planning this study (3). The data was summarized and incidence and percentages were calculated with 95% Confidence Intervals (CI) using (SPSS)V.13.0(SPSS Inc, Chicago, Illinois, USA) software package.

The study participants who were in need of any further management were directed to appropriate referral centers. All possible efforts were taken during data collection to minimize the disturbances to the day-to-day activities of the respondents. Ethical approval was obtained from the Ethical Review Committee, Faculty of Medicine of University of Peradeniya.

III. RESULTS

Data was collected from 3110 individuals living in 696 households. The incidence of injuries among all age groups was 17.7 per 1000 population per six months (n=55, 95% CI: 12.2-24.6). Age of the participants with injuries ranged from 2-83 years (Mean=33.8, SD=21.8). Among injured persons, majority (n=14, 25.5%) were below the age of 18 years, while the next highest number of injuries were reported in the age group of 41 to 50 years (n=13, 23.6%).

Age distribution of the study population and number of injuries in each age group are given in Table I.

Table I: Age distribution of the study population and number of injuries in each age group

Age groups(years)	Number of people in the community n=3110(%)	Number of people injured in each age group n=3110(%)	SE*	95%CI ~	Number of injuries in each age group as a percentage of total number of injuries(n=55)
Less than 18	496(15.9)	14(2.82)	0.74	1.36-4.28	25.5
18 to 30	531(17.1)	5(0.94)	0.42	0.12-1.76	9.1
31 to 40	742(23.8)	6(0.81)	0.33	0.17-1.45	10.9
41 to 50	501(16.1)	13(2.59)	0.71	1.2-3.98	23.6
51 to 60	444(14.3)	9(2.03)	0.67	0.72-3.34	16.4
More than 60	396(12.7)	8(2.02)	0.71	0.63-3.41	14.5
Total	3110(100)	55(1.76)	0.24	1.3-2.22	100.0

* Standard error of age specific injury proportions

~95% confidence interval (CI) calculated for each age specific injury proportions

Injuries among males were significantly higher (63.6%, n=35) than among females (36.4%, n=20) (p<0.05). The majority were of low income families (monthly family income less than US\$ 250) (56.4%, n=31) (Figure 1).

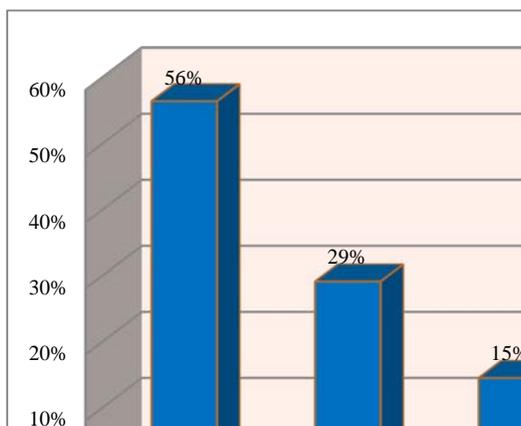


Figure 1: Distribution of persons with injuries according to income

Most of the injuries, 46 (83.6%) were reported to be recovered, 8 (14.6%) led to disability and remaining 1 (1.8%) resulted in death. Among the injuries reported, 96.4% (n=53) were of accidental nature.

The mechanism of injury reported were fall from height/due to slip (38.2%, n=21), road traffic crashes (29.1%, n=16), animal bites (snake/dog/wasp) (9.1%, n=5), sports injuries (7.3%, n= 4), cut injuries (7.3 %, n=4), poisoning (5.4%, n=3) and burns (3.6%, n=2) (Figure 2).

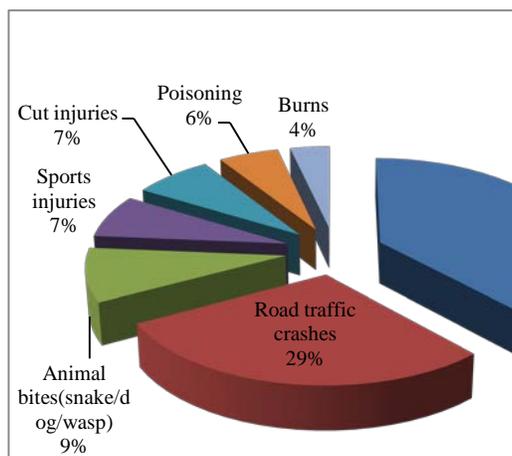


Figure 2: Distribution of persons with injuries according to mechanism of injury

Table II gives the distribution of study population according to mechanism of injuries. The percentage of total population is highest for falls from height (0.67%) followed by road traffic accidents (0.51%).

Table II: Distribution of study population according to mechanism of injuries

Mechanism of injuries	Mechanism of injury(% of total injuries) n=55	Mechanism of injury(% of total population)n=3110	SE*	95% CI
Fall from height/ due to slip	21(38.2)	0.67	0.15	0.4-1.0
Road traffic crashes	16(29.1)	0.51	0.13	0.3-0.8
Animal bites (snake/dog/wasp)	5(9.1)	0.16	0.07	0.0-0.3
Sports injuries	4(7.3)	0.13	0.06	0.0-0.3
Cut injuries	4(7.3)	0.13	0.06	0.0-0.3
Poisoning	3(5.4)	0.10	0.06	-0.0-0.2
Burns	2(3.6)	0.06	0.04	-0.0-0.2

* Standard error of the mechanism of injuries as a proportion of the total population

~95% confidence interval (CI) calculated for mechanism of injuries for the total population

Table III gives the distribution of mechanism of injuries across different age groups. Most common injuries which occurred among individuals < 18 years old, were falls from height/due to slip (n=8, 57.6%), road traffic crashes (n=2, 14.3%) and burns (n=2, 14.3%).

In adults (18-59 years), common injuries were road traffic crashes (n=12, 36.4%), falls from height/ due to slip (n=9, 27.2%), animal bites like dog, snake or wasp (n=3, 9.1%) and poisoning (n=3, 9.1%), cut injuries (n=3, 9.1%) and sports injuries (n=3, 9.1%). However, among older population (60+ years), majority had falls on ground from height/ due to slip and (n=4, 50%) followed by road traffic crashes (n= 2, 25%) and animal bites by snake/dog/wasp (n= 2, 25%).

Table III: Distribution of mechanism of injuries across different age groups

No	Mechanism of injuries	Age						Total	
		Less than 18 years		18-59 years		60 or above		No	%
		No	%	No	%	No	%		
i	Road traffic crashes	2	14.3	12	36.4	2	25.0	16	29.1
ii	Animal bites(snake/dog/wasp)	0	0	3	9.1	2	25	5	9.1
iii	Falls from heights/ due to slip	8	57.6	9	27.2	4	50	21	38.2
iv	Burns	2	14.3	0	0	0	0	2	3.6
v	Poisoning	0	0	3	9.1	0	0	3	5.4
vi	Cut injuries	1	7.1	3	9.1	0	0	4	7.3
vii	Sports injuries	1	7.1	3	9.1	0	0	4	7.3
Total		14	100	33	100	8	100	55	100

Table IV demonstrates the distribution of mechanism of injuries according to sex. Among males, falls on the ground from heights/ due to slip (n=14, 40%) were higher than road traffic crashes (n=11, 31.4%). Similarly, among females, majority had undergone falls from heights/ due to slip (n=7, 35%) followed by road traffic crashes (n=5, 25%).

Table IV: Distribution of mechanism of injuries according to sex

No	Mechanism of injuries	Sex				Total	
		Female		Male		No	%
		No	%	No	%		
i	Road traffic crashes	5	25	11	31.4	16	29.1
ii	Animal bites(snake/dog/wasp)	4	20	1	2.9	5	9.1
iii	Falls from heights/ due to slip	7	35	14	40	21	38.2
iv	Burns	0	0	2	5.7	2	3.6
v	Poisoning	2	10	1	2.9	3	5.4
vi	Cut injuries	1	5	3	8.6	4	7.3
vii	Sports injuries	1	5	3	8.6	4	7.3
Total		20	100	35	100	55	100

Table V describes the injuries according to place of occurrence. Majority of the injuries have occurred in the homes of the study participants. Further 25.5% (n=14) injuries have occurred inside the homes while 12.7% (n=7) has occurred in the home garden. The second commonest place of injury occurrence was road (29.1%, n=16) followed by workplace (20%, n=11).

Table V: Distribution of study population according to place of injury occurrence

Place of injury	Site of injury(% of total injuries) n=55	Site of injury (% of total population) n=3110	SE	95%CI
Home:				
Inside home	14(25.4)	0.45	0.12	0.2-0.7
Home garden	7 (12.7)	0.22	0.08	0.1-0.4
Workplace	11(20.0)	0.35	0.11	0.1-0.6
Road	16(29.1)	0.51	0.13	0.3-0.8
School	4(7.3)	0.13	0.06	0.0-0.3
Recreational facility(play-ground, gymnasium)	3(5.5)	0.10	0.06	-0.0-0.2

* Standard error of the mechanism of injuries as a proportion of the total population

~95% confidence interval (CI) calculated for mechanism of injuries for the total population

Among the injured individuals, 25.5% (n=14) had experienced injuries in more than one site. Commonest site of injury were limbs: lower limbs in 42% (n=23). There were 32.7% (n=18) with upper limbs injuries. Facial injuries were reported by 16.4% (n=9) and two (1.8%) head injury was reported (Figure 3).

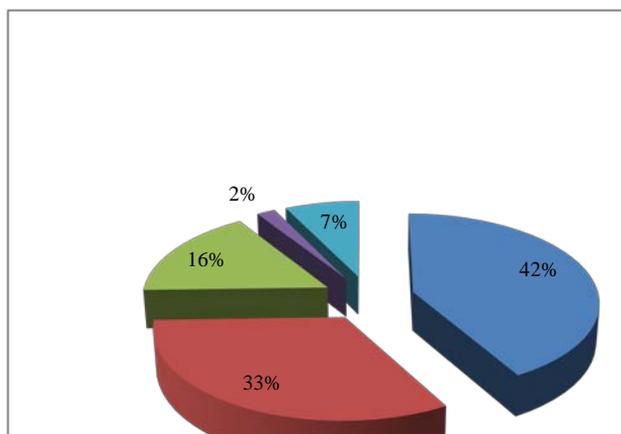


Figure 3: Distribution of injured people according to site of injury

Majority (70.9%, n=39) of injured persons had obtained allopathic treatment, while 12.7% (n=7) obtained Ayurvedic treatment and 21.8% (n=12) obtained both types of treatment modalities. Ritualistic treatments in Sri Lanka included reading horoscope, wearing a yantra/ “epa noola” (blessed necklace/bracelet/ring), dehi kapeema (cutting lime), Thovil/Bali/ Yaga (ancestral devil and god worshipping celebrations), bodhi pooja (worshipping Bo-tree), “bara weema” (help from gods), praying for relief from illness. Among those with injuries, 22% had sought ritualistic treatments in the present study.

IV. DISCUSSION

The present community survey is of high importance since it provides data on all injury occurrences together with the data on place of occurrence, site of injuries and type of treatments obtained and it could be further characterized based on parameters such as demographic subpopulations and socio-economic subgroups. This enables identification of high risk individuals and to set up preventive measures and evaluated as patterns of injuries vary from one community to another. Further assessment of the incidence facilitates identification of the socio-economic impact to the country incurred by the cost of treatment

and loss of productivity. This study further describes the utilization of health facilities which could be best evaluated by community based data. Additionally the community based data can be utilized to perform direct comparisons of injury rates among communities. There are only a very few studies on injury incidence in Sri Lanka which have been done several years before But the injury occurrence is in a striking rise in Sri Lanka during the recent past and majority of the injury data are hospital based. Therefore, the present study was carried out to explore the current situation of injury occurrence in a community setting.

Authors followed the guidelines for conducting community surveys on injuries and violence given by World Health Organization. The community selected was in a semi-urban setting facilitating data collection adjacent to the Kandy city. The sample size of the study was relatively large consisting of 696 households including 3110 residents. However the analysis of some subgroups could have drawn significant results if a larger sample had been used.

Our data demonstrates that the incidence of injuries among all age groups in the study population was 17.7 per 1000 population per six months (n=55, 95% CI: 12.2-24.6). A study done by Lamawansa and Piyatilake (2008) in a rural community in Sri Lanka has revealed that the incidence of injuries was 8.5

per 100 person years for a past one year recall period. The second study exploring injury statistics was conducted by Navaratne et al. (2009) which revealed an incidence of injuries of 24.6 per 100 people in a Southern Sri Lankan population with a recall period of one month. As there are differences in operational definitions of injury, sampling methods, type of data collection tools and the analysis of data it seems difficult to compare the study results directly. A similar situation exists with the other studies conducted on injuries in other countries like India (14), Uganda (15) and Nigeria (16) as well. The results of the present study as well as the other studies may have been affected by the socio-economic factors, range of injury types (whether minor injuries included or not), influence of seasonal variation and by the probable underestimation due to recall bias. As the present study includes severe and less frequent injuries and deaths, a recall period of 6 months which enables the respondent to recall easily a major injury, was utilized in this study.

Injury prevalence in the present study was higher among males particularly in the age group of 18 to 60 years which is the highly productive age group in a country. Similarly, Lamawansa and Piyatilake (2008) has shown that majority of injuries had occurred in the age group of 25-60 age group among males while Navaratne et al. (2009) has reported majority of injuries among the age group of 20-59 years of age. The present study finding on age and sex group is comparable to a study done in India too (17). These findings may indicate that the productive male population is vulnerable to injuries as the majority is involved in occupation as they are the sole bread winners to their families facing a high economic burden. Further, these findings are in keeping with the national inpatient data as well which depicts the highest number of injury occurrence among the most active age group (18).

Falls (38.2%) were the leading cause of injury followed by road traffic crashes (29.1%) and animal bites (9.1%) according to the present study. Similarly Navaratne et al. (2009) has reported falls (26.7%) as the most common cause of injury followed by road traffic accidents (20.5%) and animal bites (16.9%) which was done in an urban setting in Sri Lanka. Similar findings were reported in a study done in India recently as well(17). Further, a study done using multiple data sources in Sri Lanka has shown that road traffic injuries has been steadily rising during the recent past.¹⁹ In contrast, a Sri Lankan study done in a rural setting in 2008 has identified the animal bites (28.2%) as the commonest cause for injuries followed by falls(18.8%) and objects fallen on the victim(17.6%)(5). However, in the present study third most common cause of injury was the animal bites caused by snakes (n=2), dog(n=1) and wasp(n=1). Interestingly, although our study population belonged to a semi urban area there were no agriculture related injuries. However, in India agriculture related injuries were commonly reported until recently (17,20). These differences may suggest that the patterns of the occurrence of injuries have changed with time and geographical locality. Industrialization and commercialization taking place in Sri Lanka may have contributed to the said changes indirectly.

Majority of the injuries had occurred in the homes (38.1%) of the residents in the present study. Further, a higher proportion had occurred inside the homes (25.4%) than in the home gardens (12.7%). The second commonest place of injury occurrence was

road (29.1%) followed by work place (20.0%). Whereas Lamawansa and Piyatilake(2009) has reported more injuries occurring on the road(41.1%) than the home(34%). Therefore, in planning preventive measures this fact is significant as home injuries seems to be in an increasing trend when a rural and a semi urban settings are compared. It may be due to the rather busier life pattern and the nuclear family settings when getting urbanized putting respondents on more home injuries. Further, first aid measures for injuries in the houses, schools and work places seem to be inadequate and inappropriate and need to be strengthened. Therefore, the findings of this study warrant need for community-based health education projects focusing on pre-hospital care, life skill development and behavior change among semi-urban Sri Lankan population. Apart from health education efforts, there is a need to strengthen government supported primary health care facilities.

It is interesting to know that majority of the injuries were limb injuries (74.7%) which significantly contribute for long term disability status among people. This is also noteworthy when setting up health care facilities in order to reduce the burden of disease and disability as well as in implementing rehabilitation facilities in the country.

About 96.4% (n=53) of the reported injuries were accidental and it is noteworthy that almost all reported injuries were accidental in nature, which could have been prevented by care and protective measures. Unfortunately, a misconception in the society is that the injuries are due to fate and are unavoidable. Similarly in Sri Lanka people are influenced by the religions, cultural beliefs and etc. But it is no longer true as injuries are largely predictable and preventable (1).

In the present study, majority ((70.9%, n=39) had received allopathic treatment and only a minority 12.7% (n=7) had received traditional indigenous medical treatment-Ayurvedic medicine only. Still 21.8% (n=12) had obtained both types of treatments. Ritualistic treatments were received by 21.8% (n=12) of all participants which are not potentially harmful. These findings are similar to Lamawansa and Piyatilake (2009) which reports majority injured obtaining treatment from the local hospitals (28.2%) and tertiary care (21.2%) which predominantly offer allopathic treatment. Whereas only 11.8% of injured had obtained indigenous medical treatment. There are no other studies done in Sri Lanka on ritualistic treatment facility utilization but still the present study gives evidence that still with all the industrialization and mechanical changes undergoing in the country a significant percentage rely on some kind of ritualistic treatment as well.

Finally, the present study describes the local situation of injuries in different age groups and according to sex and it explores the various treatment seeking behaviours of the community which may be useful for development of injury surveillance and prevention. As a developing country it is worth exploring and presenting these findings in order to contribute for the pool of global knowledge of injuries which can be used for the initiative of reducing the burden of unintentional injuries (21).

Further, there are limitations of the present study such as it being a medium scale study but it was based on a probability sample. Still being a community-based survey, the present study relied on reporting by respondents although cross checking with

medical records was done whenever possible. Therefore the accuracy of respondents' answers on the occurrence of injury events or the duration of the resultant disability is debatable. Information was gathered from the respondent him/herself or from the residence housewife assuming she can recall injuries better than other members in the family.

V. CONCLUSION

Considering the high prevalence of injuries related to road traffic accidents, fall from height and animal bite related injuries across all age groups, especially among men injury prevention interventions are needed to target different age and sex groups. These interventions should be planned according to the local epidemiology and need to focus on changing injury-related risky behaviors and practices. In addition to the health education practices, there is a need to strengthen basic health care facilities to provide appropriate first-aid treatments for different injuries and awareness programmes for the primary health care workers.

ACKNOWLEDGMENT

Our special thanks to all study participants. Our heartiest gratitude to Dr. Andrea C. Gielen, Director, Johns Hopkins Center for Injury Research and Policy, Johns Hopkins University for her kind support provided during this work.

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Emerging Trends in Training and Development

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Abstract- Organizational training is undergoing a transformation. This is primarily due to changes in technology, mainly the computer/internet. The article traces the evolution of training to present day. It then discusses the current technological trends in training- YouTube, Social Media, Smartphone, and E- Learning trends are discussed.

Index Terms- Training, YouTube, Social Media, Training trends, E- Learning trends.

I. INTRODUCTION

In today's era employees are not keen to join an organization where their Knowledge and skills are not upgraded. Many organizations provide opportunities for learning and use it as a retention tool. A large number of organizations use the strategy of proper & effective training by increased their training budgets to retain and get quality output from the employees. Employees are delegated with different role & responsibilities & training helps them to accomplish these roles & responsibilities & prepare them for the future responsibilities as well. Also the study is aimed at studying the current & expected future training trends worldwide.

II. CORPORATE TRAINING INITIATIVES IN INDIA

In the last few years Indian organizations have made exceptional progress in terms of their training initiatives. This is mainly due to the increase in competition and because of the entry of multinational companies in India, which has forced them to look for various alternatives to develop organizational effectiveness.

- Training is considered as more of a retention tool than as a cost to the organization.
- Not only have organizations increased their investment in training and development practices, but they have also systematized training policies and practices right from the training need analysis to training evaluation and feedback
- The training system in the Indian industry has been distorted to create a smarter workforce and yield the best results.
- The optimum utilization of human resource is the target of any company and training is a tool to increase business outcomes.

- This is an optimistic sign which clearly shows that organizations operating in India are also very serious about their learning and development function.
- Information technology has drastically modified the working patterns of industry and the lifestyle of people. Vision for meeting the challenges is a very important requirement of the corporate sector. Due to this, even training and development department is also not exempted from it. The various trends are

III. MOVE TOWARDS COMPUTER-GENERATED TRAINING

As technology advanced, so did the nature of training. Companies today rely more so on computer-generated training such as simulation or virtual training techniques. These types of training become critical especially as companies search ways to become more cost efficient and training more effective. Today, a number of computer-based training approaches have arisen and continue to develop.

Computer assisted training:

Computers are used in support of more traditional training approaches. This support was initially the inclusion of computer requirements and mini-programs in multimedia learning packages, extending the audio and video elements described above to the much more flexible computer. Other CATs were used in training programs at work, again being inserted into the more traditional approaches, taking the place of audio and video inserts. These inserts permitted instant practice of skills particularly those related to the use of the computer, for example the learning subject might be the use of spreadsheets on the computer.

Computer based training:

Dating all the way back to World War II, computer-based training (CBT) also known as e-learning, found itself most useful in private industries or the government. "E-learning refers to the delivery of training or education through electronic media. Today e-learning is converted into numerous training programs, but not all training programs should be incorporate a e-learning format simply due to companies' specific training needs..

CBT extends significantly the involvement of the computer in training, particularly self-learning and self-development approaches and all indications are that this could be a significant learning force in the future. The programs nowadays customarily consist of a computer package, usually on CD-ROM or

interactive CD-ROM, perhaps supported by text and/or video material, questionnaires, projects and activities.

Pros and cons:

Advantages	Disadvantages
<ul style="list-style-type: none"> • self paced • provides variable training goals • interactive • proficiency ensured • simulation is possible • Drill and practice possible • Higher levels of learning can be addressed 	<ul style="list-style-type: none"> • Limitation in integration • Logistics problem • Expensive • Students lack motivation • Unable to adapt to the use of computers • More time to develop

Latest methods used by the Organization:

CD ROM DVD Laser Disc	Interactive Video
<ul style="list-style-type: none"> • PC enables integrated animation, video clips and graphics • Interactive using joy stick or touch screen monitor • Used in Nuclear power plant, Plymouth, Massachusetts 	<ul style="list-style-type: none"> • Instructions are provided one by one • Interact with the programs • Used for technical and interpersonal relations skills • Used in Apple

Internet	E-Learning	Learning Portal		
<ul style="list-style-type: none"> • Various News groups • Discussion groups • Various blogs • World wide web • Browser and search engine 	<ul style="list-style-type: none"> • Instruction and delivery of training online • Web based training • Learning portals • Distance learning • Virtual reality 	<ul style="list-style-type: none"> • Websites or online learning centres • E- communication, transactions • Provides access to training courses, services and online learning communities • Used in Ford Motor company 		
Distance Learning	Process Involved	Types	Advantages	Disadvantages
<ul style="list-style-type: none"> ➤ physical separation between the learners and the instructors ➤ two way communications ➤ use of audio and data links ➤ using pre-packaged learning resources or courseware ➤ requires peer support and instructor help ➤ used by IBM, Kodak 	<ul style="list-style-type: none"> ➤ Virtual classroom ➤ Audio link between instructor and trainee ➤ Computer software applications ➤ Instant polling technology ➤ White board marking tools 	<ul style="list-style-type: none"> ➤ Teleconferencing ➤ Individualized, personal CBT 	<ul style="list-style-type: none"> ➤ cost reduction ➤ access to experts ➤ save travel costs and time 	<ul style="list-style-type: none"> ➤ Lack of interaction ➤ Technology issues
Walkabout	Basic Challenges	Skills Used		
<ul style="list-style-type: none"> • Introduced by the Asian Institute of Management, Manila • Trainee is left on his own to complete his training 	<ul style="list-style-type: none"> • adventure • creativity • practical skills • logical enquiry 	<ul style="list-style-type: none"> • opportunity seeking • goal setting • strategy formulation • planning 		

• Minimum trainee intervention		• implementing
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Action Learning		Advantages	
<ul style="list-style-type: none"> • Learning is better experientially and mostly by doing • Gives teams or work groups an actual problem, has them work on solving it and committing to as action plan, and then holds them accountable for carrying out the plan • Six sigma training programs use this method • Used by : Novartis, GE. 		<ul style="list-style-type: none"> • lies in its practicality • promotes communication • develops resilience ad determination • a way of transforming the culture and providing continuous learning • involves real- time problems 	
Net varsity (corporate university)	Outbound training programme	Intelligent tutoring systems	
It refers to a company's centrally managed umbrella of in house or off site training initiatives	To place the participants in a challenging risk-taking situation	Instructional systems that use artificial intelligence	
Man aims is to systematize training as a function, maximize investment in employee education, or develop workforce employability	To provide a hands-on experience in which team spirit, leadership and communication skills are tested	Customize the training experience for individuals to meet their needs Used by NASA in astronaut training	
Used in IBM, Ford, Motorola, Disney world	Post exercise debriefing Used in ONGC, Cadbury's and CEAT	Three types of ITC environments <ul style="list-style-type: none"> • tutoring • Coaching • empowering 	

Virtual reality	Blended learning
Provides three dimensional learning experience	Combines online learning, face to face interaction, and other methods
<ul style="list-style-type: none"> • Allows simulations to be more realistic • Technology is used to stimulate the senses of the trainee • Technology is used to stimulate the senses of the trainee • Use of audio interface, gloves that provide sense of touch etc • Used in Motorola 	Advantages <ul style="list-style-type: none"> • Increased learner control • More interaction • Brings learning into real life through discussions • More effective

Source: Recent trends in training and development www.slideshare.net

Web and internet based training:

Probably the biggest revolution in the world of training and development in recent years has been the increased and increasing use of the internet to transport training programs to learners, whether they are individuals or groups within an organization, although not necessarily a group that has come together for training. This approach started quite simply with real time, e mail contact between a self learning, open learning program learner and the central expert or supporting trainer/manager. The logical development of this was a learning program controlled over a set of learners form a central source form which the learning material had been sent. This learning material could be in the form of traditional text, e-mail material or electronic web pages. The learners respond to progress

questions form the source, taking part in subsequent electronic (by email or in an instantaneous chat room format) discussions where necessary, before moving on to other parts of programs.

The revolutionary techniques (and these are seen by many people as the way in which electronic methods of learning will proceed) involve the internet equivalent of traditional methods is that the presence of any social contract is unnecessary-contact is the interaction of the learner seated in front of the computer visual display unit with a program that originates with a web site any location in the world.

Although CBT is not the panacea for all training problems, it is a technique that has been delayed in introduction, for a number of reasons. Computers are often introduced or offered by enthusiast or establishment organizers from on high and this over

enthusiasm or direction has often frightened trainers or organizations with limited experience of computers. The widespread use of and familiarity with computers has not been with us very long and there are still many people who are computer restricted. Trainers were also suspicious of the introduction of computer training because they saw it as yet another management ploy that would reduce their control of the training situation, or even threaten their jobs.

Time has shown that these fears are, to a large extent baseless. An explosion of computer ownership and awareness, in homes as well as in commerce and industry, has educated many more people in the use and operation of computers and their programs, and the relative ease of working with them. More people now-a-days are becoming familiar with computer applications and programs in use, and these developments have increased substantially the advantages and disadvantages of computers systems.

Technology based training:

Good TBT motivates and enables learners to learn what they want to learn or are required to learn, so that they acquire the knowledge, skills, attitudes and behaviour that the TBT was designed to generate. Learner's expectations from TBT are:

Ease of use- The way in which learners start to use the program, the process of loading program should be easy with nothing more to do than to load the disk which should then load the program automatically.

Clarity- Everything in the program should be crystal clear. This includes text, graphics, video, exercises, games and simulation. Text should be in simple words and short sentences, and upper and lower case rather than being all in capitals.

Interest- the first question that TBT designers should ask themselves is- why are people choosing to learn the materials? This is the starting point of their interest. Points to be considered to create interest and curiosity among the TBT users are given below:

1. present a problem for solution
2. provide information and help if called for
3. offer ways for learners to solve the problem in particular
4. provide scope for exploration for experimentation
5. provide one or more possible solutions and explanations

Choice- As people learn in different ways, TBT designers should try to offer scope for them to choose as they want to learn. Some might want to go straight to the problem and try to solve it using trial and error method; some might like to study information before going to the problem; some might even want to see how the solution was arrived at; yet others might want to take careful, guided and step-by-step approach to reach solutions.

Freedom- People learn in different ways, they learn best when they have the freedom to learn the way they want to learn. This can be met partly by providing choices. But, choice can be offered within a tightly structured program that should not deviate from the learning principles

Help- One of the best ways to put people off is by offering help that they haven't asked for. At the same time, one of the traditional ways of responding to learners who give an incorrect answer is, let them try again and/or provide correct answers.

Fun- learning should be fun. It might not be fun all the time. Sometimes it can be quite serious; but, fun is a funny situation and being uncomfortable, as long as they can end them when they wish. The dictionary defines fun as 'enjoyment', 'pleasure', 'amusement'. But it is more than this. It is something to do with challenge and achievement with problems and solutions at the same time taking risk with exploring and experimenting. Also, being allowed to make mistakes and to learn and grow. This is the fun that should be built into all learning programs.

Assessing progress- we all like to know how well we are doing when we are learning anything new. This should not be in comparison to others in competitive way, although some people have been conditioned to judge themselves in this way. It is rather to do with knowing that we are moving forward and learning what we have set out to learn. Conventional TBT often seeks to do pre and post testing. This may have a value, but it is doubtful. It is more like introducing a threat and pressure that will actually get in the way of free, enjoyable learning. Progress can be assessed by individuals choosing to tackle problems which clearly become increasingly difficult.

Accuracy- people object sometimes violently, when they receive inaccurate information given during training. This means that TBT designers have to carry out research diligently and thoroughly to ensure that what people learn is accurate; when information is presented graphically, it must also be accurate-near enough is not good enough.

Involvement- From the very beginning, learners need to be involved in the program. The idea of users entering their names at the beginning is friendly, but hardly constitutes involvement. Providing freedom and choice obviously involves the learner, but it is much more effective to enable learners to construct their own problems, or to develop alternative solutions and then test them out appropriately.

Programmed instruction:

In the 1950s, B.F. Skinner introduced programmed instruction (PI) with his patented teaching machine. Initially, his teaching machine would recognize correct answers and progress to the next. If an answer was wrong, the machine would explain the correct answer. Typically, information to be learned with PI is taught in pieces. Trainees are tested after each piece of material is presented. PI has developed more so as technology advances. For instance, PI can be seen in the latest training technologies such as online courses.

Intelligent Computer Assisted Instruction:

After commercial computers were released in the 1950s, IBM launched the Course writer 1 in the 1960s. This is considered to be the first paradigm of intelligent computer-assisted instruction (ICAI). Based on the trainees' interactive responses, this type of CBT is personalized in that it tailors assistance to the trainees'

needs with characteristics similar to that of a human tutor. ICAI helped cultivate intelligent tutoring systems (ITS). These systems area spinoff of the ICAI and demonstrates a more advanced approach. It operates in a way that “learns” the best methods to facilitate training based on the trainee’s response,” Employees have found this method advantageous in that ITS effectively corrects wrong answers or perceptions.

Simulations and Virtual Reality

As mentioned earlier, simulations mimic real world job situations for trainees. A more sophisticated simulation is known as virtual reality (VR). It was established in the mid 1980s when Jaron Lanier coined the term “virtual reality” as he sold VR goggles and gloves to a number of organizations. Computer simulation in the form of virtual reality often requires the trainees to wear specialized equipment and interact with objects in a virtual environment that is similar to the situation that will be encountered back on the job. An example of VR is aircraft training. Pilots in training are placed in aircraft simulations with light, sound and even wind factors added in. Although this type of training method is most similar to the job, it is quite costly. In alignment with the techniques mentioned above and any choice of training methods, an organization should always analyze a needs analysis, determine strengths and weaknesses and then decide on a training program that best fits its goals. Typically, small businesses maintain a traditional method of training more suitable for a small business’s needs. However, larger firms are finding CBT to be more supportive and accommodative within their organizational structure.

IV. MOST RECENT MEANS OF TRAINING

Intranet:

Intranets are also a popular use of computer-generated training that has developed over time. Intranets are utilized via a company portal and are used to share information within an organization. Intranets were made popular in the mid 1990s. Intranets have found to increase workforce productivity, reduce the time it takes to complete a task or operation, improve communication, make more cost-effective, allows for quick updates/announcements and enable teamwork through collaboration. The intranet’s success lies in its design. An intranet is structured with one audience in mind- company employees. While the intranet provides a high level of benefits, it can also be improperly managed due to the overflow of data instead of being utilized in a way that creates company value.

Webinar:

Webinars also find themselves in the midst of evolving training trends. Webinars are a form of web conferencing via slideshows, videos, etc. Webinars deem to be useful in that they are interactive in such ways that members partaking in online webinars can interact with on-screen calendars and other facilitation tools as a slide show or some type of presentation is being conducted. Webinars are quite popular among organizations; however, there is a downside: one-way communication. This aspect of the webinar can enhance cultural/past behaviours that desire to replace present day training technology such as webinars. These behaviours are

derived from individuals who prefer a traditional way of operating within the business realm. “Regardless of the advantages or disadvantages, webinars which were historically used for demos or meetings, are now trending as means of employee training along with DVDs, Internet usage such as YouTube, and even cell phones, more widely known as Smartphone.

Smartphone:

To this day we associate Smartphone with operating systems such as Android, Blackberry, Apple’s iOs and more. Smart phones are convenient, plain and simple, but can also pose as a distraction in the workplace, typically requiring the need for a high level of monitoring. For instance, being able to distinguish employees checking e-mails versus those employees updating their latest twitter status can sometimes seem to be a difficult task. Distributing company issued phones for business purpose only can help reduce personal use. At the same time, this can be a costly manoeuvre. For the most part however, smart phones can prove to be valuable in the workplace. Smart phones have made huge leaps in the corporate world and remarkably have the ability to perform the functions of a computer. Consequently, an employee can quickly access or send an e-mail, participate in a conference call, take pictures, upload information to the company site, gain access to apps that prove to be beneficial to company goals. Smartphone or tablet users, such as the iPod, may download applications from an app store that are specifically designed with the end-user in mind. From a social media app like LinkedIn to a company-specific app such as Bump, used for media sharing, millions of apps are available for download at the tips of your fingers. Employee training may be exercised through smart phones through the use of video sharing, e-mails that provide links to a training sessions, and even apps like “Mobile Employee” that make note of training and more over, provide employees with deadline reminders, appointments, travel reward programs, work times including the ability to e-mail files that can be integrated into the timesheet spreadsheets, etc. Needless to say, the possibilities appear endless.

WIKI:

Wikis are another resource that can be used for training purposes. Developed in the early 2000s, wikis provide information sharing sites that run via the Internet and allow users to modify information. Some wikis are limited as to who receives access to modify a site while others such as Wikipedia welcome any user to change or add facts/details to a particular subject matter. Organizations that utilize wikis should be aware of faulty information; some users are illiterate in dealing with wikis. Certain companies may even find themselves having to implement a wiki “how-to” training session before even conducting training via wiki. The value for companies lies in the fact that wikis can be used as a collaboration tool, setting the stage for company-specific tasks/jobs such as project management, knowledge management, and fostering information. The obvious advantage at hand is the cost effective aspect, as with most new technologies.

THE EFFECT OF SOCIAL NETWORKING IN THE WORKPLACE:

Due to the social media rave, connecting and information sharing occur quicker than ever. While social media has served as a catalyst in the business world, it has also deemed to be detrimental to employees who have not illustrated social responsibility on their personal networks. Making snarky remarks online, for example, with regards to an employee's work life or towards the company itself can land an employee in great turmoil and in most cases resulting in termination for that employee. While the consequences seem high for the employee, companies can still seek benefits through social media. For instance, it is a great marketing tool, among other uses. Take Facebook, for example. Facebook originally focused on connecting with peers and sharing personal experiences through photos, statuses, messages, etc. Facebook has since evolved into more than just a platform for individual use. Companies now utilize Facebook to create groups or events to promote their business. Other organizations go as far to use Facebook for communication purposes by creating a group, inviting individuals and posting announcements/updates to the discussion forum. This networking tool is of great worth to organizations who like to get information out quickly and at no cost. Individuals can even modify their settings to receive notifications of when updates are posted. For example, if a manager posts a new training video to the discussion forum, better known as the "wall", group employees are notified of this action through e-mail, text message alert, or even Facebook app notifications via smart phones. LinkedIn, another social networking site similar to Facebook, was launched around the same time. LinkedIn targets a more career oriented audience. The site connects numerous professionals in a variety of occupational areas and assists users by reconnecting them to past or present colleagues, making inside connections to jumpstart business opportunities or careers and offers a host of advice/knowledge sharing groups and experts. Here, both the employer and employee benefit from what the site has to offer. In addition, training tips/advice are readily available through group discussions on LinkedIn such as "Focus on Training," "Training Principles" and more.

Likewise, Twitter has contributed to business training solutions as well. The site was launched in 2006 providing users with news, updates and tips as well as permitting twitter users to update their own status, opinions or thoughts. Twitter gained a lot of popularity first because it offered more different options such as micro blogging and secondly because it was used by some celebrities. It was not long before organizations jumped on board opening their own twitter accounts. Companies can "tweet" about their recent news, discounts, and endorsements and so on. Some accounts include Training Journal SHRM, Human Resources IQ and more. These twitter accounts also make use of sharing very broad subjects via external links, documents, videos, and podcasts. Podcasts offer video and audio to make information available to the consumer. Podcast training sessions from iTunes have been heavily exploited, growing in popularity. Organizations appreciate podcasts' ease of use in terms of no cost to the creator or consumer, if so desired. YouTube was a revolution in the social media world because it did need a simple interface in a world where it was not easy, almost impossible to post videos online. Through YouTube, organizations have found another way to use video sharing with more convenience and at little or no cost at all.

EVOLUTION OF YOUTUBE TRAINING:

The use of YouTube for training in the workplace is still in the beginning steps, but there is no doubt it is evolving and quickly at that. Parents are using YouTube for their children to learn and even athletes are making use of the video-sharing website to acquire new skills. So why not take this approach in the work place? Monsanto Company is already exercising this concept by making their own training videos and posting it on YouTube. The company is not only cutting training costs significantly, they are also dramatically increasing the company website traffic which in turn is boosting the company's popularity. YouTube offers the company two different approaches: Companies can record and post their own videos so that trainees can visit the site and watch multiple viewings of the video. On the other end, companies can take a slightly different approach by accessing the videos of pre-recorded training video published by outside sources. However, companies should be weary as to how the video fits as far as company's needs are concerned. Regardless, YouTube carries many advantages for the company as a whole as well. Not only do employers use the information to train a workforce, but by placing it on YouTube, future, potential employees can view how employees are trained and treated. It can also be viewed by customers whom know when purchasing your company's product; they are supporting a socially responsible organization that cares about its employee's safety and about the product being produced. YouTube training is still in the developmental process; however, it is changing workplace training as we know it. Larger companies indicated that they provided 37 percent of their training via eLearning also known as electronic media.

YouTube's Role in Training:

YouTube serves various functions in training and its role as a training tool is hardly going unnoticed. Online interface is assertively making its debut as a routine and reliable lifestyle. Other forms of YouTube training that can be searched includes training for salesmen, human resource generalists/specialists, geologists, medical nurses/doctors, technicians, financial auditors, consultants, chemists, engineers and more. The broad, YouTube training scope includes numerous professions and is constantly growing.

V. WHY IT WORKS?

YouTube training becomes more apparent in organizations looking for ways to reduce trainee learning time, cut training costs, keep material consistent with presentation, monitor training progress and allow for easy access to training for trainees. YouTube, among other CBT tools, can be integrated into other methods of training as well. A simple lecture can be transformed into a captivating training demonstration with the use of YouTube videos. "Given the rich digital media we have today, we all of a sudden have an opportunity to use a platform that is inexpensive and easy to use for companies to express themselves, share ideas and collaborate". Video sharing allows for an open forum in which company customers may easily provide feedback. By properly responding to the viewer, companies can instil trust within customers, employees and even

the local community, ultimately resulting in a higher return on investment. At the same time, content management is becoming more of a concern for those companies turning to video training. While companies may benefit from streaming media sites, these sites can also leave room for information to easily be leaked. Some argue that YouTube will soon become detrimental to information knowledge and dismantle confidentiality. One way organizations are successfully combating this issue is by taking advantage of IT specialists.

Yet, YouTube training still serves as a convenient tool for numerous corporations. There are many benefits to incorporating training videos into an online platform. With video training that is standardized and visually stimulating, organizations are assured that trainees will receive all needed information in a way that helps retain knowledge. Retention is more likely to occur using a computer-based method due to the fact that is simply more captivating compared to an instructional lecture. Visual and auditory stimulation help to better tap into an individual's cognitive thinking process. In addition, behavioural reproduction is more likely to produce greater outcomes especially when companies exercise methods such as virtual reality. In all, e-learning such as YouTube makes training available "for more employees, in more locations, and at a lower cost than other training methods".

E-Learning: Seven trends in E- learning:

Trend 1: Moving away from class based or course based training to multiple ways of training:

While the classroom based training will still remain, its role will be shared with technology based learning, mobile learning and on the job workplace learning. The challenge for learning managers will be to coordinate various inputs from all these various forms of learning. For the past five to ten years, corporations have been subjected to considerable hype about technology based training. Predictions that web based learning would take 90% of corporate training have not simply panned out. Rather, classroom learning and technology based learning often coexist in the formulation known as blended learning.

Advantages over class based learning:

- addresses individual rather than group
- learning can be at any place and at any time
- Has greater reach in connecting to other learners and other learning resources
- Learning is at a pace decided by the learner rather than group
- Learning can take place on the job as the time is available
- Travel and time away from the job can be avoided
- Learning resources can be searched through online search engines
- Instructors do not necessarily be paid on an ongoing basis
- Does not require physical space
- Changes to course materials can be made available immediately
- Links directly to performance support.

Today computer based learning (CBL) is being main form the technology based learning used by corporate training departments, gradually being replaced by web based learning (WBL).

Advantages of WBL over CBL:

- WBL does not require expense of media such as floppy disk, CD ROMs
- Changing web based materials quickly and easily without additional expense
- WBL allows social interaction over a wide area
- WBL allows the availability of human instructors over the network
- WBL, properly designed, uses high degree of simulation and interactivity
- Easily adapted to performance support systems.

Trend 2: Move away from grades and certificates to personal portfolios:

The implication of the first trend is that tracking skills and achievements will move from the issuance of standardized diplomas and certificates, to the maintenance of personal portfolios for each person. Because most people will have multiple careers, employers will want to know what the person knows now and not necessarily what pieces of paper he or she received 10 years ago. And, what a person will need to know in the future cannot be accurately predicted today- the pace of change is just too rapid. This means that curriculum planning should not be too precise, but exploratory, ready to move in the direction of emerging trends.

In fact desired workplace skills of the future will include forgetting and relearning. The pace of change will require people who can put aside previous learning and think of new ways of doing things without too much discomfort.

Trend 3: dramatic changes in eLearning Technologies:

The introduction of artificial intelligence and neural networking will make e learning software smarter and more responsive. New online learning programs will be both prescriptive and adaptive. Prescriptive programs will sense the strengths and weaknesses of the learner, and adjust the curriculum accordingly. A computer will get better at doing this as it gets to know you. In other words, the computer will also learn from experience. All this adds up to a huge leap in the quality of interactivity from eLearning software. Instead of page flipping being the primary hook to engage the learner, new software will respond according to a learner's behaviours, especially responses to tests and performance tasks.

Computers will also become more unobtrusive. Most people do not think of their watch, a calculator or a car as a computer. This is because the computing function of these devices has become "invisible". Similarly, there are a number of developments that will make the computing functions in training technologies also invisible. The implications of invisible computing for training are that training will become a more natural kind of learning rather than something that is viewed as a planned intervention by a training department, and that learning can happen at any time or any place. In fact, training will become just one corporate information system that will become

invisible. Computing devices for training will also deliver human resources information, business metrics, documents and corporate communications organized through web base electronic “portals”. Here are just some of the applications in AI that will have an impact on eLearning in the near future:

Simulated annealing- used in task assignment and scheduling

Adaptive resonance theory- use in smart web search engines and data mining

Ant colony optimization- used for demonstrating “swarm intelligence” and improving group learning

Neural networks and the back propagation algorithm: used in mimicking brain functions, and in complex educational gaming

Genetic algorithms- used for demonstrations of complexity theory, computer aided design, problem solving, and educational games.

Artificial life algorithms- used in the study of biological and social systems

Rules based systems- use in knowledge based expert systems, generation of automatic programming of instructional strategies, and the simulation of common sense.

Fuzzy logic- used for quality of service (QoS) testing, and control of rules-based systems

Bigram models (aka Markov Models)- used for speech, music and text recognition, automatic writing, spell checkers, and verification of authorship

Agent based software- used for Web research, search engines, scheduling, planning, negotiating, and notifying.

Autonomic computing- used to make computers self-configuring, self-healing, self-optimizing and self protecting.

Semantic web- used to make the content of the Web more meaningful so that it can be more easily searched and shared.

Affective computing- computer software will sense your emotions and act accordingly. They may even show emotions in return. This will increase the realism of eLearning simulations.

Trend 4: move from document centric training to simulation and tutoring:

It is generally recognized that presentations to large groups, while occasionally entertaining, are generally a waste of time in terms of learning, but tutoring or an apprenticeship with a master teacher can be very rich learning experience. Unfortunately, the document centric model has followed us to technology-based learning with the proliferation of web pages and power point moving towards learning through simulation and using the computer as a master tutor. The reality is that most corporations cannot afford this kind of training. The next best thing is to try to use the computer to simulate real-life situations and to respond to the learner as an online tutor.

Trend 5: move from group based training to personalized performance support in the workplace:

Most people are taught in groups; most learning is an individual experience. The development of large scale databases and intelligent computer programming finally makes possible the dream of individualized competency based learning. This means that learners can learn at their own pace, learn what is most

relevant and necessary for them, and do not need to study those things they already know.

Trend 6: move from expert centric knowledge delivery to collaborative knowledge capture and dissemination:

Companies are beginning to realize, however, that highly useful knowledge of the corporation resides not only with experts or with top-level managers but is spread throughout the whole organization. Knowledge management is now seen as a key to winning competitive advantage. In order to solve pressing problems of the near future, we will not only have to improve the skills and knowledge of individuals, but also the collective intelligence of groups. The development of ‘learning communities and “communities of practice” are part of this trend.

Such knowledge management systems are now being developed and include functions like internal discussion groups and chat rooms, company-wide reference libraries, online suggestion boxes, internal glossaries and directories, personnel databases, archived newsletters, and group work applications. When valuable employees leave the company, their knowledge is not lost if it has been used to develop an expert system, or at the very least has been documented and made accessible to others.

Trend 7: move from large proprietary applications to standardized interchangeable objects:

Much has been written on the problem of ‘bloatware’, those large-scale proprietary application and suites that take up hundreds of megabytes of hard drive space and are difficult to implement and learn. The trend today is to small interchangeable software “objects” delivered over a standardized information grid. These objects can be delivered quickly in a modular fashion as needed from anywhere on the information grid, and played through a “thin client” on the user’s computer. Today the standardized information grid most commonly used is the World Wide Web.

There are already repositories of shareable educational objects, such as the one found at www.Merlot.org. Merlot lists nine types of educational objects, including simulations, animations, tutorials, drill and practice, quizzes / tests, lectures / presentations, case studies, collections, and reference material this list is in no way exhaustive as instructional designers find new uses for educational materials on the web.

COMPANIES TAKING A PROFITABLE ADVANTAGE OVER THE E-LEARNING TREND:

Digicast Productions, an internet-based company has taken advantage of the shift towards online training. Digicast Productions “help[s] companies influence behaviour change through creating communication and training programs” via Internet (www.digicast.com.au). A similar company, Media-Partners has also realized the window of opportunity in creating training videos. Media-Partners are emerging on the forefront as a leading, video training company with a slogan that reads, “*Best Training Videos at the Best Prices*”. Each company, both Digicast Productions and Media-Partners, has established a successful platform and reveals case studies to prove it.

VI. CURRENT GLOBAL TRENDS IN TRAINING AND DEVELOPMENT

- **Strategic focus:** Organisations are aligning their practices towards the organization's overall business strategy.
- **Employee Training & Development governance:** Organisations are focusing on the proper governance of the Employee Training & Development function, in line with corporate governance principles.
- **Proactive needs analysis:** Organisations are running training needs analyses proactively, with a direct link to business goals and future priorities.
- **Combined learning:** Organisations are using a blend of different methodologies to facilitate learning, with a particular emphasis on electronic learning.
- **Performance improvement:** Organisations are no longer doing training purely for the sake of training; but there is a shift towards delivering only training that improves the business.
- **Create Learning culture:** Organisations keep the perspective that training is a waste of time if there is no environment conducive to learning and growth
- **Outcomes-based learning:** There is a global shift towards outcomes-based learning, in which the focus is on clear outcomes and applied competencies rather than a great deal of interesting but inappropriate information.
- **Learner support:** Training departments are developing focused learner- support strategies to support learning and remove obstacles to learning and growth.
- **Mentoring and coaching:** Training alone is not enough; supportive mentors and coaches are needed in the workplace to accelerate learning and growth.
- **Training measurement:** Companies are measuring the impact of training based on clear tangibles in terms of the financial value of training.
- **Talent management:** Employee Training & Development is being integrated into talent management strategies, in which talented employees are given opportunities to develop their talents further so that their potential can be optimised in the workplace

VII. EXPECTED TRENDS IN TRAINING

The training and development (T&D) sector is expected to shape in the year ahead by some current trends, according to AMA Enterprise, a division of American Management Association that provides assessment, measurement and tailored learning solutions. AMA Enterprise identifies the following trends that will have an impact on the industry

- Organizations will become more open about their T&D policies and practices. This means employees will expect greater openness from executives about performance review criteria, changes in corporate strategy, career advancement opportunities, high potential program selection and even management succession.

- Coaching will continue to be a key tool in executive and leadership development
- A renewed demand for training programs design to build communications skills, critical thinking and creativity which are required to improve employee productivity are expected.
- While some organizations have long global dimension in their leadership development initiatives, most companies find they must play catch-up or lose ground in an increasingly integrated, competitive global marketplace.
- With organizations facing more employee turnover, senior management will turn to HR and T&D to build closer relationships with high-performing workers and to use development as a means to improve retention and engagement.
- The process of selecting will become more open and ambitious individuals volunteer enthusiastically for any kind of leadership development offering.

VIII. CONCLUSION

Corporate training technologies are rapidly changing. The trend is away from classroom training to web base learning on the Internet and corporate intranets. Computers are becoming faster, smarter, smaller and invisible. Instructional design for the web is changing from simple page turning of documents to highly sophisticated artificial intelligence applications using simulation and computerized tutoring. Because intelligent programming and the use of large databases allow greatly increased personalization, online learning is moving from web based courses to just in time performance support systems. At the same time networking has allowed greater collaboration in the workforce, and a better utilization of the intellectual capital within an organization. These are exciting times in the field of corporate training. The new global trends in the corporate world is to emphasize more on applying systematic approach to training and development in order to achieve higher level of organizational effectiveness. Organizations now a days try to link business strategy with training. Current and future trends show that organisations that want to retain skilled employees need to provide for ongoing development and educational opportunities. Many organizations measure the return on investment for training activities.

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Secure Transformation Based Approach for Outsourced Image Reconstruction Service

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Abstract- Now-a-days image or data is not retrieve properly in cloud because large number of problem is created, from this the data may losses. So, we choose OIRS under the compressed sensing framework, which is known for its simplicity of unifying the traditional sampling and compression for image acquisition. Data owner only need to outsource compressed image samples to cloud for reduced storage overhead. OIRS provides security, efficiency and it also reduce design complexity. In OIRS design the sparse image is taken because, it takes less memory in the database memory. By using this technique the retrieved image becomes accuracy and efficiency. The data users can easily reconstruct the original image without any loss.

Index Terms- sparse image, compressed sensing, security and efficiency, cloud computing.

I. INTRODUCTION

Technology has been improved and large-scale datasets are being exponentially generated today. Examples for various application contexts include medical images, remote sensing images, satellite image databases, etc. Along with the data explosion is the fast-growing trend to outsource the image management systems to cloud and leverage. It should be very effectively and efficiently store and share images to data owner to data user. Cloud is the open network can be operated by the third party. On the other hand, many image datasets, e.g., the medical images with diagnostic results for different patients, are privacy-sensitive by its nature. Thus, it is of critical importance to ensure that security must be embedded in the image service outsourcing design from the very beginning, so that we can better protect owners' data privacy without sacrificing the usability and accessibility of the information. Generally for image acquisition and sharing service, the data owner follows the Nyquist sampling theorem and often needs to acquire massive amounts of data samples, e.g., for high resolution images. Prior to transmission and image reconstruction, it is highly desirable to further pass these massive data through a compression stage for efficient usage of storage and bandwidth resources. Such that large data acquisition followed the compression can be wasted and it often lot of complexity on the data acquisition at the data owner side. Compressed sensing is a recently proposed data sampling and reconstruction framework that unifies the traditional sampling and compression process for data acquisition, by leveraging the sparsity of the data. Without data compression is data owner have faced lot problems so the data owner use the compressed sensing, then the data owners can easily capture compressed image

samples via a simple non-adaptive linear measurement process from physical imaging devices, and later easily share them with users.

In this paper, we initiate the investigation for these challenges and propose a novel outsourced image recovery service (OIRS) architecture with privacy assurance. For the simplicity of data acquisition at data owner side, OIRS is specifically designed under the compressed sensing framework. The acquired image samples from data owners are later sent to cloud, which can be considered as a central data hub and is responsible for image sample storage and provides on-demand image reconstruction service for data users. Because reconstructing images from compressed samples requires solving an optimization problem [11], it can be burdensome for users with computationally weak devices, like tablets or large-screen smart phones. OIRS aims to shift such expensive computing workloads from data users to cloud for faster image reconstruction and less local resource consumption, yet without introducing undesired privacy leakages on the possibly sensitive image samples or the recovered image. Compared to directly reconstructing the image in the cloud is prohibited. OIRS is expected to bring considerable computational savings to the owner/users.

The rest of this paper is organized as follows. Section II discusses the related work. Section III introduces the system architecture, threat model, system design goals. Then Section IV gives the detailed mechanism description, followed by security and efficiency analysis.

II. LITERATURE SURVEY

Here we briefly review distributed image reconstruction systems, compressed sensing, and security mechanisms. M. Atallah and J. Li proposed the sequence comparison problem, given two strings and of respective lengths n and m , consists of finding a minimum-cost sequence of insertions, deletions, and substitutions (also called an edit script) that transform [6]. In this framework a client owns strings and outsources the computation to two remote servers without revealing to them information about either the input strings or the output sequence. This solution is non-interactive for the client (who only sends information about the inputs and receives the output) and the client's work is linear in its input/output. The servers' performance is $O(m \times n)$ computation (which is optimal) and communication, where is the alphabet size, and the solution is designed to work when the servers have only $O((m + n))$ memory. By utilizing garbled circuit evaluation techniques in a

novel way, they completely avoid the use of public-key cryptography, which makes this solution efficient in practice[6]. It is now well-known that one can reconstruct sparse or compressible signals accurately from a very limited number of measurements, possibly contaminated with noise. This technique known as "compressed sensing" or "compressive sampling" relies on properties of the sensing matrix such as the restricted isometry property [4]. In this E. Cande's, establishes new results about the accuracy of the reconstruction from under sampled measurements which improve on earlier estimates, and have the advantage of being more elegant. When complete information on the signal or image is available this is certainly a valid strategy. However, when the signal has to be acquired first with a somewhat costly, difficult, or time-consuming measurement process, this seems to be a waste of resources: First one spends huge efforts to collect complete information on the signal and then one throws away most of the coefficients to obtain its compressed version. One might ask whether there is a more clever way of obtaining somewhat more directly the compressed version of the signal. It is not obvious at first sight how to do this: measuring directly the large coefficients is impossible since one usually does not know a-priori, which of them is actually the large ones [4]. Nevertheless, compressive sensing provides a way of obtaining the compressed version of a signal using only a small number of linear and non-adaptive measurements. Even more surprisingly, compressive sensing predicts that recovering the signal from its under sampled measurements can be done with computationally efficient methods, for instance convex optimization, more precisely, 1-minimization [4].

The novel theory of compressive sensing (CS) also known under the terminology of compressed sensing, compressive sampling or sparse recovery provides a fundamentally new approach to data acquisition CS relies on the empirical observation that many types of signals or images can be well-approximated by a sparse expansion in terms of a suitable basis, that is, by only a small number of non-zero coefficients. This is the key to the efficiency of many lossy compression techniques such as JPEG, MP3 etc. A compression is obtained by simply storing only the largest basis coefficients. When reconstructing the signal the non-stored coefficients are simply set to zero. This is certainly a reasonable strategy when full information of the signal is available. However, when the signal first has to be acquired by a somewhat costly, lengthy or otherwise difficult measurement (sensing) procedure, this seems to be a waste of resources: First, large efforts are spent in order to obtain full information on the signal, and afterwards most of the information is thrown away at the compression stage. One might ask whether there is a clever way of obtaining the compressed version of the Signal more directly, by taking only a small number of measurements of the signal. It is not obvious at all whether this is possible since measuring directly the large coefficients requires knowing a priori their location. Quite surprisingly, compressive sensing provides nevertheless a way of reconstructing a compressed version of the original signal by taking only a small amount of linear and non-adaptive measurements [5]. Image compression algorithms convert high-resolution images into a relatively small bit streams (while keeping the essential features intact), in effect turning a large digital data set into a substantially smaller one[4]. E. Cande's and M. Wakin proposed

Compressive sampling (CoSamp) is a new paradigm for developing data sampling technologies. It is based on the principle that many types of vector-space data are compressible, which is a term of art in mathematical signal processing [1].

III. RELATED WORK

Compressed sensing is a data sensing and reconstruction framework well-known for its simplicity of unifying the traditional sampling and compression for data acquisition. Compressed sensing is to compress the storage of correlated image datasets. The image is in compressed format that gives the reduction 50% in the storage. The uncompressed format it takes more storage in space. But it does not provide any security. OIRS aims to achieve a much more ambitious goal, which is an outsourced image service platform and takes into consideration of security, efficiency, effectiveness and complexity. Those works explore the inherent security strength of linear measurement provided by the process of compressed sensing. This secure image recovery service in OIRS that we propose to explore is also akin to the literature of secure computation outsourcing [3], [6], [18], [20], [2], which aims to protect both input and output privacy of the outsourced computations. The Fully Homomorphic Encryption is in the technique. The application of Homomorphic Encryption method on the Cloud Computing security, particularly the possibility to execute the calculations of confidential data encrypted. Homomorphic Encryption systems are used to perform operations on encrypted data without knowing the private key (without decryption), the client is the only holder of the secret key. When we decrypt the result of any operation, it is the same as if we had carried out the calculation on the raw data. Another existing list of work that loosely relates to (but is also significantly different from) our work is secure multiparty computation (SMC). SMC allows two or more parties to jointly compute some general function while hiding their inputs to each other. However, schemes in the context of SMC usually impose comparable computation burden on each involved parties, which is undesirable when applied to OIRS model. In short, practically efficient mechanisms with immediate practices for secure image recovery service outsourcing include are still missing.

IV. SYSTEM ARCHITECTURE

V. RELATED WORK

The OIRS system architecture consists of following model service that include the following: At first, data owner acquires raw image data, in the form of compressed image samples, from the physical world under different imaging application contexts.

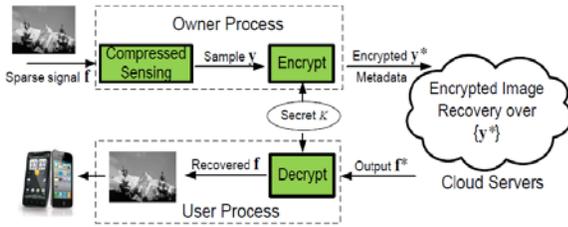


Fig. 1. The OIRS architecture in public cloud.

To reduce the local storage and maintain the data owner later outsource the image samples to the cloud for storage and processing. Depend on the request only the user can reconstruct the image. In this model data users are assumed to possess mobile devices with only limited computational resources.

Fig. 1 demonstrates the basic message flow in OIRS. Let f and y be the signal and its compressed samples to be captured by the data owner. For privacy protection, data owner in OIRS will not outsource y directly. Instead, he outsources an encrypted version y_* of y and some associated metadata to cloud. Next, the cloud reconstructs an output f_* directly over the encrypted y_* and sends f_* to data users. Finally, the user obtains f by decrypting f_* . We leave the management and sharing of the secret keying material K between the data owner and users in our detailed decryption of OIRS design. In Fig. 1, each block module is considered as the process of a program taking input and producing output. We further assume that the programs are public and the data are private.

VI. THE PROPOSED OIRS DESIGN

For security, OIRS needs to protect the image samples before outsourcing. The protected image samples should support image recovery as needed, while the recovered images at cloud should still be in an protected form. For these purposes, we study the secure transformation based approaches. Note that the 1-1-min of Prob (1) is essentially a linear program (LP) [2]: $\min \|T \cdot r, s.t. f = Ax, -r < x < r$. Here r is an $n \times 1$ vector of variables. Let $x+r-2s$ and $x-r-2t$.

Basic Requirements algorithm

Algorithm 1: Key Generation

Key Generation is a key generation algorithm running at the data owner side, which generates the secret key K upon getting input of some security parameter l .

Data: security parameter lk , random coins σ **Result:** $K = (P, Q, e, \pi, M)$

Begin

1. uses σ to generate random $P, e, \pi,$
2. uses σ to generate random Q and $M,$
3. return secret key $K = (P, Q, e, \pi, M),$

Algorithm 2: Problem Transformation Step 1 $\text{ProbTran}(K, \Omega) \rightarrow \Omega_k$. To better present our transformation in a flexible

way, we propose to separate the transformation described into two steps. Namely, we can define $\text{ProbTran} = (\text{ProbTran 1}, \text{ProbTran 2})$, where ProbTran1 takes as input the secret key K and y, F in original LP Ω and outputs a tuple y' in Ω_k , while ProbTran2 takes as input K and F and outputs tuples (F', π') in Ω_k .

Data: transformation key K and original LP Ω **Result:** protected sample y' in Ω_k

Begin 1. picks P, e from K and F from Ω , 2. return $y' = P \cdot (y + F \cdot e),$

Algorithm 3: Problem Transformation Step 2 $\text{ProbSolv}(\Omega_k) \rightarrow h$. Because our transformation based design outputs Ω_k as a standard LP problem, this algorithm on cloud side can be a general LP solver and thus its description is omitted.

Data: transformation key K and original LP Ω **Result:** protected coefficient matrices F', π' in Ω_k

Begin

1. picks (P, Q, π, M) in K and F in $\Omega,$
2. computes $F' = PFQ$ and $\pi' = (\pi - MF)Q,$
3. return transformed $F', \pi',$

Algorithm 4: Original Answer Recovery

$\text{DataRec}(K, h) \rightarrow g$. The user uses the secret key K to recover the original answer g for problem Ω from protected answer h of Ω_k returned by cloud upon getting input of the secret key K and the answer h of k from cloud.

Data: transformation key K and protected answer h of Ω_k

Result: answer g of original problem Ω

Begin

1. picks Q, e from $K,$
2. return $g = Qh - e,$

VII. EMPIRICAL EVALUATION

A. Experimental settings

We now show the experiment results of the proposed OIRS. We implement both the data owner/user and the cloud side processes in MATLAB and use the MOSEK optimization toolbox as the LP solver. All experiments are done on the same workstation with an Intel Core i5 CPU running at 2.90 GHz and 6 GB RAM.

B. Efficiency Evaluation

We first measure the efficiency of the proposed OIRS. Specifically we focus on the computational cost of privacy assurance done by the data owner and data users, i.e., the local side, and the cost done by the cloud side. The cloud solves it for the data user, who then performs a decryption process to get the original image data vector and then recover the image. For completeness, we report the time cost here. For 32x32 image block it is 0.009 sec on average, while for 48_48 image block size it is 0.021 sec on average.



(a) Input image



(b) Compression



(c) Encrypted image



(d) Decrypted image

VIII. CONCLUSION

In this paper, we have proposed OIRS, an outsourced image recovery service from compressed sensing with privacy assurance. OIRS exploits techniques from different, and aims to take security, design complexity, and efficiency into consideration from the very beginning the service low. With OIRS, data owners can utilize the benefit of compressed sensing to consolidate the sampling and image compression via only linear measurements. Data users, on the other hand, can leverage cloud's abundant resources to outsource the image recovery related ℓ_1 optimization computation, without revealing either the received compressed samples, or the content of the recovered underlying image. Beside its simplicity and efficiency, we show OIRS is able to achieve robustness and effectiveness in handling image reconstruction in cases of sparse data as well as non-sparse general data via proper approximation. Both extensive security analysis and empirical experiments have provided to demonstrate the privacy-assurance, efficiency, and the effectiveness of OIRS.

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Measuring Service Quality in M-commerce Context: A Conceptual Model

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Abstract- Due to the scant research in the area of m-commerce service quality, this study proposes a model for measuring the service quality of m-commerce in a commercial environment. In this study, a comprehensive analysis of the literature in the area of marketing, service quality (SQ), and information systems service quality was carried out to identify the inter-related factors that lead to the service quality of m-commerce. The various past measurement models of electronic service quality (e-SQ) were also reviewed. It was found that overall perceived service quality is determined by three dimensions, which are service quality, information quality, and system quality. The overall service quality will have an impact on customer satisfaction, which will then affect the customer behavioral intention. The study provides insights to researchers and practitioners in the area of m-commerce on the important inter-related dimensions and determinants for measuring service quality. The proposed m-commerce service quality model was developed by revising and modifying the SERVQUAL scale.

Index Terms- m-commerce, e-service quality, m-commerce service quality, e-service quality measurement, e-service quality factors.

I. INTRODUCTION

Information Technology (IT) has brought about many changes in the world, including in the industrial and service sectors. Most businesses nowadays depend on IT to manage their operations and develop products, as well as improve machinery, automation, and other processes involved in production (Ombati, Magutu, Nyamwange, & Nyaoga, 2010). Closely related to IT is the role of the Internet, which is evolving very rapidly. Many commercial activities, like sale of goods and services, are now conducted via the Internet. This is called Electronic commerce (e-commerce). However, e-commerce much depends on the availability of a wired network connection to the Internet. The limitation of wired technology is the lack of mobility, meaning that customers cannot enjoy the luxury of access at anytime and from anywhere; wireless technologies, however, have this advantage. Mobile technologies are not necessary to increase mobility, but they could reduce consumer need to travel about (Mallat, Rossi, Tuunainen, & Oorni, 2009). Moreover, consumers can quickly find out about a company's resources and services from anywhere and whenever they want (Suki, 2011). The buzzword is m-commerce (Sadi & Noordin, 2011). With this fast evolving trend, users of mobile devices are being looked upon as a large group of potential customers (Aungst & Wilson, 2005).

M-commerce studies can be categorized into technology and services, and cover issues such as small screens and multifunctional keypads, reduced power of computation, memory and disk capacity, shorter battery life, complicated mechanisms for text input, data storage and higher risk transaction errors, lower display resolution, less surfability, user unfriendly interfaces, unreliable network connections, and graphical limitations (Lu & Su, 2009; Siau, Lim, & Shen, 2001). Moreover, studies in m-commerce services mostly focus on providing customers and users with access to purchases on websites, including electronic flight tickets, and other modes of transportation, bank services, peer-to-peer payments, and parking fees payment, which are among the potential applications (Anckar & D'Incau, 2002; Herzberg, 2003; Kim, Mirusmonov & Lee, 2010; Mallat, Rossi, Tuunainen, & Öörni, 2009; Masterson, & Wei, 2005; Stafford & Gillenson, 2003). It is expected that customers' satisfaction with m-commerce services can be achieved through providing a high quality service. Since there seems to be a lack of studies in the m-commerce area, the researcher is motivated to find out what factors enable a high quality m-commerce service in the commercial environment.

Another important aspect in m-commerce, as in all other service sectors, is service quality (Lu, Zhang, & Wang, 2009; Turel & Serenko 2006). This is because quality services can fulfill customer needs (Dedeke, 2003). Service quality can impact a customer's behavioral intention and, eventually, intention to purchase, making it vital for successful business competition, both for the provider of the service and manufacturers (Bolton & Drew, 1991; Parasurman et al., 1988, 1991; Parasurman et al., 1994; Zeithaml et al., 1996). In Information and Communications Technology (ICT) service-quality field, researchers (e.g. Berry et al., 1994; Jiang et al., 2000; Kettinger & Lee, 1997; Pitt et al., 1995) have suggested five dimensions for measuring quality, which are: 1) tangibles, encompassing facilities, equipment, and personnel appearance; 2) reliability – the service must be able to deliver what it promises, accurately; 3) responsiveness, measured by the willingness to help end-users promptly; 4) assurance, referring to the employees' knowledge and politeness and also their ability to gain the confidence and trust of customers; and 5) empathy – individual attention and care given to end-users by the service provider.

Previous research on ICT service quality can help in the understanding of m-commerce service quality. The mobile device is not merely a communication tool but has increasingly become a tool for online commerce. Hence, it is crucial that the service providers understand the consumers' perception of m-commerce quality and undertake measures to ensure continued provision of service quality for m-commerce users (Lu, Zhang &

Wang, 2009). Nevertheless, there is scant research in the area of m-commerce service quality. Therefore, there is an increasing need to focus on the factors that can ensure the service quality of m-commerce (Lu, Zhang, & Wang, 2009; Turel & Serenko 2006). In addition, a number of researchers (e.g. Lu, Zhang, & Wang, 2009; Turel & Serenko 2006) asserted that it is necessary to explore service quality, customer satisfaction, and customer behavioral intentions and their inter-relationship in using m-commerce services in future. Such a study would benefit vendors, providers, and researchers in services technology in their attempts to measure customers' satisfaction and to understand its underlying dimensions. It will also enable service providers to benchmark their performance and identify areas that require improvement to ensure continuous usage of the available m-commerce services.

This study proposes a service quality model for m-commerce in a commercial environment. A comprehensive analysis of the literature in the area of marketing, service quality (SQ), and information systems service quality was carried out to identify the inter-related factors that lead to the service quality of m-commerce in a commercial environment. The various past measurement models of electronic service quality (e-SQ) are also reviewed. Dependent and independent variables as well as their potential relationship are also identified from the literature analysis to form the conceptual model.

II. THEORETICAL BACKGROUND

2.1 Conceptualization of Service Quality

Service Quality (SQ) is a critical factor and noted lately as the measure of effectiveness and efficiency in organizational performance. It has also become an important part of the discourse on the web among academics and practitioners, especially those in the service marketing areas (Jensen & Markland, 1996). Many service organizations seek profitable ways to differentiate themselves from other organizations and gain a lasting competitive advantage by improving relative SQ. Therefore, an organization providing higher quality of service can have higher market share and higher returns on investment and, finally, can gain long-term profitability (Buzzell & Gale, 1987; Ghobadian, Speller, & Jones, 1994; Margolies, 1988). Accordingly, it is pertinent for practitioners and academics to be informed about SQ, in terms of its definition and measurement (Asubonteng et al., 1996). In the modern marketing literature, most definitions of quality have focused on consumer perceptions of service, product excellence, and satisfaction of consumer requirements (Ghobadian et al., 1994; Gronroos, 1982; Parasuraman et al., 1985, 1988). From this perspective, perceived SQ has been defined as "a global judgment, or attitude, relating to the superiority of the service" (Parasuraman et al., 1988), and as "the consumer's overall impression of the inferiority/superiority of the organization and its service" (Bitner & Hubbert, 1994). Generally, perceived SQ is seen as the resulting direction and degree from comparing actual perceptions of service performance with consumer expectations (Parasuraman et al., 1988; Zeithaml, Parasuraman, & Berry, 1990). Parasuraman et al. (1988) defined consumer expectation using the SQ perspective as: "desires or wants of consumers, what they feel a service provider should offer rather than would

offer". Most SQ research has been based on product satisfaction, especially on the disconfirmation paradigm. This paradigm has been used to evaluate the level of consumer satisfaction with the chosen product or service, and is operationalized in terms of the comparison between consumer expectation and perceived performance of the product or service.

On the basis of the disconfirmation paradigm, Parasuraman et al. (1988) developed SERVQUAL as an instrument used for the measurement of consumer perception of overall SQ. Five dimensions of SQ were identified: 1) tangibles; 2) reliability; 3) responsiveness; 4) assurance; and 5) empathy. The SERVQUAL instrument has been vastly utilized and applied as a global scale in measuring the perceived SQ for a variety of service industries, with both managers and academics (Babakus & Boller, 1992; Crompton & MacKay, 1989; Cronin & Taylor, 1992; Johnson, Dotson, & Dunlap, 1988; Webster, 1989; Woodside et al., 1989). Nevertheless, later researches in some service settings suggested that the SERVQUAL instrument is inappropriate for the measurement of SQ across industries (Asubonteng et al., 1996; Babakus & Boller, 1992; Bolton & Drew, 1991; Bowers, Swan, & Koehler, 1994; Brown, Churchill, & Peter, 1993; Buttle, 1996; Carman, 1990; Cronin & Taylor, 1992; Finn & Lamb, 1991; McAlexander et al., 1994; McDougall & Levesque, 1995; Rowley, 1996).

1.2 Conceptual Foundations of Electronic Service Quality (E-SQ)

From the fields of marketing and information systems, the theories used to explain web SQ can be drawn. These theories are related to attitude, such as Attribution Theory (Heider, 1958), Expectancy-Value Theories, Learning Theories (Fishbein, 1963), and the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975). TRA holds that when behavior is viewed as positive (attitude), and there is preference for others' belief in the performance of the behavior (subjective norm), the intention (motivation) will be greater in instilling a behavior in such a way that there is more possibility to act.

The terms website SQ and online SQ have been used interchangeably by researchers (Aladwanian & Palvia, 2002; Lee & Lin, 2005; Piccoli et al., 2004; Riel et al., 2001; Zeithaml, 2002). As one of the pioneers who introduced the concept of e-SQ, and examined the SQ of websites as well as their role in SQ delivery to customers, Zeithaml (2002) defined e-SQ and website SQ as "the extent to which a website facilitates efficient and effective shopping, purchasing and delivery of products and services". Based on this definition, the quality of a website is to provide sufficient service to customers to shop comfortably and confidently, and to expect fast delivery and reliable service. In order to achieve this, companies should understand clearly customers' perceptions of SQ (Zeithaml et al., 2002).

The dimensions of E-SQ determined by previous researchers, including Gounaris and Dimitriad (2003), Novak et al. (2000), and Loiacono et al. (2002), have their origin in the Technology Acceptance Model (TAM) theory developed by Davis (1989). Davis defined perceived technology ease of use as "the degree to which the prospective user expects the target system to be free of effort". He further perceived technology usefulness as "the degree to which a person believes that using a particular system would enhance his or her job performance".

These dimensions can help companies to predict the behavior of consumers when they decide to use a specific technology. It is argued that the ease of use of a particular system affects its adoption by customers (Davis, 1989; Davis et al., 1989; Legris et al., 2003). Zeithaml et al. (2002) described eight criteria used by customers when they evaluate e-SQ and the quality of websites. These criteria are: 1) Information availability, which can help consumers search for any relevant information on any products they are interested in enquiring about; 2) Ease of use/usability, which implies the easiness of using the web site, including downloading speed, design, and organization; 3) Privacy/security, this being the protection of personal information of customers such as hiding their personal information from other websites, shielding identity, and offering informed consent. As far as security is concerned, it refers to protecting users from the risk of fraud and financial loss when they use their credit card or any other financial information. Security also concerns the provision of data confidentiality, security auditing, encryption, and anti-virus protection; 4) Graphic style refers to the attributes of a website in terms of choice of colors, size and type of the print, layout, graphics, photographs, 3D-effects animation, and multimedia; 5) Fulfillment/reliability relates to the company's actual performance, and not the website performance. It is defined as the ability to provide a product or service under agreed terms; 6) Access is the ability to reach quickly the company website; 7) Responsiveness is how quickly a company responds to customers; and 8) Personalization is the ability of the website to address customers' preferences by providing personalized and customized services. Zeithaml et al. (2002), in another exploratory study, categorized the criteria into four core and three recovery dimensions that are used in measuring the customers' perceptions of e-SQ. The core dimensions are the following: 1) Efficiency measures the ability of the customers to access the website and check any relevant information effectively with minimal effort; 2) Fulfillment is the company's actual performance in terms of service promise accuracy, the in-stock product availability, and delivery time; 3) Reliability refers to the accurate technical functioning and the service promises of the website; 4) Privacy defines the degree to which a company is able and willing to sustain the integrity of customer data. The main concern of the three recovery dimensions is with the problem that needs resolving and requires a "personal service". These recovery dimensions are: 1) Responsiveness – the ability of the company to provide processes that can easily solve problems; 2) Compensation – money-back guarantee, handling costs, and return of shipping; 3) Contact points – the ability of the company to offer live contact and real-time support for the customers through any communication means (online or otherwise). In the same vein, Parasuraman (2004) suggested that 11 criteria of e-SQ influence the perceptions of the customers about website quality and e-SQ. These criteria are: Ease of navigation, Access, Customization/personalization, Efficiency, Responsiveness, Security/privacy, Assurance/trust, Site aesthetics, Reliability, Knowledge on price, and Flexibility.

Cronin and Taylor (1992) examined the causal relationships between SQ, customer satisfaction, and behavioral intention, measuring each variable with one item. A total of 660 usable questionnaires were collected randomly for the examination of

the causal relationship between the three variables mentioned above. The questionnaires were from customers of four types of businesses in the south-eastern USA: banking, dry cleaning, pest control, and fast food. The correlation analysis result suggested that: 1) SQ is an antecedent of consumer satisfaction; 2) SQ has less effect on purchase intentions than does consumer satisfaction; and 3) consumer satisfaction has a significant effect on purchase intentions. Dabholkar et al. (2000) revealed that customer satisfaction is a strong mediating factor for the effect of SQ on behavioral intentions. The data used in their own study were systematically and randomly collected from 397 churches. A test of discriminant validity showed that the SQ's construct is not the same as the construct of customer satisfaction. The result of regression analysis done in structural equations modeling supports their proposition that customer satisfaction influences more behavioral intentions than SQ (Dabholkar et al., 2000).

The SQ literature indicated that perceptions of high SQ and high service satisfaction resulted in a high level of purchase intentions (Boulding et al., 1993; Cronin & Taylor, 1992; Taylor, 1997; Taylor & Baker, 1994; Zeithaml et al., 1996). Coner and Gungor (2002) argued that customer loyalty is affected by product quality, SQ, and retailer image. They also suggested that quality of product and service are directly related to customer satisfaction, leading to customer loyalty. The literature on customer satisfaction shows that the relationship between customer satisfaction and customer behavioral intention is dependent on the type of satisfaction. There is a strong positive impact on customer behavioral intention by satisfaction manifestation. This is also stronger than that of latent satisfaction on customer behavioral intention (Bloemer & Kasper, 1995; Bloemer & De Ruyter, 1995). Based on the results of the empirical studies, customers' SQ is one of the antecedents of satisfaction, in the sense that if there is SQ, there is a possibility for obtaining customer satisfaction (Anderson & Sullivan, 1993; Cronin & Taylor, 1992, 1994; Reidenbach & Sandifer-Smallwood, 1990; Spreng & Mackoy, 1996; Woodside, Frey, & Daly, 1989). This satisfaction can result in customer's loyalty intention to the service provider (Coner & Gungor, 2002; Cronin & Taylor, 1992, 1994; Dabholkar, Shepherd, & Thorpe, 2000).

III. CONCEPTUAL RESEARCH MODEL

A broader examination of empirical literatures in the area of marketing, service quality (SQ), and information systems service quality brings the proposed conceptual model of this study to the fore. The various past measurement models of electronic service quality (e-SQ) are presented. Moreover, a broad outline of the underlying theoretical concepts is provided. This study found that m-commerce in an academic environment is a new area of research and it is very difficult to find related studies, supported by evidence, that focus on service quality, customer satisfaction, and their influences on customer behavior intentions in the m-commerce environment. However, similarities between mobile and e-services can be expected since both are Internet-based. In this research, much attention is paid to the measurement model of service quality in m-commerce based on the well-known SERVQUAL model. Many previous studies related to service quality suggest that it is necessary to add and modify items of the SERVQUAL scale, developed by Parasuraman et al. (1985,

1988), and to create a unique and comprehensive conceptual model of service quality, depending on the nature of the service sector under investigation (Carman, 1990; Cronin & Taylor, 1992; 1994; Finn & Lamb, 1991; Parasuraman & Grewal, 2000). Based upon this suggestion, the present study proposes a multi-dimensional model of service quality for m-commerce and outlines the relationships between service quality and other significant constructs. To understand and organize the m-commerce services quality in a structured manner, for theoretical purposes, it is organized by dimensions and sub dimensions taking into account that mobile services can be considered a subgroup of electronic services. The sub dimensions adopted in this study are website design, reliability, responsiveness, trust, personalization, perceived risk, perceived cognitive control, content usefulness, content adequacy, ease of use, accessibility, interactivity, and perceived website innovativeness. The adoption of these dimensions is suitable because they seem to have an influence on the customer's overall perception about m-commerce service quality and customers' satisfaction. This will then affect the formation of his/her behavioral intention. The overall service quality was determined by three dimensions – service quality, information quality, and system quality – which are described next.

Service quality: customers' attitude formed by a long-term, overall evaluation of an m-commerce performance. The dimensions of service quality are measured using seven sub-dimensions: website design, reliability, responsiveness, trust, personalization, perceived risk, and perceived cognitive control.
Information quality: customers' perception of the quality of information presented on a mobile commerce application. The dimension of information quality is measured by two sub-dimensions: content usefulness and content adequacy.
System quality: this refers to customers' perception of a mobile commerce application performance in information retrieval and delivery. The dimension of system quality is measured by four sub-dimensions: easy of use, accessibility, interactivity, and perceived website innovativeness.

3.1 *Service Quality Dimensions*

The first dimension, website design, refers to the appearance of a mobile portal and is consistent with the tangibility dimension in the SERVQUAL model. While Parasuraman et al. (1988) defined a tangible dimension as the physical appearance, such as facilities, equipment, and personnel, many researchers replaced this definition with that of the website user required for adapting to the e-service context (Aladwani & Palvia, 2002; Lee & Lin, 2005; Loiacono et al., 2002; O' Cass & Carlson, 2012; Riel et al., 2001; Udo, Bagchi & Kirs, 2010; Wolfinbarger & Gilly, 2003). In this context, the literature suggests that there is a potential positive relationship between website design and overall customer perceived service quality.

The reliability dimension in the SERVQUAL model is composed of dependability, consistency, and accuracy of promised service performance (Parasuraman et al., 1988). New service-delivery studies, with options of computer technology, realized that dependability of performance and consistency are important dimensions in measuring SQ, because the user's consideration of performance risks is based on new technology service (Cox & Dale, 2001; Dabholkar, 1996; Davis, Bagozzi, & Warshaw, 1992). This is relevant to m-commerce services as

customers are always on the move and often in time-critical situations. Therefore, it can be seen that there is a potential positive relationship between reliability and overall customer perceived service quality.

The third dimension is responsiveness, which is similar to the responsiveness dimension in the SERVQUAL model. The SERVQUAL model (Parasuraman et al., 1988) defines responsiveness as employees' willingness to provide a prompt service and to deal with consumer complaints. According to Wang (2003), "responsiveness" is a measure of the company's ability to support customers with the appropriate information when a problem occurs. It is also the mechanism that handles returns, and has the capacity to execute arrangement for online guarantees. Responding quickly to customers' request indicates that the company is customer-oriented. Subsequently, this can subdue the issue of uncertainty and thus increase the perceived convenience of customers (Gummerus et al., 2004; Wolfinbarger & Gilly, 2003). Henceforth, it can be concluded that there is a possible positive relationship between responsiveness and overall customer perceived service quality.

Lynch and Lundquist (1996) noted that e-service, with much academic discourse surrounding security, privacy, and confidence, centers on trust. This is similar to the assurance dimension in the SERVQUAL model. Kimery and McCard (2002) argued that "trust is the user's willingness to accept the vulnerability of an online transaction based on their positive expectations regarding future online provider behaviors". Reichheld and Scheffer (2000) pointed out that trust is a significant antecedent of participation in online settings because of the increased ease with which online transaction can behave opportunistically. Therefore, it is proposed that there will be a positive relationship between trust and overall customer perceived service quality.

Personalization in relation to SQ is defined as caring, individualized attention for the consumer and subject knowledge of employees (Parasuraman et al., 1988). Riel et al. (2001) additionally define personalization, in the e-service context, as the degree of customization of communication and service provider awareness of consumer needs in the e-service context. Personalization is a key feature of most e-commerce and m-commerce business models because it offers real values for a customer and creates a perception of high-quality service. At the heart of personalization is satisfying the unique needs of each customer (Huang & Lin, 2005; Riel et al., 2001). Therefore, it is possible that there is a positive relationship between personalization and overall customer perceived service quality.

Risk, from the e-customers' perception, is one of the major hindrances to online shopping. As a result, major m-commerce firms have endeavored to address risk associated with security technologies, awareness campaigns, and assurance policy statements (Chang et al., 2005; Liao & Cheung, 2002; Lopez-Nicolas & Molina-Castillo, 2008; Shih, 2004). System failure is part of perceived risk and is often associated with a loss. Therefore, understanding how perceived risk influences e-SQ and e-customer satisfaction is easy. Lopez-Nicolas and Molina-Castillo (2008) and Gefen et al. (2003) state that perceived risk influences shopping behavior and e-purchasing intentions. The implication is that the higher the perceived risk, the less likely is an e-customer's intention to purchase. Therefore, it can be said

that there is a negative relationship between perceived risk and overall customer perceived service quality.

Perceived cognitive control depicts a cognitive state of flow experience and generally refers to the belief that the person has, at his or her disposal, a response that can influence an event (Ajzen, 1991). Among others subtle dimensions of perceived control (Ajzen, 1991), cognitive control is said to be an essentiality. Cognitive control requires a person to predict probable sequences of an event and also understand the implications of those consequences. Cognitive control reduces uncertainty (Imada and Nageishi, 1982), and increases the service value perceived by the customers (Bateson, 1985). Also, it clarifies a situation, particularly regarding the need for service involvement (Botvinick et al., 2001). In a retail setting, a customer's perceived cognitive control should evoke affect, because perceived control closely associates with the customer's judgment of whether the environment will facilitate or frustrate his or her goal achievement (Ward and Barnes, 2001). Therefore, it is concluded that there is a potential positive relationship between perceived cognitive control and overall customer perceived service quality.

3.2 Information Quality Dimensions

Scholars in the area of traditional computing settings have established well-known models to measure information quality. In a study on the determinants of IS success, DeLone and McLean (1992) assumed that IS success is measured by SQ and information quality. DeLone and McLean (1992) highlighted the importance of relevance, timeliness, and accuracy of information. In the same vein, Doll and Torkzadeh (1988) and Doll, Xia, and Torkzadeh (1994) also emphasized three determinants of user satisfaction: content, accuracy, and timeliness. The dimensions suggested in these two studies and others (Aladwania & Palvia, 2002; Belcher et al., 2000; Bitner et al., 2000; Kaisara and Pather, 2011; Koller 2001; Loiacono et al., 2002; Shemwell & Yavas, 1999; Udo, Bagchi & Kirs, 2010) could be classified into content usefulness and content adequacy.

Content usefulness: This refers to the reliability, value, currency, and accuracy of information. To be specific, relevancy and clearness are the concern of information value. Information reliability is defined as the accuracy, dependability, and consistency of the information, while Information currency is interested in the information timeliness and continuous update. Information accuracy describes the extent to which the system information is free from error. Henceforth, it can be assumed that there will be a positive relationship between content usefulness and overall customer perceived service quality.

Content adequacy: This is the extent of information completeness. Mobile portals should provide information so as to aid the understanding of the customers as regards the materials and services offered. Additionally, the customers are in need of supplementary services like: professional advice from the providers, useful information, hyperlinks to relevant sites, and contact and promotion information. Therefore, it is deduced that there will be a positive relationship between content adequacy and overall customer perceived service quality.

3.3 System Quality Dimensions

Davis et al. (1992) defined ease of use as "the degree to which a person believes that using a particular system would be free of effort". Teo (2001) defined it as "the degree to which the

user expects the use of the system to be user friendly". In the m-commerce environment, what can be used to describe adoption and use of a system increases if there is ease when the system is used to find the customers' needs, and support services are available (Costabile et al., 2005; Uther, 2002). In summary, "ease of use" plays a vital role in customers' perceived mobile SQ (Costabile et al., 2005; Lin & Hsieh, 2011; Papanikolaou & Mavromoustakos, 2006; Udo, Bagchi & Kirs, 2010;). Consequently, it is assumed that there will be a positive relationship between ease of use and overall customer perceived service quality.

Accessibility, in traditional marketing literature, speed of delivery, is defined as the time it takes to perform the service actively (Dabholkar, 1996). Maister (1985) argued that if consumers perceive that service is delivered quickly, they are likely to evaluate the service more highly. In the e-services environment, speed of access may also be an important factor to lure users to a particular website (Cho & Park, 2001; Sohn, 2000). Therefore, it is proposed that there is a positive relationship between accessibility and overall customer perceived service quality.

The third dimension for measuring system quality is interactivity, which refers to the interactive relationship between the provider, customers, and other customers on the m-commerce portal, through e-mail communication methods and discussion group activities. According to Wang (2003), Papanikolaou and Mavromoustakos (2006), Aldridge and Rowley (1998), Yang et al., (2005), Kaisara and Pather (2011), Ding et al., (2011), and Papadomichelaki and Mentzas (2012), communication methods, like e-mail and discussion groups, are important tools for customers to use in communicating complaints and inquiries to the provider. Therefore, interactivity is one of the substantial dimensions of the mobile SQ, and has significant positive impacts on the customers' perceived SQ and satisfaction (Aldridge & Rowley, 1998; Ding et al., 2011; Kaisara & Pather, 2011; Kim & Ong, 2005; Papanikolaou & Mavromoustakos, 2006; Papadomichelaki & Mentzas, 2012; Santos, 2003; Siau, & Shen, 2003; Wang, 2003; Yang et al. 2004). Consequently, it is deduced that there is a possible positive relationship between interactivity and overall customer perceived service quality.

The last dimension for measuring system quality is perceived website innovativeness. Prior offline branding studies have shown that based upon their perception of brands, consumers respond to the product or service by, for example, finding it useful/useless, identifying they like/dislike it, or they may approach/avoid buying it (Bloch, 1995; Mono, 1997). In the context of this study, the researchers argue that once a customer makes an assessment that the provider's website-service experience is innovative, he or she will then be more likely to evaluate the website as having delivered a quality e-service. Therefore, it is said that there is a possible positive relationship between perceived website innovativeness and overall customer perceived service quality.

3.4 The Relationships between Service Quality, Satisfaction, and Behavioral Intention

In the research literature, there are three different relationships between SQ, consumer satisfaction, and behavioral intention. In the first approach, satisfaction is an antecedent of perceived SQ (Satisfaction → SQ) and SQ directly influences

behavioral intentions (SQ → Behavioral Intention) (Bitner, 1990; Bitner & Hubbert, 1994; Bolton & Drew, 1991; Mohr & Bitner, 1995; Oliver, 1981; Zeithaml, Berry, & Parasuraman, 1996). In the second approach, SQ is modeled as an antecedent of satisfaction (SQ → Satisfaction) and satisfaction directly influences behavioral intentions (Satisfaction → Behavioral Intention) (Anderson, et al., 1994; Anderson & Sullivan, 1993; Cronin & Taylor, 1992; Gotlieb, et al., 1994; Taylor & Baker, 1994). In the final approach, the relationship between SQ and satisfaction is not recursive (SQ ↔ Satisfaction); that is, neither SQ nor satisfaction is an antecedent of the other (McAlexander et al., 1994; Taylor & Cronin, 1994). Because of the absence of empirical support for the first and third approaches, and the relatively strong empirical support for the second approach, the second approach (SQ → Satisfaction →

Intention) is applied to the proposed conceptual model for this study. The direct paths from both overall SQ to customer satisfaction, and the direct path from customer satisfaction to behavioral intention on the m-commerce services, are specified in the proposed conceptual model. Therefore, it is deduced that that the customer perception of overall service quality can directly influence the level of customer satisfaction. In addition, it is also deduced that the level of customer satisfaction will directly influence the behavioral intention.

The comprehensive literature review and the in-depth discussions mentioned above provide us with a foundation for developing the theoretical model for customer perceived service quality, customer satisfaction, and their impacts on behavioral intentions of customers as presented in Figure 1:

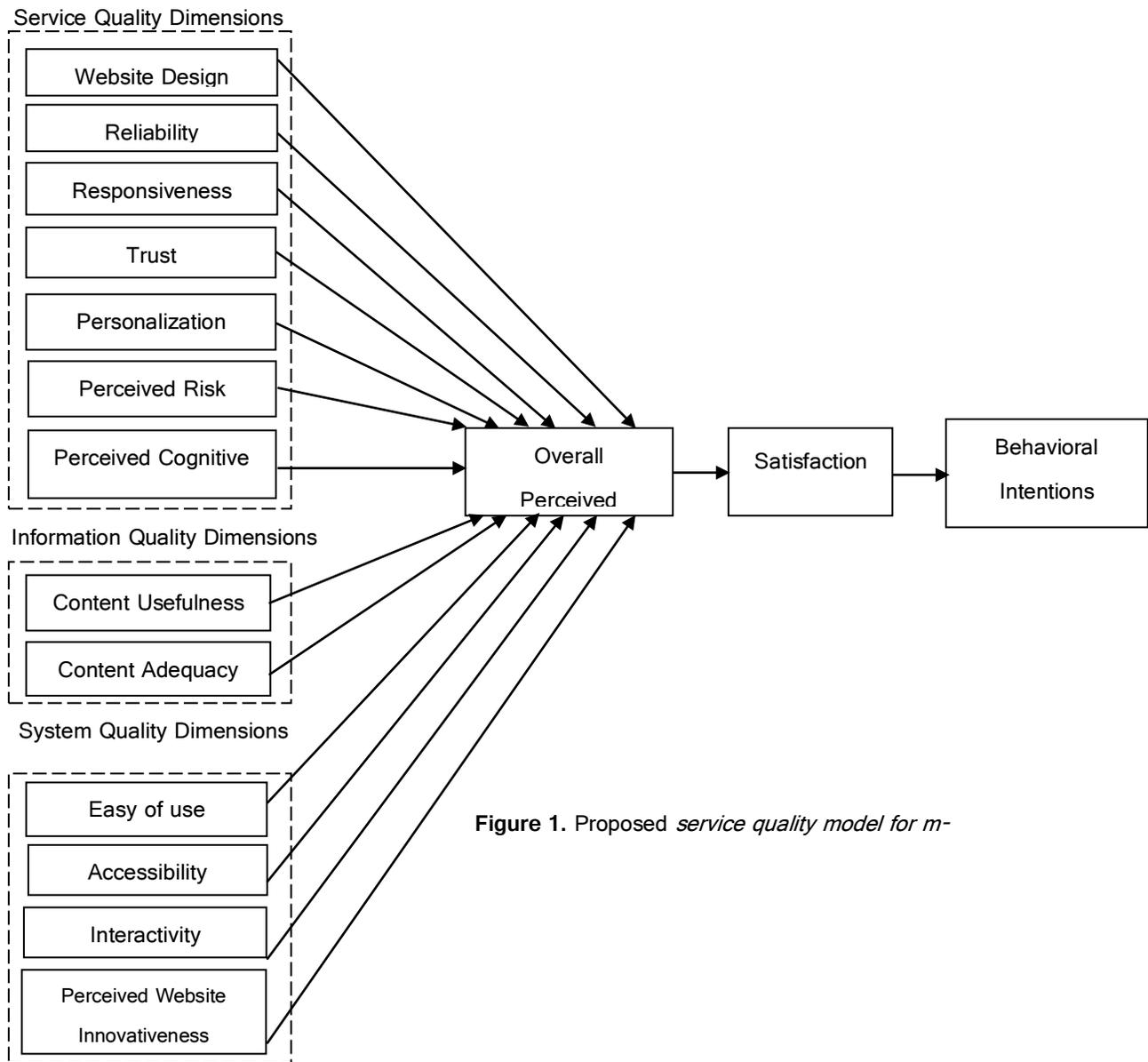


Figure 1. Proposed service quality model for m-

IV. DISCUSSIONS AND CONCLUSION

Based on a comprehensive review of empirical literatures in the area of marketing, service quality (SQ), and information systems service quality, the present study proposed a multi-dimensional model of service quality for m-commerce. In this model, which also includes the relationships between service quality and other significant constructs, it is proposed that overall perceived service quality is determined by three dimensions, which are Service Quality dimensions (reliability, responsiveness, trust, personalisation, perceived risk, and perceived cognitive control), Information Quality dimensions (content usefulness and content adequacy), and System Quality dimensions (Ease of use, accessibility, Interactivity, and perceived website innovativeness). The overall perceived service quality will then have an impact on satisfaction, and satisfaction will consequently shape the behavior of the customers.

In the process of developing this model, much attention is given to the measurement model of service quality in m-commerce based on the well-known SERVQUAL model. This is in line with the recommendations from many scholars (e.g. Carman, 1990; Cronin & Taylor, 1992; 1994; Finn & Lamb, 1991; Parasuraman & Grewal, 2000), who suggest that the SERVQUAL scale, developed by Parasuraman et al. (1985, 1988), should be modified and revised to suit a particular environment and the nature of the service sector under investigation.

Nonetheless, the proposed model is developed based only on a theoretical perspective. The model will have to be tested empirically in order to measure its practicality and robustness. Henceforth, the model will be more conclusive and the contribution to the research area much more significant.

Despite its limitation, this study provides understanding, specifically to the organizations, companies, and their respective clients, of the strengths and benefits of m-commerce service quality. Thus, it will help to create awareness and new knowledge regarding the importance of using mobile phones for commercial purposes among customers and vendors, hence serving as a long-term benefit to them. A better understanding and practice of m-commerce would increase ability in the purchasing power of customers and the efficiency of businesses. Moreover, this study could increase the understanding of the determinants of m-commerce service quality by customers and vendors, so that users' behavioral intention can benefit the m-commerce vendors. The users could also benefit from the research by knowing how to select the appropriate m-commerce vendors who can provide the m-commerce service quality that they seek. Other than this, the study can assist top management to develop and provide appropriate strategies to support m-commerce.

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Design and Implementation of SDRAM controller based Digital Watermarking with combined DWT-DCT Technique on FPGA

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Abstract- Safeguarding creative content and intellectual property in a digital form has become increasingly difficult as technologies, such as the internet, broadband availability and mobile access advance. It has grown to be progressively easier to copy, modify and redistribute digital media, resulting in great declines in business profits. Digital watermarking is a technique which has been proposed as a possible solution to this problem. Digital Watermarking is a technology which is used to identify the creator, owner, distributor of a given video or image by embedding copyright marks into the digital content, hence digital watermarking is a powerful tool used to check the copy right violation. A robust watermarking technique based on DWT (Discrete Wavelet Transform), DCT (Discrete Cosine Transform) and combined DWT-DCT is presented. In these techniques the insertion and extraction of the watermark in the gray scale image is found to be simpler than other transform techniques. All three methods are simulated using two watermarking algorithms. The performance of the two algorithms is evaluated by applying various attacks on the watermarked image and results tabulated. This paper describes SDRAM control which enhances the overall performance.

Index Terms- DWT, DCT, SDRAM.

I. INTRODUCTION

Digital watermarking can be defined as the process of embedding a certain piece of information (technically known as watermark) into multimedia content including text documents, images, audio or video streams, such that the watermark can be detected or extracted later to make an assertion about the data [14]. In the digital watermarking system, information carrying the watermark is embedded in an original image. The watermarked image is transmitted or stored, and then decoded to be resolved by the receiver. The goal of the watermarking system is not to restrict access to the original image, but to ensure that embedded data remain recoverable. The essential factors of a good watermarking scheme are robustness, imperceptibility, watermark capacity and security. Robustness refers to the ability to survive intentional attacks as well as accidental modifications, for instance, lossy compression, and noise insertion, region cropping, local and global geometrical transformations.

Imperceptibility or fidelity refers to the perceptual similarity between the watermarked image and its cover image. Watermarking methods with highly complex algorithms that incur more computational costs compared to low complexity. Higher robustness often offsets imperceptibility of a watermark [3]. The number of watermark bits encoded in a message is data payload and the maximum repetition of data payload within an image is the watermark capacity. A watermark may have higher capacity but lower data payload. Higher capacity would compromise its imperceptibility because more modifications to the cover image are needed to embed the watermark. Many of the watermark properties have conflicting characteristics. Therefore, designing a watermarking method usually requires finding a balance among these conflicting factors. The main focus is on image watermarking. Image watermarking can be done in the spatial domain as well as in the frequency domain. The most common and the simplest watermarking technique in the spatial domain is the least significant bit (LSB). The watermark to be embedded is placed in the LSB of the source image. Spatial domain methods are less complex as no transform is used, but are not robust against attacks. To obtain better imperceptibility as well as robustness, the addition of the watermark is done in a transform domain/frequency domain. DCT and DWT are popular transforms widely used in transform based watermarking. Frequency based techniques are robust against attacks involving image compression and filtering, because the watermark is actually spread throughout the image, not just operating on an individual pixel [11]. Frequency domain methods are similar to spatial domain watermarking in that the values of selected frequencies can be altered. Because high frequencies will be lost by compression or scaling, the watermark signal is applied to lower frequencies, or better yet, applied adaptively to frequencies containing important elements of the original picture. Upon inverse transformation, watermarks applied to frequency domain will be dispersed over the entire spatial image, so these methods are not as susceptible to defeat by cropping as the spatial technique.

II. LITERATURE SURVEY

Digital watermarking can be defined as the process of embedding a certain piece of information (technically known as watermark) into multimedia content. Watermarking techniques can be divided into four categories according to the type of document to be watermarked, their working domains, based on human perception and area of application [14]. To understand watermarking methods and determine their applications, one needs to know the properties of digital watermarks. The fundamental properties include: robustness, imperceptibility and computational cost [3]. Watermarks added to digital content serve a variety of purposes. The applications include owner identification, copy protection, finger printing, content authentication, broadcast monitoring, medical applications etc [14]. In order to resist attacks, many approaches to robust watermarking have been investigated throughout the years. Some of them can be implemented in the spatial domain while others utilize the frequency domain. The frequency domain includes DFT, DCT, DWT and many others. With the standardization process of JPEG2000 and the shift from DCT to wavelet based image compression methods, watermarking schemes operating in wavelet transform domain have become more interesting. The proper selection of the frequency transform is dependent on the fact, the better the image transform approximates the properties of the HVS (Human Visual System) the easier is to put more energy in the embedded signal without causing perceptible distortion [6]. According to the HVS the high frequencies are less visible than the low frequencies. The wavelet transform is used because it is more close to the Human Visual System than DCT. Wavelet-based watermarking methods exploit the frequency information and spatial information of the transformed data in multiple resolutions to gain robustness [14]

III. WAVELET TRANSFORM

Wavelet transforms are the most powerful and most widely used tools in the field of image processing due to its flexibility in representing non-stationary image signals and its ability in adapting to human visual characteristics. A wavelet transform divides a signal into a number of segments, each corresponding to a different frequency band. The wavelet transform can be broadly classified into continuous and discrete wavelet transform. For long signals, continuous wavelet transform can be time consuming since it needs to integrate over all times. To overcome the time complexity, discrete wavelet transform was introduced. Discrete wavelet transforms can be implemented through sub-band coding. The DWT is useful in image processing because it can simultaneously localize signals in time and scale, whereas the DFT and DCT can localize signals only in the frequency domain [11].

Frequency transform is a powerful tool that has been available to signal analysts for many years. It gives information regarding the frequency content of a signal. However, the problem with using Fourier transform is that frequency analysis cannot offer both time resolution and frequency resolution at the same time. A Fourier transform does not give the time at which a particular frequency has occurred in the signal. Hence, a Fourier transform is not an effective tool to analyse non-stationary signal. To overcome this problem, windowed Fourier transform, or short time Fourier transform, was introduced. Even though a short time Fourier transform has the ability to provide time resolution, multi-resolution is not possible with the short time Fourier transforms. Wavelet is the answer to the multi-resolution problem. A wavelet has the property of not having a fixed-width sampling window.

IV. DIGITAL IMAGE WATERMARKING

DWT Image Water marking: Wavelet based watermarking methods exploit the frequency information and spatial information of the transformed data in multiple resolutions to gain robustness [9]. The wavelet transform is closer to the human visual system since it splits the input image into several frequency bands that can be processed independently. It is a multi-resolution transform that permits to locate image features such as smooth areas, edges or textured areas.

DCT Image Watermarking: Discrete Cosine Transform (DCT) is a Fourier-related transform similar to the discrete Fourier transform (DFT), but using only real numbers to orderly express data points in terms of a sum of cosine functions oscillating at

different frequencies. DCT is equivalent to DFT of roughly twice the length, operating on real data with even symmetry, wherein some variants of the input and/or output data are shifted by half a sample. Discrete Cosine Transform is a general orthogonal transform for digital image processing and signal processing, with advantages such as high compression ratio, low bit error rate, good information integration ability and good synthetic effect of calculation complexity.

Combined DWT-DCT Image Watermarking: Further performance improvements in DWT-based digital image watermarking algorithms could be obtained by combining DWT with DCT. The idea of applying two transform is based on the fact that combined transforms could compensate for the drawbacks of each other, resulting in effective watermarking. Watermarking is done by altering the wavelet coefficients of carefully selected DWT sub-bands, followed by the application of the DCT transform on the selected sub-bands. In this method, the benefits of DWT is to choose the most proper sub-bands in case of robustness and imperceptibility. Then, the block based DCT is applied on these selected band to embed watermark in middle frequencies of each block to augment further robustness of watermarked image against different attacks. In fact by combining the two common frequency methods, we take the advantage of both the algorithms to increase robustness and imperceptibility. At the same time, we suppress the effect of attack that is designed for each of these frequency methods such as jpeg and jpeg2000 compression [2].

V. RESULTS

The project is implemented in NI LABVIEW and standard database gray-scale images are used for testing. In this process two gray-scale images, “Cameraman” image is used as original host image and the “Iris flower” image is used as the watermark. Both the images are of equal size of 256x256. The performance evaluation is done by two performance evaluation metrics: Perceptual transparency and Robustness. In our experiments for additive modification and alpha blending techniques, we performed fidelity tests to analyse the unobtrusiveness of the watermarks after watermark embedding, whether perceptual distortion occurred to the host images or not. Also different attacks like noise, rotation, compression were applied on the watermarked images and the visual quality of watermarked and attacked images was measured using the Peak-Signal-To-Noise Ratio (PSNR) and Mean Square Error (MSE) between the original and distorted images. For our results we supposed that the correlation coefficient of about 0.75 or above is assumed as an acceptable value for the extracted watermarks from noisy images.

The watermark can be embedded into the cover image using DWT, DCT and combined DWT-DCT methods



Figure 5.1 DWT based image watermarking using scaling factor $\alpha = 0.0001$

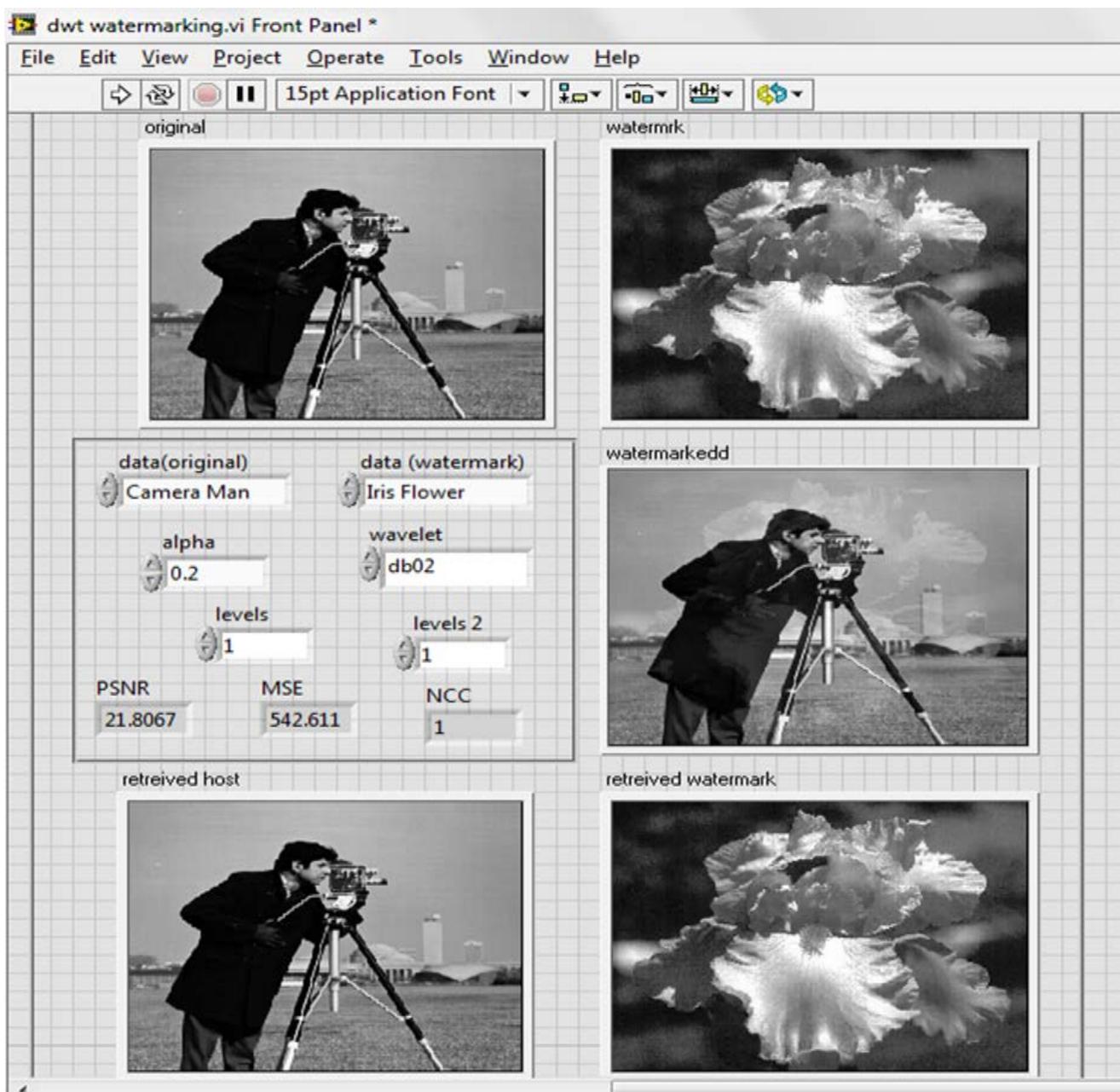


Figure 5.2 DWT based image watermarking using scaling factor $\alpha = 0.2$

The wavelet used here is the wavelets of daubecheis (db02). The value of α can be varied from 0.0001 to 0.2. As the value of α is decreased further to 0.2 the watermark in the watermarked image becomes darker and finally becomes invisible. For the process of recovering the original watermark image from the watermarked image the scaling factor α is used.

TABLE I. The values of the mean square error (MSE) & PSNR are calculated for different values of the scaling factors α .

Scaling factor α	PSNR (db)	MSE
0.0001	86.8065	0.000135653
0.0005	72.8271	0.00339132
0.001	66.8065	0.0135653
0.005	52.8271	0.339132

0.01	46.8065	1.35653
0.05	32.8271	33.9132
0.1	26.8065	135.653
0.2	21.8067	542.611

The mean square error gradually decreases as the value of the PSNR increases. It can be observed that the PSNR value for cover image and the watermarked image decreases as the scaling factor value is increased. This is because the content of the watermark in watermarked image increases with scaling factor.

TABLE II. Experimental results for various attacks on the watermarked image with $\alpha = 0.2$.

Attack	Using DWT			Using DCT			Combined DWT-DCT		
	NCC	PSNR	MSE	NCC	PSNR	MSE			
No attack	1	21.8067	542.611	0.996311	20.8173	538.699	0.9951	20.9061	711.506
JPEG compression	0.99629	20.8512	719.764	0.996548	20.8512	719.764	0.97998	21.1449	630.928
Median filtering (3x3)	0.97899	20.8506	639.957	0.988964	20.0842	637.77	0.89551	16.8253	1159.3
Blurring effect	0.89908	16.8056	1166.28	0.990091	16.7507	1161.8	0	8.49814	9948.03
Resize (scale=2)	0.663907	15.2431	2290.44	0.970625	15.2431	2290.44	0.99615	21.1285	531.7
Noise insertion($\sigma=5$)	0.99629	21.0235	554.389	0.99746	21.117	564.289	0.99465	22.938	2323.22
Sharpening	0.995942	22.8108	2432.54				0.998761	22.1223	529.69

TABLE III. Experimental results for various attacks on watermarked image with $\beta=0.9$ and $\alpha = 0.2$.

Attack	Using DWT			Using DCT			Combined DWT-DCT		
	NCC	PSNR	MSE	NCC	PSNR	MSE			
No attack	1	24.1648	265.514	1	23.8889	265.578	0.998422	22.7011	434.03
JPEG compression	0.99774	22.3913	444.474	0.998174	22.3861	445.196	0.98061	22.8923	356.297
Median filtering (3x3)	0.980944	22.3847	373.144	0.989744	22.3752	373.373	0.905265	16.8938	955.147
Blurring effect	0.908616	16.839	916.658	0.987788	16.8413	961.576	0	8.8253	8969.28
Resize (scale=2)	0.661034	15.525	265.514	0.958025	15.5247	1987.45	0.999033	24.1976	272.365
Noise insertion($\sigma=5$)	0.997935	23.8799	290.308	0.997835	23.9477	289.227	0.998016	23.5676	2036.58
Sharpening	0.997501	23.6919	1700.76						

Synchronous RAM Controller Results: The usual memory hierarchy of a FPGA includes the data path, Main Memory Controller (MMC) and Local Memory Controller (LMC) as shown in the below figure1. The MMC will control the SDRAM (Synchronous Dynamic Random Access Memory) and generates the burst signals for the remaining units of the device. The LMC controls the data path and waits for the burst signals from the MMC. The main aim of our paper is to design Synchronous Ram Controller which is the main part of MMC [1].

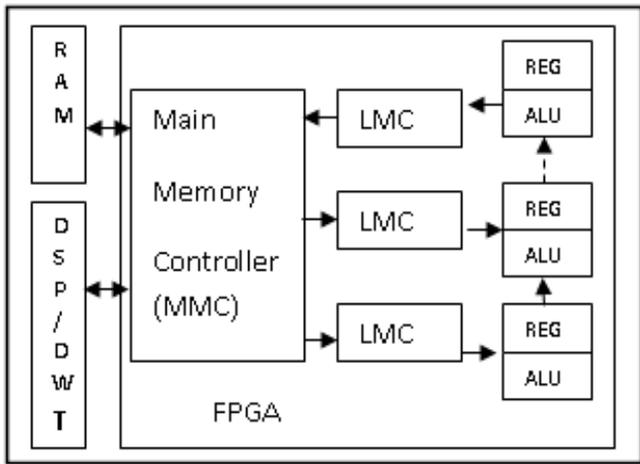


Figure 5.3 Memory Hierarchy

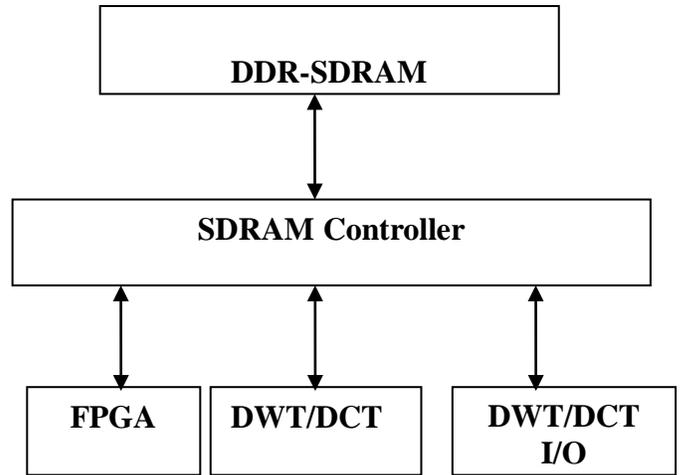


Figure 5.4 Memory Hierarchy

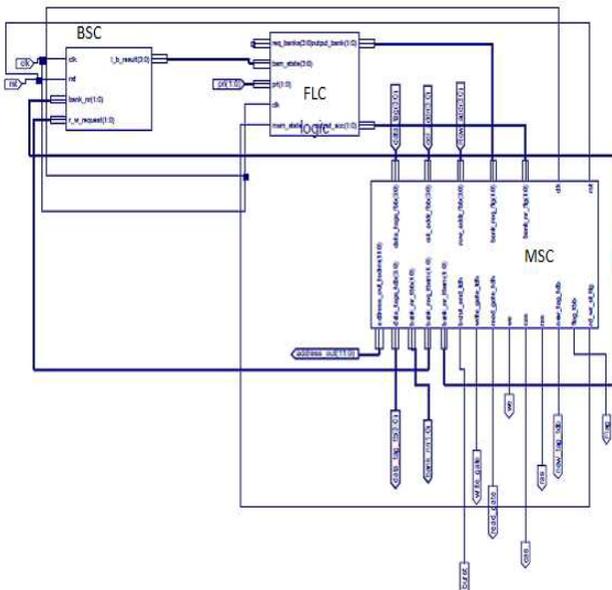


Figure 5.5 RTL schematic of top module of the design

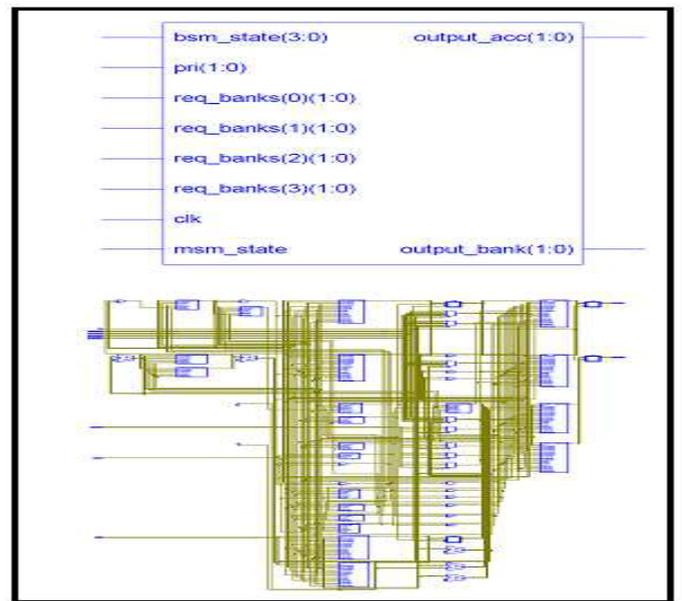


Figure 5.6 RTL schematic of FLC module

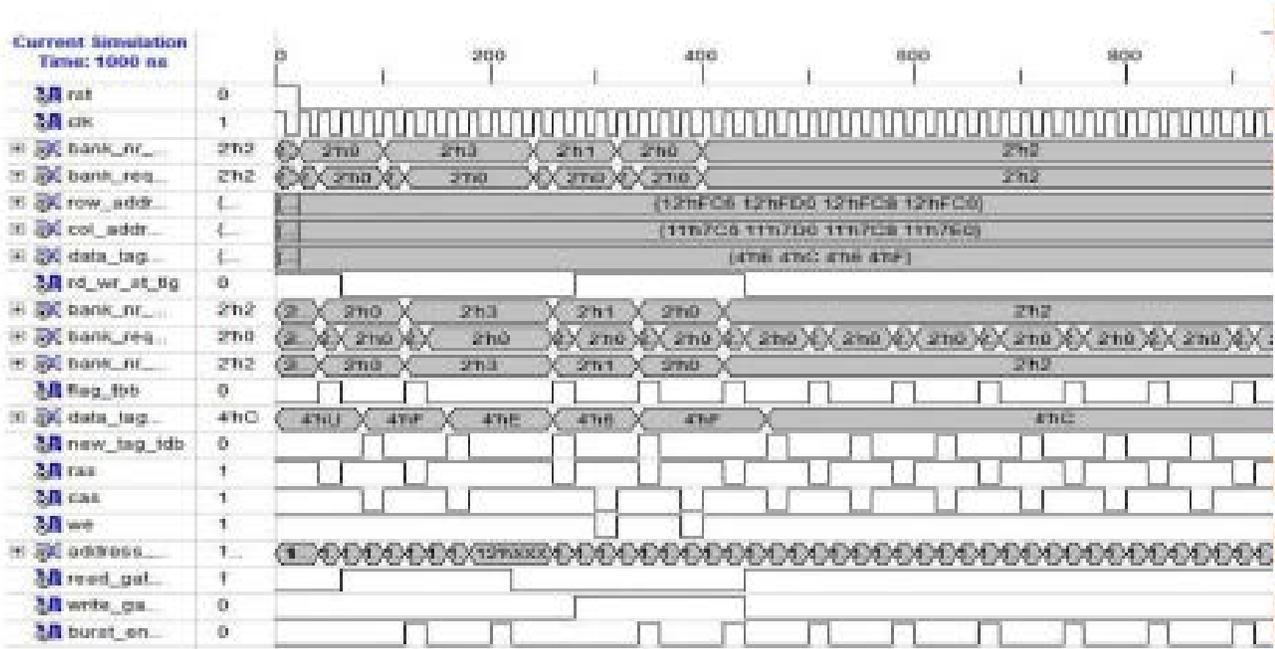


Figure 5.7 Simulation result of MSC module

VI. CONCLUSION

A robust watermarking scheme is implemented using NI LabVIEW. Two watermarking algorithms, additive modification and alpha blending were simulated using DWT, DCT and combined DWT-DCT in detail to analyse the robustness for copyright scenario. Both the algorithms were found non-obtrusive in gray level images. The performance of the watermarking scheme is evaluated with common image processing attacks using DWT, DCT and combined DWT-DCT and the results compared. For robustness, DWT technique showed better results when compared with DCT and combined DWT-DCT technique. Based on experimental setup an architecture for reconfigurable image processing system was implemented which increases the level of controllability.

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Influence of open cast mining on the soil properties of Ledo Colliery of Tinsukia district of Assam, India

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Abstract- Open cast coal mining cause severe alteration of soil characteristics that leads to instability and functional irregularity of ecosystem. The present investigation, therefore, was carried out to evaluate the role of open cast coal mining in alteration of native soil characteristics. Soil samples are collected from disturbed soils of Ledo colliery and undisturbed forest soil. Soil characteristics of Ledo colliery deviated from forest soil. The pH of the disturbed soil was 4.53 compared to 5.83 of undisturbed forest soil. Open cast mining significantly ($P < 0.05$) altered the soil pH from normal forest soil. Statistically insignificant deviation of soil Temperature, MC, OC, N and Mg in disturbed soil was observed. However, pH, P, K and Ca of disturbed soil varied from forest soil significantly ($P < 0.05$). The concentration of all the heavy metals studied viz. Cr, Ni, Cu, Zn, As, Cd and Pb was high in disturbed soil compared to forest soil. However, site has significant influence on the variation of Ni ($P < 0.01$), Zn ($P < 0.01$) and Cu ($P < 0.05$) concentration. Thus, open cast mining altered the soil properties, making nutrient deficient, highly acidic and increased heavy metal toxicity.

Index Terms- Open cast coal mining, acid mine drainage (AMD), soil nutrient deficiency and heavy metal.

I. INTRODUCTION

Soil is an important and vitalizing component of ecosystem and its properties are influenced by continuous interactions of its abiotic and biotic constituents (Machulla et al., 2005). Due to rapid pace of development and industrialization there is a gradual increase in the demand of mineral resources of earth crust. The development of our society and human civilization rely heavily upon the mining of mineral resources resulting in alteration of pristine land forms and release of toxic mineral wastes (Sheoran et al. 2010). Mining activities, specifically unscientific open cast coal mining cause drastic alteration of the landscape, topography and land use pattern of the soil (Nessa and Azad, 2008; Sheoran et al., 2011; Maharana and Patel, 2013). Additionally, it leads to acid mine drainage (AMD) and heavy metal contamination. Heavy metals are elements with metallic properties and specific weights higher than 5 gm cm^{-3} , which do not degrade (Gorhe et al., 2006) but enter the food chain consequently forming complex toxic compounds leading to detrimental effect on biological functions (Jarup, 2003; Lenart and Wolny-Koladka, 2013). Open cast coal mine overburden dumps contain mixture of coal seam, parent rock and subsoil (Jha and Singh, 1991; Mummey et al., 2002). The mine spoils are deficient in plant nutrient due to lack of biologically rich top soil and represents a disequibrated geomorphic system (Soulliere

and Toy, 1986; Keefer and Sajwan, 1993), consequently causing problem for pedogenesis, revegetation, and restoration (Maharana and Patel, 2013).

North-eastern region of India is rich in floral and faunal diversity. Coal mines of Assam are mainly located in the Indo-Burma biodiversity hot spot. Open cast mining and improper and insufficient post-mining practices are being practiced in all the coal mines of Assam (Nessa and Azad, 2008). In view of the increased unscientific open cast coal mining activities, decreasing soil fertility and adverse effects on soil flora and fauna, it is of utmost concern to monitor the physico-chemical characteristics of coal mine overburden spoil, which pave the way for better understanding the directions of improving soil fertility, reclamation and leading to vegetation development. The present study, therefore, was designed to assess the impact of unscientific open cast coal mining on different physico-chemical properties of soil.

II. MATERIALS AND METHODS

Study site and sampling

The study area for the present investigation was located in Tinsukia district of Assam, India. The Ledo colliery as open cast mining disturbed site and one undisturbed forest site were considered for the study. The geographical locations are $27^{\circ}17.272' \text{ N}$ & $95^{\circ}45.012' \text{ E}$ (Ledo colliery) and $27^{\circ}16.748' \text{ N}$ & $95^{\circ}44.175' \text{ E}$ (Forest). The area under investigation has subtropical and high humid climate. The coal mine overburden soil was disorganized, poor in supportive and nutritive capacity. The area experienced annual average rainfall of 194.87 mm, average relative humidity of 78.58 % and 12.9° C & 25.6° C were mean minimum and maximum temperature respectively. A total of 51 rhizospheric soil samples ($< 20 \text{ cm}$ depth) were collected from both disturbed and undisturbed sites in year 2010-2011 during February and August. The individual samples of each site of a sampling were mixed in equal proportions separately to make a total of 4 composite samples. Samples were stored at 4° C prior to analysis.

Soil physical and chemical characteristics

Soil pH of the composite samples was determined using digital pH meter in 1:5 (w/v) soils: water suspension. During sampling, soil thermometer was used to measure soil temperature ($^{\circ} \text{ C}$). To maintain uniform depth of measurement in dumping spoil soils, pilot hole of 10 cm was drilled using nail of same diameter as the thermometer through wooden block. Soil temperature was recorded after 2 minutes of insertion into the pilot hole.

Soil moisture content (%) of sub-samples was determined by drying 10 g of fresh soil in hot air oven at 105 ± 5 °C until constant weight was observed. The formula used for calculating the soil moisture content (%) is as follows:

$$\text{Soil moisture content (\%)} = \frac{W_2 - W_3}{W_3 - W_1} \times 100$$

Where, W1= Weight of foil (g); W2= Weight of moist soil + foil (g); W3= Weight of dried soil + foil (g).

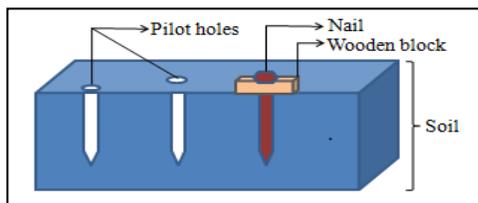


Figure 1: Design of wooden block to measure soil temperature

Soil organic carbon (%) was determined by titrimetric chromic acid wet oxidation method of Walkley and Black (1934). The soil organic carbon < 0.50% was interpreted as low, between 0.50-0.75% as medium and > 0.75% as high. Subbiah and Asija's (1956) alkaline potassium permanganate method was used to determine available nitrogen (Kg/ha). The available nitrogen < 250 Kg/ha was interpreted as low, between 272-544 Kg/ha as medium and > 500 Kg/ha as high. Available phosphorus (Kg/ha) was determined by Brays method (Bray and Kurtz, 1945) while, flame photometric method of Toth and Prince (1949) was followed for determination of potassium (Kg/ha) concentration. Ammonium saturation method followed by complexometric titration method was used for concentration (ppm) determination of Ca and Mg (Schwartzbach et al., 1946).

Soil heavy metal analysis

The concentration of soil heavy metals viz. chromium (Cr), nickel (Ni), copper (Cu), zinc (Zn), arsenic (As), cadmium (Cd) and lead (Pb) was determined spectrophotometrically (AAS, Shimadzu, AA-7000) according to Jackson (1967). For this, 1 g

soil was mixed with 20 ml triple acid mixture of HNO₃: HCl: H₂SO₄ (1:2:4) in a digestion flask and digested by heating. 10 ml of HCl: H₂O (1:1) mixture added and whole digested content was filtered through Whatman filter paper no. 42. Total volume of the filtrate adjusted to 50 ml with distilled water and analyzed for different heavy metal concentrations (mg/ml) using AAS. The following calculation was used to estimate the heavy metal concentrations.

$$\text{Heavy metal (ppm)} = A \times 50^* \times 1000^{**}$$

Where, A= concentration of heavy metal (mg/ml); * = volume of the filtrate (50 ml = 1 g soil); **= conversion factor to ppm (mg/Kg).

Statistical analysis

One-way Analysis of Variance (ANOVA) was performed to evaluate the significance of variation influenced by open cast mining disturbance using SPSS 16.0 version.

III. RESULTS AND DISCUSSION

Soil physico-chemical properties

The physico-chemical properties of the disturbed coal mine dump soil and undisturbed forest soil is presented in Table I. The comparative analysis indicated that the open cast coal mining altered native soil characteristics. The heterogeneous and altered soil characteristics of coal mine dumps were also reported by Boruvka et al. (2010). The disturbed coal mine soil dumps were highly acidic as compared to slightly acidic undisturbed forest soil. The average pH of the disturbed soil was 4.53 as compared to 5.83 of forest soil. High acidity of the coal mine soil dumps is consistent with the reports of Biswas et al. (2013). The high acidity of the dumping soil may be due to acid mine drainage (AMD) as was reviewed by Johnson and Hallberg (2005). AMD is mainly due to exposure of iron pyrite (FeS₂) and other sulphide minerals to both oxygen and water, subsequently their oxidation resulting in low pH (Johnson and Hallberg, 2005). Ghose (2004) reported that high acidic conditions of soil make it nutrient deficient, while, increased the availability of heavy metals resulting into toxic effects on the plant growth and also on the microbial populations which is a key component of the soil ecosystem.

Table I: Physico-chemical characteristics of disturbed coal mine dump spoils and undisturbed forest soil. (Temp.: temperature; Av.: available).

Site	pH	Temp. (°C)	MC (%)	OC (%)	Av. N ₂ (Kg/ha)	Av. P ₂ O ₅ (Kg/ha)	Av. K ₂ O (Kg/ha)	Av. Ca (ppm)	Av. Mg (ppm)
Disturbed soil	4.53	24.39	9.85	2.01	468.29	47.04	37.19	160.72	109.44
Forest soil	5.83	21.5	23.95	1.612	623.34	178.75	296.16	424.82	92.12

The average temperature of disturbed soil was high as compared to forest soil Table I. This may be due to lack of plant cover on the disturbed mine dump soil as was also reported by Javed and Khan (2012). Disturbed soils of Ledo colliery contain less moisture content (9.85 %) compared to undisturbed forest soil (23.95 %). The lack of plant cover, less organic matter and poor soil quality of disturbed site decreased soil water holding capacity and is consistent with the reports of Kumar and Patel (2013).

Soil organic carbon was high (> 0.75 %) in both the disturbed and undisturbed soil. Disturbed soil harbored less concentration of N, P and K compared to Forest soil (Table I). This finding is consistent with the reports of Ghose (2004). Similarly, Maharana and Patel (2013) also found low concentration of N and P in the Basundhara open cast coal mine

dump soils as compared to undisturbed forest soil. The anionic phosphate forms strong bonds with particles that generate anion exchange capacity. In highly acidic coal mine dump soil, P react with heavy metals and consequently might reduced its bioavailability (Vetterlein et al. 1999). Similarly, nitrification is also slow and simultaneously, low pH plays key role in loss through volatilization. Additionally, reduction of soil microbial population might have some role in reduction of soil N concentration (McKenzie, 2003).

Calcium concentration of disturbed soil was also found low (160.72 ppm) compared to undisturbed forest soil (424.81 ppm) might be due to excavation and subsequent weathering of Calcium rich rocks. However, concentration of Magnesium was higher in disturbed soil.

Table II: One-way analysis of variance (ANOVA) showing the influence of site /open cast coal mining on the physico-chemical and heavy metal properties the soil.

<i>P-value</i>	
	p H Te m M C OC N P K Ca Mg Cr Ni Zn Pb Cu Cd As
Site	
Ledo	0.033
Forest	0.718 ^{NS} 0.311 ^{NS} 0.567 ^{NS} 0.115 ^{NS} 0.035 0.025 0.030 0.789 ^{NS} 0.423 ^{NS} 0.018 0.005 0.781 ^{NS} 0.055 0.544 ^{NS} 0.183 ^{NS}

NS: not significant ($P > 0.05$)

P values without NS are significant either at $P < 0.05$ or < 0.01

One-way ANOVA results (Table II) showed that site has highly significant effect on pH, P, K, Ca and also indicates that open cast mining significantly altered key soil properties. Kumar and Patel (2013) reported similar findings from Ib valley coalfields in Odisha.

The results of heavy metal concentrations of two different categories of soils are presented in Figure 2. The concentrations of seven heavy metals (Cr, Ni, Cu, Zn, As, Cd and Pb) studied were found higher in disturbed soil compared to undisturbed forest soil.

Heavy metal concentrations

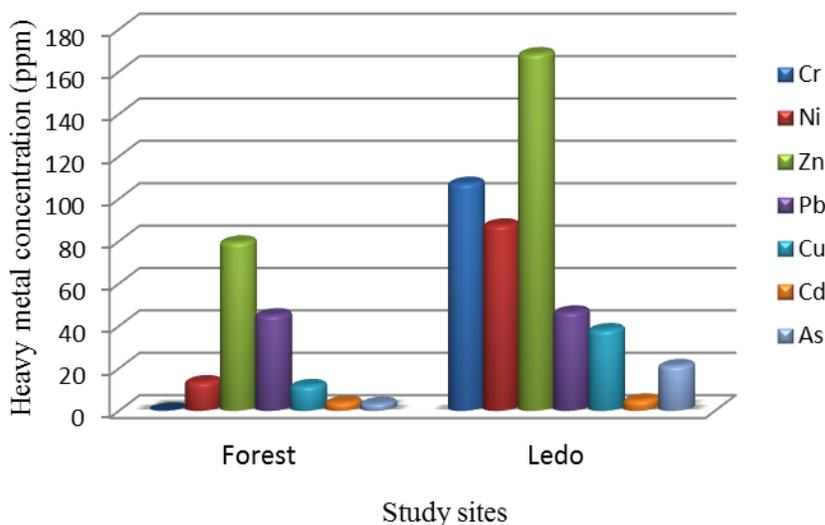


Figure 2: Heavy metal concentrations (ppm) of undisturbed forest soil and disturbed Ledo colliery dump soil.

Nessa and Azad (2008) reported the increased heavy metal concentrations in spoil soils of Makum coal field. Increased concentration of Cr and Ni were detected in Bhowra open cast coal mine as reported by Masto et al. (2011). One-way ANOVA results (Table 2) showed that Ni, Zn and Cu were significantly influenced by the open cast coal mining. However, statistically no significant variation of Cr, Pb, Cd and As among disturbed and undisturbed sites was observed both at $P < 0.05$ and $P < 0.01$.

IV. CONCLUSION

From the above discussion, it can be concluded that unscientific open cast coal mining and poor post mining practices severely altered the native soil properties. The spoil soil became highly acidic and nutrient deficient which is detrimental to the growth and establishments of the plants. Highly acidic condition of the spoil soil increased the bioavailability of the heavy metals. Consequently, soil became toxic and cause mainly oxidative stresses in plants. Simultaneously, it affected negatively the growth and activity of microorganisms which play key role in soil dynamics. Thus open cast mining destroyed the soil structure, increased the soil acidity, made the soil nutrient deficient and increased the heavy metal toxicity.

ACKNOWLEDGEMENT

The first author acknowledges University Grants Commission (UGC), New Delhi, India for financially supporting the investigation in the form of Maulana Azad National Fellowship. Thanks are also due to the Colliery Manager, Ledo Colliery, Tinsukia, Assam for his permission and cooperation to collect the samples.

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Economic growth is linked with supply of Energy: An environmental perspective

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Abstract- Over the years the population of country has increased manifolds. To sustain the growth, people have cleaned the forest & changed into the agricultural land to maintain the living standard. We need to provide infrastructures for an industrial base to run the industry. We need power to run the industries. Power is derived from two sources i.e. -renewable sources of energy, & non renewable sources of energy. We are still banking on non renewable sources of energy to a greater extent .our energy consumption pattern may be categorized in two ways i.e. commercial energy & non commercial energy. More emphasis is given on renewable sources of energy to meet our demands as the non renewable sources of energy reserves are limited. The environmental impact of the energy industry is diverse. Energy has been harnessed by humans for millennia. Initially it was with the use of fire for light, heat, cooking and for safety, and its use can be traced back at least 1.9 million years.(Bowman, D. M. J. S. (2009). "Fire in the Earth System". Science 324 (5926) □ 481-4 In recent years there has been a trend towards the increased commercialization of various renewable energy sources.

I. INTRODUCTION

Global warming and climate change due to human activity is generally accepted as being caused by anthropogenic greenhouse gas emissions. The majority of greenhouses gas emissions are due to burning fossil fuels with most of the rest due to deforestation¹

There is a highly publicized denial of climate change but the vast majority of scientists working in climatology accept that it is due to human activity. The IPCC report *Climate Change 2007: Climate Change Impacts, Adaptation and Vulnerability* predicts that climate change will cause shortages of food and water and increased risk of flooding that will affect billions of people, particularly those living in poverty. (BBC NEWS Science/Nature. 2007-04-06. Retrieved 2011-04-22)

Biofuel use---Biofuel is defined as solid, liquid or gaseous fuel obtained from relatively recently lifeless or living biological material and is different from fossil fuels, which are derived from long dead biological material. Also, various plants and plant-derived materials are used for biofuel manufacturing. Bio fuels are a renewable energy and can be sustainable (carbon neutral) in terms of greenhouse gas emissions since they are in the carbon cycle for the short term.**Bio-diesel**-High use of bio-diesel leads to land use changes including deforestation.

Firewood Unsustainable firewood harvesting can lead to loss of biodiversity and erosion due to loss of forest cover. An example of this is a 40 year study done by the University of Leeds of African forests, which account for a third of the world's total tropical forest which demonstrates that Africa is a

significant carbon sink. A climate change expert, Lee White states that "To get an idea of the value of the sink, the removal of nearly 5 billion tonnes of carbon dioxide from the atmosphere by intact tropical forests is at issue.

According to the U.N. the continent is losing forest twice as fast as the rest of the world. "Once upon a time, Africa boasted seven million square kilometers of forest but a third of that has been lost, most of it to charcoal."(Rabl A. et al. (August 2005).)

Fossil fuel use Global fossil carbon emission by fuel type, 1800-2007 AD.The three fossil fuel types are coal, petroleum and natural gas. It was estimated by the Energy Information Administration that in 2006 primary sources of energy consisted of petroleum 36.8%, coal 26.6%, natural gas 22.9%, amounting to an 86% share for fossil fuels in primary energy production in the world. (GaBE (Paul Scherrer Institut)). 2005

The burning of fossil fuels produces around 21.3 billion tonnes (21.3 gigatonnes) of carbon dioxide per year, but it is estimated that natural processes can only absorb about half of that amount, so there is a net increase of 10.65 billion tonnes of atmospheric carbon dioxide per year (one tonne of atmospheric carbon is equivalent to 44/12 or 3.7 tonnes of carbon). Carbon dioxide is one of the greenhouse gases that enhances radiative forcing and contributes to global warming, causing the average surface temperature of the Earth to rise in response, which climate scientists agree will cause major adverse effects.

Coal-The environmental impact of coal mining and burning is diverse. Legislation passed by the U.S. Congress in 1990 required the United States Environmental Protection Agency (EPA) to issue a plan to alleviate toxic pollution from coal-fired power plants. After delay and litigation, the EPA now has a court-imposed deadline of March 16, 2011, to issue its report.in 2004 natural gas produced about 5,300 Mt/yr of CO₂ emissions, while coal and oil produced 10,600 and 10,200 respectively; but by 2030, according to an updated version of the SRES B2 emissions scenario, natural gas would be the source of 11,000 Mt/yr, with coal and oil now 8,400 and 17,200 respectively. (Total global emissions for 2004 were estimated at over 27,200 Mt.) In addition, natural gas itself is a greenhouse gas far more potent than carbon dioxide when released into the atmosphere but is released in smaller amounts.

Electricity generation-The environmental impact of electricity generation is significant because modern society uses large amounts of electrical power. This power is normally generated at power plants that convert some other kind of energy into electrical power. Each such system has advantages and disadvantages, but many of them pose environmental concerns.

II. ENERGY: CONSUMPTION & PRODUCTION

Global perspective ----- The energy demand over the years have increased manifolds. As per the data available about two billion people still banks on traditional sources of energy, such as dung , wood and agricultural residues etc. About 800 million people have an access to power grid and use regular energy. In spite of various efforts of the government, still a chunk of population in rural areas do not have access to electricity.

Economic growth & energy use

Access to energy services is fundamental to human activities, development and economic growth. Since last couple of decades, energy has been emerged as the centre of the global debate. Energy issues are directly impacting the achievement of the development objectives outside the energy sector. The most important of them is emission of the greenhouse gases that leads to severe adverse impact on the regional as well as global environment.

Apart from air pollution and consequent human health problem, climate change due to emission of carbon dioxide is posing serious threat to the future generation. Large-scale efforts are needed to meet a wide range of social and economic needs to reconcile economic development along with strategies to mitigate carbon emissions from energy usage.

All the industries and factories need energy to run and function properly. Industries only the sources of production which not only soffise the need of our country, countries people but also exports to the foreign countries as well.

Excess energy → excess production → Import → Income → Excess Economic growth, therefore we can say that energy and industries are interrelates without either of it nothing is possible if energy level is increased, the production in industries will also increased,-e.g. instead of one unit more units will function hence productions will be more, excess production will be exported to the foreign country which will fetch us excess money hence the

economic condition of the country will be improved and will be secure foreign currency as well. Thereby energy and industrial development are complement to each other. We all know that the non-renewable sources of energy such as Coal, petroleum product etc, are likely to exhaust one day, banking only on non-renewable sources of energy will jeopardized our national interest.

Therefore all the countries of the world started thinking and producing renewable sources of energy such as hydyl energy, wind energy, tydle energy since renewable sources of energy are much beneficial as they do not pollute the atmosphere but are produced again& again at very short span of time.

III. POTENTIAL VS ACHIEVEMENTS.

Two major issues, namely, the ever widening gap between **energy demand and supply**, and associated greenhouse gas emissions, place the renewable energy resources in the right perspective. Technologies based on renewable energy sources (RETs) have developed rapidly in India due to a strong political support. The contribution of renewable energy technologies in India's economy and impact on Overall development can be classified into two categories: off-grid and grid-connected applications. Table 7 shows the prevalent RE technologies in the country. The cumulative subsidies spent on RET since 1980 is to the tune of 1040 Million €

After making bad experiences with public programmes that led to a rush in building of RET plants that were quickly abandoned afterwards, the MNES now places greater reliance on developing market linkages and promoting commercialisation by involving private sector, rather than public investment, and providing more fiscal and tax incentives. However, also many of these incentives such as one-off Depreciation were not conducive to long-term maintenance of plants.

Table 1: Potential³ and Achievements for Renewable Energy Technologies

Source/Systems	Potential according to past studies	Cumulative physical achievements (31st March 2003)
Biogas plants (nos.)	12 million	3.5 million
Improved cook stoves (numbers)	120 million	35.2 million
Biomass power / Co-generation	19500 MW	484 MW
Biomass gasifiers		53.40 MW
Solar photovoltaic systems	20 MW/sq.km	121 MWp
Solar water heating (collector area)	140 million sq. m.	0.70 million sq. m
Wind energy	45000 MW	1870 MW
Small hydro power	15000 MW	1509 MW
Waste-to-energy	1700 MWe	25.80

Source : <http://rmes.nic.in/frame.htm?majorprog.htm>
 various SPV systems viz., Lanterns, Home & Street lighting systems & SPV power plant
 * MWe - Megawatt electricity equivalent, MWp -Megawatt Peak

Only slowly policymakers have realised that incentives for long-term operation of the RETs such as low interest loans, interest subsidies, financing packages for consumers, fiscal benefits, preferential tariffs for imports and viable power purchase prices are needed. The successful penetration of renewable energy into conventional markets depends on several factors that in turn are driven by the institutional and policy environment

- alternative sources of energy to replace the use of fossil fuels which are linked to global climate change
- new reliance on public transportation systems in order to reduce vehicle emissions, congestion in cities and the health problems caused by polluted air and smog
- the growing scarcity of water

Issue of environmental change

Keeping in view the global environmental change and heavy energy use. A number of seminars conferences and summits have taken place .Indeed, The earth summit needs mention .

Earth Summit

The **United Nations Conference on Environment and Development**, also known as the **Earth Summit** (or, in Portuguese, **Eco '92**) was a major conference held in Rio de Janeiro from June 3 to June 14, 1992.

172 governments participated with 110 at level of heads of State or Government. Some 2,400 representatives of non-governmental organizations (NGOs) attended, with 17,000 people at the parallel NGO Forum, who had so-called Consultative Status.

The issues addressed included:

- systematic scrutiny of patterns of production — particularly the production of toxic components, such as lead in gasoline, or poisonous waste

IV. SUGGESTION

Energy conservation refers to efforts made to reduce energy consumption. Energy conservation can be achieved through increased efficient energy use, in conjunction with decreased energy consumption and/or reduced consumption from conventional energy sources.

Energy conservation can result in increased financial capital, environmental quality, national security, personal security, and human comfort. Individuals and organizations that are direct consumers of energy choose to conserve energy to reduce energy costs and promote economic security. Industrial and commercial users can increase energy use efficiency to maximize profit.

Energy policy is the manner in which a given entity (often governmental) has decided to address issues of energy development including energy production, distribution and consumption. The attributes of energy policy may include legislation, international treaties, incentives to investment, guidelines for energy conservation, taxation and other public policy techniques.

Sustainable energy is the provision of energy that meets the needs of the present without compromising the ability of future

generations to meet their needs. Sustainable energy sources are most often regarded as including all renewable energy sources, such as hydroelectricity, solar energy, wind energy, wave power, geothermal energy, bioenergy, and tidal power. It usually also includes technologies that improve energy efficiency.

V. ECONOMIC INSTRUMENTS

Various economic instruments can be used to steer society toward sustainable energy. Some of these methods include eco taxes and emissions trading. Green consumerism is enhanced on free energy markets. In Europe environmental NGOs have developed EKOenergy label to help consumers to choose more sustainable electricity products.

Ecological economics aims to address some of the interdependence and co evolution of human economies and natural ecosystems over time and space.^[33] Environmental economics, is the mainstream economic analysis of the environment, which views the economy as a subsystem of the ecosystem, while ecological economics emphasis is upon preserving natural capital. (Robert Nadeau (Lead Author); Cutler Cleveland (Topic Editor) (2008-08-26). , Jeroen, C.J.M.; Bergh, van den (2000)).

Biophysical economics sometimes referred to as thermo economics is discussed in the field of ecological economics and relates directly to energy conversion, which itself is related to the fields of sustainability and sustainable development especially in the area of carbon burning. *National Council for Science and the Environment. Retrieved 2011-04-21)*

VI. CONCLUSION

Adopting clean technologies will help limit emissions growth and India is the only country with a renewable energy ministry. The government says the aim is to generate at least 10 percent of energy from renewable or more environment-friendly sources such as water, wind, biomass and natural gas.

In an effort to clean its air, the government has introduced stringent emission standards for vehicles and introduced greener fuels such as compressed natural gas in some cities.

India's Ministry for Non-conventional Energy Sources has estimated that India has the potential to generate 80,000 megawatts of power from renewable sources but produces only 5,000, half of it from windmills. But the government is firm that it will not agree to any targets even after 2012, the Kyoto pact's second phase when signatories are supposed to back deeper emissions cuts.

"In developing countries where the objective is to eradicate poverty and where we're on such a growth trajectory, we can't agree to any binding commitments," said a senior government official.

"Emissions in India will not rise because of economic development because the economy is dominated by the services sector. Of course, we will welcome any technology to help emit less, but we are in no position to forego our economic targets," the official said.

Regarding the earth summit India is now trying to use the energy sources like wind, thermal and solar etc to avoid the

global situation of climatic change. These renewable energy sources deserves global attention and accelerated promotion due to its triple benefits of enhancing sustainable development, augmenting energy security and abating GHG emissions.

There are various reasons for India to push renewable energy such as.:

– The inability of conventional systems to meet growing **energy demand** in an equitable and Sustainable manner.

– The large scale negative impact of conventional energy production and consumption on the Physical and human environment.

– The need for meeting energy needs of an unserved population in rural and remote areas as well as those residing on islands.

– The need for maintaining a properly diversified energy mix. Such a diversified portfolio would also help in minimizing the socio-economic impact if the supply of a particular fuel were to break down.

However, maintaining a back-up infrastructure for periods when renewable energy

Supply is scarce (e.g. no wind is blowing) can be very costly. This becomes the more important, the higher the renewables penetration. Due to these benefits, Indian policymakers have decided to allocate different kinds of subsidies to the RE Sector. Over the past decade, the country has witnessed a rapid growth in this sector and several RE Technologies have attained technological maturity. They are biomass power, solar energy (photovoltaic and thermal), small hydro and wind energy with a cumulative installed capacity of around 4000 MW (MNES 2003). India is the only country in the world which has a dedicated ministry for promoting RE viz., Ministry of Non-conventional Energy Sources (MNES) and an exclusive public sector financial institution, viz., Indian Renewable Energy Development Agency (IREDA).

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Query Recommendations for Interactive Database Exploration

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Abstract- Traditional DBSMs are suited for applications in which the structure, meaning and contents of the database, as well as the questions to be asked are already well understood. There is, however, a class of applications that we will collectively refer to as Interactive Data Exploration (IDE) applications, in which this is not the case. IDE is a key ingredient of a diverse set of discovery-oriented applications we are dealing with, including ones from scientific computing, financial analysis, evidence-based medicine, and genomics. The need for effective IDE will only increase as data are being collected at an unprecedented rate. IDE is fundamentally a multi-step, non-linear process with imprecise end-goals. For example, data-driven scientific discovery through IDE often requires non-expert users to iteratively interact with the system to make sense of and to identify interesting patterns and relationships in large, amorphous data sets.

To make the most of the increasingly available complex and big data sets, users would need an expert assistant, who would be able to effectively and efficiently guide them through the data space. Having a human assistant is not only expensive but also unrealistic. Thus, it is essential that we automate this task. We propose database systems be augmented with an automated database navigator (DBN) service that assists as a tour guide to facilitate IDE. Just like a car navigation system that offers advice on the routes to be taken and display points of interest, DBN would similarly steer the user towards interesting trajectories through the data, while highlighting relevant features. Like any good tour guide, DBN should consider many kinds of information; in particular, it should be sensitive to a user's goals and interests, as well as common navigation patterns that applications exhibit. We sketch a general data navigation framework and discuss some specific components and approaches that we believe belong to any such system.

I. INTRODUCTION

System Overview

A. Query Fragmentation

The SQL syntax checker checks if the given input query is in SQL syntax. It also checks if the given fields match with that of the tables in the database and verifies the attributes in the database table. And then the input SQL query (IQ) is fed to the query fragmentation algorithm. The given query is split into fragments with respect to the keywords (select, from, where, group by, having, order by). Names are given for the fragmented queries. The fragmented query attributes are stored in the fragment table (Ft) with respect to the fragment name.

B. Query Filter

The query limit (QL) is set to n . The active users query (IQ) is fragmented using the FQ algorithm. The query q is compared with the already recorded fragments in querylog (stack table). If the queries match, the query rating is incremented by 1. If the queries don't match, the new fragments are updated in the query log. This is done till the number of entries in the query log are within the query limit. If the number of entries is to exceed the query limit, the query log is full. The query is then removed from the query log accounting to an LRU policy.

C. Query Suggestion Engine

The query suggestion engine gives a set of recommended queries SQ for the given input SQL query (IQ). The input query IQ is first fragmented and the fragmented query FQ is stored in a table t . The query Pro_le QP from the query rating contains fragmented id and rank of the queries. The fragmented query is compared with the queries in the query pro_le. If the fragmented query matches with any of the queries in the query pro_le, the rank of the queries in the query pro_le is checked. The top n rank queries are returned as SQ. If the FQ does not match with any of the queries in the query pro_le, the result of the input query IQ is returned. Here we consider two different waiting schemes, a binary scheme and a weighted scheme. Both using the queries Q posed by user i . In binary scheme all participating fragments receive the same importance weight, regardless of whether they appear in many queries in the session or only one. In weighted scheme fragments that appear more than once in a user session will receive higher weight than others. The fragment-based instantiation of the Query framework works in a similar manner to the tuple based.

II. WHAT IS RECOMMENDATION SYSTEM ?

Recommender systems or recommendation systems are a subclass of information filtering system that seek to predict the rating or preference that user would give to an item. Recommender systems have become extremely common in recent years, and are applied in a variety of applications. The most popular ones are probably movies, music, news, books, research articles, search queries, social tags, and products in general. Recommender systems typically produce a list of recommendations in one of two ways through collaborative or content based filtering. Collaborative filtering approaches build a model from a user's past behaviour as well as similar decisions made by others: then use that model to predict items that the user may have an interest in. Content based filtering approaches utilize a series of discrete characteristics of an item in order to

recommend additional items with similar properties. Recommender system is an active research area in the data mining and machine learning areas.

III. RELATED WORKS

A multidimensional query recommendation system is proposed in [4]. In Contextual Database Preferences it suggest that context may express conditions on situations external to the database or related to the data stored in the database. It outlines models for expressing both types of preferences. Then, given a user query and its surrounding context suggests that the size of datasets being collected and analyzed in the industry for business intelligence is growing rapidly, making traditional warehousing solutions prohibitively expensive. In this paper, we provide a comprehensive presentation of QUERIE, including an overview of previous work (tuple based instantiation).

System Architecture For Query Recommendation System

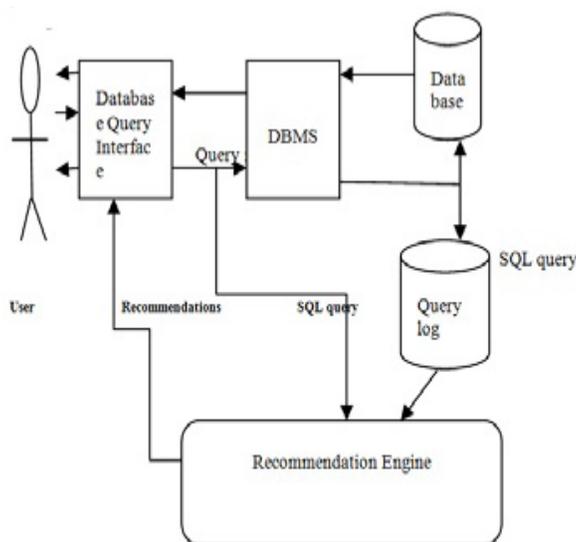


Figure 1.1: System Architecture

IV. RECOMMENDATION ALGORITHMS

The queries of each user touch a subset of the database that is relevant to the analysis the user wants to perform. We assume that this subset is modeled as a session summary S_i for user i . We use $1, \dots, h$ to denote the set of past users based on which recommendations are generated and 0 to identify the current user. To generate recommendations, our framework extends the summary S_0 of the active user to a predicted summary $Spred_0$. This extended summary captures the predicted degree of interest of the active user with respect to all the parts of the database, including those that the user has not explored yet, and thus serves as the seed for the generation of

recommendations. To summarize, our framework consists of three components: (a) the construction of a session summary S_i for each user i , (b) the computation of a predicted summary $Spred_0$ for the active user, based on the active users and the past users summaries, and (c) the generation of queries based on $Spred_0$. Those queries will be presented to the user as recommendations. The details of each step differ for each recommendation engine. We provide a brief overview of both approaches in what follows.

V. TUPLE-BASED RECOMMENDATIONS

Session summaries :-

We define the session summary S_i as a vector of tuple weights that covers all the database tuples. The weight of each vector element represents the importance of the respective tuple in the exploration performed by user i . For this purpose we employ two different weighting schemes which are detailed in the accompanying paper

[1]. Using the session summaries of the past users, we can define the conceptual session-tuple matrix that, as in the case of the user-item matrix in web recommender systems, will be used as input in our collaborative filtering process. Computing the predicted summary. Similarly to session summaries, the extended summary $Spred_0$ is a vector of tuple weights. In order to compute this summary, we assume the existence of a function $sim(S_i, S_j)$ that measures the similarity between two summaries and takes values in $[0,1]$. Using this function, we compute the extended summary as a weighted sum of the existing summaries: $Spred_0 = \sum_{i \neq 0} sim(S_0, S_i) S_i$. The similarity function sim can be realized with any vector-based metric, such as the cosine similarity measure. Generating recommendations. The final step is to generate queries that cover the interesting tuples in $Spred_0$. In order to provide the users with intuitive, easily understandable recommendations, we use the queries of past users. We assign to each past query Q an importance with respect to $Spred_0$, computed as $rank(Q, Spred_0) = sim(SQ, Spred_0)$. Hence, a query has high rank if it covers the important tuples in $Spred_0$. The top ranked queries are then returned as the recommendation. Accelerating the online computations. To ensure that the aforementioned approach generates real-time recommendations for the active users of a database, we need to compress the session-tuple matrix and to speed up the computation of similarities. For this reason, we employ the MinHash probabilistic clustering technique that maps each session summary S_i to a signature $h(S_i)$

[2]. The Jaccard similarity between vectors is thus reduced to the similarity of their signatures: $JaccardSim(S_i, S_0) = sim(h(S_i), h(S_0))$.

Fragment-based recommendations

Session summaries :-

This approach is based on the pair-wise similarity of query fragments (attributes, tables, joins and predicates). We need to identify fragments that co-appear in several queries posed by different users. The session summary vector S_i for a user i consists of all the query fragments of the user's past queries. Let Q_i represent the set of queries posed by i and F represent the set of distinct query fragments recorded in the query logs. For a

given fragment $2 F$, its importance in session S_i is represented by $S_i[]$ and depends on its importance in the session. We can define $SQ[]$ as a weighted or binary variable that represents the importance of in a sessions query Q .

Then, S_i is defined respectively as a sum ($S_i = PQ2Q_i SQ$), or O -ed ($S_i = WQ2Q_i SQ$). Computing the predicted summary. Using the session summaries of the past users and a vector similarity metric, we construct the $(|F| |F|)$ fragment-fragment matrix that contains all similarities $\text{sim}(-, i), -, i \in F$. The recommendation seed, modeled by $\text{Spred } 0$, represents the estimated importance of each query fragment with regard to the active users behavior S_0 . Similarly to the item-to-item collaborative filtering approach of web recommenders systems, we employ the fragment-to-fragment similarities that are computed in the previous step: $\text{Spred } 0 [] = P-2R S_0[-] - \text{sin}(-, i) P-2R \text{sin}(-, i)$

VI. IDENTIFY, RESEARCH AND COLLECT IDEA

Collaborative Framework with User Personalization for Efficient web Search : Mining approach Introduction

User personalization becomes more important task for web search engines. We develop a unified model to provide user personalization for efficient web search. We collect implicit feedback from the users by tracking their behavior on the web page based on their actions on the web page. We track actions like save, copy, bookmark, time spent and logging into data base, which will be used to build unified model. Our model is used as a collaborative framework using which related users can mine the information collaboratively with little amount of time. Based on the feedback from the users we categorize the users and search query. We build the unified model based on the categorized information, using which we provide personalized results to the user during web search. Our methodology minimizes the search time and provides more amount of relevant information. Methodology. The user interface is a tabbed web browser, which is a part of the system. Through this browser the user can provide short-term query simultaneously in multiple tabs for his information need. The user interacts with the system to give search query, to view the ranked results and to view the re-ranked results. The re-ranking is done based on the past search behavior of the user with the system. The browser also supports for providing actions like SAVE, COPY, PRINT AND E-MAIL, which depicts the importance of the web page for his need. The browser also projects the re-ranked results in an interactive graphlike structure rather than list based representations. Each user-visited web page is represented by a set of index words that comes under top list. The usage time of each search query and usage-time of each visited page is calculated transparently without disturbing the user. Based on the search query, index word and usage-times, the User Conceptual Index (UCI) is calculated. The UCI can be represented mathematically as a function of weights of above parameters. The usage time directly indicates whether previous search results were relevant or irrelevant to the users information need. The search queries that have similar or related meaning are categorized to a group using word dictionary in-order to avoid inconsistencies that arise in above strategies. The visited-pages that have similar or related index words are also categorized to recommend the pages for a

novice user. The users with similar search behavior are categorized to a group to improve the efficiency of personalization mechanisms. The pages are re-ranked by analyzing individuals behavior and are projected to them in dual window.

Some of the strategy for personalization of web search is described as follows:

1. A users search history can be collected without direct involvement.
2. The users profile can be constructed automatically from the users search history and is dynamically updated.
3. The categories that are likely to be of interest to the user are deduced based on his search behavior.

Feature Extraction

The first step in the project is to extract the feature of the user-visiting page. The feature of a page, P is defined as a set of top n frequently occurring terms. In order to extract the features, the source content of each page is extracted and it is de-tagged. From the de-tagged page, the stop words are removed and the terms in the page are extracted. From the set of terms, the top n frequently occurring terms is extracted. These n terms form an index words of the page.

Algorithms

Feature Extraction

User visiting page P_i

Procedure:

step1:

The de-tagged and stop words eliminated page P_i can be represented as $IW = \{IW_1, IW_2, IW_3, IW_n\}$ and $F = \{F_1, F_2, F_3, F_n\}$ where IW is the index word set and F is the Frequency set corresponding to IW and n is the number of index words in the page.

step2:

Select top k frequency words $F_{\text{top}k} = \{F_1, F_2, F_t\}$ which corresponds to $IW_{\text{top}k} = \{IW_1, IW_2, IW_t\}$ Where $k \leq t \leq n$.

step3:

Compute the mean for the above set $(F_{\text{top}k}) = \frac{F_1 + F_2 + \dots + F_t}{t}$

step4:

The keywords in $IW_{\text{top}k}$ that have frequency above $(F_{\text{top}k})$ form the feature of the page.

step5:

Now represent the feature of the page as $\text{Feature}(P_i) = \{F_1, F_2, F_m\}$ Where $1 \leq m \leq k$.

step6:

End

User Association Analysis

The user association is analyzed to find the similarity of search among different users. From the set of visited-pages, the actions performed by the user are monitored. From the action it is concluded whether the page is useful to the user. The order in which the page is visited is also tracked and a directed graph is constructed. The usage-time for each page forms the weight of the page.

Algorithm :

Similarity measure

Given: User behavior graph Procedure:

step1:

Indexingfor i:=1 to N dofor every vertex j of the web graph doBehavior [i] [j] []: =reversed path of length l starting from j.

end

end

step2:

User Sim(i,j) ,Sim:=0

for i:=1 to N do

for j:=1 to N do

let k be the smallest offset with

Behavior[i][u][k]=Behavior[j][u][k]

if such k exists then

Sim=Sim+ck

end

end

return Sim/N

step 3:

End

The above algorithm is used to identify the similarity behavior between two users. Whenever the search behavior is common, then it is certain that the users might come from same source point. Thus, higher the length l in the above algorithm, greater is the similarity.

Search Query Categorization

Greater the number of times a user uses a particular SQ, greater is the interest of the user on the particular topic associated with the search query terms. If the previous search result is not relevant to the user's information need, then the user might modify the SQ to $_{t}$ into their context of search. Even though the search keyword gets changed, the information need on a topic doesn't get changed in that session. Hence the alternate keyword supplied by the user may also be intended to search exactly for same topic. So it is necessary to identify the alternate meanings of user's search query, which leads to categorization of the search query. The query categorization is necessary to reduce the limitations in key word based search.

Algorithm :

SQ Categorization

Step1: Collect all the search queries given by the user in a due course of time.

Step2: Find the alternate meaning of the search query using a word dictionary.

Step3: Find whether the result exists in the search query set provided by the user.

Step 4: If such commonalities exist, update the TF matrix and ST matrix.

Visited Page Categorization

Higher the similarity ranks between two users, greater the commonalities of search between them. Two pages can be said to be similar even if they spoke of exactly the same topic with different keywords. Hence it is necessary to identify the alternate meanings of the Index words, which leads to categorization of the visited page. The categorization of the page is used to expand the similarity rank calculation, which aids to identify common search behavior.

Algorithm:

Page Classification

Step1: Collect all the index terms of all the visited pages by the user in a due course of time.

Step2: Find the alternate meaning of the index terms using a word dictionary.

Step3: Find whether the result from step2 exists in the index terms set collected from user history.

Step 4: If such commonalities exist, update the SF matrix.

Use of Simulation software

- Jdk , JCreator , Net beans etc.

- Oracle , MySQL, WampServer etc

- SkyServer etc.

- TC for C programming

VII. CONCLUSION

Scientists need help in exploring databases. Query recommendations can be an effective tool in guiding exploration.

Collaborative filtering provides a natural method to generate recommendations. Experiments show promising results on real world datasets.

ACKNOWLEDGMENT

With all respect and gratitude, we would like to thank all people who have helped us directly or indirectly for the completion of this project work. We express our heartfelt gratitude towards **Prof. S. G. Chordiya** for guiding us to understand the work conceptually and also for his constant encouragement to complete this Project work on *Query Recommendations for Interactive Database Exploration*. We also express our thanks to **Prof C.N.Patki** Head of department of Computer Engineering for providing necessary information and required resources. With deep sense of gratitude we thank to our Principal **Prof.Dr.Dayanand P.Joshi** and Management of the A.V.E.W. Trust's for providing all necessary facilities and their constant encouragement and support. Last but not the least we thank to all the Teaching and Nonteaching staff members of Computer Engineering Department for providing necessary information and required resources.

We are ending this acknowledgement with deep indebtedness to our friends who have helped us.

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Status and Threats of Asiatic Black bear in Gais Valley of Diamer District, Gilgit-Baltistan, Pakistan

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Abstract- The team conducted informal interviews of the shepherds, farmers, teachers, religious, political leaders and elites of Gais valley District Diamer Gilgit-Baltistan of Pakistan to determine threats to Himalayan black bear (*Ursus thibetanus*) from October 29 to November 6, 2013. Based on our interviews and discussions, we evaluated the existence of Black bear in the valley and one other adjacent valley of the district. During the visit we conducted interviews in Banga, Gumbas, Katrochung, Changa, Shang, Sonologah and proper Gais village. Eleven (11) numbers of bears have been reported by the local in the valley which they have seen in the year 2013. The shepherds told that they have seen the species mostly in night and very rare in day time, while damaging fruits of mulberry. Some of the old hunters and community members told that the species has been sighted during the month of January in the valley. Due to harvesting of forest in adjacent valleys, the Black bear shifted to Gais valley forest. According to the respondents the species damage with an estimated figure of 4 mounds crop/fruits per household with a market value of Rs.3000-4000/- per household and per year and damage Fifteen (15) livestock (Cow, goat and sheep) annually in the pastures, of the valley with a market value of Rs 450000/- in Pak Rupees. Mostly, the Black bear attacks on crop field of Maize, grapes, apricot, walnut, mulberry fruits during night time. The fruits were usually damage in late evening and especially, when the people shifts from lower villages to upper villages. 85% of the population told about the damages of their crops and fruits. The agriculture field near to forest is most affected by the bear.

The species usually attack livestock in in night and very rare in day time in pastures. Only one time the Black bear entered in cattle shed and killed one goat. There is no any compensation mechanism on losses of the livestock. Due to revenge of these losses the farmers killed 6 bears in the valley since last 10 years. The species attacked on six (6) human and only wounded by him, and no any death case of human being is reported by bears in the valley.

The populations of Black bears are decreasing in the district due to increased human activities, like human settlements, habitat destruction, livestock grazing in bear habitat, agricultural extension, leisure hunting and retaliatory killing against depredation of livestock and crops.

The objective of the study was to know the status and threats of Himalayan Black bear through conducting structural and unstructured interviews. Our intent was that this information be used to determine the threats, losses of livestock, crops and fruits

and also seeks the views of local communities to protection of the species, its habitat along with other associated wildlife in the valley and other parts of the Black bear habitat in the district.

During travelling on the way, Bear digs holes and drag stone and eat ant. Some hunters follow this to kill the animal.

Index Terms- Asiatic Black bear, status, threats, indigenous interviews, Gais valley, Pakistan

I. INTRODUCTION

Eight species of Bears are reported to be in the world; among only 2 species, Himalayan brown bear and Himalayan black bear can be sighted in the Pakistan. According to T.J Robert (1977) the Himalayan black bear is mainly confined to Himalayan moist forests of Pakistan and occur in Neelum valley of A&JK, Kagan valley in Hazara District and in Chitral. In Gilgit-Baltistan it occurs in Diamer district extending southward into Indus Kohistan. The status of Black bear is in IUCN Red List is vulnerable (A2cd+3d+4d); CITES Appendix I. (Garshelis & Steinmetz (2008). The range of the Black bear may be used to extend continuously southward from the northern mountains, through the Khyber Pukhtoon Khawa Province and the Suleiman Range; into Baluchistan Province, and on westward into the Iranian Baluchistan. Both the northern and Baluchistan bear populations are suffering the effects of persecution and habitat disturbance, but the former is the more acutely threatened. The species preferred to live in broad leaved and coniferous forests to an elevation of above 5000m. The Asiatic black bear has a hair of smooth black and can be famous by a V of white fur on its front site.

The Himalayan Black bear has been identified in southern and eastern Asia from westward through Pakistan and Afghanistan to Baluchistan Province Pakistan; east to Indo-China through much of China, Korea, Japan and some numbers in Taiwan (Servheen 1990, Sathyakumar 2001). Schaller (1977).

According to the survey conducting in 2005 by Sathyakumar and Choudhury, in press) the population status of Black bear in state of Jammu and Kashmir is properly common. The survey is conducted in 16 Pas and 20FDs, RFs and FVs of the state and reported Black bear in different National Parks, Wildlife Sanctuary and five Conservation Reserves viz. The Black bear is also reported in 20 other sites, these includes FDs in Lidder (Pahalgam), Sindh, Wangat, Anantnag and Reserved Forests etc. some other FDs of Marwa, , Doda, Badhruwa, Kistwar, Jammu

Poonch, Nowshera, Reasa, Mahor, and Rajouri the species has been sighted.

In southern part of Indian range degradation of habitat is one of the biggest severe. The species is <10% range is inside the Protected Areas and due to extraction of fuel wood and collection of fodder it is different (Sathyakumar 2006). While in Bangladesh, Black bears live only in small leftover covers in the east adjacent to Myanmar border where forest cover is now <7% of the land area. Myanmar, although still well forested (nearly 50%), is fourth in the world in the annual rate of loss of forested area. (FAO 2006). Thailand occupied forest cover (<30%), and its lasting forests are inside the Protected Areas and about half of these are occupied by Black bears (Vinitpornawan et al (Garshelis, 2013) al. 2006).

Commercial trade of body parts and gall bladders is the major threat to Black bears in China and Southeast Asia. In 1984 China introduced saleable bear farming to fulfill the demand for bile by experts of Traditional Chinese Medicine (TCM; and also Traditional Korean Medicine, TKM). Several small-scale bile farms have been underway in Viet Nam, which were supplied by numerous thousand bears detached from the wild and as well as from neighboring countries of Viet Nam. (J. Robinson and G. Cochrane, Animals Asia Foundation pers. com).

The maximum favorable conservation steps for Black bears would be to significantly decrease the request for bear products, and thus decrease hunting and trade. The Baluchistan bear, a subspecies (*U. thibetanus gedrosianus*) living in the arid thorn forest in the Baluchistan region of southern Pakistan and Iran, was listed as Critically Endangered (B1+2abc, C2a) in the 1996 IUCN Red List, and is nationally listed as critically endangered in Pakistan. The government has suggested a protected area to support in the recovery of the isolated population (Sheikh 2006)

There is no any demanding population approximate present for Black bears. Previously Japan evaluated of 8–14,000 bears on Honshu Island, but the figure is not been considered valid. According to Russian experts the population is about 5–6,000, but the dependability of this is uncertain (Aramilev 2006). Similarly, in India Sathyakumar 2006 the bears are 7-9000 and Pakistan is 1000: Sheikh 2006. Asiatic black bears in China, ranging from 15–46,000 (summarized by Garshelis 2002, Gong and Harris 2006), with an official government estimate (in 2003) of about 28,000; none of these assessments have been validated.

Thailand has lower forest cover (<30%), but most of the forests are present in the Protected Areas, where about half part of the forests black bears are present (Vinitpornawan et al. 2006). These forest areas have been increasing in Viet Nam, but much of the existing forest is highly felled from both legal and illegal (Nguyen Xuan Dang 2006).

The Baluchistan black bear (*Ursus thibetanus gedrosianus*) locally known as "Mum" was once widely distributed in most of Baluchistan. According to T.J. Roberts, this species has been reported in the Sulaiman Range, Ziarat, Harnai, Khuzdar, Kharan and the Lasbela Hills, but now it is considered extinct in most of the areas. Two surveys have been conducted one by WWF-Pakistan in 1993-96 and the other by the Himalayan Jungle Project in 1994 and both confirmed the presence of the species in the Pub area. The population status is not certain, but local hunters report 8-10 animals still survive in the area. A WWF survey team has also reported scats and footprints of the Black

Bear in the Suleiman range in 1998. (<http://wildlifeofpakistan.com/wildbears.html>)

Asiatic Black Bears have once been present in both Europe and Asia. In France and Germany the species have been revealed with fossil records, but have more recently been narrowed to regions in Central and Southern Asia from Afghanistan to Japan and south to Thailand with a minority of populations also found as far north as Russia. The habitats depend on the geographical region where they are found although Asiatic Black Bears prefer deciduous forests and brush land at lower altitudes. The extension of agricultural land by human caused in the remaining populations of Asiatic Black Bears compel to come in small patches of vegetation at higher altitudes (<http://a-z-animals.com/animals/asian-black-bear/>)

Asiatic Black Bears are listed by the IUCN's Red List as a species, populations is decreasing by as much as 49% over the past 30 years alone and although no official estimates have been made, it is extensively supposed that there are fewer than 50,000 left in the wild today. The ban of hunting in their natural habitat with the exclusion of Japan where it population is increasing, Asiatic Black Bears is still severely threatened by hunting, habitat loss and capture as pets, leisure hunting (<http://a-z-animals.com/animals/asian-black-bear/>)

Survey was conducted in 1992-3 to ascertain the population status of Black Bears by Wildlife Department N.W.F.P. According the results the estimated figure was up to 234. The survey report presenting that in Kohistan there were 98 Black bears (survey reports of wildlife department Kohistan in 1998)

Black bears and Sun bears are present at least 20 numbers in 22 NPAs in Laos. Tracks, findings and camera traps images have been documented in Bokeo (North), Nam Et Phou Louey (North), Nam Kading (South), and Dong Ampham (South) National Protected Areas (Chanthavy Vongkhamheng, pers. comm., 2010).

Dr. Gary Galbreath has identified a genetic study of blond color phase of the black bear occurring in the northern Annamite Mountain range of Laos in 2001 (Galbreath & Heene, 2001). Presence of both species sign has been confirmed in Bokeo NPA, northwest Laos by (Long & Abley, 2008). During camera trap the Black bear in north eastern and central Laos has been sighted (Johnston, pers. comm., 2009). In May 2010 in NEPL NPA the presence of Black bear has also been confirmed.

II. MATERIAL AND METHODS

1.1. Study Area:

Gais is a remote eastern valley of Diامر district with three kilometer distance from KKH. The valley has a population of about 1840 with 230 households in the nullahs and 60-70 households are permanent settled in the nullahs of the valley. Gais is part of Goharabad village and comes under the tehsil Thack of district Diامر. The second highest peak Nanga Parbat with eight thousand, one hundred and twenty-five (8125) meters height is situated in Raikot valley of Goharabad.

The village has formed when floods comes from Leachier village about 500 years ago. Noor Saeed Lumbardar the first who came here and constructed an irrigation channel. Then the people of Goharabad came and divided the area into 36 peoples according to the Hati system. Before 1970 rice has been

cultivated in the valley. Black cereal has also been cultivated in the valley up to 1990. Two major floods came in 2008 and 2010 and 95% agricultural fields and fruits trees destroyed in the village along with 2 casualties. The valleys come under double cropping zone and cultivated maize and wheat crop. The valley has Lower Middle and two primary schools without furniture and students were sitting in ground during their education. No any health facility in the valley. The local community constructed traditional houses by using timber of Deodar and Kail trees. The wood is being used in the walls, roof and even floor in upper areas of the valley.

Gais has his community owned commercial forest and renowned for version of Deodar forest. The communities of Goharabad has banned on illegal cutting of the forests. Only dead fallen are allowed to the villagers by a special permission from the committee locally called (Zoati) with the permission of Jirga (elders of the village/valley). Forest Committee (Zoati) is only protecting the forest in Gais as well as other villages of Goharabad and they are not concentrating wildlife and other natural resources. Gais is one of the potential valleys for wildlife species like, Himalayan black bear, Astore markhor, Musk deer, Himalayan lynx and other endangered fauna, avi-fauna and flora species. Himalayan Monal pheasant (*Lophophorus impejanus*) and Koklas pheasant (*Pucrasia macrolopha*) are the Threatened Species in IUCN Red List of Version 2012.2 and Version 2013 1. Some other birds like Himalayan snow cock, Chakor Partridge (*Alectoris chukar*) and others are found in the valley. Due to lack of awareness and ecological importance of these species, the locals are involved in hunting of these birds as sport hunting, meat, sale of their crown and stuff.

The valleys is potential for alpine pastures like Darogah bala, daraogah pain, korati bala korati pain, Jatori, Malpat, khom,

Damarali, Changa and Moshtar are the main pastures in the valley. These pastures are being used by the shepherds from May to October. The Mostar pasture and Chnaga is used during winter.

According to the locals, varieties of snakes are found in the valley, like black, white, brown, red and grey colors. Cobra has also seen in the valley by local people. Due to lack of research and other conservation interventions, the valley is undiscovered of such species and other reptiles.

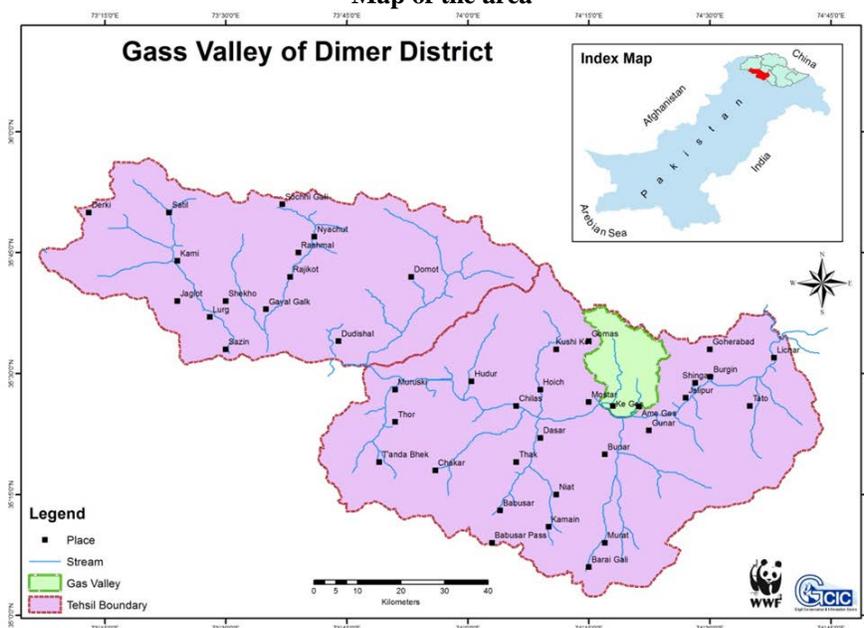
The source of livelihood is agriculture, livestock, laboring, government services and Chilgoza fruits. The locals sell maize, livestock and Chilgoza fruits to meet their health, education and household expenses. The average household size is 14 and with high female ratio. 5-7 years old girls are getting education in primary schools and their strength is only 5% in the class.

The team also visited Geah valley of Diamer for similar interviews. Only four people were contacted, as the other people were busy in collection of firewood from the forest for winter season. The team sighted damages of fruit trees and scats of bear in the village. The respondents told that only one Black bear has been sighted in the valley. He comes in night and damage maize crops and fruits (grapes, walnut and apricot). They have sighted a den in Jalwogar forest area in 2011 which is still there. They told that 20 years ago the population of the species was high and about 5-6 bears had been sighted in the valley.

Due to cutting of forests, increase in population, damages of livestock and crops the people killed the animal or shifted to other valleys.

When asked about on human attack by Black bear in Geah valley, they told that Mr. Farkhan of Thorli valley, Diamer is being attacked and damages his both eyes by the animal in couple of year ago.

Map of the area



1.2. Methodology:

Before conducting the study a questionnaire was developed and tested on 38 individuals. During the interview structural and un-structural questions were preferred to conduct from shepherds

and the effected communities of livestock, crop and fruits. Therefore, we interviewed notables, hunters, educated people, teachers, government employees, and farmers, religious and political leaders from the valley. During the interviews it was

discovered that 95% of people were aware about the shape and attack on crops and fruits. Discussions and interviews with local educated local people are a fast method to acquire information on lasting phenomenon (Sathyakumar, 2001)(Sathyakumar 2001, Hwang 2002). Our team spent nine days in the valley, because our work was to done by foot travelling from one village to another. While travelling to another village we conducted interviews on the way and in the villages. The interviews were conducted from 18 -70 years old members. The questions were asked in local language and before conducting the interviews the member was briefed about the objectives of the interview to create any confusion and raise their expectations from WWF and the project. The questionnaire was filled by four educated members from the valley they were also trained in a session on how to ask the questions and attitudes during interviews. The interviews started from N 35 29 36 6 E 074.18 29 7 and N 353090.1 E 0741913.8

Carvings have also sighted in the valley at the GPS points of N 35 29 34 2 and E074 18 39 0.

III. DISCUSSIONS

In Diamer district the Black bear has been reported in Gais, Gonar farm, Khinar, Hudur, Geach, Khanbari, Thor, Thorley, Darel and Tangir valleys. Due to commercial harvesting of forest in these valleys the population of the species have been shifted to Gais valley due to habitat disturbance and human interference. The Gais Valley forest is protected by the local communities and no any commercial harvesting has been undertaken.

The Himalayan black bear is primarily a forest species; it lives in the conifer forest, and so in the valleys originates lower areas some 3000 m and rarely occurs in areas barren of significant forest cover. The bear graze at night, and rests during the daytime; mostly the species active in night and come in the valleys during day time when there is no disturbance of human in search of food. Especially in May during the Mulberry season. During winter its feeds on the nuts of oak trees.

Table 1:Pastures, types, losses duration of Livestock and human attack by Black bear in Gais Valley:

Pasture	Number of livestock	Types	Duration	Losses by bear (livestock)	Attack on human	No. of bears sighted
Damralie	2000	Goats, sheep & cows	May-Oct	3	-	2
Khom	900	Goats, sheep & cows	May-Oct	3	3	1
Khorati bala	1300	Goats, sheep & cows	May-Oct	5	-	1
Khorati pain	1200	Goats, sheep & cows	May-Oct	-	1	1
Jatori	400	Goats, sheep & cows	May-Oct	1	-	1
Malpat	4000	Goats, sheep & cows	May-Oct	2	-	3
Darogah bala	1500	Goats, sheep & cows	May-Oct	-	-	1
Darogah pain	700	Goats, sheep & cows	May-Oct	-	-	-
Shadatokhur	900	Goats, sheep & cows	May-Oct	1	-	-
Changa	170	Goats, sheep & cows	Oct-April	-	2	1
Moshtar	2000	Goats, sheep & cows	Nov-April	-	-	-

Due to agricultural extension in the habitat by local communities for additional productive land uses, illegal hunting for its skin, fats, to save their lives, livestock and lack of awareness about its ecological importance, population of the specie is declining from its natural habitat of other valleys of the district. The Gais's forest is protected by local communities and felling of forest is strictly prohibited. According to the locals the Black bears comes from other parts of the district due to commercial harvesting of forest. At higher altitudes, animal comes often into agricultural fields and damage maize crop,

attack on livestock and break fruit trees (Grapes, Mulberry, Apricot, Walnut and Fig) in search of food. Local people kill the animal in revenge of such damages. Moreover, due to extreme poverty and dependence on subsistence agriculture and livestock herding, animal is also hunted for sale of its skin and fats by locals in the markets of Chilas and Gilgit as well as to outsiders from Khyber Pukhtoon Khawa province of Pakistan.

During interviews with the residents on its den and living places they told that the bear leaves in a big hole and prepare with its own forelimbs, or in a suitable hole in fallen rocks, or

under tree roots. It does not always enter a prolonged phase of deep hibernation during winter, but may emerge to forage from time to time, especially if food is abundant, and some individuals may move to lower elevations. The bear collects bark of Juniper trees and put in the living places during rest time, especially in sleeping sites.

When asked about its attack and aggressiveness with the herders they told that they have seen two times the Bear becomes dangerous when it feeds especially meat and while crossing a

ridge, when there is no alternate route for crossing. The female with cubs become very dangerous when suddenly appear on the way.

The species is mostly found in Harkali, Moshtar, Darogah, Dassa, Dadapsh, Changa and Neelidar forest of the valley. During late winter the species shift to Moshtar forest from other forests, because this area has dense forest of conifer trees.

Table 2: Fruits and Crops damage by Black bear in Gais valley, 2013:

Crop/Fruits	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Maize												
Grapes												
Apricot												
Mulberry												
Fig												
Vegetables												

The shepherd did not like the animal due to damages of their livestock, fruits and maize crop. The local communities were killing the species due to retaliation of their losses, because their livelihood depends on livestock, agriculture and fruits. They were in view that if government or any other department or conservation organization shall pay the compensation of their damages then they will not kill the animal.

During the years they have sighted 11 species in the agriculture filed, pastures and forests. Sometime they have put poison in the decade of livestock, but the bear did not eat. The shepherd told that the species kills 15 numbers livestock (goats, cows and ox) and the market rate /- per goat Rs.18000/-and per cow and ox/bull is Rs.45, 000/-and the average is Rs. 30000/-and total amount is Rs. 450000/-

The Black bear when enters in an agricultural filed of maize first he collects the Maize’s grains eat and then damage the whole crop by rolling. Fruits like grapes, apricot, Mulberry, Fig is being damaged by the species in the valley. The bear drag the whole branch of grape and damage the whole fruit and branches also.

During the interviews the interviewers told that the species with market value of Pak Rupees 140000/-crops and fruits have been damaged in the year 2013 in Banga, Gumbas, Chnaga,

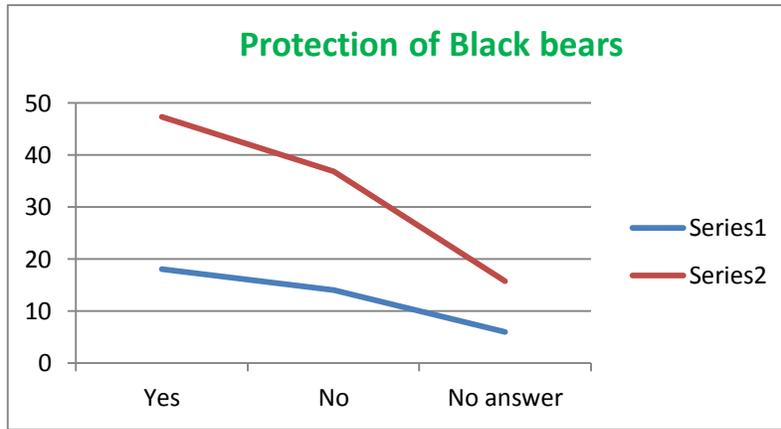
Shutrochung, Samato shing, Darella hat, Gais hat and Sunolagah villages of Gais valley.

The species mostly attack on cows, calf and rarely on goats during night time. Sometime in the forests or pastures it attacks on the goats and sheep. According to the locals the Black bear killed 15 numbers of livestock during the last two years with an approximate value of Rs. 450000/-.

Although the bear attacked on six people during their travelling on the way, no any death cases have been occurred in the history of the valley.

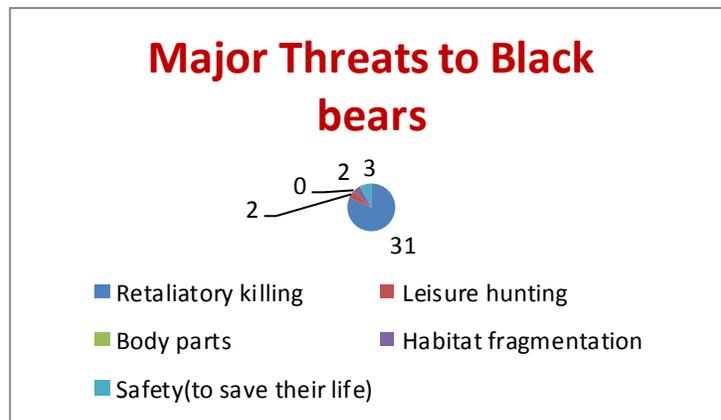
IV. RESULTS

Black bear is present in Khinar, Khanbri, Geach, Darel, Tangir, Thor, Thorley, Hudur and Gais valleys of district Diamer, Gilgit-Baltistan of Pakistan. Due to commercial harvesting of conifer forest in the adjacent valleys and human interference in the valleys, the population of the species has been shifted to Gais valley’s forests. The shepherd did not like the animal due to damages of their livestock, fruits and maize crop. The local communities were killing the species due to retaliation of their losses, because their livelihood depends on livestock and agriculture. They were in view that if government or any other department or conservation organization shall pay the compensation of their damages then they will not kill the animal.

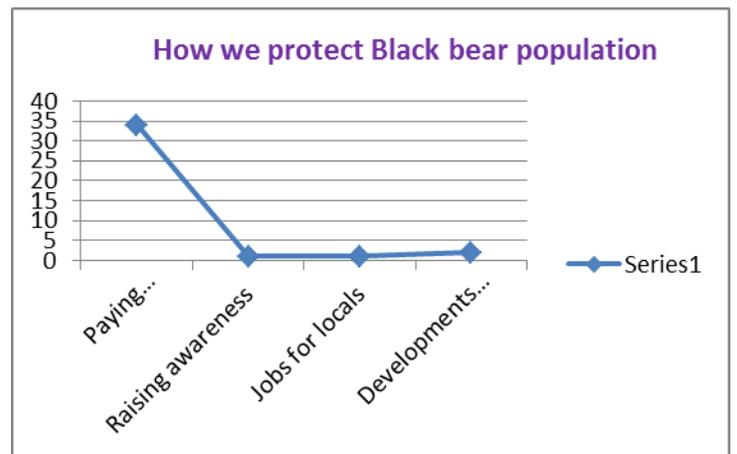


During the years they have sighted 11 species in the agriculture filed, pastures and forests. They have never put poison in the decade of livestock. The shepherd told that the species kills 15 numbers livestock (goats, cows and ox) and the market rate /- per goat Rs.18000/-and per cow and ox/bull is Rs.50, 000/-and the average is Rs. 30000/- and total amount is Rs. 450000/-

The Black bear when enters in an agricultural filed of maize first he collects the Maize’s grains eat and then damage the whole of the filed. Fruits like grapes, apricot, Mulberry, Fig is being damaged by the species in the valley. The bear drag the whole branch of grape and damage the whole fruit on it After eating he destroys rest of the crop in the field by up routing and crawling.



During the interviews the interviewers told that a total of 40 mounds crops/fruits have been damaged in the year 2013 in Banga, Gumbas, Chnaga, Katrochung, Samato shing, Darella hat, Gais hat and Sonolagah villages of Gais valley. The total amount according to the market value is Pak Rupees 140000/- is damaged by Black bears



The species mostly attack on cows, calf and rarely on goats during night time. Sometime in the forests or pastures it attacks on the livestock. According to the locals the Black bear killed 15

numbers of livestock during the last two years with an approximate value of Rs. 450000/-.

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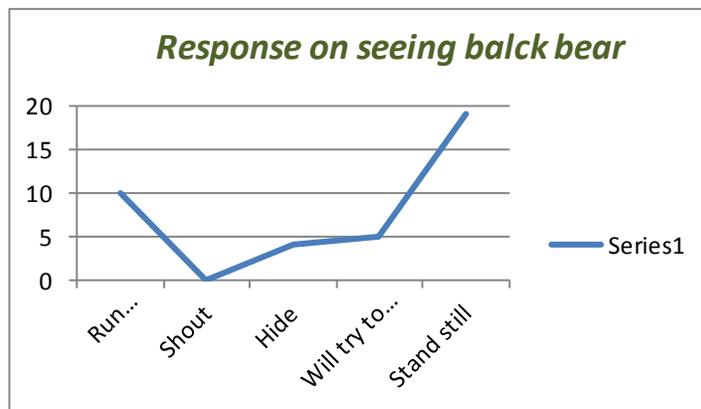


Table 3: Losses of Maize and Fruit Crops

Village	Crop/fruits	Month	Value (Pak Rupees)
Gais	Bell pepper & maize	May-June	20600
Banga	Maize, grapes, apricot, & walnut	May-Oct	45600
Samato shung	Grapes, apricot, & walnut	May-July	15000
Gumbas	Maize & grapes, apricot, & walnut	Oct	12600
Chunga	Maize	Sept-Oct	9000
Sonologah	Maize & grapes, apricot, & walnut	Sept-Oct	21900
Shutrochung	Maize, grapes, apricot, & walnut	Sept-Oct	1300
Darela hat	Maize and grapes,	Sep-Oct	14000
Total			140000

V. RECOMMENDATIONS FOR PROTECTION/CONSERVATION/MANAGEMENT OF BLACK BEAR:

No any efforts have been made for conservation of Black bear in the valley by government or any other conservation organization. This was the first initiative taken by WWF-Pakistan for conservation of Black bear and other natural resources Gais valley, Diamer District of Gilgit-Baltistan. The locals shown their keen interest in protecting the animals with the following recommendations;

1. By paying compensation of their losses of livestock, crops and fruits by the Black bear.
2. Improving their education by providing education aids and trained teachers
3. Providing basic health facilities in the valley
4. Introducing modern techniques in agriculture sector
5. Raise environmental awareness and build their capacities in NRM and income generation interventions.

6. Strengthening local protection system (Zoati) by providing financial support.
7. Proper lightening system should be installed in the most effected fields and orchards sites to reduce crops and fruits damages.
8. Population status survey should be conducted in other valleys of the district to know the population of Himalayan black bear in the district.

ACKNOWLEDGMENT

This research was funded by WWF-Pakistan through its Small Grants Programme. We thanks for the support of local communities of the valleys for cooperating with the staff of WWF-Pakistan, Gilgit-Baltistan during the study.

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Reservation Based Parking System with Dynamic Slot Allocation

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Abstract- The objective of this paper is to highlight the implementation of dynamic memory allocation using arrays and how it is better than other methods. It is often observed that parking vehicles manually takes longer time wherein user searches the parking area and parks the vehicle which is a tedious task, to save the time spent for searching the slot a registration based application circle parking system is designed which provides platform to users to book parking spaces online in advance for a given location and then park the vehicle with a minimal fees. This application allocates slots dynamically using array and stores the booking details. This paper discusses the benefits of the dynamic allocation in circle parking system.

Index Terms- Manual; Automated; Parking; location; Array; Memory; Circle parking system.

I. INTRODUCTION

Parking of vehicles in existing scenario is getting difficult as number of vehicles keeps on increasing whereas the parking area remains the same. As a result, people would spend a certain amount of time looking for parking space and thus cause a situation where the traffic would be slowed down and cause congestion. The situation of looking for parking space and traffic congestion in parking areas is due to the fact that the information of available parking spaces is not readily available to the people looking for parking spaces. As such different approaches have been used to develop a car park management system such as wireless sensor network system and a vision system. This paper highlights the difficulties faced by the customers searching for spaces while parking vehicles, shows difference between manual and automated parking system, outlines circle parking system architecture and how the dynamic slot allocation is done in it and the devices required to implement it.

II. CHAPTER SUMMARY

The previous section offers conclusions and discusses current research. Chapter 3 is about existing parking system, chapter 4 comparison of existing system, chapter 5 discusses the dynamic slot allocation done using array in circle parking system, the chapter 6 is the conclusion of the paper and finally chapter 7 is about references.

III. EXISTING SYSTEM

Time and cost are two important factors of human life, whether for an individual or a business. As quality of life increases, more and more people are inhabiting cities. Urban life requires centralized public facilities. Shopping complexes are an important point of interest both for a city's inhabitants as well as for visitors. With the emergence of modern shopping complexes which provide a variety of services, more and more people are attracted to visit them. Hence, more shop owners prefer to locate their business in shopping complexes to target more customers and increase revenue.

Recently, shopping complexes have begun providing services much more diverse than just pure selling and buying. Customers can use banking services, post offices, food courts, cinemas, children's play areas, and so on. The growth of shopping malls has influenced shopping culture and behavior. For instance, in Bangalore window-shopping, or visiting shopping complexes simply for looking rather than buying, is a common activity.

Providing sufficient parking for visitors is one of the main issues in developing shopping complexes. Offering safe and secure parking lots with a sufficient number of spaces and paying attention to handicapped drivers are a few of the factors which can increase customer loyalty and attract customers to visit a shopping mall more frequently. Among the various types of parking lots are multilevel parking, roadside, roadside with ticket and barrier gate and roadside with parking meter; of these, the multilevel parking[2] lot is the most preferred by patrons [3]. Safety, weather conditions, proximity and car park fees respectively are the main factors by which patrons choose a specific parking lot. Hence, multilevel parking lots are preferred, and for this reason were selected as the parking lot type for this study. Sensors detects parking space occupancy through circle parking system application which shows the present status of the parking slots. Vacant, occupied, handicapped or reserved spaces are indicated by different colors of slots in the application. "Improper parking" is the situation in which one car is parked straddling two vacant spaces and occupies both. Detection of improper parking and providing directions to vacant spaces and payment facilities are other services offered by wireless sensor networks have attracted a great amount of attention[1][9].

A multistoried parking system can be an automated one or it can be a manual system. Such systems can be implemented above or below the ground level and it aims at providing parking space to large number of cars in a comparatively smaller area.

Here it becomes quite necessary to quote an example of an existing parking system situated in a very crowded area. It is a manual multistoried parking system containing steep slopes, blind turns and a single path for both entry and exit. Now, it need not be mentioned what degree of menace must be created every day in that parking system on account of traffic jams, accidents, quarrels and sometimes, even physical assaults.[10]

IV. COMPARISON OF EXISTING SYSTEM AND RESERVATION BASED PARKING SYSTEM

Automatic vehicle parks provide lower building cost per parking slot, as they typically requires less building volume and less ground area than a conventional facility with the same capacity. However, the cost of the mechanical equipment within the building that is needed to transport cars internally needs to be added to the lower building cost to determine the total costs. Other costs are usually lower too, for example there is no need for an energy intensive ventilating system, since cars are not driven inside and human cashiers or security personnel may not be needed.

Automated [4] vehicle parks rely on similar technology [5] that is used for mechanical handling and document retrieval. The driver leaves the car in an entrance module. It is then transported to a parking slot by a robot trolley. For the driver, the process of parking is reduced to leaving the car inside an entrance module. At peak periods a wait may be involved before entering or leaving. The wait is due to the fact that loading passengers and luggage occurs at the entrance and exit location rather than at the parked stall. This loading blocks the entrance or exit from being available to others. Whether the retrieval of vehicles is faster in an automatic car park or a self-park car park depends on the layout and number of exits.



Fig 1: Automated parking system

Manual Parking system [6] account for much higher building cost as compared to the automated parking system. Also, the cost of ventilating systems, security personnel etc. to be borne by the developer. In the case of manual [8] Parking system, the car is to be driven in and parked in available slots. Waiting period maybe limited to payments to the cashier as against loading and unloading of passengers as in automated system. Although, the benefits may seem obvious between the automated and manual Parking system [7], the pros and cons of each are significant and may help in deciding the technology to be implemented or the

technology that may be feasible at the parking system. These issues may be further discussed in the feasibility report.



Fig 2: Manual Parking System

V. DYNAMIC MEMORY ALLOCATION USING ARRAY

There are two type that is associated with memory allocation of array. First one is static and another one is dynamic allocation [13][14]. The size of array is predefined in static allocation whereas the size is unknown in dynamic allocation. In dynamic allocation size of it index is decided at run time. So it is better operation considering memory management problem while working with array. The wastage of memory is less in matter of dynamic allocation. Generally when working with patterns example, this two types are used to assign a method of allocation. [12]

Following is the comparison between automated and manual parking system based on the below parameters:

Sl.No	Parameter	Automated	Manual
1.	Cost of setting up system	High	Low
2.	Maintenance cost	High	Low
3.	Land Requirement	Low	High
4.	Wait Time	Low	High

```
Data_type Var_name[ ];
Var_name=new Data_type[size];
```

Code.1. Syntax to define array allocation in 1 dimension

```
Data_type Var_name[ ] [ ];
Var_name= new Data_type [size][size];
```

Code.2. Syntax to define array allocation in multiple dimension

The size of an array is fixed when it is created. Elements are not allowed to be inserted or removed. However, it is possible to implement a dynamic array by allocating a new array and

copying the contents from the old array to the new one. A dynamic array has variable size and allows elements to be added or removed. For this, allocate a fixed-size array and divide it into two parts: The first part stores the elements of the dynamic array and the second part is reserved, but not used.

Then elements can be added or removed at the end of the array by using the reserved space, until this space is completely consumed. After that, a bigger array is created and contents of the old array is copied to the new array.

- **Logical size (size):** the number of elements in the dynamic array
- **Capacity:** the physical size of the internal array (the maximum possible size without relocating storage)

Dynamic arrays of integers has two attributes:

- int[] data: an integer array, and
- int size: the logical size, the number of elements used

The capacity of this dynamic array is simply data.length. An important method needed is to add elements to the end of the dynamic array. This method should provide automatic extension if the capacity is not large enough to hold the added element. Designing Dynamic Array can be done with the following members: Attributes / Constructors / Methods:

- int[] data: the array storing the elements
- int size: the number of elements
- DynamicArray(): initialize this dynamic array with size 0
- DynamicArray(int capacity): initialize this dynamic array with the capacity
- int get(int index): get the element at the specified index
- int set(int index, int element): set the value of the element at the specified index
- boolean add(int element): add the element to the end of the array
- void ensureCapacity(int minCapacity): increase the capacity
- int size(): return the size of the dynamic array
- boolean isEmpty(): check whether the array is empty
- void clear(): clean up the elements [11]

Circle parking which is taken as example involves the use of computer controlled mechanism, which allows patrons to drive up to the bay, lock the cars and let the machines automatically place the vehicle in the allocated space. This type of car park offers maximum utilization of space as it is machine controlled unlike conventional car park where space is needed for navigation of vehicle within the car park. Among its benefits are that the implementation works great in locations, where there are limited room for expansion due to its structure. Besides that, the Automated Parking System also offers efficiency in car storage as it allows car stacking and the patron does not even need to go into the car park which indirectly provides extra safety measures which covers both the vehicles and patron.

5.1 DYNAMIC SLOT ALLOCATION IN CIRCLE PARKING SYSTEM

Circle parking system is a registration based parking system where in users can register the parking slots and park the vehicles. This application offers users facilities such as user registration, booking slots prior to occupying parking space,

booking slots for weekly, monthly and yearly format. The application uses array in dynamic slot allocation where the user selects the slot and books it, here the memory is allocated in an order and released in same order. Here fixed allocation is not used so that pre-allocating structures is not allocated, and dynamic memory allocation during normal processing. VARIABLE ALLOCATION avoids unused empty memory space by using dynamic allocation to take and return memory to a heap. MEMORY DISCARD simplifies de-allocating temporary objects by putting them in a temporary workspace and discarding the whole workspace at once. POOLED ALLOCATION avoids the overhead of variable allocation given a large number of similar objects, by pre-allocating them as required and maintaining a 'free list' of objects to be reused. COMPACTION avoids memory fragmentation by moving allocated objects in memory to remove the fragmentation spaces. REFERENCE COUNTING manages shared objects by keeping a count of the references to each shared object, and deleting each object when its reference count is zero. GARBAGE COLLECTION manages shared objects by periodically identifying unreferenced objects and deleting them. The following diagram shows the relationships between the patterns.

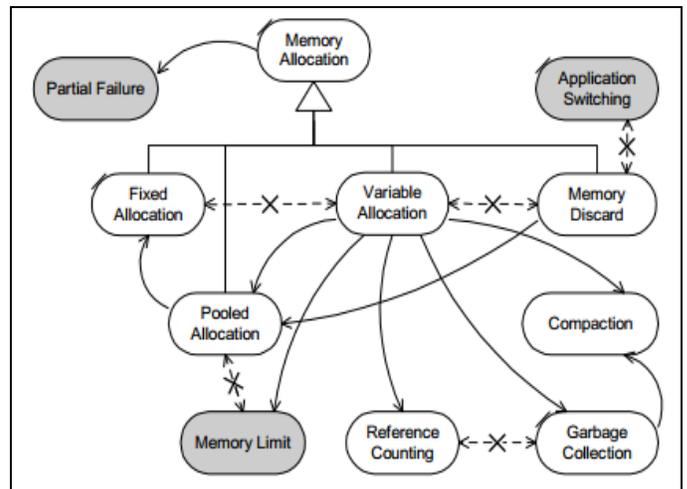


Fig 3: Allocation Pattern Relationships

5.2 IMPLEMENTATION OF RESERVATION BASED SYSTEM IN CIRCLE PARKING SYSTEM.

Circle parking system allows user to do registration and reserve [15][16] the parking slit before going to the location which saves two important factors for users' i.e., time and money.

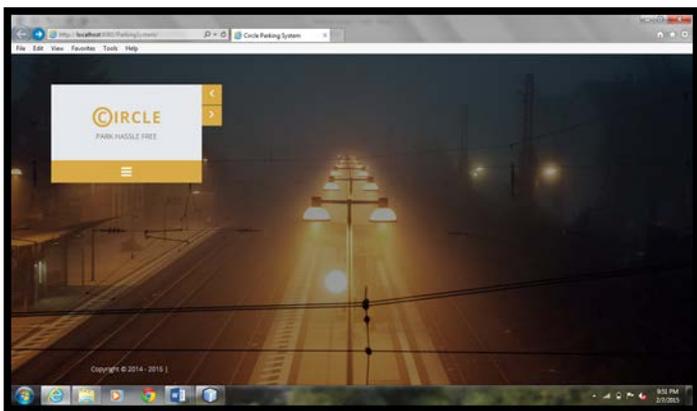


Fig 4: Circle Parking System Home Page

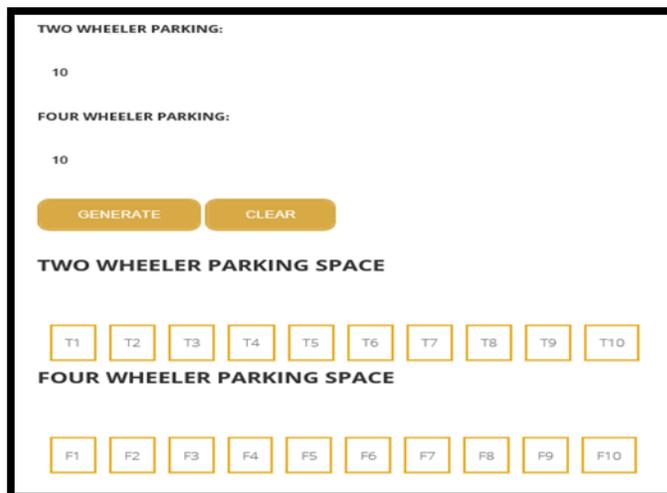


Fig 6: Circle Parking System Booking page

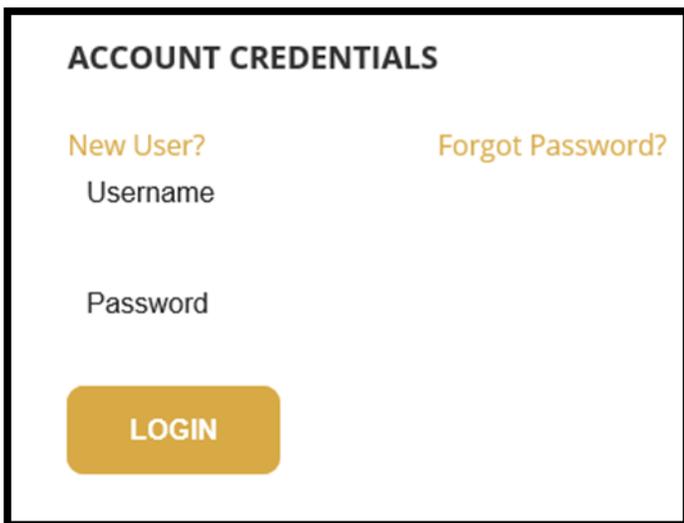


Fig 5: Circle Parking System Login Page

For booking slot the users are required to register first and then proceed with booking, in the booking module the user is given option to select and book the slot. User logs into the application, navigates to booking page and clicks on the one of the slot area, a slot booking modal window opens up in which the user is required to fill in the requested details, once the user submit these details the pop up closes and the selected slot color changes to green color and the value is stored in database. When the user releases the slot by clicking the slot and clicks on release button the color changes to red color. Based on the booked and released status the time is taken into consideration and the parking fees is calculated which user is required to pay during leaving the location. If the user books the slot for specified time the booking time is taken in account and parking fees is calculated.

VI. CONCLUSION

Reservation based dynamic slot allocation in parking system first and foremost reduces human intervention required for parking vehicles. It is time efficient and cost effective as the whole process of building a software system is being automated. The delivery of the software system can be assured on time with reduced cost and quality code which is mostly spent on the resources if there were manual work. Hence, this approach plays a vital role in reducing time required in manual parking system. This system is not the replacement for the current manual and automated system available but can be implemented to remove time and cost constraints to build robust applications.

Drivers spend more time in finding place for parking and to overcome this issue the final solution is rarely known at the beginning. Circle parking system implemented using reservation based dynamic slot allocation is a working system that is built to overcome the parking issues. Subsequent planning sessions will be helpful to uncover the unseen issues.

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Awareness of anemia in pregnancy among the caregivers of pregnant women in Saveetha Medical College Hospital

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Abstract- Anemia is the most common nutritional deficiency disorder in the world. WHO has estimated that prevalence of anemia in developed and developing countries in pregnant women is 14 per cent in developed and 51 per cent in developing countries and 65-75 per cent in India. Anemia is one of the important factor which decides the outcome of pregnancy. Affects of anemia among pregnant women includes increased risk of low birth-weight or prematurity, perinatal and neonatal mortality, increased risk of maternal morbidity and mortality. Anaemia is estimated to contribute to more than 115,000 maternal deaths and 591,000 perinatal deaths globally per year(4).

This study is focused on the awareness of affects of anemia in pregnancy among the persons who are taking care of these women at home(caregivers). Indian customs have food taboos and implementation of supplemental iron during pregnancy experiences a kickback because of the common belief that any drug in pregnancy can cause teratogenicity(malformed fetus). We have taken the help of a questionnaire which targets the knowledge of anemia in various aspects like affects in pregnancy, sources of food which can improve anemia, foods which can affect the absorption of iron etc. among these caregivers.

AIM: To find out the awareness of anemia in pregnancy among the caregivers of pregnant women reporting to Saveetha Medical College and Hospital.

RESULTS: Among 300 participants, 70% were unaware of the symptoms of anemia, 100% were unaware of the cardiac complications, postpartum hemorrhage, maternal mortality due to anemia in pregnancy; however more than 70% were aware of the diet rich in iron and proteins which can improve anemia 100% of the participants were unaware that iron tablets should not be taken with tea or coffee or milk. No significant difference was found between the level of awareness and the demographic variables like sex, age, income, literacy or caregiver's relation with the patient.

CONCLUSION: Participants were totally unaware of the grave complications of anemia. It needs to be re-emphasized that through media-radio, television (which contributed to the sources of health information in 48.4% of the participants) we can impart more knowledge to the general population regarding the complications of anemia and need for regular follow up with their doctor(who contributed to sources of health information in 46.3% of the participants) for decreasing the maternal mortality in India. Distribution of pamphlets with information regarding these aspects of anemia to the caregivers will definitely improve the knowledge of anemia among these people.

Index Terms- Anemia, pregnant women, awareness, knowledge.

I. INTRODUCTION

Anaemia has major consequences on human health as well as social and economic development. Anaemia is the world's second leading cause of disability and is responsible for about 1 million deaths a year, of which three-quarters occur in Africa and South-east Asia⁸. In terms of lost years of healthy life, Iron Deficiency Anaemia causes 25 million cases of Disability Adjusted Life Years (DALYs); this accounts for 2.4 per cent of the total DALYs worldwide⁹. In the World Health Organisation (WHO)/World Bank rankings, IDA is the third leading cause of DALYs lost for females aged 15–44 years^{10, 11}. Physical and cognitive losses due to IDA cost developing countries up to 4.05 per cent loss in gross domestic product (GDP) per annum, thereby stalling social and economic development¹². When results are expressed as a percentage of GDP these losses are 1.18 per cent of GDP in India.

The consequences of anaemia in women are enormous as the condition adversely affects both their productive and reproductive capabilities. . Among women, iron deficiency prevalence is higher than among men due to menstrual iron losses and the extreme iron demands of a growing foetus during pregnancies, which are approximately two times the demands in the non-pregnant state. Worldwide, it is estimated that about 20 per cent of maternal deaths are caused by anaemia; in addition, anaemia contributes partly to 50 per cent of all maternal deaths¹⁴. First, anaemia reduces women's energy and capacity for work and can therefore threaten household food security and income. Second, severe anaemia in pregnancy impairs oxygen delivery to the foetus and interferes with normal intra-uterine growth, resulting in intrauterine growth retardation, stillbirth, LBW and neonatal deaths. Therefore, anaemia is a major contributor to poor pregnancy and birth outcomes in developing countries as it predisposes to premature delivery, increased perinatal mortality and increased risk of death during delivery and postpartum . One of the primary aims of antenatal care is to prevent and treat anemia during pregnancy, since the safety of labour and the puerperal state, to say nothing of the future health, depend upon the state of the patient's hematological reserve

Implementation of any programme to reduce the incidence and prevalence of anemia in pregnant women needs participation of the beneficiaries which again is affected by the awareness of the benefits among the caregivers

Hence there is a potential need to reinforce the knowledge of anemia in pregnancy among the caregivers.

This need to educate the caregivers lead us to conduct this study.

II. OBJECTIVES

- a) To describe the background of the caregivers who will be interviewed.
- b) To ascertain the level of awareness in the target population
- c) To propose methods for increasing awareness in the target population

III. MATERIALS AND METHODOLOGY

Study population: caregivers of the pregnant women with anemia attending saveetha hospital

Study area: Saveetha Medical College hospital, Thandalam.

Study period: Aug2013 to jan2014

Sample selection

All anemic antenatal patients attending OP and IP were included

INCLUSION CRITERIA

All pregnant women with Hemoglobin <11gm%

Definition of the caregiver: one who is taking care of the pregnant woman at home.

EXCLUSION CRITERIA

Caregivers of women with other medical disorders like hypothyroidism, heart disease, hypertension.

Attenders who do not take care of the woman at home.

PROCEDURE

Study was begun after approval from the institutional ethical board.

The caregivers of pregnant women who were anaemic by inclusion criteria were taken into the study. After informing them about the research and taking consent, a questionnaire was read by the caregiver or the investigator for which they had to answer according to the options given. The questionnaire was analysed on a scale to measure awareness of anemia among these caregivers.

Sample size : 300

Statistical analysis: Results were analyzed by descriptive and inferential statistics. Chi square test was used to establish whether there was any significant difference in knowledge among various demographic variables.

IV. RESULTS

Background of the caregivers :

Among the 300 caregivers involved in the study, 91.3% were females and 8.7% were males.

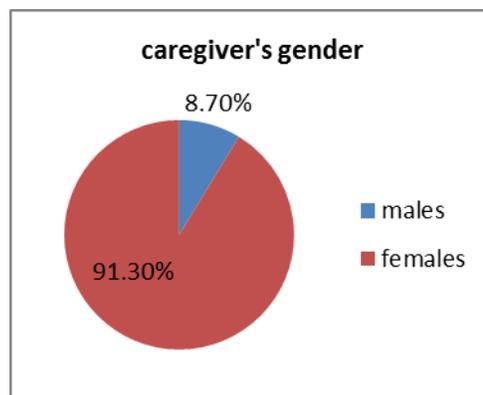


figure1:GENDER DISTRIBUTION

Relationship of the caregivers with the patients: among 300, 51.7% were mothers,32.3% were mother in law, a small proportion of 7.3% were the sibling, whereas 8.7% were the husbands

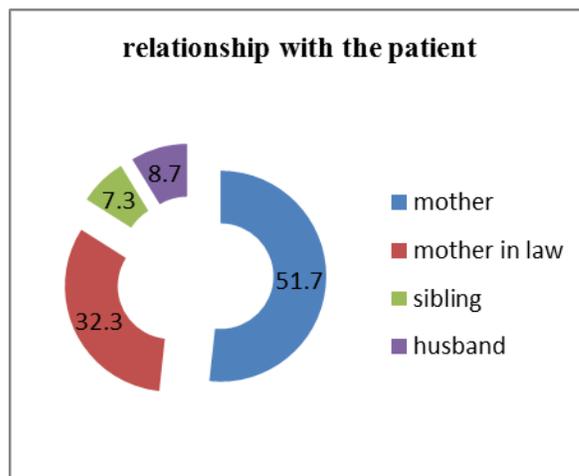


FIGURE2:RELATION WITH PATIENT

Literacy of the caregivers: Among 300, 41.3% were illiterate, 38% had a primary education, 14.7% had made it upto 10th/12th, and only 6% were graduates/postgraduates.

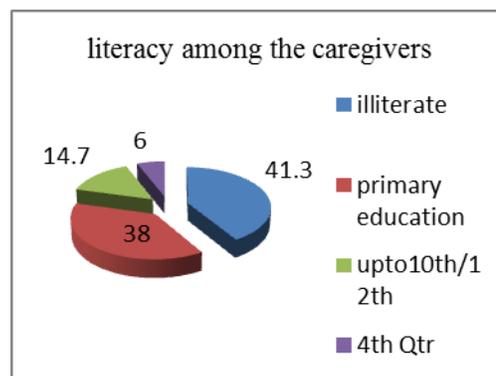


FIGURE 3:LITERACY STATUS

Income of the caregivers: among 300, 5.7% were earning >10,000 per month, 19.7% were earning 3-5,000 per month and 30.7% had income between 5-10,000 per month. A large proportion about 44% did not want to reveal their income.

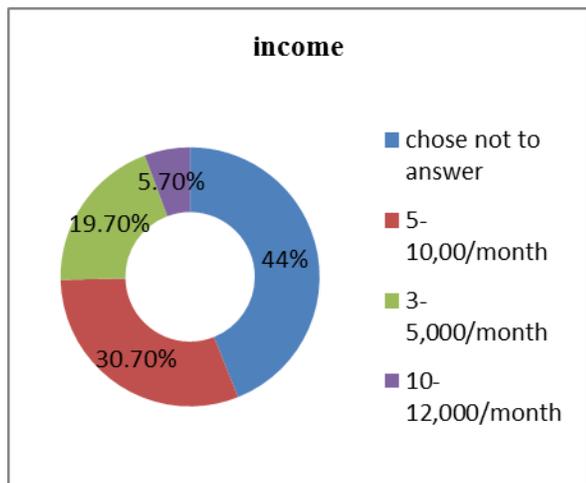


FIGURE 4: FINANCIAL STATUS

Sources of health information among the caregivers: Among 300, 43.6% depended on their physician for health information, 27.7% depended on radio, 20.7% on television and 8% on newspaper.

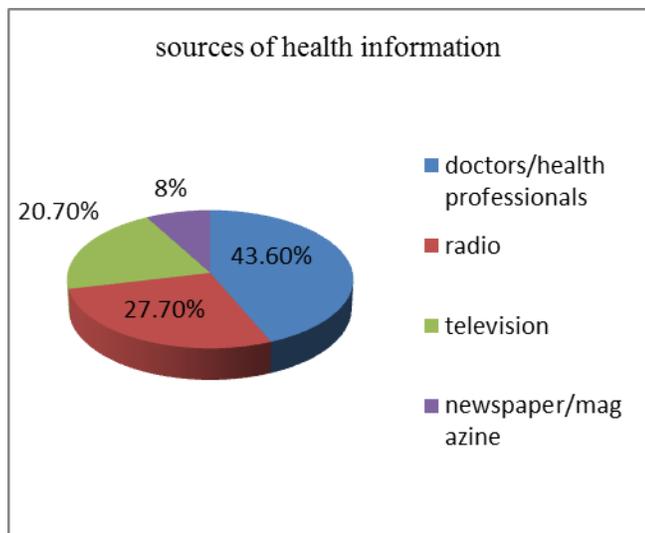


FIGURE 5: HEALTH INFORMATION SOURCE

Knowledge of the common causes of anemia

Cause of anemia/awareness	Nutritional deficiency	Worm infestation
Aware	75 (25.1%)	76 (25.3%)
Unaware	224 (74.9%)	165 (55%)

Denied the cause	1 (0.3%)	59 (19.7%)
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Knowledge of symptoms and signs of anemia

	symptoms	signs
Aware	90(30%)	198(66%)
Unaware	210(70%)	102(34%)

Knowledge regarding food which can improve anemia

	Diet rich in Iron and protein can improve anemia	Pulses and egg as sources of iron	Green leaves, jiggery, beetroot as sources of iron	Lemon, amla, orange, guava as sources of vit.C	Non-veg meals improve anemia
Aware	212 (70.7%)	125 (41.7%)	180 (60%)	121 (40.3%)	250 (83.3%)
Unaware	88 (29.3%)	175 (58.3%)	120 (40%)	179 (59.7%)	50 (16.7%)

Knowledge of affects of anemia in pregnancy

	Anemia affects pregnancy	heart failure	UTI	HTN/APH	Affects labour	PPH
aware	237 (79%)	0	0	0	116 (38.7%)	0
unaware	63 (21%)	300 (100%)	300 (100%)	300 (100%)	184 (61.3%)	300 (100%)

Knowledge of affects on maternal and perinatal mortality and morbidity

	Preterm labour	Affects newborn	Low birth weight babies	New born infections	Fetal anaemia	Maternal mortality
aware	0	225 (75%)	0	35 (11.7%)	210 (70%)	0
unaware	300 (100%)	75 (25%)	300 (100%)	265 (88.3%)	90 (30%)	300 (100%)

Knowledge regarding contraception and spacing between pregnancies

	Contraceptive methods	Minimum spacing of 2 years between pregnancies
aware	205(68.3%)	54(18%)
unaware	95(31.7%)	246(82%)

Knowledge of iron supplements and blood transfusion in pregnancy

	Iron supplements necessary in pregnancy	Blood transfusion in severe anemia	Iron supplements not to be taken with tea and coffee
aware	145(48.3%)	63(21%)	0
unaware	155(51.7%)	237(79%)	300(100%)

Chi square test was done on the variables of demography to establish any difference in the knowledge among the caregivers based on sex; literacy etc. which did not reveal any positive association.

V. DISCUSSION

The results of the study reveal the following data-Among 300 participants, 224(74.9%) were unaware of the commonest cause of anemia as nutritional deficiency.

And 165(55%) were not aware that worm infestation also can lead to anemia.

Among 300 participants, 210(70%) participants said they were unaware of symptoms of anemia whereas 90(30%) were aware.

Of the 300, 102 (34%) were aware of the signs of anemia like pallor whereas 198(66%) were not aware.

Regarding the knowledge of diet which can improve anemia, 180(60%) among the 300 participants said they knew that greenleafy vegetables and jiggery can improve anemia, also 250(83.3%) participants said non-vegetarian diet helps improve anemia.

Although 237(79%) were aware that anemia can affect pregnancy, none of the participants were aware of the fact that anemia can lead to heart failure, urinary tract infection, hypertension, postpartum hemorrhage and maternal mortality.

Out of 300 participants, 205(68.3%) were aware of the contraceptive methods whereas 246(82%) did not know that minimum spacing advisable between two pregnancies is two years.

Although 145(48.3%) participants were aware of the need to take iron supplements during pregnancy, 237(79%) were unaware of the need for transfusion of blood in severe anemia and none of the participants were aware that iron tablets should not be taken with tea, coffee or milk.

There was no significant difference in knowledge of anemia in pregnancy with the sex, age, literacy or income of the caregiver.

VI. CONCLUSION

In conclusion, overall awareness among the participants regarding anemia in pregnancy was 38%.

Participants were unaware of the grave complications of anemia like heart failure, postpartum hemorrhage and maternal mortality.

Anemia being a major contributor to the maternal mortality and morbidity due to its complications in pregnancy, it is a need of the hour to disseminate this basic knowledge which can have an impact on our health care system.

There was no significant difference in the knowledge of anemia among the caregivers based on their sex, literacy, income and socioeconomic status.

It needs to be re-emphasized that through media-radio, television (which contributed to the sources of health information in 48.4% of the participants) we can impart more knowledge to the general population regarding the complications of anemia and need for regular follow up with their doctor (who contributed to sources of health information in 46.3% of the participants) for decreasing the maternal mortality in India.

APPENDIX

QUESTIONNAIRE BACKGROUND

1. Have you ever been diagnosed with anemia? a) Yes b) No
2. Are you caregiver of pregnant woman diagnosed with anemia? a) Yes b) No
3. Do you have a medical background or fall into any of the following category- doctor, nurse, and medical technician? a) Yes b) No
4. Caregiver's gender a) male b) female
5. Relationship with the patient. Caregiver is— a) mother b) father c) mother in law d) father in law e) sibling f) spouse g) not related
6. Level of education of the caregiver being interviewed a) illiterate b) primary education c) upto 12th std d) graduate/post-graduate
7. Approximate monthly household income a) <3000 b) 3k-5k c) 5k-10k d) 10k-20k e) >20k f) I choose not to answer
8. What are the sources of information do you use routinely for health a) internet b) my doctor or health professional c) relative or friend talks, seminars or health awareness camp d) radio e) television f) newspaper or magazine g) other

KNOWLEDGE OF ANEMIA

1. Have you ever heard of anemia? a) Yes b) No
2. Nutritional deficiency is the commonest cause of anemia in pregnant women. a) True b) False c) I don't know
3. Worms in the intestines can cause anemia.

- a)True b)False c) I don't know
4. Facial pallor, conjunctival pallor, white nails are features of anemia.
a)True b)False c) I don't know
5. Breathlessness, fatigue are the symptoms of anemia.
a)True b)False c) I don't know
6. Diet rich in protein, iron and vitamin C can improve anemia
a)True b)False c) I don't know
7. Pulses and egg are rich sources of protein.
a)True b)False c) I don't know
8. Green leafy vegetables, drumsticks, beetroot, jiggery are rich sources of iron.
a)True b)False c) I don't know
9. Lemon, amla, orange, guava are rich sources of vitamin c.
a)True b)False c) I don't know
10. Non-veg meals especially red meat and liver good in improving anemia.
a)True b)False c) I don't know
11. Anemia can affect pregnancy.
a)True b)False c) I don't know
12. Anemia can cause heart failure in pregnancy.
a)True b)False c) I don't know
13. Anemia can precipitate urinary infections in pregnancy.
a)True b)False c) I don't know
14. Anemia can aggravate bleeding in pregnancy and hypertension
.a)True b)False c) I don't know
15. Anemia can affect labour .
a)True b)False c) I don't know
16. Anemia can cause preterm labor?
a)True b)False c) I don't know
17. Anemia can cause increased bleeding after delivery.
a)True b)False c) I don't know
18. Anemia can affect the newborn.
a)True b)False c) I don't know
19. Anemia can lead to low birth weight babies.
a)True b)False c) I don't know
20. Anemia can lead to newborn infections.
a)True b)False c) I don't know
21. Anemia in pregnancy can cause anemia in the newborn later in the life.
a)True b)False c) I don't know
22. Anemia can cause maternal mortality .
a)True b)False c) I don't know
23. Anemia in pregnancy can be prevented.
a)True b)False c) I don't know
24. Iron supplements are necessary in pregnancy.
a)True b)False c) I don't know
25. There is high prevalence of anemia in pregnancy in India.

- a)True b)False c) I don't know
26. Are you worried of developing anemia? a)Yes b)No
27. Have you heard of blood transfusion? a)Yes b)No
28. Blood transfusion is necessary in severe anemia.
a)True b)False c) I don't know
29. Are you ready to donate blood if your patient requires? a)Yes b)No
30. Iron tablets should not be taken with tea, coffee or milk.
a)True b)False c) I don't know
31. Are you aware of contraceptive methods? a)Yes b)No
32. Minimum spacing between each pregnancy must be 2years. a)True b)False c) I don't know

ACKNOWLEDGMENT

We express our acknowledgement to Dr Gopi Biostatistician who helped in evaluating the information obtained into statistical data and gave conclusions on the results .

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A Study on the Impact of Women Self-help Groups (SHGs) on Rural Entrepreneurship Development-A Case Study in Selected Areas of West Bengal

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Abstract- The emergence of women entrepreneurs and their contribution to the national economy is quite visible in India. The women entrepreneurship is seen as an effective strategy to solve the problems of rural poverty as well as urban development. It promotes the quality of life by motivating female human potential. This proposed research work aims at focusing some specific areas pertaining to possibilities and constraints of developing rural entrepreneurship exclusively governed by rural women SHGs. Role of SHGs for promoting rural entrepreneurship using local skills, local knowledge and local resources involving women workforce has long been emphasized. During the last three decades rural development practitioners have been focusing on SHGs as an instrument for rural-entrepreneurship development in rural sector.

Index Terms- entrepreneurs, national economy, rural poverty, possibilities, constraints, self help groups, women.

I. INTRODUCTION

The emergence of women entrepreneurs and their contribution to the national economy is quite visible in India. The number of women entrepreneurs has grown over a period of time, especially in the 1990's. The emergence of entrepreneurs in a society depends to a great extent on the economic, social, religious, cultural and psychological factors prevailing in the society. It is estimated that presently women entrepreneurs comprise about 10% of the total entrepreneurs of India and this percentage is growing every year. If prevailing trend continue, it is not unlikely that in another five years, women will comprise about 20% of the entrepreneurial force in India. (Nayyar et al 2007).

Women entrepreneurship is the process where women organize a business or industry and provide employment opportunities to others. Women entrepreneurship can be engaged in both organized and unorganized sectors. Entrepreneurship is a process where one person getting himself employed and provides job to others also. It is bred by self employment and enhances economic growth of the country. The women entrepreneurship is seen as an effective strategy to solve the problems of rural poverty as well as urban development. It promotes the quality of life by motivating female human potential.

Sidhu and Kaur(2006), revealed that entrepreneurship is the only solution for the growing employment among the rural youth. It helps to generate employment for a number of people within their own social system. Kuratka and Richard(2001), in

their book on entrepreneurship stated that entrepreneurship is the dynamic process of creating incremental wealth. This wealth is created by individuals who take the major risks in terms of equity, time and career. Commitment of providing value to some products or services, the products or services itself may or may not be new or unique but the value must somehow be infused by the entrepreneur by securing and allocating the necessary skills and resources. The delivery of microfinance to the poor is smooth, effective and less costly if they are organized into SHGs. Role of SHGs for promoting rural entrepreneurship using local skills, local knowledge and local resources involving women workforce has long been emphasized. Planning Commission as well as the Indian Government has rightly recognized the potentiality of women for livelihood improvement and economic development. During the last three decades rural development practitioners have been focusing on SHGs as an instrument for rural- entrepreneurship development in rural sector. In this context, attempts are being made to assess the role of SHGs in terms of their performance and effectiveness in grass root level.

II. OBJECTIVES

1. To ascertain how far Self Help Groups (SHGs) motivated rural women to undertake rural based entrepreneurship in selected sample areas.
2. To study the impact of women-lead SHGs in terms of income generation, savings and promoting entrepreneurship.

III. MATERIALS AND METHODS

Sampling procedure:

This study had been carried out on three purposively selected districts of West Bengal. They are, viz: Nadia, 24-Parganas(North) and Bankura respectively. The first two districts are forerunners in terms of SHG- growth in West Bengal. Moreover, 24-Parganas district is relatively urban-oriented comparing to the rest districts of the state. Further, Nadia district is agriculturally advanced showing highest cropping intensity. In contrast, Bankura district lags far behind the above two districts. The chief reason for such selection was to examine the impact of SHGs in diversified and heterogeneous areas.

In the next stage, from each district, one block was chosen at random. The selected blocks are namely; North Barasat-1,

Chakdah, and Chhatna of 24-Parganas, Nadia and Bankura district respectively. Thereafter, two villages in each block were selected purposively. This was done in consultation with the block level officials considering concentration of SHGs, convenience and costs. The focused villages under study comprises the villages namely ;Chaltaberia and Duttapukur of North Barasat block -1, Ghoragaccha and Katabele of Chakdah block; and Hansapahari and Poragola of Chatna block.

In turn, a list of SHGs falling under these focal villages was prepared. Then, ten SHGs were selected randomly from the above villages. Finally, three members from each selected SHGs were selected randomly as sample stakeholders. Thus a total of ninety sample members were selected for the purpose of detailed study.

Statistical tools and tests used:

K-Means Cluster Analysis-

K-means cluster analysis is a tool designed to assign cases to a fixed number of groups (clusters) whose characteristics are not yet known but are based on a set of specified variables.

$$J(V) = \sum_{i=1}^c \sum_{j=1}^{c_i} (||X_i - V_j||)^2$$

Where

$||X_i - V_j||$ is the Euclidean distance between x_i

and v_j

' c_i ' is the number of data points in i^{th} cluster

' c ' is the number of cluster centers

Algorithmic steps for k-means clustering

Let $X = \{x_1, x_2, x_3, \dots, x_n\}$ be the set of data points and $V = \{v_1, v_2, \dots, v_c\}$ be the set of centers.

- 1) Randomly select 'c' cluster centers.
- 2) Calculate the distance between each data point and cluster centers.
- 3) Assign the data point to the cluster center whose distance from the cluster center is minimum of all the cluster centers.
- 4) Recalculate the new cluster center using.

$$V_i = \frac{1}{c_i} \sum_{j=1}^{c_i} X_j \quad \text{where, 'c' represents the number of data points in } i^{th} \text{ cluster.}$$

5) Recalculate the distance between each data point and new obtained cluster centers.

6) If no data point was reassigned then stop, otherwise repeat from step 3.

Discriminant Analysis linear equation-

Discriminant Analysis involves determination of linear equations like regression that will predict which group the case belongs to. The form of the equation or function is-

$$D = V_1 X_1 + V_2 X_2 + V_3 X_3 + \dots + V_i X_i + a.$$

V_i = the discriminant coefficient or weight for i^{th} variable

X_i = respondent's score for the variable

a = a constant

This function is similar to a regression equation or function. The v 's are unstandardized discriminant coefficients analogous to the b 's in the regression equation. These v 's maximize the distance between the means of the criterion (dependent) variable. Standardized discriminant coefficients can also be used like beta weight in regression. Good predictors tend to have large weights. What we want this function to do is maximize the distance between the categories, i.e. come up with an equation that has strong discriminatory power between groups. After using an existing set of data to calculate the discriminant function and classify cases, any new cases can then be classified. The number of discriminant functions is one less the number of groups. There is only one function for the basic two group discriminant analysis.

IV. RESULTS AND DISCUSSION

In calculating the overall impact assessment of SHGs irrespective of space, we have created a virtual cluster comprising all the members. We want to see whether impact of SHGs has been translated in terms of income & savings equally across all the members or not. Table1 shows classification of all the members in reference to SHG's contribution in income & savings. The following table shows the distribution of members in four distinct classes.

Table 1: Final Cluster Centers: 90 sample members

Components	Cluster			
	1(Worst group)	2(High group)	3(Medium group)	4(Poor group)
Family income(Rs)	4262	30000	20300	12892
Additional income(Rs)	454	15000	9067	3447
Additional savings(Rs)	70	4000	1483	641

A dismal picture of SHGs has been surfaced. Out of ninety members 83 have shown additional average income as meager as below 3447 after joining SHGs. On the contrary, only seven have shown average income more than Rs.10000.00 per month.

Table 2: Number of Members in each Cluster: 90 sample members

Cluster	Number of SHG members
1(Worst group)	47
2(High group)	1
3(Medium group)	6
4(Poor group)	36
Total	90

In our study, we consider those SHG members whose monthly income increased after joining SHGs to the tune of Rs.9000.00 or above as **entrepreneurs**. Thus we short listed 7 members as entrepreneurs based on above cited criteria.

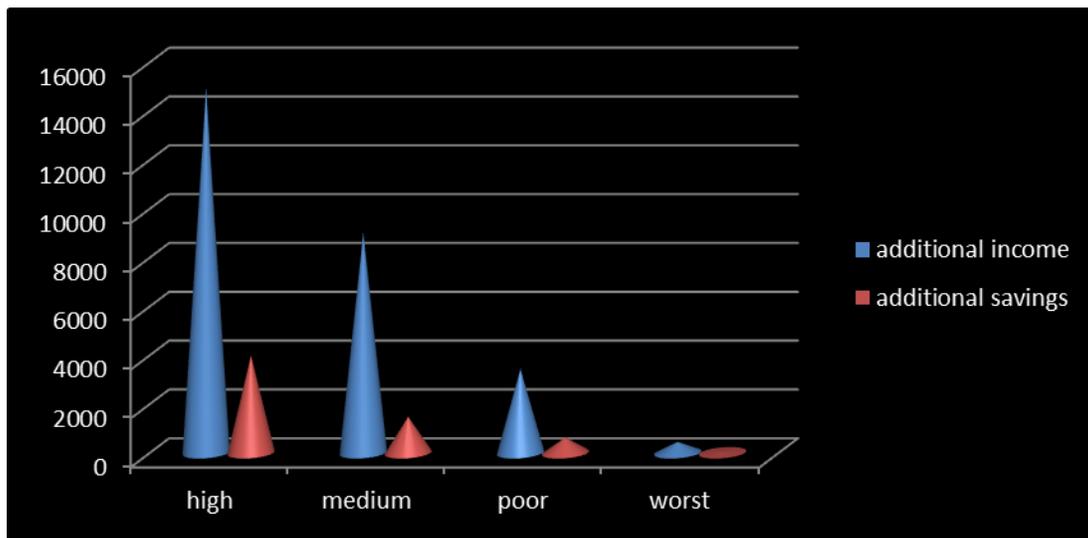


Fig. 1: Graphical representation of the impact of SHGs in terms of additional income and savings

Table3:Distances between Final Cluster Centers: 90 sample members

Cluster	1(worst)	2(high)	3(mediaum)	4(poor)
1(worst)		29823.674	18258.641	9151.470
2(high)	29823.674		11645.946	20915.159
3(mediaum)	18258.641	11645.946		9336.536
4(poor)	9151.470	20915.159	9336.536	

Table4: ANOVA: 90 sample members

	Cluster		Error		F	Sig.
	Mean Square	df	Mean Square	df		
Family income(Rs)	9.356E8	3	3615010.960	86	258.816	.000
Additional income(Rs)	2.143E8	3	1164676.796	86	183.980	.000
Additional savings(Rs)	9032554.900	3	78111.783	86	115.636	.000

Group variation in terms of income & savings is statistically evidenced from above ANOVA table.

Distribution of entrepreneurs across clusters is shown below in Table5.

Table5: Distribution of entrepreneurs across clusters: 90 sample members

Cluster	Efficient group	Moderate group	Worst group
24 Parganas	7	22	1
Nadia	0	14	16
Bankura	0	0	30

In our study none of the members belonging to Bankura & Nadia clusters are entrepreneurs. All the so called entrepreneurs are being engaged in other than agricultural activities. All of them are associated with non-farm activities such as clay-pottery enterprise. It may also be mentioned here that all the SHG-

members undertaking pottery are not necessarily entrepreneurs. This has prompted us to discriminate between entrepreneurs and non-entrepreneurs in terms of several indicators.

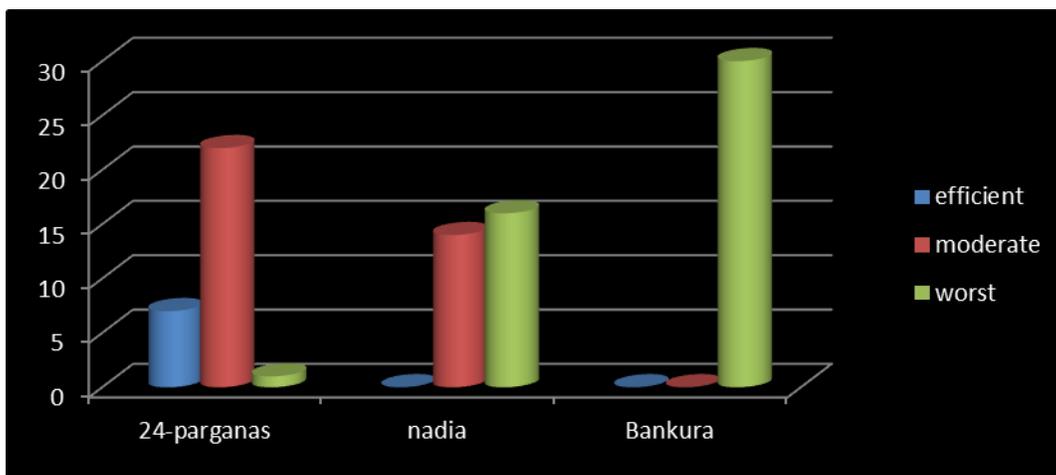


Fig. 2: Graphical representation of entrepreneurs across the three selected districts

Discriminant Analysis of the entrepreneurs: 90 sample members

Here through discriminant analysis, we have divided the total of ninety sample members that have been randomly selected

from the three districts into two groups, viz; Non-Entrepreneur and Entrepreneur on the basis of certain indicators like family income, bank loan, education level and possession of land area.

Table 6: Group Statistics: 90 sample members

	Indicators	Mean	Std. Deviation
0 (Non Entrepreneur)	Family income(Rs)	8103.98	4763.774
	Bank loan(Rs)	3807.23	5538.023
	Education level(standard)	5.10	2.761
	Land(cotta)	22.67	28.406
1 (Entrepreneur)	Family income(Rs)	20514.29	6615.998
	Bank loan(Rs)	19571.43	8343.803
	Education level(standard)	10.57	2.699
	Land(cotta)	68.43	51.910
Total	Family income(Rs)	9069.22	5918.697
	Bank loan(Rs)	5033.33	7139.776

	Education level(standard)	5.52	3.113
	Land(cotta)	26.23	32.817

Table 7: Tests of Equality of Group Means: 90 sample members

	Wilks' Lambda	F	df1	df2	Sig.
Family income (Rs)	.681	41.203	1	88	.000
Bank Loan (Rs)	.646	48.140	1	88	.000
Education(standard)	.776	25.457	1	88	.000
Land(cotta)	.859	14.444	1	88	.000

It is observed from table 7 that economic status, particularly gross income of the family, educational level, asset possession (Land) and access to credit are statistically significant ingredients sufficiently discriminating between entrepreneurs and non-entrepreneurs.

$$D = 0.377 \text{ Gross income} + 0.473 \text{ Bank loan} + 0.223 \text{ Education} + 0.326 \text{ land}$$

Among all the variables bank-loan is the most powerful discriminator.

The discriminant function is ;

Table 8: 90 sample members

Family income(Rs)	.377
Bank loan(Rs)	.473
Education(standard)	.223
Land(cotta)	.326

Summary of Canonical Discriminant Functions:

Table 9: Eigenvalues : 90 sample members

Function	Eigen value	% of Variance	Cumulative%	Canonical Correlation
1	.740 ^a	100.0	100.0	.652

The Eigenvalue explains 100% of total within & between variation of the data matrix and shows the relevance of the function in discriminating groups in terms of above indicators.

Thus one function is statistically justified for measuring total variation between groups. The estimates of Wilk's lamda & chi-square value corroborates above findings.

Table 10: Wilk's Lambda: 90 sample members

Test of Function (s)	Wilks' Lambda	Chi-square	df	Sig.
1	.575	47.617	4	.000

Standardized Canonical : Discriminant Function

Table 11: Coefficient : 90 sample members

	Function
	1
Family income(Rs)	.377

Bank loan(Rs)	.473
Education(standard)	.223
Land(cotta)	.326

Table 12: Structure Matrix: 90 sample members

	Function
	1
Bank loan (Rs)	.860
Family income (Rs)	.796
Education (standard)	.625
Land (cotta)	.471

Pooled within groups correlation between discriminating variables and standardized variables and standardized canonical discriminant functions. Variables ordered by absolute size of correlation within function.

Functions at Group :

Table 13: Centroids : 90 sample member

	Function (score)
0	-.247
1	2.928

Unstandardized canonical discriminant functions evaluated at group means.

Table14: Classification Function Coefficients:90 sample members

	0	
	0	1
Family income(Rs)	.000	.001
Bank loan(Rs)	.000	7.282E-5
Education level(standard)	.629	.886
Land(cotta)	.026	.060
Constant	-3.332	-13.416

Table 15: Classification Results: 90 sample members

0	Predicted Group Membership		Total
	0	1	
Original Count 0	78	5	83
1	1	6	7
% 0	94.0	6.0	100.0
1	14.3	85.7	100.0

(93.3% of original grouped cases correctly classified)

V. SUMMARY AND CONCLUSION

Group-wise difference in terms of income, savings, expenditure and debt reduction have been found. Thus we say that from the point of equity SHGs failed to serve the society in equal proportion. In summary, we can conclude that SHGs have failed to cater entrepreneurship among the women in West Bengal. In summary, we conclude that SHGs have mixed response upon the women members. Despite social and economic barriers there are a number of promising women entrepreneurs groomed by SHGs. However, constant watch, monitoring and dissemination of skills, knowledge among the women –folk in a systematic way with linkages with different rural institutions will usher in new hope in rural areas.

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The Influence of Household Income Level on Household Mortality and Life Expectancy in Dodoma Region in Tanzania

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Abstract- This study analyzed the influence of income on household mortality and life expectancy in Dodoma. Mortality and life expectancy were used as proxies for health status. The effect of income was assessed along with the social determinants of health. The study employed cross sectional design involving 150 households. Twomodels based on mortality and life expectancy were applied.

Based on mortality, the relationship with income had a negative sign as expected and was significant ($B= -0.035$; $p=0.01$). As for life expectancy and income level, the relationship was positive as it was hypothesized and was significant ($B= 1.167$ and $p= 0.015$).

The fact that two models had significant outcome on income, there is an obvious association between income and health status in the sense that health status is determined by an individual's income level, holding other factors constant. The following social determinants also seemed to significantly affect health status along with income: meals intake, educational level, and distance to health facility.

From this study the researcher suggests that as income being the dominant factor that influence better health status therefore improving household income level would lead to better welfare as it enables household to afford and access health services easily. However lifestyle like alcohol drinking habits, smoking and bad eating habits impact negatively to household's health. The government should create awareness to households on eating balanced diet, doing physical exercises and how their lifestyles can negatively affect their health.

Index Terms- Household, Income Level, Mortality, Life expectancy, Social determinant.

I. INTRODUCTION

There is a strong positive association between income and health status that is evidenced both across countries and within countries (Case, 2004). When people in low income group are compared with those with greater income, those in low income have higher rates of disease and mortality (Case, 2004). Increasing income is thought to improve health outcomes (Liu et al., 2011). Works by McKeown (1976) and Fogel (1994) revealed that improvements in longevity in the 19th century were driven not by advancements in medicine or public health, but by improvements in nutrition, largely driven by higher incomes.

Therefore, it would seem income and social status is linked to mortality and life expectancy. The greater the gap between the richest and poorest people, the greater the differences in health status like access and use of services that influence health, for example, access to safe water and clean air, healthy workplaces, safe houses, communities and roads all contribute to good health ([www. denvernaturopathic.com/ determinants of health.html](http://www.denvernaturopathic.com/determinants_of_health.html) accessed on may 12, 2009).

Based on Thoits (2010), data suggest that income is an important determinant of health disparities among peoples. In this regard, it can be concluded that policies to help equalize income offer the greatest promise to improve health and longevity. High income determines living conditions such as safe housing and ability to buy sufficient good food. The healthiest populations are those in societies which are prosperous and have reasonable level of wealth. In many ways, income should be an important determinant of health more probable in poor countries than in rich ones. When many people do not have enough money to buy food, adults and children often suffer the short and long-term effects of a poor diet, and parents who do not have enough money to feed their children report severe consequences for their own wellbeing (Deaton,2001). Though it may seem obvious that severe poverty might erode physical health through the effects of poor nutrition, crowded and dirty living conditions, not only those above the poverty line have better health than those in poverty, but those in the highest income level have better health than those just below them (Marmot et al., 1991).

In most middle and high income noncommunicable diseases (NCDs) affecting mostly people in their middle and older years and are the leading cause of death. Many NCDs were associated with economic development and so called "diseases of the rich". However, today an estimated 80% of the main types of NCDs are cardiovascular diseases, cancers, chronic respiratory diseases and diabetes (Boutayeb,et al,2005). The influence of lifestyle, including diet, physical activity, smoking, and alcohol consumption, is strongly influential to the health status , the high income people are the likelihood of having a healthier lifestyle but its evidenced that people with high income use be abusing to good health by getting involved with tobacco use, physical inactivity, unhealthy diet like eating red meat, foods with high vegetable oil and the harmful use of alcohol increase the risk of or cause most NCDs. Tobacco accounts for almost 6 million deaths every year 5.1 million from direct tobacco smoking and 600 000 from exposure to second hand smoke and about 3.2 million deaths annually can be attributed to insufficient physical

activity, approximately 1.7 million deaths are attributable to low fruit and vegetable consumption and half of the 2.3 million annual deaths from harmful drinking (Jamison et al.,2006).

Tanzania is a country that has shown marked improvement over the past decade in a number of health areas, including strong gains in reducing infant and under-five mortality rates.

In Tanzania although communicable diseases are still the major causes of mortality and life expectancy, non-communicable diseases also contribute significantly to the disease burden especially among adult populations(AMMP, 1997; WHO, 2005, 2010). Diseases that were once considered rare such as diabetes and cardiovascular diseases are now considered a normal phenomenon. The increase in the burden of non communicable diseases is being fuelled by the socio demographic transition that has rapidly been occurring in developing countries (WHO, 2005).

However, higher income results to better place for mortality and life expectancy as it accelerate health needs like eating balance diet, access to safe water, health care and health knowledge and skill. On the other hand, higher income leads to change of life style habits like excessive alcohol drinking, tobacco smoking, eating junky food and sedentary life. Under this contradictory situation what precisely triggers the researcher to perform this study is to understand the role of income level on mortality and life expectancy.

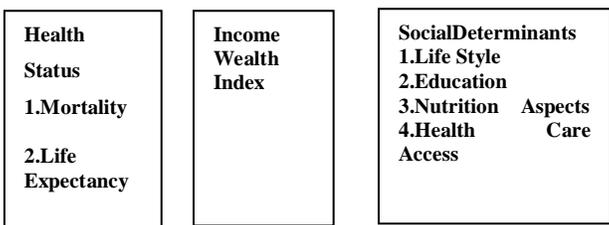


Figure 1: Conceptual Diagram of the study.

Source; Researcher’s own construct (2012)

As explained health status can be influenced by the income level and other social determinants of health status like education, nutrition aspects, health care access and life style

II. METHODOLOGY

Study Area and Research Design

This study was carried out in Dodoma region involving rural and urban areas surrounding the Municipality. The choice of the region was based on familiarity of the researcher with key people in Dodoma Region in getting permit and access to the people. Though Dodoma is the national growing capital it is among the poorest and least developed area of Tanzania and suffers the highest mother/infant mortality (www.nbs.go.tz, 5th July, 2014). This study involved a quantitative research design based on hypothesis testing, where the researcher used cross sectional approach in which the respondents were met once as recommended by Kothari (2007). In performing this study, the researcher first performed a desk literature review of issues that were addressed by other scholars and prepared research tools for data collection.

Sample Size and Sampling Techniques

Under this study the sample were 150 respondents, this is because of the nature of selected research design known as cross sectional design. Where cross sectional type of study researcher has to choose a large sample more than 30 with a significance level of 5% for the results to bring Best Linear Unbiased Estimator (BLUE). The data were collected through structured questionnaire in which the sampling strategy was based on a simple random sampling scheme.

Data Analysis

General Econometric Model

This study used Multiple Regression model. The model used is consistent with econometric literature theory which contends that the higher the level of an individual’s per capita real income, the better his or her health status. The relative income hypothesis states that an individual’s health status is influenced adversely by the degree of income inequality within the economy (Murthy, 2007), has become a standard approach to modeling this study as his objective was to empirically examine the relationship between health status as measured by infant mortality and the degree of income inequality, given the effect of certain controlled variables where the double logarithmic econometric models were used through robust econometric method.

This study on household health status and income based on an explained conceptual framework and the Murthy (2007) modeling approach. However a modification was made to this general model Multiple Regression Models in which health status being the function of income and other social determinant of health status are regressed on two models; the first step health status was measured by mortality as its proxy and second proxy was life expectancy. These equations were estimated by using Ordinary Least Square (OLS) to estimate the coefficients of the specified regression equations mathematically illustrated as;

$$HS = F (Y)..... (1)$$

Where income is a function of health status.

Econometrical equation will be

$$HS = \alpha + Y + \mu..... (2)$$

And

HSis health status.**α** is a constant term. **μ** is the error term. **Y** is income level.

As from conceptual framework health status can’t be explained by income alone but with other factors, in this study the social determinants of health status were also used so as to capture effect of Income on health status. In this case then, the general study equation has been illustrated mathematically as follows;

SD= the social determinants of health status of individual.

$$HS= F(Y+ SD) + \mu..... (3)$$

Where: **HS** is health status which was measured by mortality and life expectancy.

Y=income in which was measured by computed wealth index.

And $SD = \{Edu + Lst + Nas + Hc\}$, **Edu** is for Education in years

Lst is for lifestyle measured by number of liters of alcohol drink, frequency of exercise and number of cigarettes smoked

Nas is for nutrition aspects measured by household intake per day

Hc is health care access measured by distance in kilometer to nearest health facility

Estimation Model

From general model, the initial model was borrowed from the idea of Murthy (2007) study of Income Distribution and Health Status Econometric Evidence from OECD countries. Researcher modified it to two steps of multiple regression models.

From the general model eq. (3)

$$HS = F(Y + SD) + \mu \dots \dots \dots (3)$$

The study equations have been extended to two multiple regression equation as follows; health status proxies are mortality, and life expectancy.

$$MT = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \mu \dots \dots \dots (4)$$

$$LE = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \mu \dots \dots \dots (5)$$

Where; **MT** is the household mortality; **LE** is household life expectancy.

α = Regression constant which doesn't influenced by either income or any social determinant of individual health status. **X₁** is household income; **X₂** is for household years of schooling.

X₃ is for household life style measured in number of liters of alcohol drink, frequency of exercise and number of cigarettes smoked; **X₄** is for nutrition aspects measured by household intake per day

X₅ is health care access measured by distance in kilometer to nearest health facility

μ = stochastic error term, which is this study assumes it normally distributed around 0 mean and constant variance i.e. $\mu \approx N [0, \sigma\mu^2]$. $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$, are the differential coefficients.

The main objective of breaking down the determinants factors is to see the clear relationship between income and health status in Dodoma's households.

Estimation Techniques

The models were estimated by using the Ordinary Least Square technique (OLS), and z- test favorable for the study was used as the number of observation was above 30, and the Statistical Packages for Social Science Version11 (SPSS) was used for data entry, managements, coding and regression analysis according to study objectives and research questions which were quantitative. The Multicollinearity test and Heteroscedasticity problems were tested and the variables of the model found to be free from these econometric problems through the use of

Variance Inflation Factor (VIF) and the scatter diagram respectively.

III. RESULTS

Sample Size and Demographic Characteristics of Respondents

The study comprised 150 respondents of whom 131(87.3%) were males and the remaining were females. Household age was in three groups: < 30 years, 31-56 years, and 57-82 years. The married respondents were 126; single 7; divorced 4; and widow, 13. In education case data revealed that those with informal education were 7; those with primary education 74; secondary education 44; and 25 had college education while Income distribution was under low income group and it's was about 67 (44.7%) and high income group 83(55.3%).

The Influence of Household Income and on Mortality

The R² for this model was 62.1% (F stat. 0.000), the results portray that at 5% significant level household income had the expected sign which was (B -0.035) and had been observed to be significant (p= 0.001) on mortality (Table2) and it is in negative relation, the results imply that as income of household increases the mortality of household decreases, that means one unit increase in household income tends to decrease household mortality by 0.035. This has been because with high income households would manage to access and afford health services hence decline in mortality incidence. This being the case then the suggested hypothesis that household income tends to affect mortality is accepted as the findings shown. Many disciplines had established that those with lower income have poor health outcome and higher mortality rate (Kitigawa and Hauser, 1973; Duleep, 1986; Wolfson et al., 1993; Me-Donough et al., 1997, Deaton and Paxson, 1998).

Furthermore the influence of income on mortality was examined with social determinants, including Health care access, alcohol drink habits and eating grilled meat, frequency of exercise, nutrition aspect, year of schooling and smocking habit. These could have been considered as confounding variables. The results are as follows.

Nutrition Aspect and Mortality

As for nutrition aspect the model results meals intake a day has been used as a proxy for nutrition aspect. The results shows that at 5% significant level meals intake a day with (p=0.014 and B= -0.091) is significant to mortality (Table 2). This implies that household meals intake a day tends to influence household mortality with a negative relation. This means as household meals intake a day increases household mortality decreases and when decreases household mortality increase. Therefore one additional meal taking by household tends to decrease household mortality by 0.091.

Table 1: Household Income and Mortality Model Summary Health Care Access and Mortality

Model	R Square	Std. Error of the Estimate	Change Statistics				Durbin-Watson
			R Square Change	df1	df2	Sig. F Change	
2	.621	.22104	.621	7	142	.000	1.288

From the model results distance in kilometer has been used as the proxy of health care access, the results of this model portray that at 5% significant level ($p= 0.000$ and $B= 0.152$) has been observed to be significant on mortality (Table2). Household health care access has significant effect on mortality and it is in positive relation, the results implies that as distance in kilometer to health facility increases means household chances to mortality increases too, which means one kilometer increase tends to increase household mortality by 0.152. This is because the distance tends to limit convenient accessibility of health services hence households face difficulties on access service in

time as the result some were dying in the process. So from these results its observed that household income tends to influence household mortality and the social determinants which includes health care access and nutritional aspect has bear a significance influence to health status.

Table one, the model shows that R square is 62.1% (Table 1) above, meaning the explanatory variable explained the model by 62.1% which is a good fit.

Table 2: Mortality Results

Model	Unstandardized Coefficients		Sig.	Collinearity Statistics	
	B	Std. Error		Tolerance	VIF
2 (Constant)	.126	.132	.343		
Years of schooling	.013	.007	.055	.472	2.120
Total frequency of exercise per week	.000	.006	.897	.896	1.116
Total packet smoked per week	.007	.025	.771	.942	1.062
Total liters of alcohol household drink in a week	.006	.006	.278	.522	1.914
Total meals a day	-.091	.037	.014	.791	1.265
Household income	-.035	.010	.001	.883	1.132
Distance (km)to the health care facility	.152	.010	.000	.984	1.016

Source: Researcher Findings, 2012

Household Income impact on Life Expectancy

The R^2 for this model was 52.8% (F stat. 0.000), the results portray that at 5% significant level household income with ($p= 0.015$ and $B= 1.167$) had the expected sign and observed to be significant on life expectancy (Table 4). This means household income has significant effect on life expectancy and it is in positive relation, the results implies that as income of household increases the life expectancy of household increases by 1.167. This is the case because people with high income are in position to manage their health status through eating balance diet, access health service and information on how to take care and protect their health. The suggested hypothesis that household income impacts life expectancy is accepted as the findings show that household’s income tends to increase with life expectancy. Synder (2004), also suggested that there is widespread and longstanding agreement that life expectancy and income are positively correlated. Moreover, at 5% significant level, the

influence of income on life expectancy was examined with social determinants, including Health care access, alcohol drink habits and eating grilled meat, frequency of exercise, nutrition aspect, year of schooling and smocking habit. These could have been considered as confounding variables. The results are as follows

Health Care Access and Life Expectancy

Distance in kilometer has been used as the proxy of health care access, the results of this model portray that at 5% significant level ($p= 0.000$ and $B= -3.764$) had been observed to be significant on life expectancy (Table 4). Household health care access has significant effect on life expectancy and it is in negative relation, the results implies that as distance in kilometer to health facility increases household life expectancy decreases, that means one kilometer distance increase tends to decrease household life expectancy by 3.764. This is because whenever people are far from health centers it limits their convenient access to health care services. The suggested hypothesis that

household health care access tends to affect life expectancy is thus accepted.

Table 3: Household Income and Life Expectancy Model Summary

Model	R Square	Std. Error of the Estimate	Change Statistics				F	Durbin-Watson
			R Square Change	df1	df2	Sig. Change		
3	.528	10.199	.528	7	142	.000	1.902	

Source: Research findings, 2012

The model show that R square is 52.8% (Table 3) above, meaning the explanatory variable explained the model by 52.8% which is at least a good fit of the model

Table 4 Life Expectancy Results

Model		Unstandardized Coefficients			Collinearity Statistics	
		B	Std. Error	Sig.	Tolerance	VIF
3	(Constant)	94.417	6.086	.000		
	total frequency of exercise per week	-.171	.262	.516	.896	1.116
	total packet smoked per week	-.857	1.138	.453	.942	1.062
	household income	1.167	.472	.015	.883	1.132
	years of schooling	-.404	.315	.202	.472	2.120
	total meals a day	-1.241	1.693	.465	.791	1.265
	Total liters of alcohol household drink in a week	-.122	.273	.656	.522	1.914
	Distance (km)to the health care facility	-3.764	.477	.000	.984	1.016

Source: Research Findings, 2012

IV. CONCLUSION

Based on the results, the fact that two models had significant results it can be concluded that there is a strong relationship between income level and health status, in the sense that to a large extent health status is determined by an individual's income levels holding other factors such as social determinant constant. The social determinant have shown to influence household mortality, these variable includes health care access where the increase in distance to health facility increase incidence of household death in past one year and increase in meals intake a day lower the incidence of household mortality.

Finally is distance in kilometer to health facility and life expectancy. Health care access have influence to life expectancy, one kilometer distance increase tends to decrease household life expectancy.

V. RECOMMENDATION

From this study the researcher suggest that from the fact that the income level as the main independent variable and the confounding variables known as the social determinants of health status like meals intake, and health care access have influence in household health status particularly on mortality and life expectancy. This implies that income is main determinant of health status of household therefore strengthening the income level to an individual/community would have positive impact on welfare of the community in terms affordability and accessibility. However, this has to be taken with precaution that with strengthening household income who misbehave on lifestyle habits like alcohol drink habits ,smoking and bad eating habits would impact negatively to households health.

Also education, should be emphasized to household as level of education seem to have importance on household health status as it brings awareness and information on how to care one's health care and protection, however meals intake a day its necessary toward improving household health status by consuming balanced diet food that is good for people's health.

AKNOWLEDGMENT

It would have been impossible to finish this study without an assistance of many who devoted their time, material and moral support. Special thanks should go to all respondents for their time and honest answers. Furthermore, we have all the reasons and confidence to thank GOD for giving us courage and strength to overcome all the difficulties in this study. We gratefully thank our friends who were always available for exchanging ideas and sharing experiences and encourage us in this study. In fact, without the assistance of all the people mentioned above, it would have been very difficult to complete this study.

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Improving Productivity in Service Sector: with Special Reference to the Over Time Payment Process (OTPP) in the University of Kelaniya, Sri Lanka – A Case Study

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Abstract- There is a negative perception towards the productivity of the government sector organizations in the general public in Sri Lanka. This paper discusses the wastes in the OTTP of the University of Kelaniya, Sri Lanka. The purpose of this study is to improve the productivity by eliminating waste and improving efficiency in the University OT payment process. The key objective of this particular study is to explore the possibility of re-engineering the existing OTTP that is leading to reduce the Lead Time (LT). There are four specific objectives viz., 1) to recognize the existing OTTP, 2) to understand the bottle necks of the existing OTTP; 3) to understand the existing rules and procedures belongs to the payment of OT, 4) to identify ways and methods to overcome barricades leading to delaying OTTP. Ten numbers of individuals, twenty five OT vouchers and three hubs of the OT payment process were selected for the sample study. As the nature of the study simple random sampling technique as well as the purposive sampling technique were associated to select ten numbers of individuals appropriately. Data were collected in relation to seven types of wastes, time in minutes, distance in footsteps and numbers were used to measure the data applicably. The process map was created through observations. In the process of data presentation it was associated tabulations, process charts, and graphs. The nature of the study influenced to use simple mathematics. To recognize the existing OT payment process, four bottle necks of the existing OTTP, rules and regulations that are leading to create wastes, not updated, deceased. And also identified that adjusting slightly the existing rules and procedures, automating the process, can be simplified the process, reduced the LT drastically, and overcome the existing bottle necks. Based on these findings, it can be concluded that there are possibilities to improve the productivity of the OTTP by simplifying and automating the OTTP of the University of Kelaniya, Sri Lanka.

Index Terms- Productivity, Seven Wastes, Lead Time, Efficiency, University of Kelaniya, Service Sector

I. INTRODUCTION

Productivity is defined as a measure of quantifying the output against the amount of input. It expresses the relationship between the quantity of goods and services produced (output) and the quantity of labor, capital, land, energy, and other resources to produce it (input) (Zandin, 2001). Productivity is not a simple and it has different diversified definitions based on its taken place. Productivity is computed by dividing [average](#) output

per [period](#) by the total costs incurred or [resources](#) ([capital](#), [energy](#), [material](#), [personnel](#)) consumed in that period. Productivity is a critical determinant of cost efficiency. (businessdictionary.com). Workforce productivity is the amount of goods and services that a worker produces in a given amount of time. It is one of several types of productivity that economists measure. Workforce productivity can be measured for a firm, a process, an industry, or a country. Adam Smith (1776) divided up labor into two broad categories, productive and unproductive labor. Productive labor, according to Smith, was any work which fixed itself in a tangible object. Unproductive labor, was any work where the value was consumed as soon as it was created. Smith contrasted the role of laborers in a manufacturing plant (productive work) with the tasks of a servant (unproductive work).

Hence, the productivity is not a simple and clearly understandable term. However one thing is clear that it makes some relationship in between the input and output. To make the relationship among these two components the suitable way is to reduce the cost of the inputs. In other words eliminating the waste or non-value added activities (MUDA) from the process of working. Realizing this theoretical fact the Sri Lankan government has been made a policy decision to increase work place efficiency and productivity by 50% during the next six years by introducing a new work ethic under the policy framework of ‘*Mawbima Dinawamu*’ (Mahinda Chinthana-2010)

University system is considered as a one of the biggest public organization which is consisted of 7432 teaching staff and 14925 non-teaching staff. Teaching staff refers to the Lecturers, Senior Lecturers and Professors while non-Teaching includes all others such as Staff grades, Librarians, Medical Officers, Clerical and Allied grades, Skilled/Semi Skilled/Unskilled, Academic Support and other Academic Staff not belongs to the Teaching Staff. (Sri Lanka University Statistics 2012) Besides that the student enrolment is 73,295 internal students, External 289,234, Open University 35,665, Postgraduate 5,576, grand total 403,770 (UGC Statistics 2012). The statistics prove that the importance of the study and also its relevance to the government policy statements.

The aim of the study is to improve productivity of the OTTP by eliminating waste in the process. The key objective of this particular study is to explore the possibility of re-engineering the existing OTTP that is leading to reduce the Lead Time (LT). There are four specific objectives namely; 1) to recognize the existing OTTP, 2) to understand the bottle necks of the existing

OTPP; 3) to understand the existing rules and procedures belongs to the payment of OT, 4) to identify ways and methods to overcome barricades leads to delaying OTPP.

II. LITERATURE REVIEW

There are numbers of factors effect on productivity. Among them ineffective resource utilization, poor information flow and non-productive or unnecessary activities are considered as the main factors that contribute to low productivity. (Vilasini et al.)

Among the very few studies conducted in Sri Lanka, an empirical study carried out by Bandara & Karunaratne (2010) on Sri Lanka’s manufacturing productivity covering 27 industries over a 20 year period ending 1997 and suggests that Sri Lanka’s productivity slowdown was mainly due to the decline in technical progress rather than the technical efficiency both of which extensively contribute to the TFP. They further argue that this is mainly due to the political instability and prolonged ethnic conflicts during the period.

Many authors suggest various strategies to improve productivity. Jan (1994) suggests that reduction of throughput time is an effective strategy to improve productivity of manufacturing firms irrespective of the size, nationality and type of the industry. Wacker et al. (2006) states in their review that investment in both human and equipment resources will improve plant efficiency and the manufacturing productivity is also increased from various non-production activities such as well-defined tasks, employee improvement suggestions, and the interaction of production employees with equipment engineers. However, according to Jan (1994), factors such as investments in new technology, motivating employees through gain sharing, computer aided information management and planning systems and management restructuring could not be associated with the productivity improvements. On the other hand, studies in Japan by Yamada et al. (1997) and Tomiura (1997) stated that there is a significant positive influence of capital resources on productivity.

Most studies have made attempts to quantify the productivity of various industry sectors and few studies have discussed underlying causes for any low productivity. It is important to find out what factors affecting the productivity and how influential they are in the context of the particular region of concern. The literature shows that the popular perceptions among the industry

community regarding poor productivity which have not yet been proved with a scientific method. There is a lack of studies on international productivity regarding factors that affect productivity and understanding of how and why productivity varies between countries which is a largely untapped area of research (Wacker et al., 2006). Hence this study focuses on identifying the factors affecting productivity and estimating the extent to which each factor contribute towards productivity.

III. METHODS AND MATERIALS

The Study carried out aiming a Key objective and four specific objectives. The first stage the specific objectives will be discussed as the following ways;

1) To recognize the existing OTPP

In the process of recognizing the existing OTPP of the University of Kelaniya, empirical data were gathered using observation and interview methods as appropriately. The data are summarized in table 01, table 02 and table 03 in the paper. The table number one shows the data relevant to The OT payment eligible employee population and the Number of employees claimed for OT payments in January, February and March, 2014. The table numbers two and three shows the time taken in each position of OTPP, and the OT voucher transportation Time. According to the table number one, the average OT payment number is 450 and the average first- OT voucher checking Points were 28. The second, third OT voucher checking Point and the Shrof counter took the same average number of OT vouchers that is of 450. The average time taken in each process viz., OT preparation, first, second, third and shrof counter indicated 6755, 1875, 1348, 1875 and 900 minutes respectively as indicated by the table number two. Finally, the table number three described the average time taken for transporting the vouchers in between each points of the OT payment process. The total average transportation time between employees to first checking point signposted 1801 minutes and 425, 67, 10 minutes indicated between First Point to Second Point, Second Point to Third Point and Third Point to Shrof Counter correspondingly.

Table 01: The OT payment eligible population and the January, February and March 2014 Number of employees claimed for OT

Description	Month			Mean
	January	February	March	
No of OT Claimed	468	456	427	450
First- OT Voucher Checking Points	29	28	28	28
Second -OT Voucher Checking Point	468	456	427	450
Third -OT Voucher Checking Point	468	456	427	450
Shrof Counter	468	456	427	450

Source: as per the observed data

Table 02: The Time taken in each position of OTPP

Description	Month			Total	Mean
	January	February	March		
OT preparation Time	468x15 min=7020 min	456x15min=6840min	427x15min= 6405 min	20265 min	6755 min
First- Points OT Voucher Checking Time	468x4 min = 1872 min	456x4=1824 min	427x4 min = 1708 min	5404 min	1801 min
Second Point -OT Voucher Checking Time	468x3 min =1404 min	456x3 min=1368 min	427x3 min =1281min	4053 min	1351 min
Third Point -OT Voucher Checking Time	468x4 min = 1872 min	456x4=1824 min	427x4 min = 1708 min	5404 min	1801 min
Shrof Counter Paying Time	468x2min=936 min	456x2 min=912 min	427x2 min=854 min	2702 min	900 min
	13,104 min	12,768 min	11,956 min	37,828min	12,608 min

Source: as per the observed data

After observations and the discussions had with the employees it was decided the average OT voucher preparation time as 15 min. Similarly, 4 min, 3 min, 4 min and 2 min could

be decided for the first, second, third cheking point and the shrof counter per OT voucher respectively. These scales were considered in the table no 2 above.

Table 03: The OT Voucher transportation Time

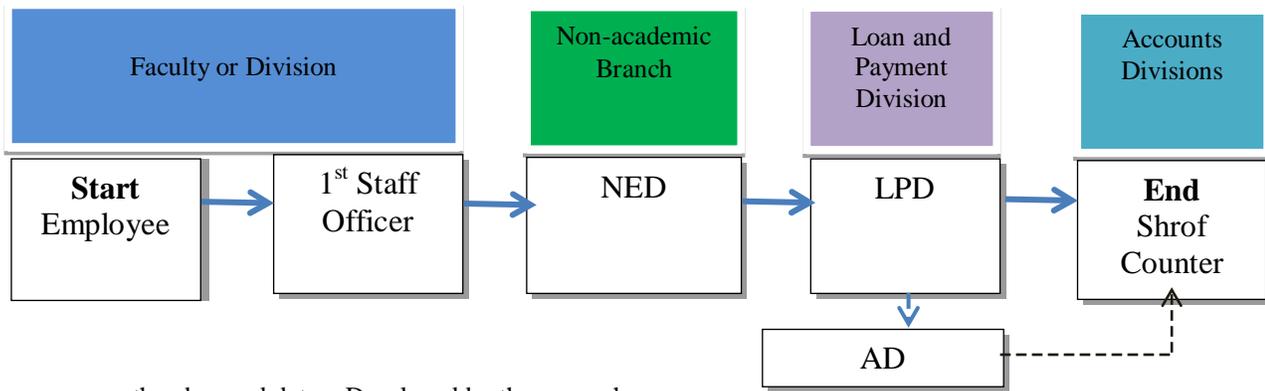
Description	Month									Average Time
	January			February			March			
	Time per employee	No. of Employees	Total Time	Time per employee	No. of Employees	Total Time	Time per employee	No. of Employees	Total Time	
Employee to First- Points	4 Min.	468	1872Min	4 Min.	456	1824 min	4 Min.	427	1708min	1801Min.
First Point to Second Point	15 min x 29 = 435 Min.			15 min x 28 = 420 Min			15 min x 28 = 420 Min.			425 Min.
Second Point to Third Point	10 Min.	6 times	60 min	10 Min.	7 times	70 min	10 Min.	7 times	70 min	67 Min.
Third Point to Shrof Counter	10 Min.			10 Min.			10 Min.			10 Min.
Total Time										2303 min

Source: as per the observed data

The figure 01 illustrates the voucher Transportation Process Map of the Existing OTPP of the University of Kelaniya, Sri Lanka. According to the University establishment code (E-code) employees are mandatory to claim for OT payment by the existing OT form and should submit them to the nearest staff officer concerned. The first staff officer's office will be check the

form and then send to the Non-academic Establishment Division (NED) for further checking. After the second checking again the voucher will be send to the Loan and Payment Division (LPD) for advanced checking. Then the after final checking at the LPD the vouchers will send to the Shrof counter and a payment voucher prepared by them for making a cheque will send to the Accounts Division (AD)

Figure 01: Step one - voucher Transportation process Map of the Existing OT payment process of the University of Kelaniya, Sri Lanka



Source: as per the observed data – Developed by the researcher

2) To understand the bottle necks of the existing OTPP

A point of congestion in a system that occurs when workloads arrive at a given point more quickly than that point can handle them. The inefficiencies brought about by the bottleneck often create a queue and a longer overall cycle time (Investopedia). The freedictionary.com pointed out bottleneck as a point or an area of traffic congestion or a narrow stretch of road or a junction at which traffic is or may be held up or a something that holds up progress, asp of a manufacturing process.

There are seven types of bottlenecks or constraints. Bottlenecks are obstacles, which reduce the entire capacity of the system. Bottlenecks are always present in the system in different forms like constraints of management, people, material, equipment, process, policy, environment etc. Its forms can be different according to the type of business but the methods to identify it can be same. A number of approaches have been developed by several scholars; whatever may be the approach of identifying root cause for the prevailing problem is the only way to get rid of bottlenecks (Binod 2012)

This paper discusses the bottleneck in OTPP itself and the bottleneck made due to overtime payment policies. As per the definitions of bottleneck there are four bottlenecks could be identified in the process. The first bottleneck is befallen at the first receiving point of OT vouchers. Within one or two days 450 average numbers of OT vouchers come to 28 points and the average numbers of OT vouchers per point is 16. Twenty eight staff members assigning to checking in this points and take at least 3days to check with them in practice since the OT vouchers are most probably in-accurate. The second bottleneck in the process could identify at the point of NED. There is only one staff member for checking and this particular person has to check 450 average number of OT vouchers. The interview made with the particular person in these point needs 4 days in practice to complete checking the vouchers. The third bottleneck could identify at the point of LPD. There is a one checking person and all the vouchers are going through this point. As the elements to be checked at the point are higher, approximately 7 days needed to pass this point. The last bottleneck showed at the Shrof counter. 450 OT payees gathered here on one particular day and effortlessly made a huge queue rush there. At the point of studying rules and regulations relevant to the payment of OT, particular OT payment process is not essentially mandatory

requirement made by the University Grants Commission (UGC) but on the policies and procedures made by the University itself. The same voucher checking in three points, all the OT payments are doing in one place and one day, given authority to one person for checking OT vouchers in point two and three, ignore the chances to be mistaken in the OT voucher preparation stage are some of policy decisions that are lead to develop bottlenecks within the OTPP.

3) To understand the existing rules and procedures belong to the OT payment

As a government organization, the University System follows chapter ix of the University Establishment Code on paying OT for employees. Besides that there are some UGC and internal circulars which are related to the payment of OT. Among them the registrar’s internal circular dated 15 May 2006 is very important since the University is still following its guidance and instructions to some extents. The empirical data pertaining to OTPP shows that the guidance given in the said internal circular cannot be followed strictly and then broken them by the authorities themselves as to fit them with the practical circumstances.

4) To identify ways and methods to overcome barricades leads to delays in OTPP.

Four types of barricades could identify in the OTPP viz., 1) waste (MUDA), 2) over Burden (MURI), 3) Unevenness (MURA) and 4) four Bottlenecks. According to the concept of MUDA waiting, transportation, over processing, was throughout the OTPP. MURI were found in three check points and Shrof counter. But the over Burden at the first checking point is shows lesser burden that it is in the other three points. The process itself is not balance (MURA) and also its compare to the other working processes. The first checking point shows a lesser bottleneck comparatively since its burden spreads over a 28 points, other three bottlenecks were indicated slightly heavy bottlenecks. There are possibilities to reduce the LT of the OTPP by eliminating the wastes (MUDA). MURI, MURA and bottlenecks can be eliminated or reduce by re-engineering the process. For this purpose some procedures need be changed but not the rules.

IV. RESULTS AND FINDINGS

According to the four objectives of the study data were collected and then for the analysis of the data, the data were summarized and is in the table number four. As per the table number four the Lead Time of the existing OTPP shows 14, 120 minutes and average cost is Rs. 23,,533.00. as it is mandatory requirement, the first step that is of preparation of OT voucher by the employee and the making the cheque and the payment stage

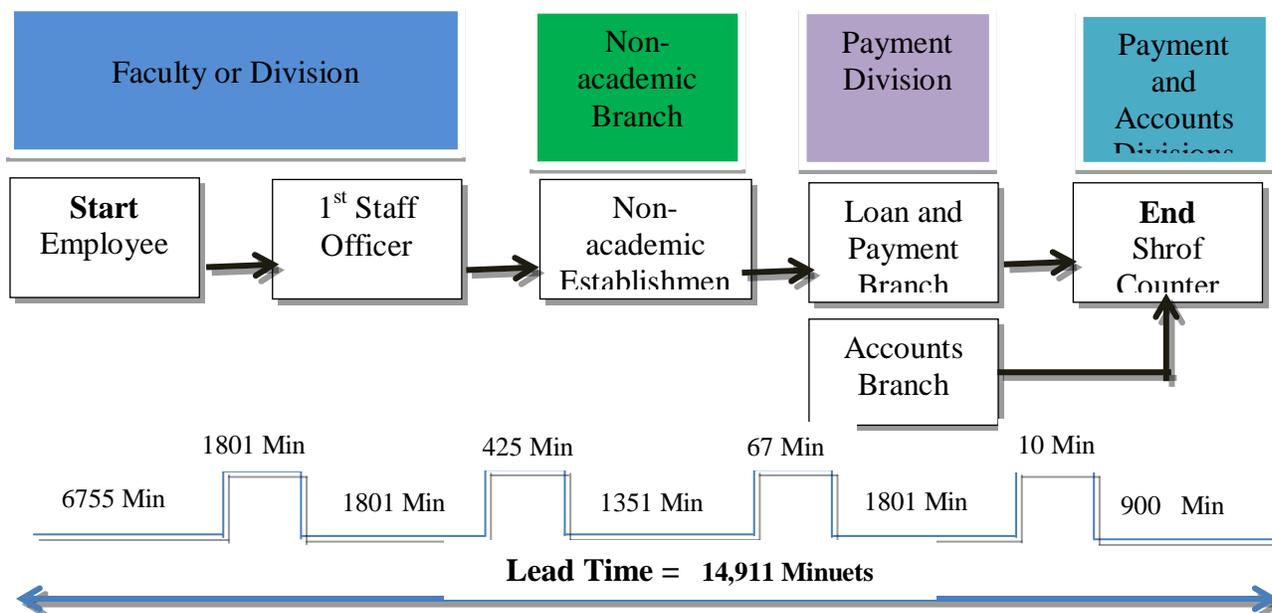
are only value added steps in the existing OT payment process as per the concept of seven waste and described under the Methods and Materials. Accordingly, Non-value added time of the existing OT payment process is 9,620 minutes and it is similar to approximately Rs. 16,200.00. This non-value added time is consisted of unnecessary transportation, unnecessary processes and waiting time in the bottlenecks. The Value Stream Map (VSM) based on these data is shows in the figure 02.

Table 04 – The average Measurements: For Existing OTPP Map

Cost Component	The average Measurement	Hours	Value
No of OT payee	450		
OT Voucher Preparation Time	6755 Minuets	112 hours	x 100 = Rs.11,300.00
1 st Staff Officer Checking Time	1801 Minuets	30 hours	x 100 = Rs. 3,100.00
Non-academic Division Checking Time	1351 Minuets	23 hours	x 100 = Rs. 2,300.00
Loan and Payment Branch Checking Time	1801 Minuets	30 hours	x 100 = Rs. 3,100.00
Shrof Counter Payment Time	900 Minuets	15 hours	x 100 = Rs. 1,500.00
Transportation	2303 Minuets	38 hours	x 100 = Rs. 3,900.00
Lead Time	14,911 Minuets	248 hours	Rs. 24,800.00

Source: as per the observed data

Figure 02: Step one - Existing OT voucher Transportation process Map of the University of Kelaniya- with VSM



Source: as per the observed data

After brainstorming session the developed OTTP with VSM figure 03 and the average new measurement (table no. 05) are below. As the fingering machines are already installed and operating well since a long period of time the man-made OT voucher preparation can be removed from the process and instead of that the machine can be prepared them accurately and then significantly

reduce the checking time in the first checking point and no need to check it in second and third points. Reason of that the OT voucher can be send directly from first checking point to Shrof counter. As the same data base used by the entire university, there is a possibility to prepare the relevant voucher for OT payment from at the third check point which belongs to the LPD.

Figure 03: Step Three - The proposed OT voucher Transportation process Map of the University of Kelaniya- without VSM

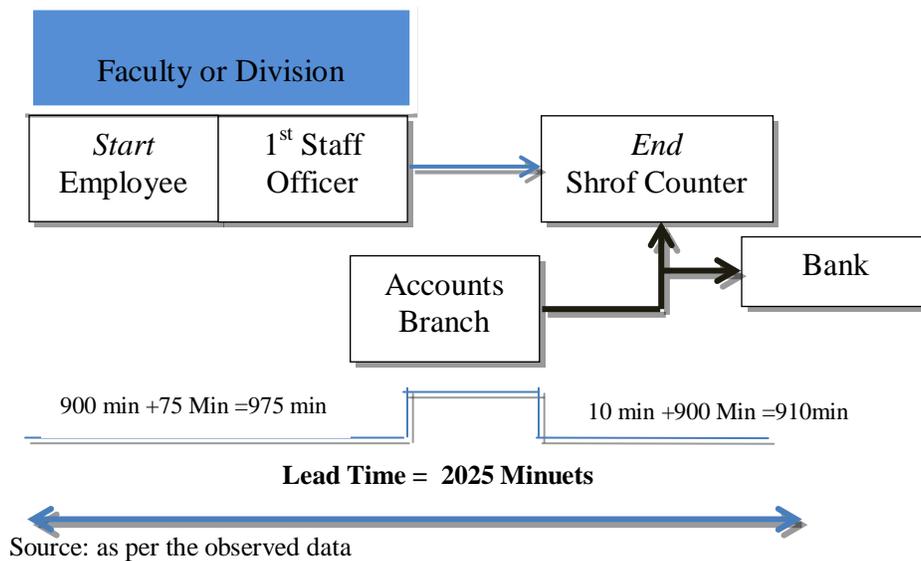


Table 05 – The average Measurements: For Developed OTTP Map

Cost Component	The average Measurement	Hours	Value
No of OT payee	450		
OT Voucher Preparation Time	450x02 Minuets = 900 Minuets	15 hours	x 100 = Rs. 1500.00
1st Staff Officer Checking Time	450x10 Sec = 75 Minuets	1.25 hours	x 100 = Rs. 125.00
Non-academic Division Checking Time	NOT		-
Loan and Payment Branch Voucher Preparation Time	10 Minutes	0.17 hours	x100 = Rs. 17.00
Shrof Counter Payment Time	450x02 Minuets = 900 Minuets	15 hours	x100 = Rs. 1500.00
Transportation	05 Minuets x 28 = 140 Minuets	2.33 hours	x100 = Rs. 233
Lead Time	2025 Minuets	33.75 hours	Rs. 3,375

Source: as per the observed data

The proposed OTPP is an automated system which is controlled by a central database. The existing prior approval process for doing OT also can proceed through the proposed system and then the hidden and non-value added activities that are beyond the considered process but relevant to this will be drastically reduced. Further to that stimulating employees to take their OT payment from the bank the bottleneck at the Shrof counter can be reduced. After discussion with union leaders, and or using managerial strategies like releasing bank OT payment two days prior to the Shrof payment date, employees may be stimulate for bank payments. However, as money based matters are very sensitive in the employees point of view, the employees should have freedom to choose their way of payment at any time without any difficulties. Keeping the system in the majority payment mode as default and the changing authority giving to the first checking point this matter can be solved smoothly.

However, before implementing such a change in the OTPP, the authorities should have taken policy decisions on that and few test runs to verify the accuracy of the new process for few months.

I. CONCLUSION

There are possibilities to reduce Lead Time and efficient the process significantly by eliminating the waste in the existing OTPP, and re-engineering the process with automation.

ACKNOWLEDGMENT

I thank the Vice-chancellor and the Registrar of the University of Kelaniya for stimulating this study and Mr. Mr. Ajith Damunupola, then Senior Assistant Registrar (non-academic establishment), for providing necessary assistance in data gathering, and Mrs. Rohini and Non-academic staff of the Non-academic Establishment Branch for helpful discussions.

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Vegetative and reproductive growth of some selected vegetables with legumes under mono-cropping vs mix-cropping and determine the soil microbial activity.

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Abstract- The study was carried out as pot experiments in the green house condition to evaluate the growth and yield performances of vegetables (tomato, curry chilli, okra) with legumes (cowpea, bush bean, Mung bean, soybean, ground nut, Sunhemp) under mono-cropping and mixcropping as well as compare the degree of soil microbial activity.

Six different crop combinations for one experiment; **Experiment one;** Sunhemp, Okra, Ground nut, Sunhemp and Okra, Sunhemp and Ground nut, Okra and Ground nut, **Experiment two;** Tomato, Cowpea, Bush bean, Cowpea and Tomato, Bush bean and Tomato, Cowpea and Bush bean, **Experiment three;** Soybean, Mung bean, Curry chilli, Soybean and Mung bean, Soybean and Curry chilli, Mung bean and Curry chilli were used. Two plants were maintained per pot. Complete Randomized Design (CRD) with three replicates was used. Statistical analysis was carried out using the Student Newman-Kuells Means Separation Test of SAS program (9.1.3).

Number of pods, number of leaves, shoot length, root length, number of pods, pod/seed weight (wet/dry) and wet/ dry weight of stem were measured. Soil microbial activity was measured according to the CO₂ evolution method. Okra grew better when mixcropped with ground nut or sunhemp (legumes) than a mono-crop. Significantly higher yield were recorded from okra when grown with ground nut (53%) and sunhemp (17.39%) as compared to mono-cropped plants. Significantly higher yield (112.37%) was recorded in sunhemp when growing with ground nut as comparing to mono-cropped sunhemp. Ground nut produced 128.61% more yield when intercropped with sunhemp as compared to mono cropped ground nut. When consider tomato, mixcropping with cowpea or bush bean (legumes) is more beneficial than mono-cropping. Significantly higher yield obtained from tomato (45% and 15%) when grow with bush bean comparing to cowpea respectively. Significantly yield was increased from 106% of cowpea when growing with tomato comparing to mono-cropping of cowpea. Bush bean, mixcropping with tomato is better than mono-cropping of bush bean obtained 35% yield increment. Higher yield were recorded from curry chilli when grown with soybean (87%) and Mung bean (171%) as compared to mono cropped plants. Mungbean produced 35% more yield when mixcropped with curry chili as compared to mono cropped Mungbean.

Mixcropping legumes with vegetables are more beneficial for legumes as well as vegetables. Significantly highest mean microbial activity (850 CO₂ mg/kg of soil, 780 CO₂ mg/kg of soil, 840 CO₂ mg/kg of soil) was observed from experiment 1, 2,

3 respectively. However the highest microbial activity does not mean the highest yield.

Index Terms- Mixcrop, Mono-crop, legumes, Tomato, curry chili, okra

I. INTRODUCTION

Mixed cropping defined as the agricultural practice of cultivating two or more crops in the same space at the same time (Hugar and Palled, 2008). Mixcropping is a key factor for approach to sustainable food security in the developing world (Garrity *et al.*, 2010). Vegetable crops are often intercropped with legume to enhance resource usage. Twenty seven present of the world's primary crop production, with grain legumes alone contributing 33% of the dietary protein nitrogen (N) needs of humans (Vance *et al.*, 2000). Legumes have ability to develop root nodules and to fix N₂ in symbiosis with compatible rhizobia. It is beneficial to use non-leguminous crop cultivation.

Okra (*Hibiscus esculentus* Var Haritha; Malvaceae) is a vegetable with high nutrient, easy to cultivate and profitable. Curry chilli (*Capsicum* spp.; Solanaceae) is one of consumer preferable vegetable crop in Sri Lanka. Tomato (*Lycopersicon esculentum* Mill.; Solanaceae) is an important Solanaceous vegetable crop grown throughout the world for its versatile uses. It is one of the most important protective foods as it possesses appreciable quantities of vitamins, minerals and sometime rightly referred as poor man's orange. (Devi M *et al.*, 2008). Ground nut (*Arachis hypogaea*; Fabaceae; Fabaceae) is an oil crop that fixes atmospheric nitrogen with the help of *Rhizobium* in the root nodules. Sunhemp (*Crotalaria juncea* L; Fabaceae) is a rapidly growing green manure crop in many tropical and sub tropical areas in the world as an organic nitrogen source. Cowpea (*Vigna unguiculata*), bush Bean (*Phaseolus vulgaris*), soybean (*Glycine max* L.) and mung bean (*Vigna radiata*) are highly consuming legumes in Sri Lanka. The main objective of the study was to determine whether mixcropping legumes with vegetables are more useful or not to increase the yield of the each crop.

II. MATERIALS AND METHODS

Experimental location: Study was conducted at Faculty of Agriculture, University of Ruhuna, Mapalana, Kamburupitiya. Mapalana is located in the low country wet zone (WL₂) where the annual rainfall is > 1900 mm. The mean monthly temperature

is 27.5 °C and relative humidity is around 72%. Potting media was prepared using 2:1/2:1 ratio of top soil, sand and compost. Pots (1x1.5x1.5 ft³) were filled with potting media and sterilized using Topsin fungicide (6g /10 L of water). After sterilization, pots were wet for seven days.

Seeds of all selected vegetables and legumes were obtained from Department of Agriculture. Six different crop combinations for each experiment;

Experiment 1: Sunhemp, Okra, Ground nut, Sunhemp with Okra, Sunhemp with Ground nut, Okra with Ground nut

Experiment 2: Tomato, Cowpea, Bush bean, Cowpea with Tomato, Bush bean with Tomato, Cowpea with Bush bean

Experiment 3: Soybean, Mung bean, Curry chilli, Soybean with Mung bean, Soybean with Curry chilli, Mung bean with Curry chilli was used.

After 21 days of nursery period healthy same size seedlings were kept in the pots and maintained three plants per pot. Thinned out weaker plant after 10-12 days and remained healthy two plants in each pot. All management practices were conducted according to recommendations of the Department of Agriculture from seed germination to harvesting.

Number of pods, number of leaves, shoot length, root length, number of pods, pod/seed weight (wet/dry) and wet/ dry weight of stem (Sunhemp) were measured. Soil microbial activity was measured according to the CO₂ evolution method. Complete Randomized Design (CRD) with three replicates was used. Statistical analysis was carried out using the Duncan's multiple range test of SAS program (9.1.3).

Determination of soil microbial activity: Soil microbial activity was measured according to the CO₂ evolution method. Ten grams (10 g) of Soil sample from the each treatment was taken in to a jam bottle and mixed with 3.5 ml distilled water. The controller set was filled with 3.5 ml of distilled water. Ignition tube was taken and filled with 3 ml of 2N NaOH and then placed on the jam bottle so that the emitted CO₂ from the soil will be absorbed in to the NaOH solution. Soil samples were kept in dark room for one week. Then contents in ignition tubes were washed in to 250ml conical flasks separately and mixed with 7.5 ml of 2N BaCl₂. Few drops of phenolphthalein were added and mixtures were titrated by 0.5N HCl. Burette reading was taken at the point of which burette color changes from pink to colorless.

III. RESULTS AND DISCUSSION

Experiment 1: Sunhemp (*Crotalaria juncea*), Okra (*Hibiscus esculentus*) and Ground nut (*Arachis hypogaea*) under monocropping Vs mixcropping

All observed parameters; number of pods, pod weight, shoots length, number of leaves, root length was higher in mixcropping with sunhemp or ground nut (legumes) comparing to mono cropping. Okra mixcropping with sunhemp or ground nut (legumes) is more beneficial than monocropping. Significantly higher yield obtained from okra (53%) when grow with ground nut. Number of pods per plant in okra was increased from 30% when grow with ground nut comparing to monocropping (Table 1a, 1b, 1c and Fig.1).

Table1a. Affect of Treatments (T2 Okra with Okra; T4 Okra with Sunhemp; T6 Okra with ground nut) for growth and yield performances Okra

Treatment	No of pods/plant	Pod weight/plant (g)	Shoot length (cm)	No of leaves/plant	Root Length (cm)
T2 Okra with Okra	6.67 b	133.26 b	57.33 b	8.67 a	54.33 a
T4 Okra with Sunhemp	7.83 b	141.82 b	65.00 b	9.67 a	39.33 b
T6 Okra with ground nut	8.67 a	203.93 a	74.33 a	10.33 a	57.00 a

Column values followed by the same letter are not significantly different as determined by Duncan's multiple range test (P=0.05). Values in same column with same letter denoted non- significant difference

Significantly yield was increased by 112.37% of sunhemp when growing with ground nut comparing to monocropping. But there was no significant different in wet and dry weight of stem. Wet weight of pods /plant, Dry weight of pods/plant and seed

weight/plant was significantly increased 90.82%, 115%, 117.55% of sunhemp respectively when growing with ground nut compare to monocropping.

Table 1b. Affect of treatment (T1; sunhemp with sunhemp, T4; Sunhemp with Okra, T5; Sunhemp with Ground nut) for growth and yield performances Sunhemp.

Treatments	No of pods/plant	No of leaves/plant	Shoot length/plant (cm)	Root length/plant (cm)	Wet weight of stem (g)	Dry weight of stem (g)	Wet weight of pods/plant (g)	Dry weight of pods/plant (g)	Seed weight/plant (g)
T1 sunhemp with sunhemp	37.67 b	54.33 a	177.5 a	35.50 a	41.67 a	21.33 a	13.95 b	11.13 b	6.95 b
T4 Sunhemp with Okra	54.33 b	72.00 a	186.0 a	40.67 a	49.33 a	25.33 a	20.62 ab	18.09 ab	11.00 ab
T5 Sunhemp with Ground nut	80.00 a	71.33 a	200.0 a	43.00 a	59.33 a	33.33 a	26.62 a	23.94 a	15.12 a

Column values followed by the same letter are not significantly different as determined by Duncan’s multiple range test (P=0.05). Values in same column with same letter denoted non-significant difference

Ground nut mixcropping with Sunhemp is better than monocropping of Ground nut, obtained 128.61 % yield increment.

Table 1c; Affect of treatment (T3; Ground nut with Ground nut, T5; Ground nut with Sunhemp, T6; Ground nut with Okra) for growth and yield performances Ground nut.

Treatment	Yield
T3- Ground nut with Ground nut	9.33 c
T5- Ground nut with Sunhemp	21.33 a
T6- Ground nut with Okra	15.00 b

Column values followed by the same letter are not significantly different as determined by Duncan’s multiple range test (P=0.05). Values in same column with same letter denoted non-significant difference

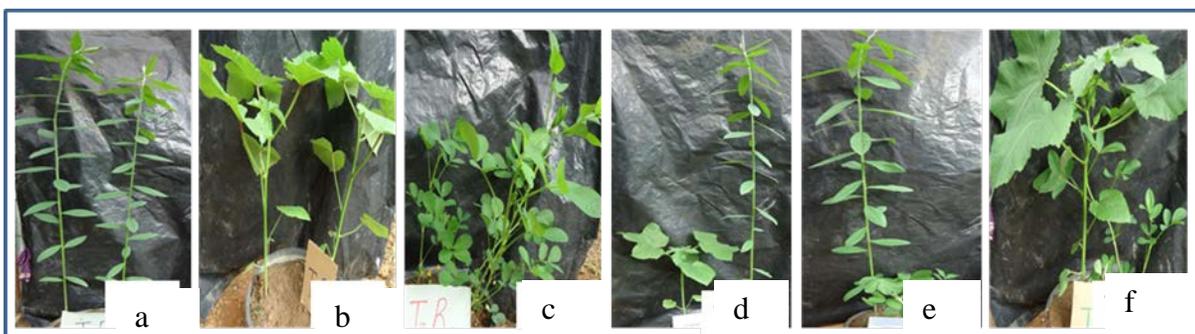


Fig 1. How plants are growing in the pots a. sunhemp with sunhemp b. okra with okra c. groundnut with groundnut d. okra with sunhemp e. sunhemp with groundnut f. okra with groundnut

Significantly highest mean microbial activity was observed in mixcropping sunhemp with okra. But the highest microbial activity does not mean the highest yield in Okra or sunhemp, may be other factors were also effect on yield (Table 1d).

Table 1d: Soil microbial activity

Treatment	Microbial activity (CO ₂ mg/kg of soil)
T1 -Sunhemp with sunhemp	210 c
T2 -Okra with Okra	480 b
T3 -Ground nut with Ground nut	480 b
T4 -Sunhemp with Okra	850 a
T5 -Ground nut with Sunhemp	570 b
T6 -Ground nut with Okra	150 c

Experiment 2: Cowpea (*Vigna unguiculata*), Bush Bean (*Phaseolus vulgaris*) and Tomato (*Lycopersicon esculentum*) under monocropping Vs mixcropping

All observed parameters of tomato; number of flowers, number of pods, weight of fruit/pod, number of leaves and plant height were higher in mixcropping with cowpea or bush bean (legumes) compare to mono-cropping. Tomato, mixcropping

with cowpea or bush bean (legumes) is more beneficial than mono-cropping. Significantly higher yield obtained from tomato (45% and 15%) when grow with bush bean comparing to cowpea respectively. Number of fruits per plant in tomato was increased by 50% when grow with bush bean comparing to monocropping. (Table 2a).

Table 2a. Affect of Treatments (T1.Tomato with Tomato; T4. Cowpea with Tomato; T5. Bean with Tomato) for growth and yield performances Tomato

Treatment	Number of flowers/plant	Number of fruits or /plant	Weight of fruit/ plant (g)	Number of Leaves/plant	Plant height (cm)
T1-Tomato with Tomato	36.00 c	27.33 c	924.00 b	39.0 b	94.0 c
T4-Cowpea with Tomato	41.33 b	33.33 b	1066.33 b	41.0 b	105.0 b
T5-Bean with Tomato	62.33 a	41.00 a	1340.33 a	59.0 a	152.0 a

Column values followed by the same letter are not significantly different as determined by Duncan’s multiple range test (=0.05). Values in same column with same letter denoted non- significant difference

Significantly yield was increased from 106% of cowpea when growing with tomato comparing to mono-cropping but the number of root nodules were decreased by 80% (Figure 2a). Number of pods per plant in cowpea was increased from 100%

when grow with tomato comparing to mono-cropping (Table 2b). But the highest number of root nodules (13/plant) of cowpea was observed when the plant is growing as mono-crop (Figure 2b).

Table 2b. Affect of Treatments (T2. cowpea with cowpea; T4. cowpea with Tomato; T6. Cowpea with bean) for growth and yield performances Cowpea

Treatment	Number of flowers/plant	Number of pods/plant	Weight of seed/ plant (g)	Number of Leaves/plant	Plant height (cm)	Number of root nodules/plant
T2- cowpea with cowpea	9.33 b	6.00 b	8.70 b	9.167 b	125.00 b	13.33 a
T4- cowpea with Tomato	22.33 a	12.33 a	18.66 a	16.00 a	158.33 a	2.667 b
T6 - Cowpea with bean	9.33 b	5.66 b	9.00 b	13.00 a	131.667 b	6.000 b

Column values followed by the same letter are not significantly different as determined by Duncan’s multiple range test (P=0.05). Values in same column with same letter denoted non- significant difference



Figure 2a. Number of seed per plant in cowpea. a. Cowpea mono-cropping, b. mixcropping with tomato, c. mixcropping with bush bean

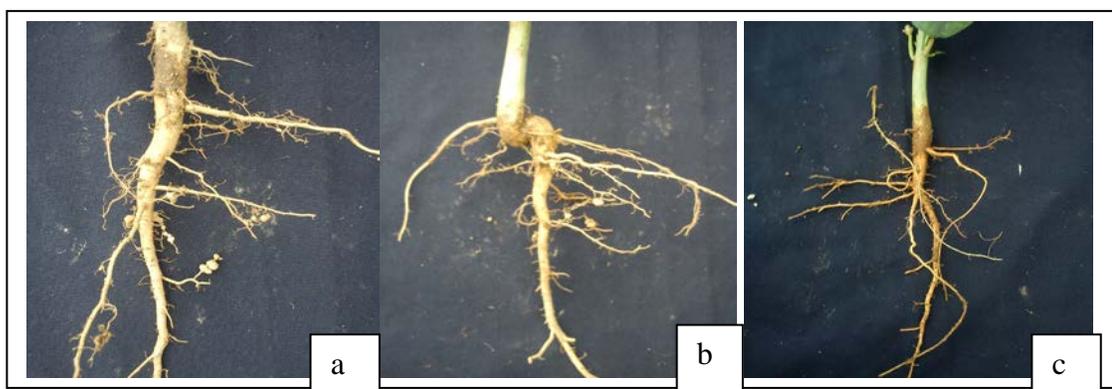


Figure 2b. Root nodules in cowpea. a. mixcropping with bean, b. mixcropping with tomato, c. Cowpea mono-cropping

Bush bean, mixcropping with tomato is better than mono-cropping obtained 35% yield increment. However the number of root nodules was decreased by 94%. The highest number of root nodules (5.7/plant) of bush bean was observed when the plant is growing as mono-crop. Number of pods per plant in bush bean

was increased by 58% when grow with tomato comparing to mono-cropping (Table 2c and Figure 2c). When legumes grow as mono-crop or inter-crop with another legume is not significantly increase the yield. Mixcropping legumes (bean or cowpea) with tomato is more beneficial for legume as well as tomato.

Table 2c. Affect of Treatments (T3. Bean with bean; T5. Bean with Tomato; T6. Cowpea with bean) for growth and yield performances Bush bean.

Treatment	Number of flowers/plant	Number of pods/plant	Weight of seeds/ plant (g)	Number of Leaves/plant	Plant height (cm)	Number of root nodules/plant
T3 B/B	14.83 c	12.66 b	65.33 b	19.167 ab	86.167 a	5.666 a
T5 T/B	26.00 a	20.00 a	88.33 a	23.667 a	72.00 b	0.333 b
T6 C/B	20.33 b	14.00 b	61.00 b	13.667 b	66.00 c	0.666 b

Column values followed by the same letter are not significantly different as determined by Duncan's multiple range test (P=0.05). Values in same column with same letter denoted non-significant difference.

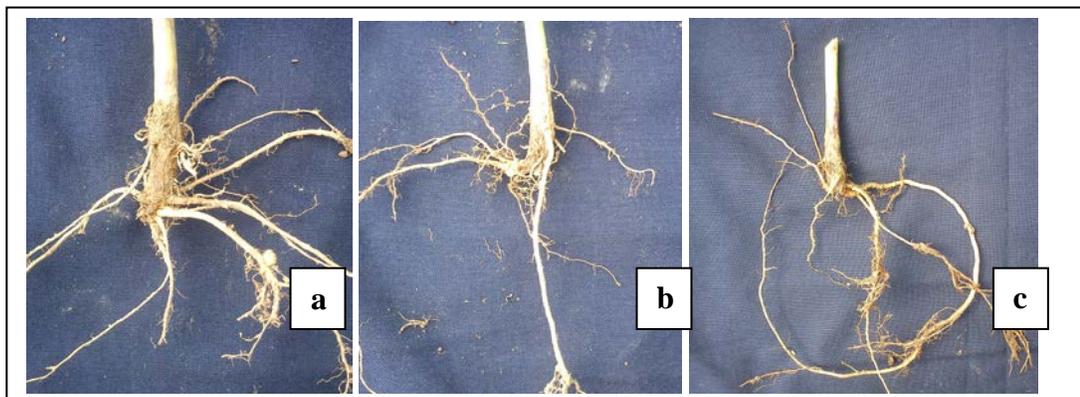


Figure 2c. Root nodules in bush bean. a. Mono-cropping bush bean, b. Mix-cropping with cowpea, c. Mixcropping with tomato

Significantly highest mean microbial activity was observed in tomato, grown as mono-crop but the highest microbial activity

does not mean the highest yield in tomato, may be other factors were also effect on yield (Table 2d).

Table 2d. Soil microbial activity

Treatment	Microbial activity (CO ₂ mg/kg of soil)
T1- Tomato with tomato	840 a
T2- Cowpea with cowpea	180 b
T3- Bean with bean	240 b
T4- Cowpea with tomato	120 b
T5- Bean with tomato	120 b
T6- Cowpea with bean	120 b

Experiment 3: Soy bean (*Glycine max* L.), mung bean (*Vigna radiata*) and curry chilli (*Capsicum annum var.grossum*) in mono-cropping and mix-cropping

All observed parameters of curry chilli; number of pod/plant, pod weight/plant (g), Wet weight of seeds (g) and Dry

weight of seeds (g) were higher in mixcropping with Mungbean compare to mono-cropping. Higher yield were recorded from curry chilli when grown with soybean (87%) and Mung bean (171%) as compared to mono cropping (Table 3a).

Table 3a. Effect of Treatments (T₃--: Curry chilli with Curry chilli, T₅--: Curry chilli with Soy bean; T₆--: Curry chilli with Mung bean) for growth and yield performances of Curry chilli

Treatment	Plant height (cm)	Number of leaves/plant	Number of Pods /plant	Pod weight/plant (g)
T ₃ C/C	54.00 c	39.00 c	8.00 b	94.20 b
T ₅ C/S	55.00 b	65.00 b	5.00 c	64.90 c
T ₆ C/M	74.00 a	80.00 a	10.00 a	176.00 a

Column values followed by the same letter are not significantly different as determined by Duncan’s multiple range test (P=0.05). Values in same column with same letter denoted non- significant difference

Table 3b. Effect of Treatments (T₁-: Soy bean with Soy bean; T₄- Soy bean with Mung bean; T₅- Soy bean with Curry chilli) for growth and yield responses of Soybean.

Treat ment	Plant height (cm)	Number of leaves/pl ant	Number of root nodes /plant	Number of Pods/plant	Pod weight /plant (g)	wet weight of seeds(g)	Dry weight of seeds(g)
T1 S/S	95.38 a	53.00 a	11.50 a	47.00 b	26.675 b	19.855 b	13.530 b
T4 S/M	65.00 a	64.50 a	15.00 a	53.00 b	29.655 b	22.020 b	16.420 b
T5 S/C	65.00 a	82.50 a	14.00 a	93.50 a	53.330 a	40.240 a	30.530 a

Column values followed by the same letter are not significantly different as determined by Duncan’s multiple range test (P=0.05). Values in same column with same letter denoted non- significant difference

Higher yield were recorded from soybean when grown with curry chilli (23%) and Mung bean (130%) as compared to mono cropping (Table 3b and Figure 3a).



Figure 3a. Growth of plants at 70 days after planting. T₁. monocropping of soy bean, T₂- Mixcropping with mung bean, T₃ – Mixcropping with curry chilli

Table 3c. Effect of Treatments (T₂-: Mung bean with Mung bean; T₄-: Mung bean with Soy bean; T₆-: Mung bean with Curry chilli) for growth and yield responses of mung bean.

Treatment	Plant height (cm)	Number of leaves/plant	Number of root nodes /plant	Number of Pods/plant	Pod weight /plant (g)	wet weight of seeds(g)	Dry weight of seeds (g)
T2 M/M	56.750 a	18.00a	0.500 b	11.50 ab	9.295 b	6.250 b	5.785 b
T4 M/S	54.000 a	16.00a	10.50 a	7.50 b	8.180 b	4.615 b	4.090 b
T6 M/C	57.500 a	12.50a	7.00 a	17.00 a	13.815 a	10.110 a	9.870 a

Column values followed by the same letter are not significantly different as determined by Duncan's multiple range test ($P=0.05$). Values in same column with same letter denoted non-significant difference

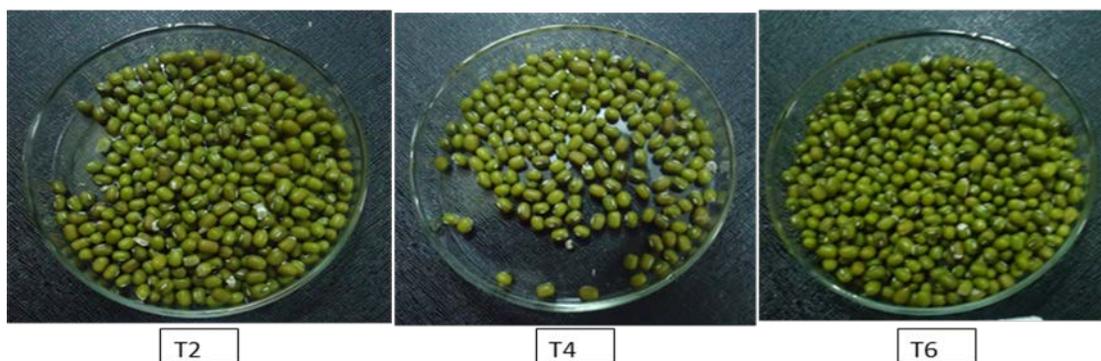


Figure 3b. Number of dry seeds per plant (T2- Mungbean with Mungbean, T4- Soybean with Mungbean, T6 Mung bean with Curry chilli)

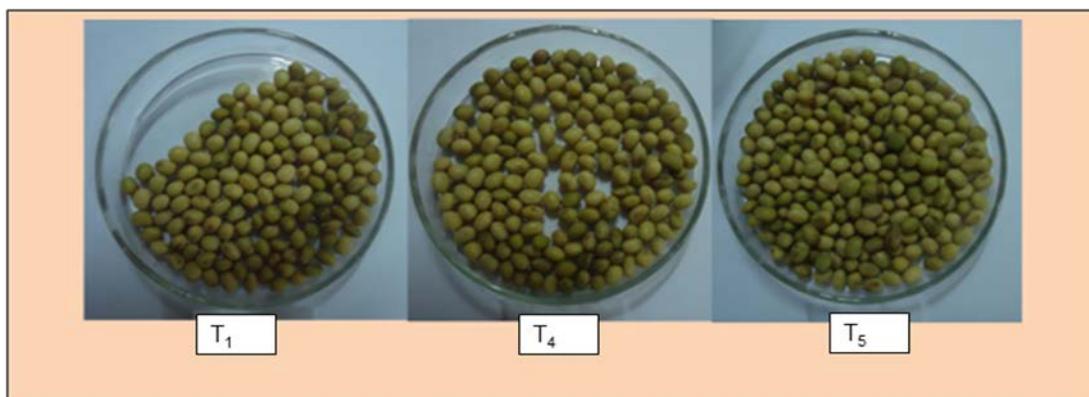


Figure 3c. Number of dry seeds per plant Mungbean produced 35% more yield when mixcropping with curry chilli as compared to Mungbean mono cropping (Table 3c, Figure 3b and 3c).



Figure 3d. T1- Soybean with Soybean, T4- Soybean with Mungbean, T5- Soybean with Curry chilli

Significantly highest mean microbial activity was observed in soybean intercropping with Mungbean. Due to both crops are legumes microbial activity may be increased (Table 3d and Figure 3d).

Intercropping cereals with food or green manure legumes is recommended for enhancing the supply of nitrogen to the cereal (Sangakkara *et al*, 2003). Introducing legumes in the productive

system can bring benefits such as improvement of the physical characteristics of the soil, including aggregation and implementation of organic carbon, increased biomass, nutrient recycling, nitrogen supplied by biological fixing, soil moisture maintenance, decrease in maximum temperatures and heat amplitude, permanent protection against the main soil degrading agents and weed control (Diego *et al*, 2013).

Table 3d. Soil microbial activity of different treatments

Treatment	Microbial activity (weight of mineralized carbon in mg/kg of soil)
T1- Soy bean with Soy bean	420 b
T2- Mung bean with Mung bean	420 b
T3- Curry chilli with Curry chilli	300 b
T4- Soy bean with Mung bean	780 a
T5- Soy bean with Curry chilli	420 b
T6- Mung bean with Curry chilli	300 b

IV. CONCLUSIONS

When legumes grow as mono-crop or mix-crop with another legume did not significantly increase the yield. Mixcropping legumes (soy bean or mung bean, cowpea or bush bean, Sunhemp or Ground nut) with curry chilli or tomato or okra are more beneficial for legume as well as vegetable crop. Significantly highest mean microbial activities were observed in mixcropping with legumes as well as mono cropping. Therefore, the highest microbial activity does not mean the highest yield; other factors may be also affected on yield.

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Study of Compressibility, Internal Pressure and Free Volume for Carbohydrates using Ultrasonic Measurements

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Abstract- The compressibility of the solution decreases with increase of solute concentration. The decrease in the compressibility is explained by assuming that the solvated molecules are fully compressed by the electrical forces of the ions. Hence a fraction namely those within the primary solvated shell of the ions is rendered incompressible. The compressibility of the solution is mainly due to the free solvent molecules. Internal pressure of liquids provides a wealth of information about the state of liquid. It explains many of the properties of liquids and solutions. The concept of free volume is a generalized aspect of the idea that its neighbors in a cell enclose each molecule. Let us consider some of the sugar alcohols like Maltose, Galactose, Mannonose

Index Terms- Velocity, Adiabatic compressibility, Internal Pressure, Free volume.

I. INTRODUCTION

The number of water molecules that interact with the solute at one time is the measure of the hydration number. Internal pressure though a single factor appears to vary due to all the internal interactions such as hydration of solute solvent interactions. Even microscopic changes occurring in the medium like in molecular orientations or in temperature will change the value of internal pressure. The free volume is broadly defined as the averages volume in which the center of the molecule can move inside the hypothetical cell due to the repulsion on the surrounding molecules.

II. EXPERIMENTAL STUDY

Computation of the acoustical parameters require measurement of ultrasonic velocity (U), viscosity (η) and density (ρ). Aqueous solutions of amides of different concentrations were prepared with AR grade salts with double

distilled water. Ultrasonic velocity through the solutions were measured with a Mittal type ultrasonic interferometer with an accuracy of ± 2 m/s. The cell temperature was maintained with a circulating ultrathermostat accurate to within 0.1° c. The viscosity of the solutions were measured using a Cannon Fensky viscometer. The density of the solutions were measured with 10 ml specific gravity bottle.

III. COMPUTATION

Compressibility measurements yield interesting information. They are also highly accurate. Here we assume that the bound water molecules are highly compressed by the intense field of the ion and that further compression affects only the unbound water. The adiabatic compressibility is the fractional decrease of volume per unit increase of pressure, when no heat flows in or out. If there is no heat flow, the entropy is unchanged in a reversible process, is one at constant entropy. Then we have,

Adiabatic compressibility can be determined with the measurement of density and ultrasonic velocity U as

$$\beta = (1/u^2 p) \text{ cm}^2/\text{dyne}$$

$$\pi_i = bRT \left[\frac{K\eta}{U} \right]^{1/2} \cdot \frac{\rho^{2/3}}{M_{eff}^{7/6}}$$

Thermodynamic importance of internal pressure is shown by bringing out its quantitative relationship with entropy and the partition function of the system. Internal pressure is shown to be related to the transport properties in liquids and solutions.

The free volume plays an important role in ultrasonic propagation in liquids, and $V_f^{1/3}$ is very small in the case of solids. The relation between free volume and viscosity has been derived by Bingham and McLeod

(1.15)Tables

Maltose

MOLALITY	Velocity					Adiabatic Compressibility				
	308K	313K	318K	323K	328K	308K	313K	318K	323K	328K
0.1	1509	1534	1560	1579	1616	44.11	43.08	41.26	41.72	38.33
0.4	1517	1547	1567	1580	1632	43.58	40.52	39.39	38.86	36.48
0.6	1527	1556	1607	1613	1656	41.51	38.96	36.72	36.46	34.28
1	1546	1610	1617	1620	1680	40.1	36.63	36.24	35.25	32.85
1.2	1578	1618	1661	1657	1696	37.41	35.59	32.63	33.03	31.25
1.6	1612	1637	1702	1698	1705	34.97	33.27	30.46	32.33	30.33
2	1640	1652	1702	1760	1740	32.61	31.94	29.77	27.92	28.39

MOLALITY

Internal pressure

Free Volume

MOLALITY	Internal pressure					Free Volume				
	308K	313K	318K	323K	328K	308K	313K	318K	323K	328K
0.1	24997	21555	22168	20589	20161	0.02364	0.03794	0.03731	0.0455	0.0548
0.4	23121	20682	22003	20955	19202	0.02486	0.03897	0.03409	0.0412	0.0558
0.6	24100	22530	21492	21326	19928	0.02098	0.02841	0.03397	0.0364	0.0476
1	26156	20185	24150	21227	18360	0.01675	0.03167	0.02394	0.0315	0.0507
1.2	24072	22719	21755	21940	19470	0.01677	0.02095	0.02667	0.0269	0.0411
1.6	25018	23522	22006	20496	18782	0.01315	0.01726	0.0225	0.0262	0.0341
2	28938	25189	24053	23071	20560	0.00764	0.0125	0.0154	0.0182	0.0272

Galactose

MOLALITY

Velocity

Adiabatic Compressibility

MOLALITY	Velocity					Adiabatic Compressibility				
	308K	313K	318K	323K	328K	308K	313K	318K	323K	328K
0.2	1518	1530	1554	1560	1566	43	42.47	41.25	41.03	40.83
0.4	1542	1548	1560	1566	1578	41.21	40.91	40.4	40.18	39.71
0.6	1548	1554	1566	1572	1578	40.38	40.64	39.64	39.44	39.29
0.8	1560	1566	1572	1578	1584	39.74	39.5	39.29	39.1	38.89
1	1578	1590	1602	1614	1620	37.04	37.47	37.01	36.66	36.47
1.2	1590	1602	1608	1614	1626	37.04	36.57	36.34	36.21	36.8
1.4	1602	1608	1614	1626	1632	36.12	35.98	35.81	35.38	35.22
1.525	1614	1620	1632	1650	1656	35.43	34.82	34.82	34.19	34.04

Internal Pressure

Free Volume

	308K	313K	318K	323K	328K	308K	313K	318K	323K	328K
0.2	24585	23590	22959	22090	21283	0.02584	0.03058	0.03456	0.04045	0.0471
0.4	24538	23650	22760	22585	21104	0.020507	0.02928	0.03336	0.0389	0.0466
0.6	24229	23438	22759	21936	21128	0.0251	0.020903	0.03301	0.03844	0.04571
0.8	23970	22897	22474	21563	20488	0.02452	0.02943	0.03247	0.03854	0.04664
1	23991	23918	22413	21713	20585	0.02421	0.02616	0.02756	0.03712	0.04407
1.2	24549	23448	22550	21459	20542	0.02185	0.02616	0.02756	0.03712	0.04407
1.4	24548	23484	22781	21840	20389	0.02118	0.02521	0.0289	0.03407	0.04359

**Mannose
Velocity**

Adiabatic compressibility

	308K	313K	318K	323K	328K	308K	313K	318K	323K	328K
0.2	1520	1532	1552	1560	1565	42.89	42.4	41.38	41.04	40.89
0.4	1538	1544	1558	1567	1576	41.42	41.13	40.51	40.14	39.82
0.6	1546	1553	1564	1573	1580	40.46	40.18	39.77	39.4	39.2
0.8	1560	1567	1570	1580	1586	39.72	39.42	39.4	39.01	38.77
1	1574	1582	1606	1616	1622	38.48	38.23	37.22	36.87	36.74
1.2	1594	1600	1612	1617	1621	37.22	36.65	36.51	36.43	36.74

Internal Pressure

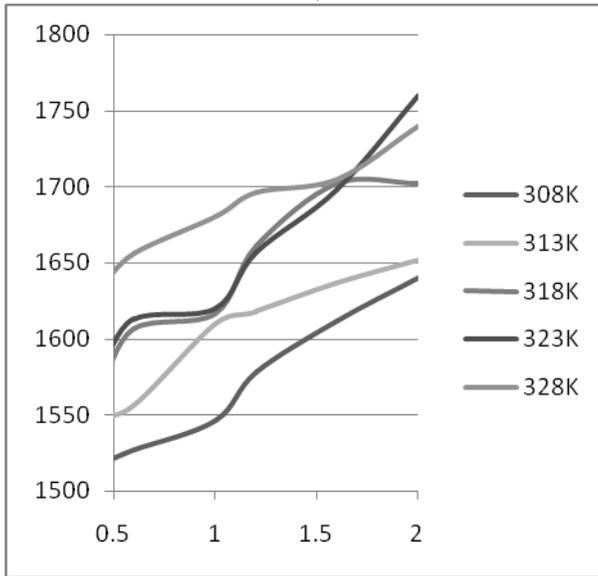
Free Volume

	308K	313K	318K	323K	328K	308K	313K	318K	323K	328K
0.2	24585	23590	22959	22090	21283	0.02584	0.03058	0.03456	0.04045	0.0471
0.4	24538	23650	22760	22585	21104	0.020507	0.02928	0.03336	0.0389	0.0466
0.6	24229	23438	22759	21936	21128	0.0251	0.020903	0.03301	0.03844	0.04571
0.8	23970	22897	22474	21563	20488	0.02452	0.02943	0.03247	0.03854	0.04664
1	23991	23918	22413	21713	20585	0.02421	0.02616	0.02756	0.03712	0.04407
1.2	24549	23448	22550	21459	20542	0.02185	0.02616	0.02756	0.03712	0.04407
1.4	24548	23484	22781	21840	20389	0.02118	0.02521	0.0289	0.03407	0.04359

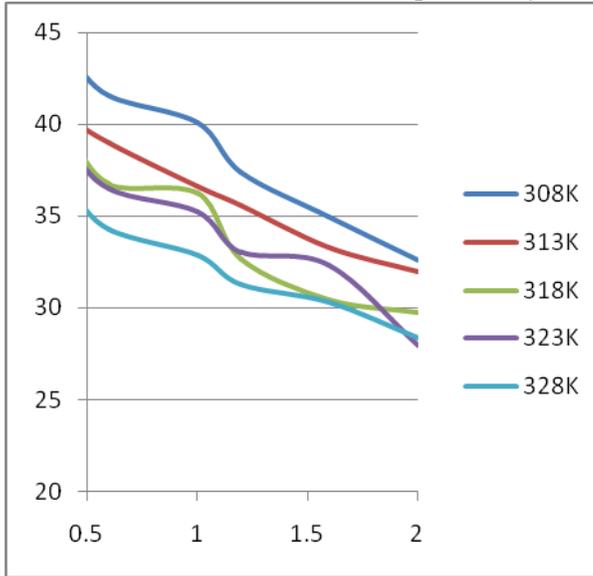
Graphs

Maltose

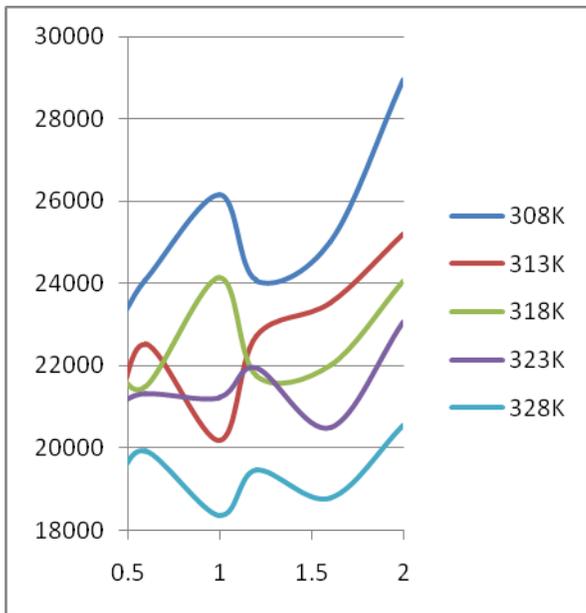
Ultrasonic velocity



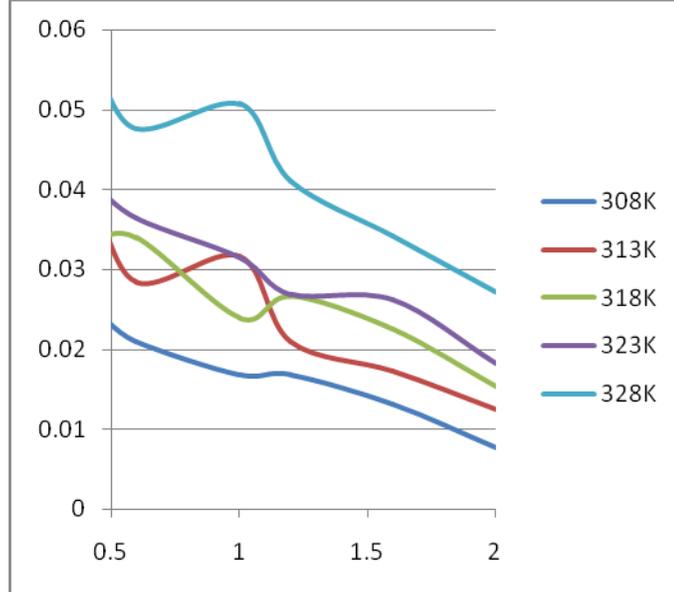
Adiabatic compressibility



Internal Pressure



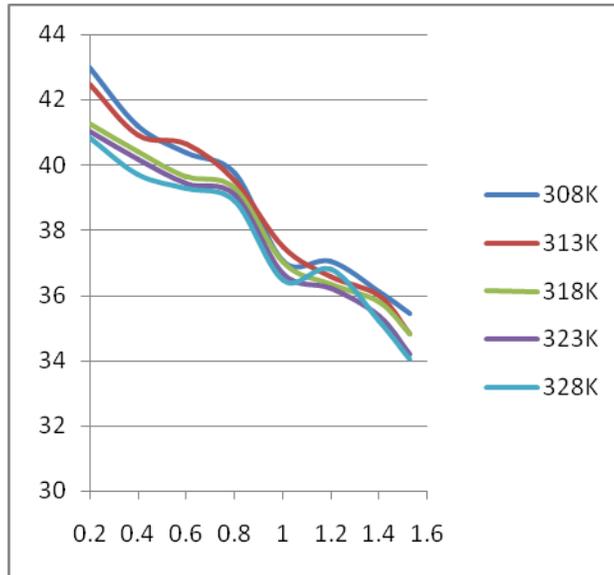
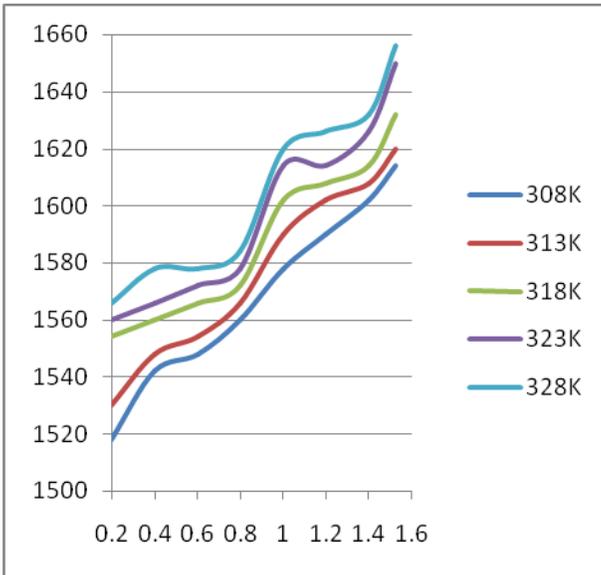
Free volume



Galactose

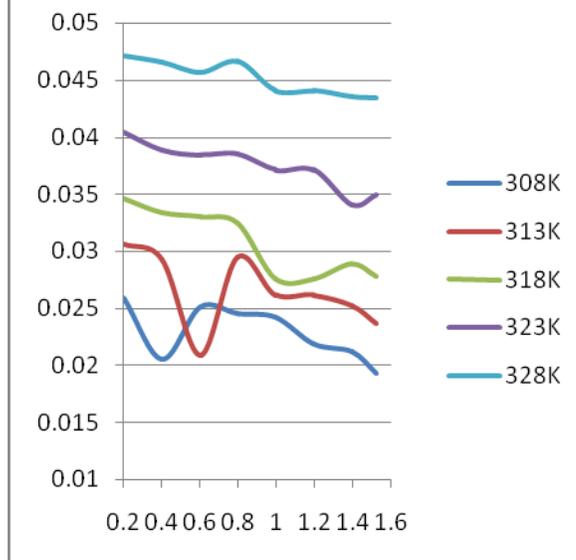
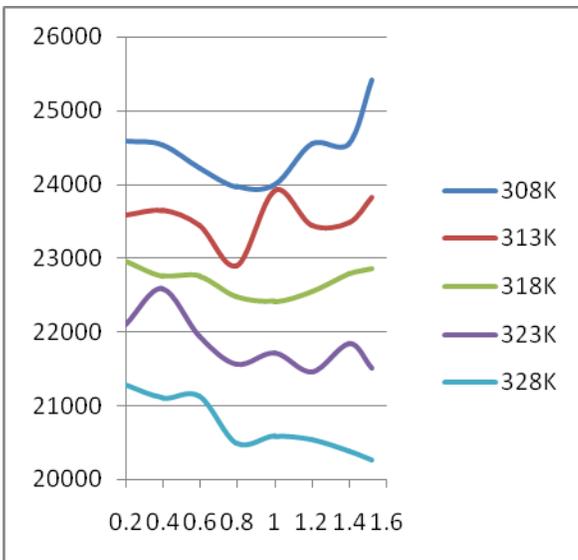
Ultrasonic velocity

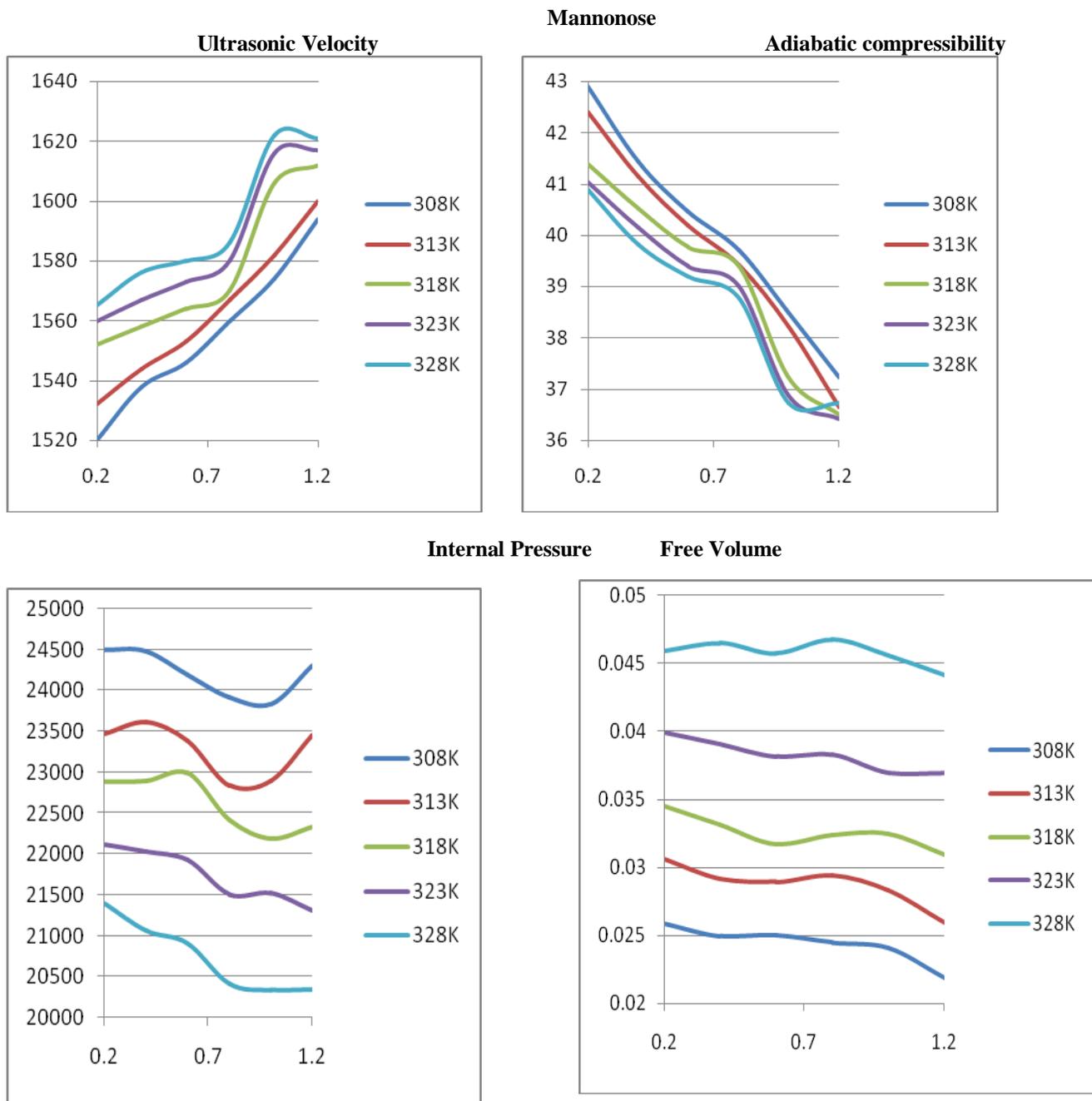
Adiabatic compressibility



Internal Pressure

Free Volume





IV. RESULTS AND DISCUSSION

The experimentally determined values of ultrasonic velocity for Maltose, Galactose, Mannonose at temperatures at, 308K, 313K, 318K and 323K, 328K are summarized in the table.

The measurement of ultrasonic velocity is an important tool to study the physical & chemical properties of the liquid. Ultrasonic velocity and allied parameters of Maltose, Galactose, Mannonose for various concentrations, at different temperatures are presented in tables and represented graphically in figures.

Ultrasonic velocity, adiabatic compressibility, Internal Pressure and Free volume for Maltose, Galactose, Mannonose were determined at different temperatures.

The plots between the ultrasonic velocity and concentration potential shows that the ultrasonic velocity is found to linearly increase with temperatures. This linear increase suggests that there are strong solute-solvent interactions in the liquid solution. These interactions are both concentration and temperature dependent. The effects of temperature on the interactions are more than that of concentration. At low concentrations, the number of hydrogen bonds formed may be less and at higher concentrations, it may be more due to solute-solute interactions. Ultrasonic velocity is found to linearly increase with

both molality as well as temperature as reported in literature for other carbohydrates[Graph1].

The compressibility is a macroscopic observable, which is sensitive to solute-solvent interactions. Any modifications induced by the solute on the local structure of the solvent generate changes in the adiabatic compressibility of the solutions and therefore compressibility can be used to characterize solvated properties of solute in dilute solutions.

The decrease in the values of adiabatic compressibility with increase in ultrasonic velocity indicates that there is a significant interaction between solute and solvent molecules due to which the structural arrangement in the neighbourhood of constituent ions is considerably affected[Graph2]. The variation in compressibility values of the carbohydrates is found to be in good agreement with the reported values for electrolytes.[11]. The solute solvent interaction becomes weak with increase in concentration and temperature. The changes in Internal pressure and Free volume was noted for Maltose,Galactose,Mannonose .

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Clustering Analysis of Ethiopian Safflower (*Carthamus tinctorius*) Using ISSR Markers

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Abstract- Safflower, *Carthamus tinctorius*, L. is an oilseed crop that belongs to the family Asteraceae. The genus *Carthamus* is comprised of 25 species including the only cultivated species of *Carthamus tinctorius*. So far, the characterization of safflower using molecular markers has been limited. The objective of this study was to examine the cluster analysis of safflower accessions collected from different regions of Ethiopia using ISSR molecular markers. For this purpose, seeds of seventy land race accessions collected from four administrative regions of Ethiopia (Amhara, Oromia, Tigray and SNNPR) were obtained from the EIB and grown in green house at Addis Ababa University, Faculty of Life Science. DNA was extracted from a bulk leaf sample of five randomly selected plants per accession using a triple CTAB extraction technique. Four primers were selected. The four selected ISSR primers produced a total of 43 bands across the 70 safflower accessions. The number of amplified fragments with ISSR primers ranged from 6 to 15 per primer with varied in size of 100 to 1000 base pairs. The cluster analysis based on ISSR data Safflower individuals assembled from different localities and regions observed to be spread all over the trees without forming strict grouping based on their geographic origin. However, some individual from Amhara and Oromia tends to form separate groups. The majority of the groups observed in UPGMA and NJ trees were intermixed individuals from SNNPR and Tigray with Oromia and Amhara populations. The results reveal the genotypes of safflower collected from different localities and regions of Ethiopia which had slightly grouping among accession.

Index Terms- *Carthamus tinctorius*, Safflower, genetic diversity, ISSR, molecular marker, cluster analysis, Ethiopia.

I. INTRODUCTION

Safflower, *Carthamus tinctorius*, L. is an oilseed crop that belongs to the family Asteraceae. The genus *Carthamus* has 25 species, of which *C. tinctorius* is the only cultivated one, and has $2n = 24$ chromosomes (Helm *et al.*, 1991). It is dicotyledonous, herbaceous, and annual plant. It has colorful flower heads, a deep taproot, and the production of white, oil-bearing seeds. It has adapted to grow in hot, dry climates, and well-drained soil (Smith, 1996). Safflower is believed to have been domesticated somewhere in the Fertile Crescent region over

4000 years ago (Ashri, 1975; Knowles, 1969). According to Vavilov (1951) considered Ethiopia, Afghanistan and India as the primary centers of origin of safflower. Currently, it is grown as an oilseed crop in over 60 countries worldwide, and India is the largest producer of safflower (Weiss, 2000).

Safflower is mainly cultivated for its seed, which is used primarily for edible oil. In the past, the crop is grown for its flowers used for coloring and flavoring foods, making dyes and medicine (Zhang, 1997). In Ethiopia, boiled and finely pounded safflower kernels are mixed with water and the supernatants is used to prepare the so called 'fitfit', which is used as fasting-food. Roasted seeds mixed with roasted chickpeas, barley or wheat, are eaten as a snack food in Ethiopia and Sudan (Dajue and Mündel, 1996). Ethiopian safflower is very much neglected and it is cultivated only as a minor oil crop with very limited information available on its genetic resources. In Ethiopia, safflower cultivation is mostly done by small scale farmers in well fertile and drained field, usually around homesteads (Edwards, 1991).

In current scenario, the DNA markers become the marker of choice for the study of crop genetic diversity (Karp *et al.*, 1997). However, agro-morphological markers were the first to be used for genetic diversity study of some safflower germplasm (Maryam *et al.*, 2011). RAPD markers were also applied to study the genetic diversity of *C. tinctorius* landraces germplasm collected from Iran (Mahasi *et al.* 2009; Pooran *et al.*, 2011) while ISSR marker has been used by Yang *et al.* (2007) and Pooran *et al.* (2011) to investigate relationship among *C. tinctorius* germplasm collected from different part of the world. None of the above studies either focused on Ethiopian germplasm or include samples from Ethiopia. This study provided valuable data to conservation attention through its ability to detect variation at the DNA level. Therefore, the main objective of this study was examining the cluster analysis of safflower (*C. tinctorius*) collected from Ethiopia using ISSR molecular markers.

II. MATERIALS AND METHODS

2.1. Plant materials and Genomic DNA extraction

Seeds of 70 safflower accessions collected from four different administrative regions of Ethiopia were obtained from Ethiopian Institute of Biodiversity (EIB), Addis Ababa, Ethiopia.

All the 70 safflower accessions seeds samples were grown in a greenhouse and fresh leaves from five week old plants were used for genomic DNA extraction. Five young leaves were collected separately from five randomly selected individual plants of each accession just before flowering and equal proportions of leaves were grinded for genomic DNA extractions. Genomic DNA was extracted from leaf samples according to Borsch *et al.* (2003) and later diluted to concentration of 1:5 .

2.2. Primer selection and optimization

Table 1: List of primers, annealing temperature, sequence motifs and amplification pattern

Primers	Annealing T°	Sequence	Amplification pattern
810	45	5'-GAGAGAGAGAGAGAT-3'	Reproducible but not polymorphic
812	45	5'-GAGAGAGAGAGAGAA-3'	Good
818	48	5'-CACACACACACACAG-3'	Good
824	48	5'-TCTCTCTCTCTCTCG-3'	Polymorphic but not reproducible
834	45	5'-AGAGAGAGAGAGAGYT-3'	Reproducible but not polymorphic
844*	48	5'-CTCTCTCTCTCTCTRC-3'	Polymorphic but not reproducible
872*	38	5'-GATAGATAGATAGATA-3'	Polymorphic but not reproducible
873*	45	5'-GACAGACAGACAGACA-3'	Good
874*	48	5'-CCCTCCCTCCCTCCCT-3'	Polymorphic but not reproducible
880**	45	5'-GGAGAGGAGAGGAGA-3'	Good

Source: *Primer kit 900* (UBC 900); Single-letter abbreviations for mixed base positions: R= (A, G) Y = (C, T)

*Tetra-nucleotide primer, **Penta-nucleotide primer and the rest are di-nucleotides.

2.4. DNA amplification

ISSR PCR amplification based on four primers was carried out using the reaction mixture below. Amplification was carried out in a 25 µl reaction mixture containing 1µl template DNA, 13.45µl ddH₂O, 5.6µl dNTP (1.25mM), 2.6µl Taq buffer (10xThermopol reaction buffer), 1.25µl MgCl₂ (50mM), 0.6µl primer (20pmol/µl) and 0.5µl Taq Polymerase (5u/µl). The amplification was performed in a Biometra 2003 version 3.10 TPersonal using 48 well plates under 2 minutes preheating and initial denaturation at 94°C, followed by a regular cycling event of 40 cycles of 20 seconds denaturation at 94°C, 1 minute primer annealing at (45°C/ 480C) based on primers used, 1.30 minutes extension at 72°C and final extension for 7 minutes at 72°C. The PCR products were stored at 4°C until loading on gel electrophoresis.

2.5. Gel electrophoresis and visualization

The quantity and quality of genomic DNA were tested using agarose gel electrophoresis. Stock solution of 10X Tris Borate EDTA (TBE), commonly used electrophoresis buffer: 108 gm Trisbase; 55 gm Boric acid; 40ml EDTA, pH 8.57 components per liter was prepared and stored at room temperature. From the stock, working solution of 1X TBE prepared and used to prepare the gel as well as fill the electrophoresis tank. The ISSR gel with 1.67% was prepared by boiling 1xTBE in 500 ml Erlenmeyer flask in micro-oven for 2:30 minutes. After the agarose solution cooled down at room temperature, 2µl of ethidium bromide was added for better visualization of the gel. Then poured on a gel tray and the comb was inserted to the gel and left for about 30 minutes to set properly. The comb was carefully removed and

A total of 10 ISSR primers (UBC 900) available at Genetics Laboratory, Addis Ababa University (AAU) were used for the initial variability test and reproducibility. Optimization and screening of primers was carried with one individual that was selected from each population. All pre-selected 10 primers were screened for reproducibility and polymorphism. Finally, two di (primer 812 and 818), one tetra- (primer 873) and one penta- (primer 880) –nucleotide primers (Table 1) were selected based on polymorphism and reproducibility.

put the gel tray in to the electrophoresis tank properly filled with electrophoresis buffer, and then the amplified ISSR product of 8µl was loaded onto ISSR gel with 2µl loading dye. DNA ladder 100 bp was used to estimate molecular weight. The electrode was connected and the power supply was turned on; the voltage was adjusted at 100 V and left for three hours. The electrophoresis gel was photographed using UV dual-intensity transilluminator, Zenith, canon camera connected with computer. But gel picture was taken after staining with 25µl Ethidium bromide (10mg/ml) which was mixed with 250 ml double distilled water for 30 minutes and washed for 30 minutes using double distilled water. Different photographs using different lens aperture, were taken and saved for later scoring.

2.6. Data scoring and statistical analysis of diversity

Although a large number of fragments were generated from each primer, only clearly distinguishable and reproducible bands were selected and data were entered in a computer file as a binary matrix “0” for absence and “1” for presence of a band. Data from the ISSR studies was analyzed using various statistical programs. The un-weighted pair group method with arithmetic mean (UPGMA) was used to analyze and compare the individual genotypes (Sneath and Sokal, 1973) and generates phenogram using NTSYS- pc version 2.02 (Rohlf, 2000). The neighbor joining (NJ) method (Saitou and Nei, 1987) was used to compare individual genotypes and evaluate patterns of genotype clustering using Free Tree 0.9.1.50 Software (Pavlicek *et al.*, 1999). To further examine the patterns of variation among individual samples, a principal coordinated analysis (PCO) was performed based on Jaccard’s coefficient (Jaccard, 1908). The calculation of

Jaccard's coefficient was made with PAST soft ware version 1.18 (Hammer *et al.*, 2001). The first three axes were later used to plot three dimensional graph with STATISTICA version 6.0 software (Statistica soft, Inc.2001).

III. RESULTS AND DISCUSSIONS

Clustering analysis and relationships of safflower populations

The four safflower populations from Ethiopia (Amhara, Oromia, SNNPRs and Tigray) were studied using ISSR markers. Out of the 10 primers, four with clear and reproducible bands were selected and used in this study (Table 2). The molecular weight of the bands amplified using the four primers were in the range of 100 to 1000bp (Figure 1). The generated ISSR marker data were used to construct a dendrogram using Un-weighted Pair-Group Method using Arithmetic Averages (UPGMA) and Neighbor joining (NJ) using NTSYS and free tree program, respectively. Both UPGMA and NJ based dendrogram for individual safflower appeared to show different grouping. Safflower individual assembled from different localities and regions observed to spread all over the trees without forming strict grouping based on their geographic origin. However, in few cases some individual from Amhara and Oromia tends to form their own groups. The majority of the groups observed in UPGMA and NJ trees were intermixed individuals from SNNPR and Tigray with Oromia and Amhara populations. Generally, different groupings was clearly in both UPGMA and neighbor joining analysis except for eight individuals assembled from

Amhara forming separate group in both UPGMA and NJ. Both trees recovered almost the same tree topology with similar groupings, although few individuals appeared to escape from groups in both cases. Yang *et al.* (2007) has got similar result, whereby the 24 accession from Asia were scattered all over the tree and comparatively, the accessions originated from Europe were relatively grouped together. In this study genotypes that were grouped in the same cluster could be because of common seed sources, similar selection criteria by local farmers, and sharing a common parentage and convergent evolution. Accordingly, Amhara and Oromia, SNNPR and Tigray have clustered in a same group (figure 2). Individuals from these regions could have originated from a common ancestor and/or could also have the same seed sources or duplicates (Khan *et al.*, 2008). This could be due to extensive seed exchange across the regions during domestication and cultivation of safflower (Khan *et al.*, 2008).

Although some work based on morphological traits has been conducted to assess genetic variation in safflower genotypes, the results are still ambiguous, because phenotypic traits are affected by developmental stages and environmental conditions. The results of the present study are consistent with those of Yang *et al.* (2007), who emphasized that ISSR, is an effective marker system for detecting genetic diversity among safflower genotypes and provides useful information about the phylogenic relationships. In line with the present study, the dispersion into the various groups appeared to be at random through a few accessions formed distinct clusters based on geographic origin.

Table 2: Fingerprint patterns generated using four ISSR primers; selected for this study.

Selected Primer	Repeated motif	No. of clear scorable bands	Amplification Pattern	ISSR gel observation
812	(GA) ₈ A	12	Good	Good with small smear
818	(CA) ₈ G	6	Good with smear	Good with smear
873	(GACA) ₄	15	Best	Good
880	(GGAGA) ₃	10	Good	Good
		43		

Source: primer kit 900 (UBC 900); Single-letter abbreviations for mixed base positions.

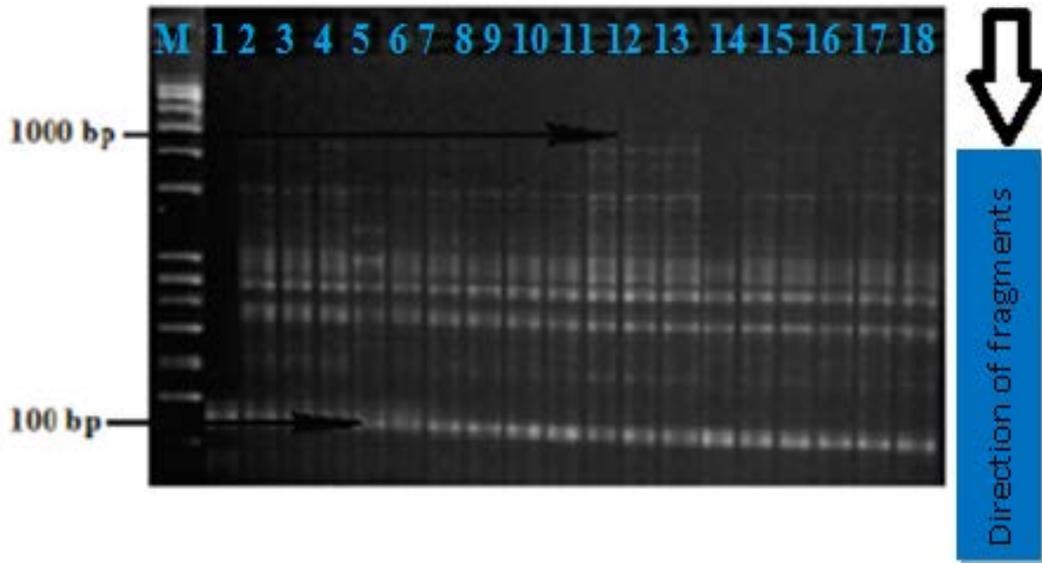


Fig. 1 ISSR amplification profile generated using primer 873 for *Carthamus tinctorius* accessions. Numbers represent the accessions from Amhara region. M: 100bp DNA ladder

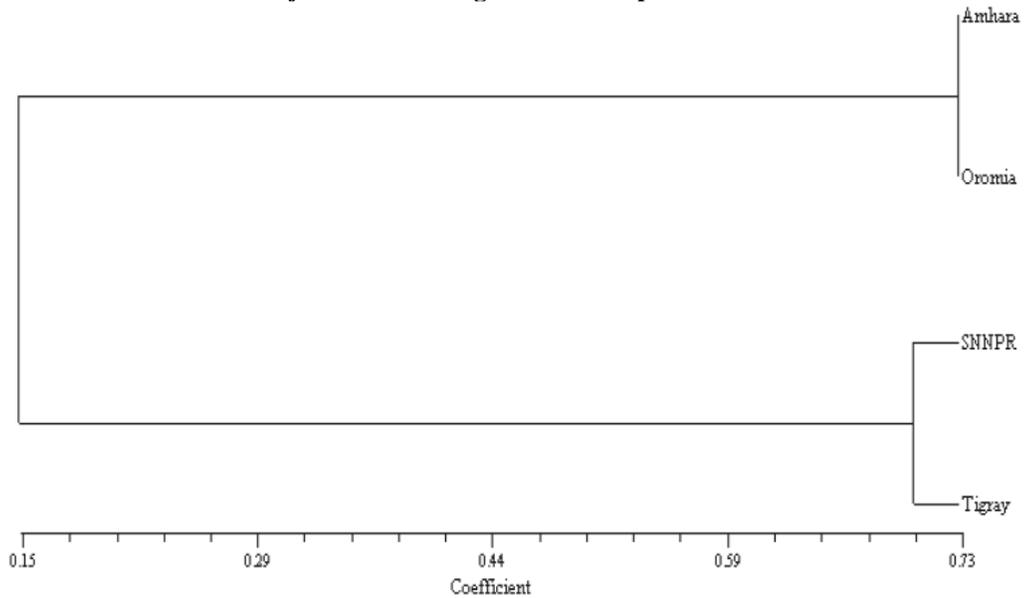


Figure 2: UPGMA based dendrogram for four safflower populations using Jaccard's similarity coefficient

Key:-AM=Amhara, OR= Oromia and TI=Tigray

Figure 3: UPGMA tree of 70 safflower individuals based on Jaccard's coefficients

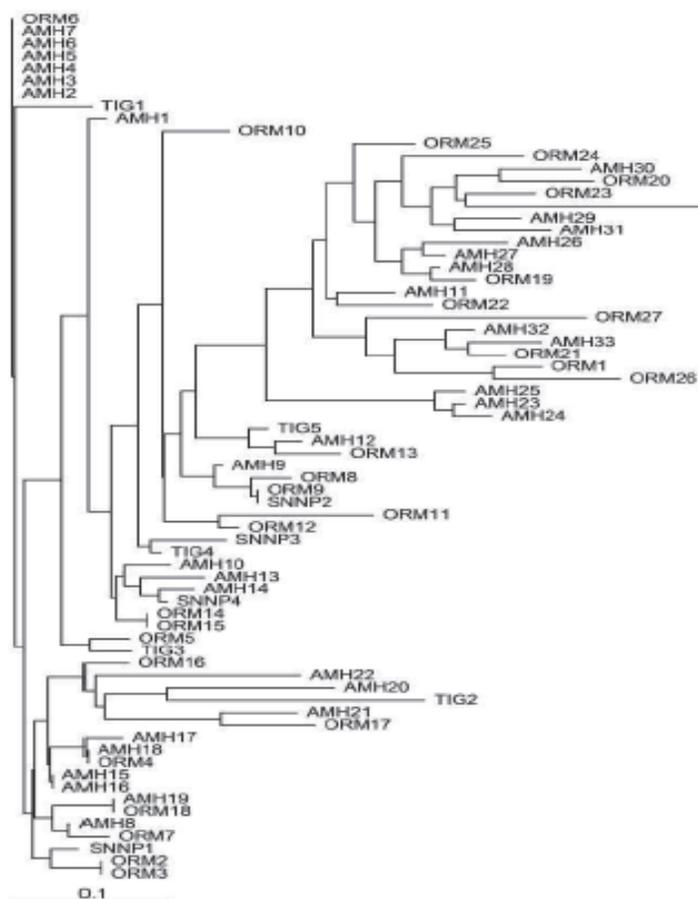


Figure 4: Neighbor-joining analysis of 70 individuals based on Jaccard's coefficients comparison of the presence-absence fingerprinting.

Key:-AMH=Amhara, ORO=Oromia, SNN=SNNPRs and TIG=Tigray

PCO Analysis (Principal Coordinate Analysis)

All the data obtained using four ISSR primers were used in PCO analysis using Jaccard's coefficient of similarity. The first three coordinates of the PCO with Eigen-values of 8.46, 2.92 and 1.92 with variance of 27.4%, 9.5% and 6.2%, respectively (Table 3) used to show the grouping of individuals using two and three dimensional coordinates. The four populations observed to form separate cluster and few of the individuals were dispersed all over both 2D and 3D space. However, some individuals from SNNPRs observed to be intermixed with Oromia and Amhara populations (Figure 5). In this investigation, there are weak

regional differentiations between safflower populations were observed and similarly patterns of grouping was also recovered in PCO UPGMA and NJ. The fact that they are grouped in the same cluster implies their close relationship in genetic characters and landrace lineages. This could also be due to the exchange of plant materials across the regions during the safflower cultivation and long distance seed transport for marketing. Therefore, their difference in cluster could imply their being originated from different sources, while grouping in the same cluster would mean genetic affinity among individuals in the same group.

Table 3: Eigen value and percent variance in the PCO

Principal Coordinate	Eigen value	Variance (%)
1	8.46	27.4
2	2.92	9.5
3	1.92	6.2
Total		43.1%

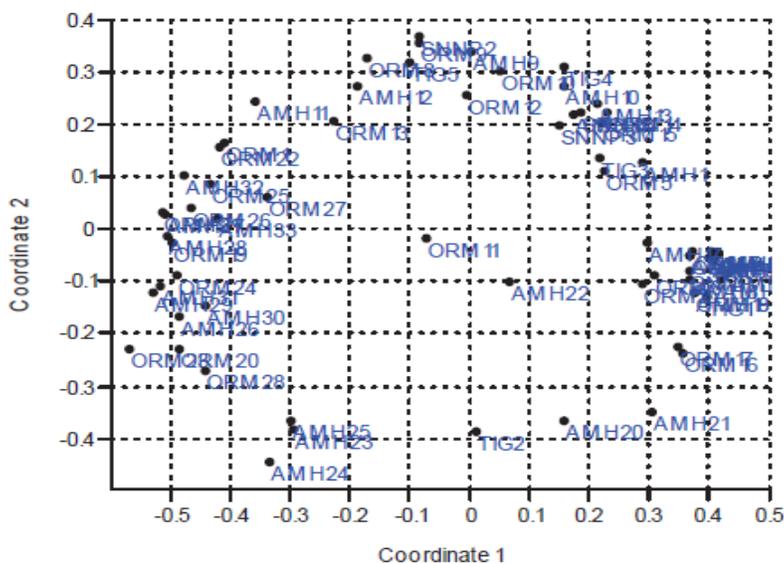


Figure 5: Two dimensional representations of principal coordinate analysis of genetic relationships among 70 individuals from four populations of safflower based on Jaccard's similarity coefficients.

Key: - AMH=Amhara, ORO=Oromia, SNN=SNNPRs and TIG= Tigray

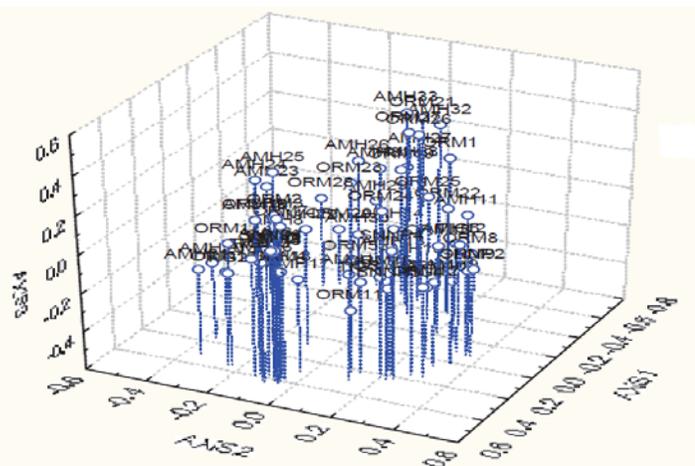


Figure 6: Three dimensional (3D) representation of principal coordinate analysis of genetic relationships among 70 individuals of four population safflower inferred from similarity matrix using the Jaccard's index.

Key: - AMH=Amhara, ORO=Oromia, SNN=SNNPRs and TIG= Tigray

IV. CONCLUSION

According to the results obtained from cluster analysis, genotypes of safflower collected from different localities and regions had no clear grouping based on geographic location. This could be due to the exchange of safflower seed across the regions during safflower cultivation and introduction from and to various geographic locations in Ethiopia. The clustering analysis based on ISSR marker was useful in revealing genetic relatedness between the safflower accessions in Ethiopia. However, other marker system such as SSR and AFLP along with sequence based markers should be utilized to further reveal the level of diversity in the Ethiopia cultivated safflower.

ACKNOWLEDGMENT

This research was supported by laboratory resources supplied from International Foundation of Sciences (IFS) under grant C/4790-1.

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Metastatic Carcinoma of Unknown Primary Presenting as Pleural Effusion

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Abstract- A 65-year-old female patient presented with unilateral massive pleural effusion. CECT abdomen and thorax revealed features suggestive of pleural, lung, parenchymal, liver and peritoneal metastasis. Despite intensive investigation primary could not be identified. Histopathology and immunohistochemistry examination narrowed down the possibilities of the metastatic carcinoma of unknown primary.

Index Terms- Metastatic carcinoma – Unknown primary – Immunohistochemistry.

I. INTRODUCTION

In male patients about 50% of malignant effusions are caused by lung cancer, 20% by lymphomas or leukemia, 7% from gastrointestinal primaries, 6% from genitourinary primaries, and 11% from tumors of unknown primary site. In female patients, about 40% of malignant effusions are caused by breast cancer, 20% from tumors arising in the female genital tract, 15% from lung cancer, 8% from lymphomas or leukemia, 4% from gastrointestinal tract primaries, 3% from melanoma, and 9% from tumors of unknown primary site [1].

Here we present a rare case of unilateral malignant pleural effusion, which was due to metastatic carcinoma of unknown primary.

II. CASE REPORT

A 65-year old female patient presented to us with shortness of breath for the last 1 month. There was no history of fever, cough, chest pain, haemoptysis, abdominal pain, vomiting or loss of appetite and weight. Past history of hysterectomy for fibroid uterus 25 years back. There was no pallor, icterus, lymphadenopathy, clubbing, or pedal edema. Air entry was decreased in the left inframammary and infrascapular regions. The cardiovascular system and gastrointestinal system were normal. The complete blood cell count, blood sugar, renal function test and liver function test were all found to be within normal ranges. A posterior to anterior (PA) view chest X-ray was done which showed homogenous opacity in the left lower lung field along with blunting of left costophrenic angles with mediastinal shift to right suggestive of left massive pleural effusion.

Examination of pleural fluid showed its exudative nature; ADA, culture and malignant cells being negative. An ultrasound of the abdomen and pelvis detected large heterogeneous mass lesion of size 8.7x 7.0 cm in the left lobe of liver and massive left

pleural effusion. Above features raised possibilities of primary Hepatocellular carcinoma or liver metastasis. A contrast-enhanced computed tomography (CECT) scan of the thorax and abdomen revealed heterogeneously enhancing irregular mass lesion in segment 4 A, 5B and 5 of liver (Fig 1) extending to the surface with irregular border multiple enlarged periportal lymph nodes, thickening of omentum with nodular appearance with small amount of ascites. Multiloculated gross left pleural effusion with nodular thickening along the pleura with multiple scattered right lung parenchymal nodules (Fig. 2). The ovaries appeared normal and no other mass lesion was detected A test for cancer antigen 125 (CA 125) showed that the level of CA 125 was elevated (410 U/ml), but carcinoembryonic antigen (CEA); alpha feto protein (AFP); CA19.9 was negative. A histologic examination of the USG guided biopsy of the liver lesion showed dense areas of fibro collagenous tissue infiltrated by few clusters of cells with moderate pleomorphism and nuclear hyperchromasia Fig3.

Immunohistochemistry was positive for Vimentin and Cytokeratin 7 but negative for Cytokeratin 20, Synaptophysin, TTF1, and Glypican. Above feature suggested possibilities of Ovary non mucinous; Thyroid; Breast; Lung; Mesothelioma; Cholangio carcinoma. A gynecological examination did not reveal any abnormality. An upper gastrointestinal endoscopy and colonoscopy did not show any abnormal lesion. A breast examination was normal. Examinations of the oral cavity and indirect laryngoscopy were also with a diagnosis of metastatic carcinoma of unknown primary; she was referred to the oncology department. She showed an initial response to cisplatin and paclitaxel and remained well at 2 months follow-up.

III. DISCUSSION

Even with an extensive diagnostic work-up using modern pathological and imaging procedures, the frequency of detection of the primary tumor site remains low. Less than 20% of patients have a primary site identified ante mortem, while from necropsy data it was found that almost 70% of autopsied cases remained undiagnosed. Post-mortem detection of a primary site may be higher in patients with well-differentiated adenocarcinomas [2,3]. Ultimately, primary sites are most frequently detected in the lung and pancreas, followed by other gastrointestinal and gynecological malignancies. In general, it appears that patients with CUP have a limited life expectancy with a median survival of ~6–9 months. However, some subsets have a better prognosis and enjoy longer survival. Analyses of prognostic and predictive factors in CUP have examined several clinicopathological

parameters. Several positive and negative prognostic and predictive factors were detected, which helped to define several favorable and unfavorable groups of CUP patients.

Immunohistochemical studies sometimes result in the identification of tumor origin, especially if the metastases are poorly differentiated by light microscopy. Several cell components can be identified by a series of monoclonal or polyclonal immuno- peroxidase antibodies including enzymes, structural tissue components, hormonal receptors, hormones, oncofetal antigens or other substances [3]

The development of monoclonal antibodies against various cytokeratin (CK) polypeptides has opened new avenues in investigating the normal and cancerous epithelial cells. Among them, CK7 and CK20 have been extensively studied in solid tumors. CK20 appears to be very useful in diagnosing gastrointestinal adenocarcinomas, while CK7 is more common in respiratory or gynecological malignancies [3].



Fig 1. LIVER LESION

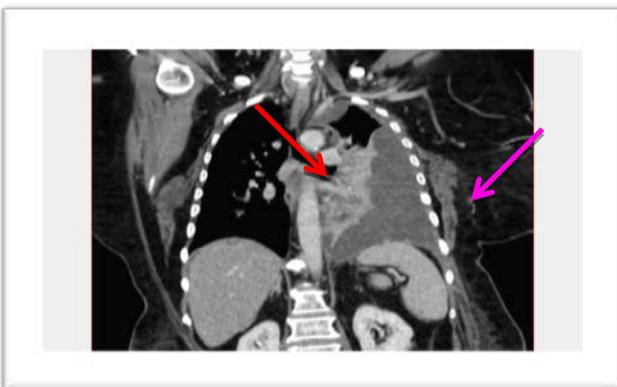


Fig 2. GROSS LEFT PLEURAL EFFUSION WITH NODULAR PLEURAL THICKENING (pink arrow) AND PARENCHYMAL METS (red arrow)

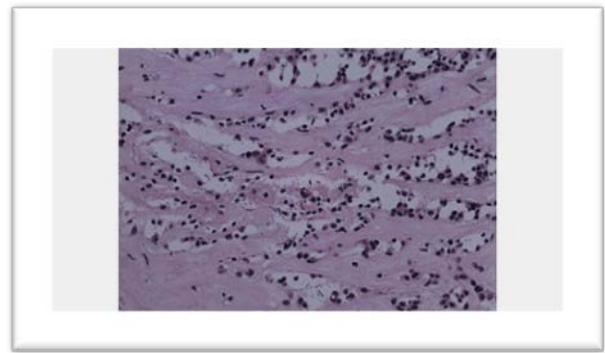


Fig 3. USG guided biopsy of the liver lesion showed dense areas of fibro collagenous tissue infiltrated by few clusters of cells with moderate pleomorphism and nuclear hyperchromasia

IV. CONCLUSION

Metastatic carcinoma of unknown primary may rarely present as pleural effusion. Hence it should be evaluated with higher imaging modalities in suspected patients even if pleural fluid is negative for malignant cells. Immunohistochemistry markers; especially, cytokeratins are useful in narrowing down the possibilities for unknown primary malignancies for starting an empirical chemotherapy.

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Measuring Effectiveness of A Review

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Abstract- Delivering on time good quality product / project is the main objective of any organization. The basic quality measure is post release defect in the product / project. In software development organization, defects identified in the product / project can primarily be because of un-clarified requirements, faulty coding, insufficient testing or poor reviewing capability. Different kinds of reviews are done to ensure highest level of quality. Hence, the role of reviewer at any stage is very crucial to avoid any defect in later stage of the SDLC.

Review is an activity to verify the work done but why it is necessary to review someone's work? According to Lean Sigma approach, manual review is considered as waste but still reviews are mandatory. So to minimize efforts invested on this waste, there are many automated reviewing tools available in the market but still there are some artifacts that cannot be reviewed using automated tools and manual review is required. Content review is one of such activity. Content can be found in many forms – technical documents, data sheet, product brochures, press releases, white papers etc. A document whether in electronic or printed form undergoes many reviews before getting finalized. The document is first reviewed by the author (self review), then peer review is done and finally the document is reviewed by the supervisor. After even so many round of reviews, it cannot be 100% guaranteed that no errors exist in the reviewed artifact, because it has human involvement.

For such reviews today, we do not have any mechanism which can indicate the effectiveness of review.

Processes can control whether a review is done or not but there is no modeling around effectiveness of reviews. This White paper aims to present a method to calculate and measure the effectiveness of the review.

Index Terms- Effective Review, KPI, Peer Review Form and Review Effectiveness.

I. INTRODUCTION

There are five phases in a software development process, starting from Requirement Analysis followed by Design, Implementation, Qualification and finally the Customer Acceptance. Each phase has set of inputs and outputs, may be documents, code, configuration settings etc. for the next phase as input. Before the next phase starts, output from the previous phase is reviewed and signed off as ok to be used as input in the next phase.

A review can be effective only if the gap gets identified at the right time. If the gap does not gets identified at the right time but

is identified later indicates that the review was not effective. So it is important to track and record gaps that do not get identified at the right time.

An effective performance measurement system helps to drive an organization towards the achievement of its strategic goals. To achieve the goal, generally organization defines Key Performance Indicators (KPI) to measure the performance of certain parameters.

The purpose of KPI is not to monitor well – good going parameters but to monitor not so good going parameters. In other words, the objective of KPI is to identify areas where the team is doing not so good and needs an improvement. To monitor this, a benchmark is decided for each parameter in KPI and the performance of that parameter is measured against the benchmark. If the score is below the benchmark, then the involved team need to analyze what went wrong and identify root cause(s) so that same / similar problem does not occur again. So keeping a not so good parameter for measurement in KPI can help the team to improve by progressing from red indicator towards green. This is a non traditional approach of KPI.

There can also be a traditional approach of following KPI. As per this approach, a well – good going parameter is measured after it has achieved the benchmark. Under this approach, objective is to monitor that the parameter should not fall below the benchmark.

To keep review effectiveness as one of the KPI parameter, the first challenge would be quantification of review effectiveness and we will follow non-traditional approach to improve this parameter.

II. CHALLENGES

Many times, we notice that the delivered product / project has a defect even after product / project is released, i.e. during the Acceptance phase because anything reviewed using an automated tool can be relied upon but anything reviewed manually is tough to be relied upon.

When a review is done manually, we are not sure about the quality of review because no such tool or method exists to depict the data to improve reviews done manually. So setting a relationship between delivering a good quality product / project and designing a reliable and capable process is a major challenge in the software development industry.

Another challenge is that people with different experience and skills participate in reviews. So in a group of reviewers some of

them are experts while others are relatively greenhorns. The challenging task is to identify experts to make the reviews more effective.

So to overcome both the challenges, there is a need to design a tool that could measure the effectiveness of a review and to include this parameter in KPI for measuring its improvement progress.

III. SOLUTION

To overcome the challenge of measuring the effectiveness of a review and improving reviews which are done manually, we need to record the review comments given in every phase for each artifact which is the output of that phase. It can be easily done using a spreadsheet. This spreadsheet is usually named as **“Peer Review Form”**.

We should keep following information in the Peer Review Form spreadsheet for every review comment, such as:

- Who was artifact creator?
- Who reviewed the artifact?
- Which artifact was reviewed?
- What was missed by the artifact creator?
- What was the reason that caused the issue?
- In which phase the issue is identified?
- In which previous phase, the issue could have been identified?

S.No.	Document Name	Author	Ver No.	Review Date	Reviewed By	Description of the Issue	Root Cause	Status	Resolution Note	Resolution Date	Identified in Phase?	Leaked From Phase?	Responsible Team	Approved By
1	Requirement Document	Sandeep	V1.0	10-Jan-15	Emly	Incorrect Product name in document	ISA	Closed	Product name corrected	10-Jan-15	Implementation			SDE1
2	Test Report	Harsh	V1.0	15-Jan-15	Sandeep	Performance is not as per the given benchmark	Lack of knowledge	Closed	Test logs are to be added	15-Jan-15	Qualification			SDE1
3	Requirement Document	Project Team	Audit	16-Jan-15	Sandeep	Reference to a requirement in meeting	Lack of Self Review	Closed	Reference corrected in the document	16-Jan-15	Qualification	A		SDE1

Figure 1: Sample Peer Review Form

Now for every project closure or phase closure the SME analyzes if the issue is identified in the appropriate phase (right time) or should it have been identified earlier. If the issue could have been identified earlier but did not get identified then it is considered as a leaked issue in review and is counted under **“Leaked From Phase”**. The phase name in which issue is identified should have been mentioned under this column.

For all leaked issues, the SME adds the phase name under **“Leaked From Phase”** column while for all issues that are not leaked, the SME adds the phase name under the **“Identified In Phase”** column. As the phase names are added under **“Leaked From Phase”** and **“Identified In Phase”** for identified issues, the count increases and the percentage of Review Effectiveness gets calculated for issues of each respective phases.

Based on the review effectiveness percentage for each phase, the average effectiveness for the respective project gets automatically calculated.

IV. BENEFITS

It is identified that the usage of such **“Peer Review Form”** during reviews has helped to identify the areas of improvement. Hence keeping **“Review Effectiveness”** as a part of KPI has proved to be very helpful in mitigating the challenge of measuring the effectiveness of a review and improving quality of reviews done manually.

The white paper is intended only for knowledge purpose. 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.

ACKNOWLEDGMENT

I would like to acknowledge and thank Mr. Sandeep Sharma for proposing the idea of making a review more effective, Md. Hamid and Nikhil Srivastava for creating required spreadsheet for calculating review effectiveness.

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Electronic structure and magnetic moments of $\text{ZnO}_{1-x}\text{B}_x$ with GGA and GGA+U

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Abstract- Electronic structure and magnetic moments of (Boron) B-doped ZnO was investigated by ab initio electronic structure calculations based on the density functional theory (DFT) with the generalized gradient approximation (GGA). We also performed GGA+U calculations to further refine our results. It is found that single B atom at O site in ZnO becomes spin polarized with its many neighboring atoms with a total magnetic moment of 0.94 and 1.27 μB for GGA and GGA+U respectively. The magnetic coupling between doped B atoms is substantial leading to either antiferromagnetism or ferromagnetism with GGA+U. For the B-B distance is 7.942 Å by replacing two oxygen atoms at the opposite vertices of a ZnO wurtzite. A strong antiferromagnetic coupling occurs.

Keywords - Magnetic moments; DOS; B; ZnO; supercell.

I. INTRODUCTION

Diluted magnetic semiconductors (DMSs) have attracted a great deal of attention because of the possibility of incorporating magnetic degrees of freedom in traditional semiconductors [1, 2]. DMSs are semiconductors which contain some magnetic atoms as impurities. They have the possibility to create functional material using the carrier control techniques in semiconductors. They are widely used in high- and low-tech applications such as anti-static coatings, touch display panels, solar cells, flat panel displays, heaters, defrosters, and optical coatings [3]. All these applications use transparent conductive oxides as simple passive electrical or optical coatings. ZnO is a direct bandgap semiconductor which is piezoelectric and has been used for transparent thin film transistors, blue and UV light-emitting diodes and laser diodes [4]. Recently ZnO attracts much attention because of its cheapness and abundance.

Interestingly, non-magnetic ion doped ZnO thin films also reveal robust ferromagnetism, e.g. nitrogen doped ZnO thin films ($\text{ZnO}:\text{N}$) [5, 6]. The mechanism behind the enhancement of ferromagnetism by the doped nitrogen is still unclear. Because of the completely filled d-orbits of the non-magnetic ion doped ZnO thin films, the origin of the ferromagnetism is out of the ordinary. Some researchers believe that the magnetic mechanism of non-magnetic ion doped thin films of transition metal oxide comes from the localized states of oxygen defects [7–9], which is different from the bound magnetic polaron (BMP) mechanism proposed by Coey [10] for magnetic ion doped transition metal oxides. Extensive studies have been carried out on ZnO based DMSs and there have been many reports of room temperature

ferromagnetism in 3d TM doped ZnO DMSs [11-18]. Despite of these successes, however, there are disadvantages to use those magnetic TM impurities. On one hand, those 3d TM impurities tend to form small clusters or secondary phases in the host ZnO semiconductor which is detrimental for real applications. It has been straightly pointed out that there exist Co-O or Co-metal clusters in Co doped ZnO [11,12], which might be the origin of ferromagnetism in this system. The first-principles calculated results of Wang et al. also indicated that Cr in ZnO bulk tends to cluster around O and favors a ferromagnetic (FM) ground state [19]. Ferromagnetism was also reported in a number of carbon systems [20-22]. Some of these studies have speculated that intrinsic carbon defects could be responsible for the observed magnetic properties. Carbon adatoms on carbon nanotubes [23] and carbon substitutional doping in boron nitride nanotubes [24] were predicted to induce magnetism in the respective systems.

From a physical/chemical point of view, ZnO is a very interesting material because of the mixed covalent/ionic aspects in the chemical bonding. ZnO crystallized in the hexagonal wurtzite structure (B4), which consists of hexagonal Zn and O planes stacked alternately along the c-axis. Anions and cations are fourfold coordinated like in the closely related zinc-blende structure. A tetrahedral coordinated bulk structure is typical for covalent semiconductors. On the other hand, ZnO shows great similarities with ionic insulators such as MgO [25]. This is why ZnO is often called the “ionic extreme” of tetrahedral coordinated semiconductors.

In this paper, we investigate the magnetic properties of $\text{ZnO}_{1-x}\text{B}_x$ DMS. The purpose of the present study is to give a guideline to synthesize new magnetic materials according to ab initio calculations.

II. COMPUTATIONAL METHODS

In this research, the possibility of fabricating wurtzite ZnO structure [26] based DMSs using non-magnetic dopant B is investigated using first principles calculations based on spin density functional theory (DFT) with the generalized gradient approximation (GGA) [27]. To simulate the $\text{ZnO}_{1-x}\text{B}_x$ alloys, supercell approach was employed. We thus extended the original ZnO unit cell of four atoms [28] to a $2 \times 2 \times 2$ supercell of 32 atoms, i.e., the unit cell size was doubled in all the three crystallographic axes. The supercell contains 16 molecules of ZnO. One and two of the 16 O atoms in the supercell was then substituted with B atoms. The substitution leads to an impurity concentration B of 6.25% and 12.5% respectively. All

calculations are carried out using the plane-wave VASP package [29-32]. The projector augmented wave (PAW) potentials [33] are used to represent the interactions between the valence electrons and the core. Since the 3d electrons on the transition metal atoms are presumably strongly correlated, the onsite Coulomb energy U was also taken into account with the so-called GGA+ U scheme. The corresponding parameters U and J used for our calculations is $U-J = 7$ eV.

The electron wave function is expanded in plane-waves up to a cutoff energy of 360 eV, and the k points sampling with a mesh of points $7 \times 7 \times 3$ generated by the scheme of Monkhost-Pack [34] ensured convergence accuracy. The Brich-Murnaghan EOS [33, 35] used to calculate the four parameters equation of states.

III. RESULTS AND DISCUSSION

Table 1, displays the calculated Lattice constants a and c , bulk modulus B_0 , bulk modulus pressure derivative B'_0 , and cohesive energy E_c of wurtzite ZnO with GGA and GGA+ U respectively. The values are determined by fitting the P - V data to the third-order Birch-Murnaghan [36] EOS. The table shows that when strong correlation is included, the lattice constant decrease, while the bulk modulus increase. Fig. 1, shows the computed lattice constants as a function of total energy for GGA and GGA+ U respectively. From this figure we found that the GGA calculation is more stable than the GGA+ U (see table 1).

Table 1: Lattice constant a and c , bulk modulus B_0 , bulk modulus pressure derivative B'_0 , and cohesive energy E_c of wurtzite ZnO with GGA and GGA+ U respectively. (c are in parenthesis).

Method	Type	a and c (Å)	B_0 (GPa)	B'_0	E_c (eV)	Reference
DFT	GGA	3.29 (5.37)	144.6	4.56	-	This work
DFT	GGA+U	3.21 (5.24)	151.7	4.05	144.95	This work
DFT	LSDA	3.184(5.111)			-	20
DFT	GGA	3.28(5.29)			143.36	38
DFT	GGA	3.262(5.226)				45

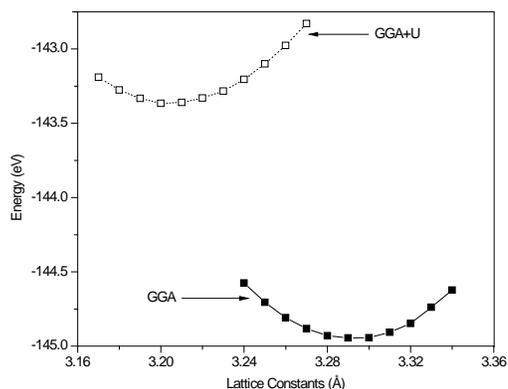


Fig. 1: Computed wurtzite ZnO lattice constants as a function of total energy for GGA and GGA+ U respectively.

Fig. 2, shows ZnO ($2 \times 2 \times 2$) supercell in wurtzite structure containing 16 Zn and 16 O atoms. To study the magnetic effect of Boron (B) doped ZnO, we replaced one O atom (O8) with B atom which formed $Zn_{16}O_{15}B$ supercell, for the concentration B of 6.25%. Our spin-polarized calculation shows resultant total

magnetic moments of 0.94 and 1.27 μ_B for GGA and GGA+ U respectively. The GGA results is quite similar to that of Cu-doped ZnO (1.0 μ_B) [37] and N-doped ZnO (1.0 μ_B) [38, 39].

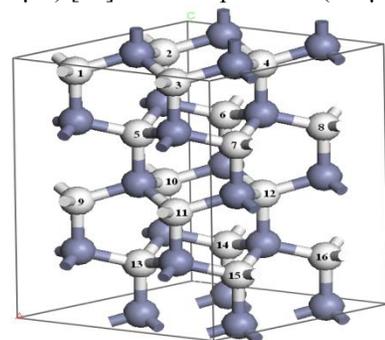


Fig. 2: (Color online) The ($2 \times 2 \times 2$) supercell of bulk ZnO wurtzite consisting of 16 Zn and 16 O atoms. The darker spheres are Zn. The numbered lighter spheres are O.

Fig. 3 shows the spin density distribution around the B atom for GGA and GGA+ U respectively (larger for GGA+ U). Most of the spin density in the B-doped ZnO is localized on the dopant itself and its 12 second-neighboring O atoms, with a minor contribution from the four nearest-neighboring Zn atoms. Therefore, the magnetic moment in B-doped semiconductors is mainly contributed by the anions, and it is resulted mainly from the delocalized $2p$ orbital. The B atom carries a magnetic moment of 0.331 and 0.49 μ_B for GGA and GGA+ U respectively. The neighboring O atoms and Zn atoms have various magnetizations from 0.038 to 0.148 μ_B for GGA, while for GGA+ U are ranged from 0.039 to 0.174 μ_B . This is quite different from the case of Mn doped GaN where the magnetization on atoms neighboring Mn is very small even though the Mn has a magnetization of 4 μ_B [40].

Table 2, shows the total magnetic moments, the spin polarized calculation of B atoms and of the $2p$ electrons of the B atoms, and the total energy with GGA and GGA+ U for concentration B of 6.25% respectively. From this table we found that the GGA is more stable than GGA+ U calculation.

Table 2: Total magnetic moments (M_{tot}), the spin polarize calculation of B atom (MB), magnetic moments of $2p$ electrons of the B atom (M_{2p}), and the total energy (E_{tot}) for concentration B of 6.25% with GGA and GGA+ U respectively.

Type	M_{tot} (μ_B)	MB (μ_B)	M_{2p} (μ_B)	E_{tot} (eV)
GGA	0.94	0.331	0.315	-139.33
GGA+U	1.27	0.490	0.467	-136.40

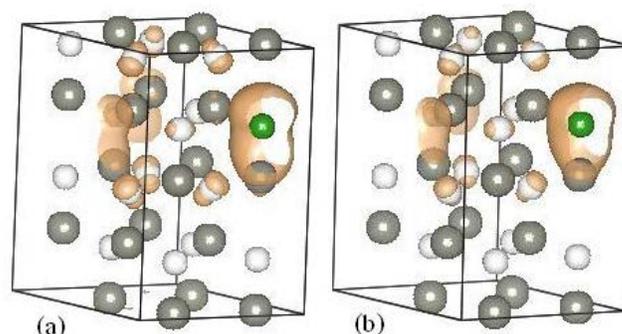


Fig. 3: (Color online) Spin density distribution around the one-B-atom doped ZnO in (a) GGA and (b) GGA+ U respectively.

The total electronic DOS of ZnO and Zn₁₆O₁₅B supercell, and the partial DOS of the 2*p* states of B atoms and of the second-nearest-neighboring O atoms and the 3*d* states of the four first-nearest-neighboring Zn atoms, for spin-up and spin-down electrons are plotted in Fig. 4 with GGA and GGA+U respectively. We note that the curves of DOS for spin-up and spin-down states are totally symmetric, and the Fermi level is located in the gap region, suggesting that ZnO is a semiconductor and nonmagnetic. We see that there is a significant change in the spin-up and spin-down total and partial DOS of the GGA compared to that of GGA+U.

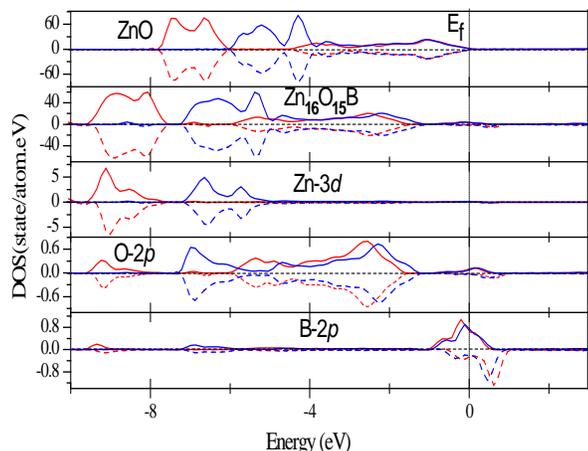


Fig. 4: (Color online) The total and partial DOS of B doped ZnO. Blue and red for GGA and GGA+U, solid and dotted lines for spin up and down respectively.

After understanding the local magnetic-moment formation in B-doped ZnO, we will go on to investigate the long-range coupling interaction of these magnetic moments. To investigate the magnetic coupling between B impurities, a pair of B atoms is incorporated into the same ZnO supercell by substituting two O atoms at sites marked Nos. (8, 6), (8, 5), and (8, 9) in Fig. 2 which are separated by 3.249, 5.628, and 7.942 Å respectively. This corresponds to a doping concentration of 12.5% B, which formed Zn₁₆O₁₄B₂ supercell. In the first configuration B₈₆, B atoms cluster around Zn, namely, B-Zn-B. In the second B₈₅, the two B atoms are separated with the configuration of B-Zn-O-Zn-B, while in the last one B₈₉, the two B atoms are separated with the configuration B-Zn-O-Zn-O-Zn-B along different directions.

The results of our calculations show that the magnetic moments of the two B dopants favor FM coupling in each of the three configurations with GGA. This verifies that the coupling between these two B atoms is FM as predicted by similar previous Cr-doped ZnO studies [41–43]. However, with the GGA+U a strong FM and antiferromagnetic (AFM) coupling takes place between the moments in each of the three configurations. The spin density distribution around the two B atoms of the (8, 5) structure is presented in Fig. 5, which shows the magnetic coupling between the two B ions separated by 5.628 Å. As can be seen, the near anions between impurity B atoms mediate the magnetic coupling. We believe that charge carriers localized around the anions between these B ions are polarized and have the same spin orientation as that of the B ions. Consequently, these polarized charge carriers mediate the long-range ferromagnetic coupling between the B ions [44].

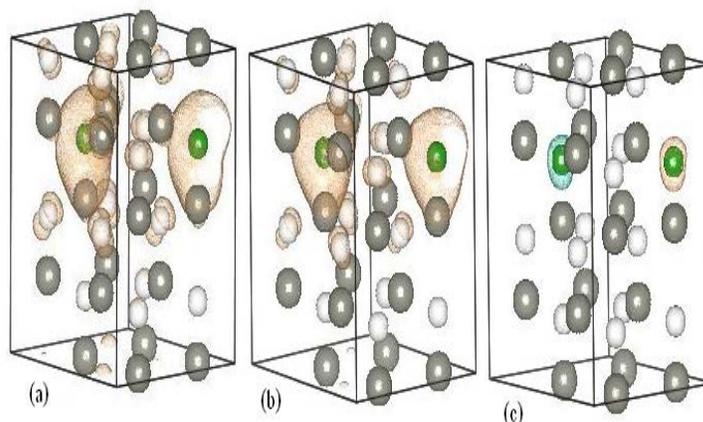


Fig. 5: (Color online) Spin density distribution around the B atoms for two-B-atom doped ZnO. For (a) FM GGA, (b) FM GGA+U, and (c) AFM GGA+U respectively.

Table 3, shows the total magnetic moments and the spin polarize calculation of two B atoms, magnetic moments of 2*p* electrons of the two B atoms, and the total energy for the three different configurations of concentration 12.5% B with GGA and GGA+U respectively. Similar behaviors of B concentration of 6.25% are obtained. The table shows that the GGA+U preference for the AFM coupling in the three configurations are much stronger than that for the FM coupling and more stable. This suggests that with GGA+U the antiferromagnetism is possible as a new coupling in B-doped ZnO. The GGA+U energy difference between the FM and AFM phases, ($\Delta E = E^{\text{AFM}} - E^{\text{FM}}$) for the three configurations are shown in Table 4.

Table 3: Total magnetic moments (*Mtot*), the spin polarize calculation of B atoms (*MB*), magnetic moments of 2*p* electrons of the B atoms (*M2p*), and the total energy (*Etot*) for concentration B of 12.5% with GGA and GGA+U respectively. (AFM values are in parenthesis).

	Type	<i>Mtot</i> (μB)	<i>MB</i> (μB)	<i>M2p</i> (μB)	<i>Etot</i> (eV)
Configuration a (d=3.249 Å)	GGA	1.54	0.281 0.281	0.267 0.267	-134.42
	GGA+U	2.16	0.429(0.483) 0.429(-0.483)	0.408(0.461) 0.408(-0.461)	-130.4402 (-130.4925)
Configuration b (d=5.628 Å)	GGA	1.54	0.280 0.280	0.266 0.266	-134.42
	GGA+U	2.16	0.429(0.483) 0.429(-0.483)	0.408(0.461) 0.408(-0.461)	-130.4409 (-130.4933)
Configuration c (d=7.942 Å)	GGA	1.49	0.283 0.270	0.270 0.257	-133.56
	GGA+U	2.35	0.464(0.528) 0.464(-0.528)	0.443(0.504) 0.443(-0.504)	-129.3823 (-129.4232)

Table 4: The GGA+U energy difference between the ferromagnetic (FM) and antiferromagnetic (AFM) phases $\Delta E = E^{AFM} - E^{FM}$.

ΔE (eV)	Configuration a (d=3.249Å)	Configuration b (d=5.628Å)	Configuration c (d=7.942Å)
		-0.0523	-0.0524

To visualize the changes in electronic structure and magnetic properties resulting from two-B doped ZnO. We plot the total and partial DOS corresponding to configuration C85 in Fig. 6. We note that there is a significant change in the spin-up and spin-down total DOS at the Fermi level in FM with GGA of $Zn_{16}O_{14}B_2$ compared to that with GGA+U. while the FM and AFM with GGA+U resulting in an asymmetric spin-up and spin-down DOSs. On the other hand, the main contribution to the moment comes from the B 2p orbitals. The spins of B 2p electrons are polarized and introduce new states near the Fermi level and magnetism does not result from Zn 3d orbitals [45].

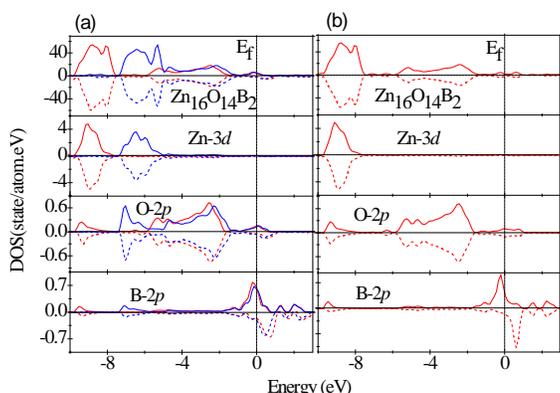


Fig. 6:

(Color online) The total and partial DOS of two-B doped ZnO of (a) FM, and (b) AFM calculations. (blue for GGA, and red for GGA+U, Solid and dotted lines for spin-up and spin-down respectively).

IV. CONCLUSION

To our knowledge there is no experimental B-doped ZnO studies, so in the present work, we performed an extensive study of magnetic and electronic properties of B-doped ZnO. To this end, we have applied the GGA+U method to correct the electron structure. The main points of our study can be summarized as following:

- 1- Substitution of O by B in ZnO results in spin polarized state. Magnetization comes ubiquitously from atoms near the B atom.
- 2- The GGA calculations obtained only FM coupling.
- 3- When strong correlations are included, a new possible AFM coupling predicted, and the magnetic moments increased.

Therefore, B-doped ZnO with the new GGA+U AFM coupling may find possible applications in spintronics besides optoelectronics.

ACKNOWLEDGMENTS

I would like to thanks African City for Technology, Khartoum – Sudan so much.

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Adsorption and Inhibitive properties of *Ficus sycomorus* gum on the corrosion of aluminium in HCl

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Abstract- *Ficus sycomorus* gum was tapped, collected and purified. The adsorption properties and inhibition potentials of the gum on aluminium in HCl was studied at different temperature of 303K and 333K using gravimetric method. The inhibition efficiencies of the gum increase with increase in concentration and decrease with increase in temperature and period of immersion. Values of activation energy of the inhibited corrosion reaction of aluminium were greater than the value obtained for the blank. Thermodynamic consideration revealed that adsorption of the inhibitor on aluminium surface was first order, exothermic, spontaneous and was through the mechanism of physical adsorption. The adsorption characteristic of the inhibitor was best described by the Langmuir adsorption isotherm.

Index Terms- *Ficus sycomorus*, adsorption, inhibition, aluminium.

I. INTRODUCTION

Gums are defined as molecular structures, tending to high molecular mass, usually with colloidal properties, such that, in an appropriate solvent, they produce gels or suspensions of high viscosity or solutions of low matter content that can absorb water at ten times their weight [1]. Generally, they contain carbon, hydrogen, oxygen, calcium, magnesium and potassium in the form of metallic salts which occur in various organic compounds. However it has been established that gums contain polysaccharides and some of their constituents.

It is very evident that gums have very vast application in pharmaceutical, food industries and recently as corrosion inhibitors. Green corrosion inhibitors are biodegradable and do not contain heavy metals or other toxic compounds. Some research groups have reported the successful use of naturally occurring substances to inhibit the corrosion of metals in acidic and alkaline environment. Green inhibitors are products of living organisms and are preferred because they are cheap, biodegradable and comply with required environmental standards that vitiated the abolition of chromates and other non-eco-friendly inhibitors. Available literature have also indicated that a wide range of natural polymers have been investigated as possible corrosion inhibitors. The role of inhibitors is to form a barrier of one or several molecular layers against acid attack [2]. This protective action is often associated with chemical and/or physical adsorption involving a variation in the charge of the adsorbed substance and transfer of charge from one phase to the other. Sulphur and/or nitrogen-containing heterocyclic compounds with various substituents are considered to be effective corrosion inhibitors [3].

The consequences of corrosion are many and varied and the effects of these on the safe, reliable and efficient operation of equipment or structures are often more serious than simple loss of a mass of a metal. Failures of various kinds and the need for expensive replacements may occur even though the amount of metal destroyed is quite small [4]. The corrosion of metals is one of the most significant problems faced by advanced industrial societies. It has been estimated that in the United States alone, the losses of corrosion annually amounts to tens of billions of dollars [5]. Therefore, there is a need to protect metals against corrosion. The use of inhibitors has been found to be one of the best options available for the protection of metals against corrosion [6]. Corrosion can be controlled by the addition of chemical substances called inhibitors into acid media. By definition, an inhibitor is a chemical compound which when added in a small amount to the corrosive environment alters the cathodic and or anodic reaction and subsequently reduces the corrosion rate [7]. Interaction between valuable metals (such as Al) and aggressive media (such as acid, base or salt) is a serious impediment that may risk cost benefit analysis in the operation of some industries. This is because, corrosion of these materials, if not reduced can induce damages to industrial installations [8].

Plant gum exudates from *Commiphora pedunculata* (CP) [2], *Raphia hookeri* (RH) [4], gum arabic [3], guar gum [9], *Anogessus leocarpus* (AL) [11] and *Ficus glumosa* (FG) have been reported as good corrosion inhibitors. The inhibitive effect of *Ficus glumosa* gum (FG) in the corrosion of mild steel in H₂SO₄ medium has been studied using the weight loss, gasometric, thermometric and scanning electron microscopy (SEM) techniques. They found that FG gum is a good adsorption inhibitor. An investigation into the mode of adsorption of the gum revealed that the adsorption is exothermic, spontaneous and fitted the mechanism

of physical adsorption. Chemical constituents and corrosion inhibition potential of *Daniella olliverri* (DO) gum exudates were investigated [6] using weight loss and FTIR methods and the results obtained showed that the gum is acidic, brownish in colour, ionic and highly soluble in water but insoluble in acetone, chloroform and ethanol. GCMS spectrum of the gum indicated the presence of sucrose, dihex-5-en-2-yl phthalate, stearic acid, 2,6-dimethyl-4-nitrophenol and (E)-hexadec-9-enoic acid.

Therefore there is a need to study the adsorption properties of *Ficus sycomorus* (Baure in Local Hausa dialect) gum and the potential of the gum as corrosion inhibitor for aluminium in HCl. The present paper aims at studying the potentials of *Ficus sycomorus* gum exudate as corrosion inhibitor by weight loss method. The effects of temperature on corrosion and inhibition processes were discussed and thermodynamic parameters governing the adsorption process were also calculated.

II. MATERIALS AND METHODS

Materials

Materials used for the study were aluminium sheets of composition (determined by x-ray diffraction technique); Al (99.94), Cu (0.01), Mg (0.02), Si (0.03), Mn (0.02) and Zn (0.01). The aluminium sheets were mechanically press-cut into different coupons each of dimension, 5×4×0.05 cm. Each coupon used was degreased by washing with ethanol, cleaned with acetone and allowed to dry in air before preservation in a desiccator. All reagents used for the study were of analar grade and double distilled water was used for their preparation.

Tapping and collection of the gum

The crude *Ficus sycomorus* gum was obtained from Uran village in Gezawa Local Government Area of Kano State, Nigeria. The gum was collected from the tree by tapping [12] around mid-December during the day time.

Purification of the gum

The procedure adopted for the purification of the gum was similar to that used by [13] but with some modifications. The gum was dried in an oven at 40°C for 2 hours. The sizes were reduced by blending. It was hydrated in double strength chloroform water for five days with intermittent stirring to ensure complete dissolution of the gum and strained through a 75µm sieve to obtain particulate free slurry which was allowed to sediment. The gum sediment was precipitated from the slurry using absolute ethanol, filtered and defatted with diethyl ether. The precipitate was again dried in the oven at 40°C for 48 hours. The dried flakes were pulverized using a blender and stored in an air tight container.

Gravimetric method

In the gravimetric experiment [14], a previously weighed metal (aluminium) coupon was completely immersed in 250 cm³ of the test solution in an open beaker. The beaker was covered with aluminium foil and inserted into a water bath maintained at 303 K. After every 24 hours, the corrosion product was removed by washing each coupon (withdrawn from the test solution) in a solution containing 50% NaOH and 100 g/l of zinc dust. The washed coupon was rinsed in acetone and dried in the air before re-weighing. The experiment was repeated at 333 K. In each case, the difference in weight for a period of 168 hours was taken as the total weight loss. From the average weight loss (mean of three replicate analysis) results, the inhibition efficiency (%I) of the inhibitor, the degree of surface coverage (θ) and the corrosion rate of aluminium (CR) were calculated using equations 1.0, 2.0 and 3.0 respectively;

$$\%I = 1 - \left(\frac{W_1}{W_2} \right) \times 100 \quad 1.0$$

$$\theta = 1 - \frac{W_1}{W_2} \quad 2.0$$

$$CR = \frac{W_2 - W_1}{At} \quad 3.0$$

where W1 and W2 are the weight losses (g) for aluminium in the presence and absence of the inhibitor, θ is the degree of surface coverage of the inhibitor, A is the area of the surface of aluminium coupon (in cm²), t is the period of immersion (in hours) and ΔW is the weight loss of aluminium after time, t.

III. RESULTS AND DISCUSSIONS

Effect of concentration of the gum on the corrosion of Aluminium

Figures 1.0 shows the variation of weight loss with time for the corrosion of aluminium in 0.1 M HCl containing various concentrations of FS gum inhibitor at 303 and 333 K. From the figure, it is evident that the weight losses of aluminium increases with increase in the period of contact and with increasing temperature indicating that the rate of corrosion of aluminium in solution of HCl increases with increase in the period of contact and with increase in temperature. It is also obvious from the figure that the weight losses of aluminium in the presence of various concentrations of the inhibitor are lower than the corresponding weight loss obtained for the blank indicating that the gum studied inhibited the corrosion of aluminium in solution of HCl. Also, the weight loss of aluminium was found to decrease with increase in the concentration of the inhibitor indicating that the inhibition efficiency of the gum increase with increasing concentration and decrease with increase in temperature. The inhibition efficiencies of *Ficus sycomorus* gum under different temperatures calculated using equation 1.0 are presented in Table 1.0. The results obtained indicated that the inhibition

efficiency of the gum increase with increase in concentration but decrease with increasing temperature hence, the gum is a good adsorption inhibitor and the adsorption on the surface of aluminium favours the mechanism of physical adsorption.

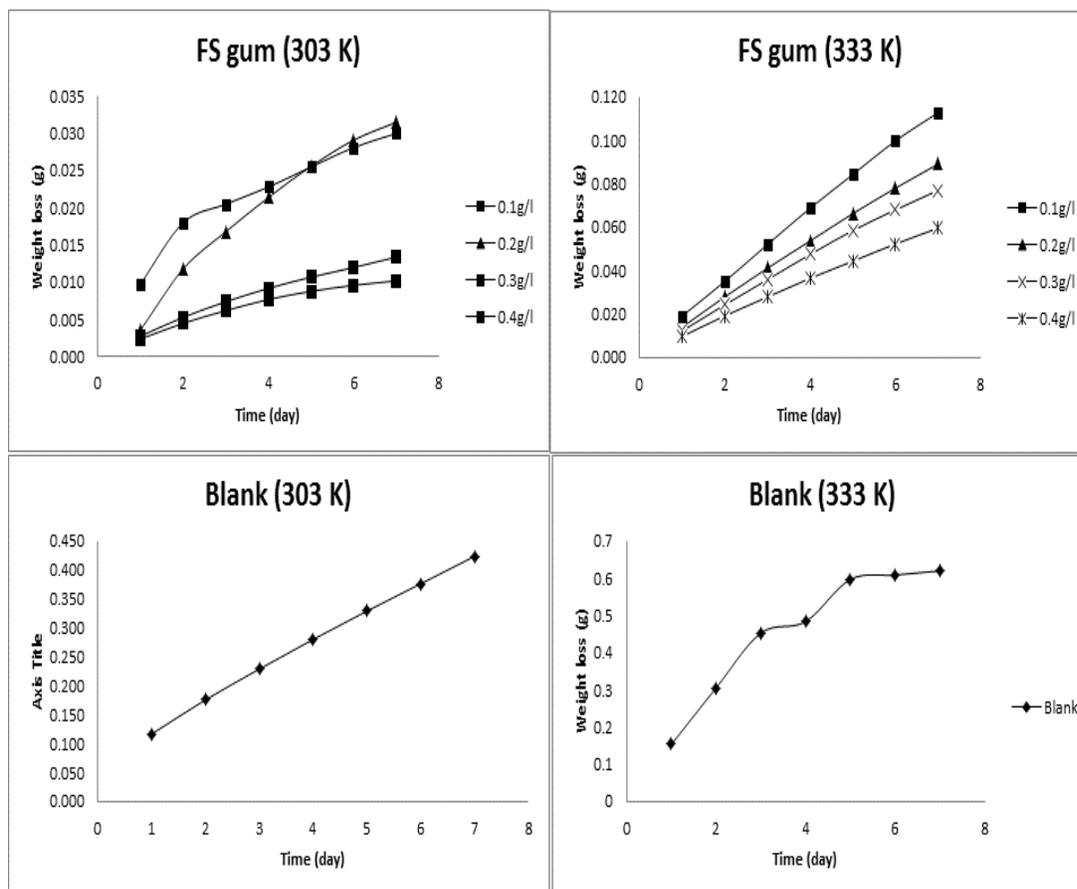


Figure 1.0: Variation of weight loss with time for the corrosion of aluminium in 0.1M HCl containing various concentrations of FS gum

Effect of temperature

The effect of temperature on the corrosion of aluminium in the absence and presence of various concentrations of *Ficus sycomorus* gum was studied using the logarithm form of the Arrhenius equation, which can be written as equation 4.0

$$\frac{CR_2}{CR_1} = \frac{E_a}{2.303RT} \left(\frac{1}{T_1} - \frac{1}{T_2} \right) \quad 4.0$$

where CR₁ and CR₂ are the corrosion rates of aluminium at temperatures, T₁ and T₂ respectively (T₁<T₂), E_a is the activation energy and R is the universal gas constant. Calculated values of E_a are recorded in Table 1.0. E_a values ranged from 29.17 to 49.61 kJ/mol for different concentrations of *Ficus sycomorus* gum. These values are less than the threshold values expected for the mechanism of chemical adsorption (80kJ/mol) hence the adsorption on aluminium surface is consistent with the mechanism of physical adsorption. The activation energy was also found to increase with increase in the concentration of the inhibitor indicating increasing strength of retardation of the corrosion of aluminium with increase in the concentration of the gum. The activation energy for the blank was significantly lower than those obtained for systems containing the inhibitor, which also indicates that the corrosion of aluminium is retarded by the presence of the inhibitor.

Table 1.0: Corrosion rates of aluminium, inhibition efficiencies of the gum, activation energy and heat of absorption for the inhibition of the corrosion of aluminium by *Ficus sycomorus* gum exudate

System	CR (303 K)	CR (333 K)	% I (303 K)	% I (333 K)	E _a (kJ/mol)	Q _{ads} (kJ/mol)
Blank	0.00013	0.000123	-	-	1.55	
0.1 g/l FS gum	8.9E-06	3.36E-05	91.15	72.69	37.20	-28.38
0.2 g/l FS gum	9.35E-06	2.65E-05	90.71	78.43	29.17	-20.72
0.3 g/l FS gum	3.96E-06	2.29E-05	96.06	81.36	49.13	-36.08
0.4 g/l FS gum	3.01E-06	1.77E-05	97.01	85.57	49.60	-35.65

Thermodynamic/adsorption considerations

The heat of adsorption of the inhibitor on the surface of aluminium was estimated using equation 5.0.

$$Q_{ads} = 2.303R \left[\log \left(\frac{\theta_2}{1-\theta_2} \right) - \log \left(\frac{\theta_1}{1-\theta_1} \right) \right] \times \left(\frac{T_1 T_2}{T_2 - T_1} \right) \text{kJmol}^{-1} \quad 5.0$$

where Q_{ads} is the heat of adsorption, R is the gas constant and θ₁ and θ₂ are the degrees of absorption of the inhibitor at temperatures, T₁ and T₂ respectively. Calculated values of Q_{ads} are also presented in Table 1.0. From the results obtained, the values are negative indicating that the inhibition of the corrosion of aluminium in solution of HCl by *Ficus sycomorus* gum is exothermic.

The adsorption characteristics of the inhibitor was studied by fitting data obtained for the degree of surface coverage into different adsorption isotherms including Langmuir, Freundlich, Temkin, El awardy, Flory Huggins and Brokris Swinkel adsorption isotherms. The tests revealed that the adsorption of *Ficus sycomorus* gum best fitted the Langmuir adsorption isotherm, which can be expressed as equations 6.0 and 7.0.

$$\frac{C}{\theta} = C + \frac{1}{b_{ads}} \quad 6.0$$

$$\log \left(\frac{C}{\theta} \right) = \log C - \log b_{ads} \quad 7.0$$

where C is the concentration of the inhibitor in the bulk electrolyte, b is the adsorption equilibrium constant and θ is the degree of surface coverage of the inhibitor. Figure2.0 shows the Langmuir plot for the adsorption of *Ficus sycomorus* gum on aluminium surface. Adsorption parameters deduced from the plots are presented in Table 2.0. From the results obtained, calculated R² values and the slopes of the plots were very close to unity indicating the fitness of the data to the Langmuir adsorption model. Therefore, there is no interaction between the adsorbed molecules.

The equilibrium constant of adsorption obtained from the Langmuir adsorption plot is related to the free energy of adsorption according to equation 8.0.

$$\log b_{ads} = - \frac{1}{1.744} \left(\frac{\Delta G_{ads}^0}{2.303RT} \right) \quad 8.0$$

Values of ΔG_{ads}⁰ calculated from equation 8.0 are also presented in Table 8.0 The free energies are negative and are within the range of values expected for the mechanism of physical adsorption hence the adsorption of *Ficus sycomorus* gum on aluminium surface is spontaneous and supports the mechanism of physical adsorption.

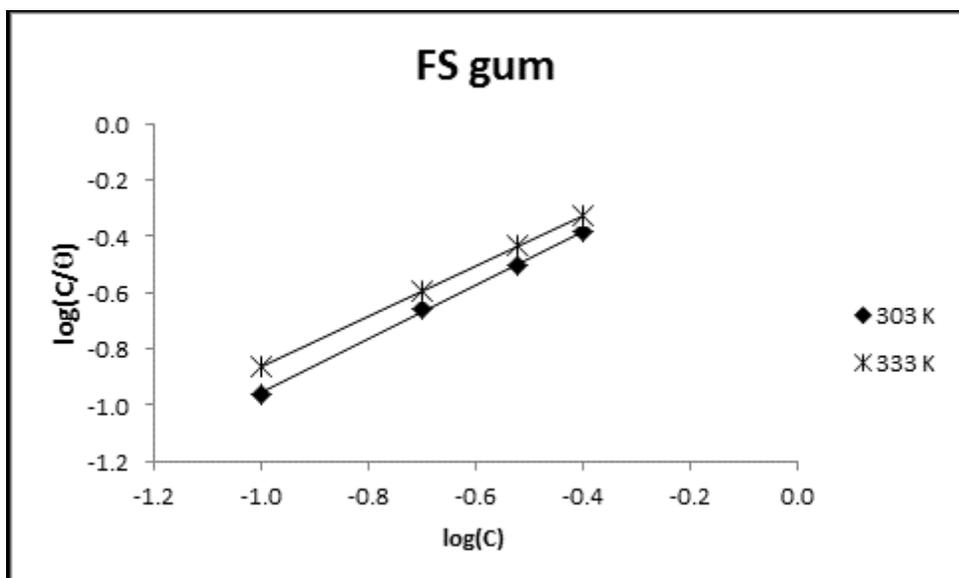


Figure 2.0: Langmuir isotherm for the adsorption of *Ficus sycomorus* gum exudate on aluminium surface

Table 2.0: Langmuir adsorption parameters for the adsorption of *Ficus sycomorus* gum on aluminium surface

Inhibitor	T (K)	Slope	$\log b_{ads}$	ΔG^0_{ads} (kJ/mol)	R^2
<i>Ficus Sycomorus</i>	303 K	0.9508	-0.0039	-10.10	0.9999
	333 K	0.8865	0.0260	-10.27	0.9998

IV. CONCLUSION

Ficus sycomorus gum exudate is a good adsorption inhibitor for the corrosion of aluminium. The inhibition process was found to be first order, exothermic and spontaneous. The adsorption characteristics of the inhibitor favours physical adsorption and are consistent with Langmuir adsorption model. The gum is adsorbed on the surface of aluminium through some functional groups via the formation of multiple adsorption layers.

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Detector Placement for Critical Variables Using Static Backward Slicing

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Abstract- In this contemporaneous world, in order to fulfill consumers' limitless mandate for developing density, advancing functionality, and dominating power consumption, the dimensions and operating voltages of computer electronics are lessening day by day. This reduction in size raises sensitivity to radiation dramatically triggering soft error. If the radiation is large enough then even a single radiation may cause a stored data bit to be corrupted and flipped [1]. This deviation in the data values is termed as data errors. The consequence of the deviation is very vital on critical variables which consequently modify the system control flow prompting system failure [2]. Critical variables are characterized as those having high sensitivity to errors. This paper concentrates on critical variables for developing and employing error detectors to keep them away from data errors and provides high coverage for errors in any data value used in the program. The development is performed automatically through the support of backward slice of a program. The error detectors yield the method of checking expressions optimized in each control flow path surveyed at runtime [3].

Index Terms- Critical Variable, Detector, Program execution flow, Program Slice, Backward Static Slice.

I. INTRODUCTION

Along with the enhancement of fabrication technology, the act of microprocessors has been amplified remarkably. The improved act of today's microprocessors is also being highlighted by reduced feature size, lesser operating voltage levels and condensed noise margins. On contemporary, it is evidenced that this progression on the integrated circuits with the advanced complexity of computer will accelerate chips more susceptible to transient faults which are temporary unintended changes of states arising from the latching of single event transient outcomes of external particle strikes or process-related parametric variation. Any system when affected by these transient faults generates soft error [2] leading towards a less reliable system. These kinds of errors are a vital threat to computer systems and becoming more significant with the development of technology. Soft errors are very critical as they do not arise consistently and cannot be expected as manufacturing faults or design faults. Soft errors affect both the control flow and data of a program. Recent researches verified that about 33% to 77% of transient faults are transformed to Control Flow Errors (CFE) and the rest transformed to data errors [4] [5]. Soft error interrupts the system's reliability and affects the data stored in memory. In current investigation it has

been revealed that with a rate of about 5000 FIT per Mbit, the modern memory elements have been attacked by single-event upsets (SEU) [6]. Several software applications already infer fault tolerance moderately [7].

To deliver high-coverage at runtime for both the software and hardware errors, the Duplication technique has gained some popularity. The technique is executed by duplicating instruction at nominated program point such as stores or branches [8] and associating each instruction with the duplicated instruction. Although this employment may avert error propagation and block crashes, they are affected by high performance overhead. Along with this, it sacrifices coverage of program crashes before attaining the association point. Besides this, the native program and the reproduced program may subject to common mode errors, therefore proposing inadequate protection against software errors and permanent hardware faults.

For defending the system from common mode faults, a diverse execution method titled ED4I has been introduced in [9]. It is accomplished by implementing two different versions of the same program. ED4I is based on software and provides protection against transient and permanent hardware faults. The native program is multiplied by a constant factor k . The two programs: the native program and the transmuted program; are then performed on the same processor and the outcomes of their performance are compared. The data operand set of the transmuted program is altered as compared to the native program hence it is capable of masking several types of hardware errors resides in processor functional units or in memory. ED4I separates the data values consumed by a program from the instructions processing that data values and employs diversity simply on the data values not on the instructions. As a consequence, ED4I cannot detect errors in instruction issue and decode logic [3].

To contract with the risk of SEUs and single-event transients (SETs), numerous hardware and software protection structures have been projected. These structures can handle the SEUs or SETs but employing these structures to each memory elements of a circuit or to entire portion of a software application, rises the costs extensively or diminishes the performance tremendously. Besides this, modern microprocessors cover a considerable amount of the transient faults completely that have no effect to the system termed as benign fault [10]. In this circumstance only those variables or registers having the highest dependency than the rest in the system are considered and delivers high coverage [11] notated as critical variable.

Fault detection and recovery technique can be classified as software-only technique, hardware-only technique and hybrid technique. Among them, as the software-only structures against fault detection and recovery do not involve any hardware

alteration, they are beneficial in enlightening reliability of the system appreciably. Therefore, software-only structures like software redundancy techniques are considerably inexpensive, faster, and simpler to set up. In order to transmute the system from a susceptible state to a reliable state, they only entail recompilation of the running program. On the other hand, hardware-only techniques comprise a majority of fault protection schemes, demanding the acquisition and disposition of advanced machines. The techniques are also convenient for the application developer, distributor or end users in terms of making resolutions of when and how to raise reliability. On the contrary, in hardware-only organizations, reliability options are regulated by the hardware designer or manufacturer only. The absence of the necessities of hardware also permits software-only skills to be directed to organizations that are previously installed. Arrangement of redundancy structures to organizations that are previously installed may become significant as a result of inadequate approximation of the soft-error rate by designers or vagueness concerning the operational settings of the organization. Any modification in the functioning environment of a hardware results in perceptible consequences on reliability, requiring disposition of upgraded software redundancy structures [12].

This paper emphasizes on software-only technique. The methodology proposed by this paper is to develop runtime error detectors for a critical variable utilizing the idea behind static analysis of a computer program. The method employs detectors or checks into an application for defending it from crashes and delivering high-coverage to detect errors that consequence in application failures. The detector is derived by acting the backward slicing of a program.

The key point of this paper is to check the precedence variables of critical variables in a block of software program and putting checks or detectors. These extracted detectors estimate the values of critical variables in a different manner than the other previous methods, evaluated in the original program to avoid the occurrence of common mode errors.

The paper is organized in some sections. Section II will illustrate techniques related to this research. Section III will recite some terminology which will be used to analyze the underlying method. The proposed methodology will be illustrated with examples and techniques in section IV. Finally, section V will conclude this paper.

II. RELATED WORKS

In order to narrate the underlying methodology of this paper, certain research work has been discoursed here. First of all, some software, hardware and hybrid approaches have been revealed. Then, researches accomplished on critical variable have been recounted. After then, works on some slicing techniques has been stated. Some researches related to static analysis and dynamic analysis are also being studied in order to gain the basic idea behind them.

In order to lessen soft errors the some software centered methods like [13-16] for the recognition of soft errors including redundancy of given programs and/or [17], duplicating instructions [8] [18], task duplication [19], and Error detection and Correction Codes (ECC) [20] etc. for recuperating from soft

errors. Other duplication techniques entitled SWIFT [18] and EDDI [8], replicate instructions along with the data of the program to identify soft errors. Nevertheless, they generate complex memory pre-requisite as well as escalate register load too. Alternative practice is Error detection and Correction Codes (ECC) [20] which attaches extra bits through the actual bit sequence to recognize error. But it necessitates further logic and calculations and becomes complicated while using into combinational logic blocks. In order to minimize soft error by means of hardware tactics, the most popular solutions are classified into circuit level, logic level and architectural solutions. The gate sizing techniques [21-23], increasing capacitance [24] [25] are certain circuit level solutions. The resistive hardening [26] is a circuit level solution that maintains the critical charge (Q_{crit}) of the circuit node as favorable as possible. Nevertheless, these techniques lean towards low speed and high power consumption. [27] [28] are some of logic level solutions that practice redundant or self-checking circuits in order to offer recognition and repossession in combinational circuits. The architectural solutions like [8] [29] familiarize redundant hardware in the organization to become more vigorous over soft errors. [30] [31] [23] [17] remark some hybrid (Hardware and software combined) approaches. But, all of them are susceptible to soft errors in main areas.

The idea of preceding variables has been introduced [2] in order to mitigate soft error and generates critical variable. They illustrate critical variable and invent corresponding critical block which is the most vital area having highest dependency in a program. They also demonstrate that accumulate detection towards critical variable inside a critical block will provide high protection and high coverage from soft error. The preceding variable analysis technique exposed in [11] detects soft error with reduced time overhead. A FPGA-based system in [7] has been designated in order to spot the critical variable from a specified program. Investigation shows that the FPGA-based system can diminish the critical calculation errors needed in the assessed applications expressively. The paper projected in [32] designates an automated variable dependence analysis [33] [34] that can be acted as an analyzer of a program flow and functioned such as an error checker. The technique is also capable of tracing critical variables dynamically and automatically from the original program in presence of other variables.

Slicing of a given program [35] [36] involves recognizing the fragments of the program which may influence the values of an elected set of variables directly or indirectly. The slicing schema can be verified as inter-procedural program slicing [37], dynamic program slicing [38-40], forward and backward slicing [41], program slicing using dependence graph [42] [43]. As stated by the slicing procedures, the application programmer fix a point from the given program afterward the dependency is scrutinized. Therefore, the application programmers were in charge to catch on the precedence variables physically.

The static analysis methods [44-46] used predefined fault model to assess the program typically identified by common programming bugs. They trace errors through entire possible routes in a program. Typically it is very difficult to discover all possible routes of a program. Consequently, they direct towards inefficient recognitions owing to their estimation. The dynamic

analysis technique stated in [47] [48] originates code invariants for example the linear associations between variables sets of a program, variable's steadiness and dissimilarities concerning two or more variables of the program. The key resolution of [47] is to exhibit the invariants establish to programmers. The exhibited invariants are generated with an illustrative input set that are not in this set established on the execution of the application. This could consequence in the invariants to become despoiled though the error is not present in the program [3].

III. BASIC TERMINOLOGY

Some terminologies which have been used to comprehend the proposed approach are as follows:

A. Critical Variable: The variables of a program are the most essential element for the program which affects the entire program execution flow. These variables are also responsible for keeping up the program processing. The variables are associated to other variables in a program implicitly or explicitly. A single variable of a program can be reliant on one or more than one variable of that program. The most reliant variable among the others is titled as the precedence to the others. The variables having consequence on the rest variables of the overall code are labeled as critical variables [2]. They demonstrate a prominent sensitivity for arbitrary data errors in the application. Any errors produced on these variables are expected to spread in various areas in the program triggering program malfunction. Therefore, they provide highest dynamic fan outs in the program and adding check for them provide high coverage to soft error [3]. In Fig. 1 q is a critical variable [32].

B. Program Slice: It is a program assessment technique. It confines the attention of analysis to definite sub sections of a program. The program slicing technique is capable of extracting statements from a given program that are pertinent to a particular computation.

```

int a = 4,c = 1,p = 6;
int x = 10,q,w = 40;
int y = x + c;
int z = y + a + 1;
int d = 5;
q = w + z;
    
```

Fig 1: A Code Fragment

For this resolution, a point called slicing point is delivered by the programmer which may be before or after a precise statement. This statement contains the slicing variable. The slicing is performed either in forward direction or backward. The outcome of slicing may be corresponded to the program

comprising some group of statements from the original program [50].

C. Backward Static Slicing: Characteristically, a slicing principle comprising of a tuple $\langle S, V \rangle$, where S is the number of a particular statement and V is a slicing variable is acknowledged as static slicing. If the static slicing contains the input for the variable then it is transformed to dynamic slicing. The tuple is termed as slicing criterion. If the slices are considered by accumulating statements and control predicates through a traversal of the program's control flow graph starting from the slicing criterion towards forward direction, then these slices are denoted as forward static slices. And if the traversal is achieved in backward direction it is referred as backward static slice [49]. Fig. 2 depicts the backward static slicing technique.

D. Checking Expression: An expression that will perform the verification of the value of a particular variable. The checking expression is computed by optimizing the expression related to a particular variable.

E. Detector: Expression that contains all the checking expression for a particular variable and placed across all possible path needed to access that particular variable

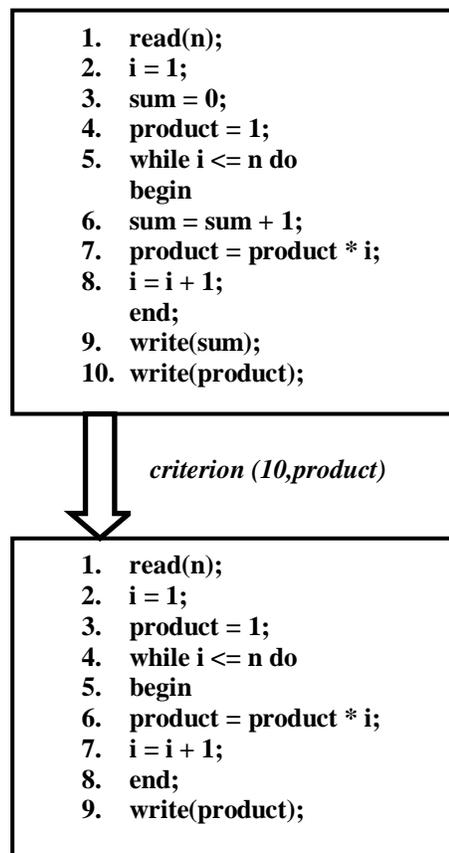


Fig 2: Backward Static Slicing Schema

IV. DETECTOR PLACEMENT USING BACKWARD STATIC SLING

The following steps are maintained to place detector for the critical variable in a program using the static analysis in backward direction.

- A. Critical Variable Documentation:** Numerous operations are already being performed to identify the critical variable. These operations are gaining more popularity as the identification of such variable can drastically reduce time to detect soft error. In variable dependency analysis, the variable having highest dependency is termed as critical variable. Utilizing critical variable to identify soft error in a program provides high detection coverage. Nevertheless, the proposed technique assumed that the critical variable identification is already performed.
- B. Finding Checking Expression Using Backward Slice:** As mentioned earlier, the checking expression for a critical variable will perform the verification of the data value of critical variable.

```

1. #include <iostream>
2. using namespace std;
3. int main()
4. {
5. int a , b ,c , d , e;
6. b = 2,c = 4, d = 5;
7. e = 3, g = 4 , t = 6;
8. cout<<"\nValue for a : ";
9. cin>>a;
10. f = b + e;
11. if(a == 0)
12. {
13. b = a + c;
14. e = b + g;
15. d = e + b;
16. f = d + b;
17. }
18. else if(a == 1)
19. {
20. d = b + c;
21. e = a + b;
22. f = d + e;
23. }
24. else
25. {
26. a = d - e;
27. c = a - d;
28. b = d + e;
29. e = g + t;
30. f = b - c;
31. }
32. cout<<f;
33. return 0;
34. }

```

Fig 3: Sample C++ Program

For this purpose, the backward slicing technique is performed. The slicing criterion comprising the critical variable along with its statement number is provided. The slicing is performed on each path that executes the critical variable directly or indirectly and provides the corresponding checking expression. Here each path inside a block is identified starting from the closing brackets '}' until an opening bracket '{' is found. For each path a stack is implemented to check the dependency of critical variable on the other variables of the program. Each expression related to critical variable is optimized using copy propagation or constant propagation.

Example: Let 'f' is a critical variable in Fig. 3. The slicing criterion is $V(31, f)$.

The 1st backward slice for V is the value of 'f' coming from the 'else' block. The checking expression for f is $f = b - c$. Now the expression will be developed using the following optimization process:

$$\begin{aligned}
 f &= (b - c); \\
 &= (b - (a - d)); \\
 &= (b - ((d - e) - d)); \\
 &= (b - ((d - (g + t)) - d)); \\
 &= ((d + e) - ((d - (g + t)) - d)); \\
 &= ((d + (g + t) - ((d - (g + t)) - d));
 \end{aligned}$$

The 2nd backward slice for V is the value of 'f' coming from the 'else if' block. The current checking expression for the value f is $f = d + e$. Now the expression will be developed as follows:

$$\begin{aligned}
 f &= (d + e); \\
 &= (d + (a + b)); \\
 &= ((b + c) + (a + b));
 \end{aligned}$$

The 3rd backward slice for V is the value of 'f' coming from the 'if' block. Now the checking expression is of the form $f = d + b$. The expression will be settled as follows:

$$\begin{aligned}
 f &= (d + b); \\
 &= (d + (a + c)); \\
 &= ((e + b) + (a + c)); \\
 &= ((e + (a + c)) + (a + c)); \\
 &= (((b + g) + (a + c)) + (a + c)); \\
 &= (((a + c) + g) + (a + c)) + (a + c);
 \end{aligned}$$

The 4th backward slice for V is the value of 'f' coming from the 'main' block. The checking expression is $f = b + e$. As there is no dependency for this expression, the optimization is not needed here. Now the value for 'f' will be renamed as 'f1' and will be verified by their corresponding block.

C. Detector Insertion: After computing the checking expression along each path of the execution of critical variable, the detector is placed to the original program before the expression involving the critical variable is executed.

```

1. #include <iostream>
2. using namespace std;
3. int main()
4. {
5.     int a , b ,c , d , e;
6.     b = 2,c = 4, d = 5;
7.     e = 3, g = 4 , t = 6;
8.     cout<<"\nValue for a : ";
9.     cin>>a;
10. //DETECTOR START
11. f1 = b + e;
12. if(a==0)
13.     f1=((a+c)+g)+(a+c)+(a+c);
14. else if(a==1)
15.     f1=(b+c)+(a+b);
16. else
17.     f1=(d+(g+t))-((d-(g+t))-d);
18. //DETECTOR END
19. if(a == 0)
20. {
21.     b = a + c;
22.     e = b + g;
23.     d = e + b;
24.     f = d + b;
25. }
26. else if(a == 1)
27. {
28.     d = b + c;
29.     e = a + b;
30.     f = d + e;
31. }
32. else
33. {
34.     a = d - e;
35.     c = a - d;
36.     b = d + e;
37.     e = g + t;
38.     f = b - c;
39. }
40. if(f == f1)
41. {
42.     cout<<f;
43.     cout<<endl;
44. }
45. else
46. {
47.     cout<<"\nError";
48. }
49. cout<<f;
50. return 0;
51. }

```

Fig 4: Program Output after Placing Detector

The detector for the critical variable ' f ' is labeled with a new variable say ' $f1$ '. The situation when the value of the critical variable ' f ' is different from the detector's variable ' $f1$ ', it is determined as an error. Fig. 4 depicts the output of the program

after placing detector. The value of ' $f1$ ' in the detector is checked before it can be used in any block. A change for to the value of a variable that affects the critical variable in any path or block can modify the value of the critical variable ' f '. If ' f ' is not equal to ' $f1$ ' then an error must be detected. For example the value of ' a ' is ' 0 ' and a single bit error within the ' if ' block, causes the value of ' c ' to be replaced by ' 5 ' then the value of ' f ' would be ' 19 ' whereas the value for ' f ' at the detector denoting by ' $f1$ ' within that block is ' 16 '. So, the error is resolved.

V. CONCLUSION

In a program the variable that possesses most reliance on others is labeled as the precedence to the others. Among them, the variables consuming effect of the rest variables within the entire program are known as critical variables. They exhibit a conspicuous kindness to data errors and deliver highest dynamic fan outs. Any faults formed by these variables are anticipated to extent in the entire coverage of the application triggering program malfunction. Therefore, adding detector for them is a wise decision providing high coverage to soft error. The instances that effect on critical may be contributed from different branch or path of a program. In this situation the detector should be a path-specific checker. The methodology portrayed in this paper contracts with this situation. To generate path-specific detector the structure performs a backward static slice. The slicing scheme is capable for analyzing dependency of the critical variable mentioned in the slicing criterion and thus delivers path-specific slicing which in terns generates the checking expression for the critical variable. Then the expression is optimized to create path-specific detector. The path-specific detector recompiles the critical variable among each path and associates the original value with the recompiled one. Any divergence of this association is detected by the detector. A single bit error in a variable resides in a specific branch that can modify the critical variable is detected by the path-specific detector.

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The epidemiology of dengue fever in district Faisalabad, Pakistan

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Abstract Dengue fever (DF) is globally emerging mosquito born viral disease. Pakistan is at high risk of dengue fever due to unavailability of vaccine, crowded cities, inadequate sanitation, unsafe water and large number of refugees. The present study was intended to investigate the epidemiology of DF in Faisalabad, Pakistan. This was a retrospective study to measure the frequency and distribution of the disease. Total 1509 cases of Dengue fever were admitted in Allied Hospital, Faisalabad during 6 months. Case-control epidemiological study was also conducted to identify some of the risk factors of the disease. For this purpose cases (n = 200) and control (n = 200) were confirmed through identification of antibodies against Dengue virus (immunoglobulin G) in the serum. The pre-tested questionnaires were used to collect the data on various factors. The results showed that the relative incidence of DF was significantly higher ($p < 0.05$) in males (71%) than in females (29%). The most susceptible age group was 21-30 years with relative incidence of 34%. Relative incidence was highest (43%) in the month of October. Various factors which were found associated with the disease were People working in Lahore, people visiting Lahore during epidemic, excessive travelling, presence of disease in the family or neighboring houses, people living near watery areas, immunocompromised persons and low level of awareness. Further epidemiological studies are needed to establish the effect of risk factor on population.

Index Terms- Antibodies, Dengue fever, Epidemiology, Immunoglobulin G

I. INTRODUCTION

Dengue fever is globally emerging mosquito born viral disease [1-7]. The causative agent of dengue fever is dengue virus of family Flaviviridae. There are four distinct serotypes of dengue virus DEN1, DEN2, DEN3 and DEN4 [8-12]. The virus has seven non structural proteins (NS1, NS2a, NS2b, NS3, NS4, NS4b, and NS5) and three core or structural proteins. There is no cross protective immunity but Lifelong immunity develops with infection of one type of dengue virus [12]. It is a confirm fact that the more severe signs were develop in patients infected with DEN-2 as compare DEN-1, DEN-3 and DEN-4 [9]. DEN-2 and DEN-3 have been mostly linked with dengue hemorrhagic fever although the exact mechanism is not still implicit [11].

The *Aedes aegypti* is a highly domesticated mosquito. It is small and black and white in color and prefers to feed blood on humans during the daytime. Its peak biting activity reaches during dawn and dusk [12]. The origin of *Aedes aegypti* is considered to be from tropical forests of Africa. *Aedes albopictus* is indigenous to South East Asia. It supposed to spread globally through import and export of tyres [10]. The most important and suitable arthropod vector for the dengue virus is *Aedes* (Ae.) *aegypti* due to its social behavior and frequent biting habit before breeding which belongs to the native African *Aedes aegypti* mosquito species which is considered as the dengue vector of urban areas. The recent urban Ae. *aegypti* domesticated from sub-saharan sylvatic Ae. *aegypti formosus*, which is an ancestral species. This urban Ae. *aegypti* dispersed to the many areas of the world especially tropical and subtropical countries of the world and involves in many outbreaks. The urbanization of Ae. *aegypti* occurred due to biodiversity, increase in population, global warming and climate change [13-14].

The residents at risk of dengue are 2500 million makes 2/5th of the population worldwide. The annually reported cases of dengue and dengue hemorrhagic fever are 50-100 million and 500,000 respectively leading to 24,000 deaths [10, 14]. Dengue fever incidence increase 30 times from 1960 to 2010 [15].

In Asia, epidemic of DHF was first documented in 1553 from Philippine [10]. In 1942 dengue virus was isolated from Japan [16]. Dengue hemorrhagic fever disseminated to Singapore, Indonesia, Vietnam, Sri Lanka and Malaysia in 1960. The disease epidemiology expands and DHF outbreaks documented from India, French Polynesia, Pakistan and Bangladesh in 1988, 1990, 1992 and 2000 respectively [10]. During last thirty years DF budded as a pandemic disease. The occurrence of DF in Asia and pacific is more than 70% and remaining from Africa, America and Middle East [9].

In last twenty years the numbers of epidemics reported from Pakistan are seven. A number of dengue fever epidemics have occurred after the period of two to three years following the previous outbreak [9, 11]. Pakistan is at high risk of dengue fever due to unavailability of vaccine, crowded cities, inadequate sanitation, unsafe water and large number of refugees. Dengue virus is supposed to come in Pakistan with tyres at Karachi sea port having eggs of infected mosquitoes. There was no official data available about dengue fever in Pakistan until 1994 [16]. Dengue fever (Anti-D3) was first reported in 1982 from Central Province of Pakistan (Punjab) according to world health organization, 12 patients out of a sample of 174 were documented [17]. In 1985, 50-60% population of Karachi was founded heamagglutination inhibition (HI) positive for flavivirus, West Nile, Japanese encephalitis. The

first epidemic of dengue hemorrhagic fever was reported in Karachi 1994 [15-17]. DEN-1 and DEN-2 serotypes were found in the blood of patients infected during the epidemic of 1994. Next epidemic occurred in Baluchistan with approximately eighteen hundred reported cases in the following year. In 1997 confirmed one hundred and forty five dengue fever cases were reported from Aga Khan University Karachi out of which 45% patients had dengue hemorrhagic fever and one died [17].

In 2005 dengue fever again hit Karachi and four thousand five hundred confirmed cases were reported [10]. First confirmed outbreak of dengue fever due to DEN-3 was reported in 2005 [18]. In 2006 Azad Jammu & Kashmir became victim of dengue fever but went chiefly undocumented [10]. Again in 2006, dengue fever became epidemic in Karachi and travelling of employees to their destinations for the Eid vacations inoculated dengue virus to other cities of Pakistan. In the same year a lot of cases of DF and DHF (approximately 220 cases) reported from the general hospital Rawalpindi during the months of October and December [19]. DEN-2 and DEN-4 were found in the serum samples of the patients infected during epidemic of dengue hemorrhagic fever in the year 2008. Dengue surveillance cell reported eight hundred and eighty one confirmed cases out of one thousand eight hundred and nine susceptible individuals and five deaths from Sindh till October 2010. In the same year sixteen confirmed cases of dengue fever and zero mortality reported from capital city of Pakistan and five hundred and sixty three cases reported from Aga Khan University Karachi. Most of the cases had DHF manifested with secondary disease while mild to moderate sign in the patients were present at primary health care centre [6]. Once again in the descend of 2011, Dengue fever epidemic occurred in Pakistan with fifteen thousand cases from Lahore and above two hundred cases from Khyber Pakhtoonkhawa and Peshawar [11, 15, 20]. In February 2012, 73 cases of dengue fever in Lahore and 13 other areas of Punjab were reported. The year 2007 and 2011 has been worst years in regard of dengue virus infection in Pakistan. Dengue virus circulates in Pakistan throughout the year with a peak incidence in the post monsoon period. Recent flood in Pakistan made the situation worse [16].

Population density, water, sanitation, level of literacy, poor socioeconomical stresses and climate variation deliberated as reasons of dengue fever occurrence in the South East Asian. DF is endemically present in Asia but epidemic of DHF repeat cyclically after three to five years [10].

II. MATERIAL AND METHOD

Descriptive epidemiological Study

Epidemiological data for retrospective descriptive studies were collected from allied hospital Faisalabad. A total of number cases reported during 6 months epidemic of DF during 2011 were selected. Epidemiological data were collected on a predesigned Performa which included name of patient, age, sex, complete residential address, contact no, sign and symptoms, date of admission and date of discharge.

Area based distribution of dengue fever

The prevalence of disease in urban and rural areas of Faisalabad was checked through distribution of cases in these areas. The most prevalent area was also found through this study.

Age based distribution of dengue fever

To check the age wise distribution of disease 9 groups was formed from <10 to >80 years and distribution of cases were found in these different groups to determine the prevalence in different age groups.

Sex based distribution

Male and female two groups were formed to check the sex wise prevalence of disease.

Month based distribution

The distribution of cases in different month of epidemic of disease was used to check the pattern of disease.

Case-Control Analytical Study

Blood collection

Case-control was done on individuals of two groups diseased and non diseased. All individuals were further confirmed through detection IgG antibodies. The blood samples of 200 healthy individuals and 200 infected individuals were collected. The blood samples were collected in sterilized syringes. The serum from blood was collected through centrifuging the samples at 2500 rpm for 5 minutes. The serum samples were store at -20 degree Celsius for detection of immunoglobulin. The immunoglobulin G (IgG) was determined through IgG capture enzyme linked immunosorbent assay ELISA. SD dengue capture ELISA was used for this purpose.

Statistical analysis

The obtained data was analyzed by measuring odds ratio of each factor and through Chi square test.

III. RESULTS

Results of descriptive epidemiological study

Age based distribution of dengue fever

To check the age wise distribution of disease 9 groups was formed from upto10 years, 11-20 years, 21-30 years, 31- 40 years, 41-50 years, 51-60 years, 61-70 years, 71-80 years, >80 years. The distributions of cases were found in these different groups to determine the prevalence in different age groups. Distributions of cases were 7%, 17%, 38%, 19%, 9%, 8%, 2%, 0.5% and 0% in upto10 years, 11-20 years, 21-30 years, 31- 40 years, 41-50 years, 51-60 years, 61-70 years, 71-80 years, >80 years respectively. The highest relative percentage was found in group at age of 21-30 years as presented in Table 1.

Table 1: Age wise distribution of dengue fever

Sr. No.	Age	Relative % age
1.	Up to 10 years	7%
2.	10-20 years	17%
3.	21-30 years	38%
4.	31-40 years	19%
5.	41-50 years	9%
6.	51-60 years	8%
7.	61-70 years	2%
8.	71-80 years	0.5%
9.	Above 80	0%

Sex based distribution

Male and female two groups were form to check the sex wise prevalence of disease. Relative percentage of cases in males and females were 71.1% and 28.9% respectively. Highest relative percentage was found in males as compare to females as presented in Figure 1.



Figure 1: Sex based distribution

Area wise distribution of dengue fever

The prevalence of disease in urban and rural areas of Faisalabad was checked through distribution of cases in these areas. The relative percentage of cases was 62% and 38% in urban and rural areas respectively. Highest relative percentage was found in urban areas as compare to rural areas as presented in Figure 2.

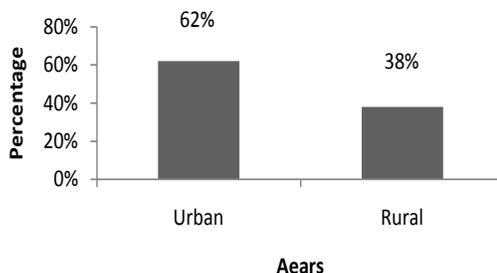


Figure 2: Area wise distribution of dengue fever

Month wise distribution of dengue fever

The distribution of cases in different month of epidemic of disease were use to check the pattern of disease. Relative percentage of cases was 1.5%, 35.5%, 43%, 17%, 2% and 0.19% in August, September, October, November, December and January respectively. Highest percentages of cases were found during month of October as presented in Figure 3.

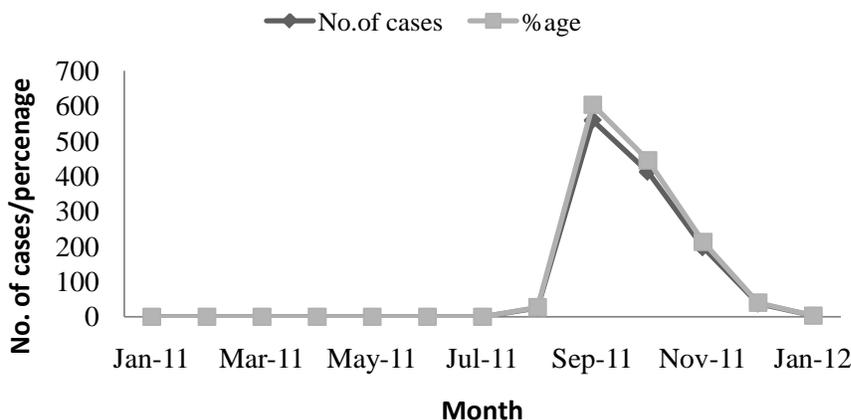


Figure 3: Month wise distribution of dengue fever

Case-Control Analytical Study

Case control analytical study determined the different risk factors associated with the disease. The associated risk factor were people work and visit to Lahore, watery areas near house, Immunocompromised individuals, dengue patients in family and neighbor, travelling, socioeconomical variables and awareness. Odds ratio for different risk factors presented in Table 2.

Table 2: Risk factors for dengue fever

Sr. No.	Risk factors	Diseased	Non diseased	Odds ratio
1	People work & visit to Lahore	102	22	2.6
2	Watery areas near house	81	21	2.05
3	Immunocompromised	65	18	1.88
4	Dengue patient in family and neighbour	40	12	1.68
5	Travelling	42	15	1.39
6	Socioeconomical variables	43	21	0.99
7	Awareness	35	89	0.11

IV. Discussion

This study describes the epidemiology of dengue fever in Faisalabad. Until now this type of study has not been described. The prospective epidemiological study showed that the ratio of incidence of dengue fever in male and female was 2.4:1. The ratio of male was > 2 as compare to females and this fact is supported by another study conducted in India which showed the male to female ratio was 2:1 in one of the retrospective study [4].

The most effected age was 21-30 years and number of cases gradually decreases up to age of 80 years, it showed that the epidemiology of dengue fever changed during recent epidemic of dengue fever 2011 because one of the studies conducted in India

showed the most effected age was 0-15years. A short report on epidemiology of dengue fever in Pakistan supports this study because it showed that the mean age detected is 32 years [4, 6].

The epidemic of dengue fever started post monsoon in august when the mosquito population was high. Highest number of cases reported during the month of October. This is supported by another study which describe that the dengue fever is endemic in Pakistan with maximum incidence during post monsoon period. Another five years Indian study showed the gradual increase in cases post monsoon from august, obtain peak in October and then gradually decrease [4, 6]

Dengue fever and dengue hemorrhagic fever has been reported as occur dominantly in urban population where density of dwelling create the favorable conditions for the transmission of disease. However the some studies shows that in some cases, outbreaks also reported in rural areas of Asia and America [21]. This study measure the incidence of dengue fever in rural and urban areas of Faisalabad. The maximum cases was reported from city area as compare to rural areas because of short flying distance of vector and congested construction which promote the rapid spread of disease leads to epidemic. The global case fatality rate has been decreasing in many of the endemic countries according to government statistics. The overall case fatality ratio in the Southeast Asia region is now less than 1%. The case fatality rate was 0.86% during epidemic of 2011 which also shows the declining trend of the case fatality ratio [21].

The case control analytical studies which are used to detect the level of IgG through IgG capture ELISA showed that patient with severe clinical sign were positive for IgG. In another study it is a well known fact that the severe form of dengue fever like dengue hemorrhagic fever and dengue shock syndrome occur in the patient having secondary infection due to antibody enhancement mediated by activated T cell response with TH-2 lineage cell activation and stimulation of other soluble factor [22]. It means out of total 30% which showed positive result remain at high risk of dengue hemorrhagic fever and dengue shock syndrome.

Acknowledgements

Authors really acknowledge the hospital staff for helping to collect data for completion of this study.

V. CONCLUSION

Various factors which were found associated with the disease were People working in Lahore, people visiting Lahore during epidemic, excessive travelling, presence of disease in the family or neighboring houses, people living near watery areas, immunocompromised persons and low level of awareness. Further epidemiological studies are needed to establish the effect of risk factor on population.

ACKNOWLEDGMENT

Authors really acknowledge the hospital staff for helping to collect data for completion of this study.

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A Study of Left ventricular hypertrophy in hypertension

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Abstract- Introduction: Increased arterial pressure is one of the most important public health problem in developed as well as in developing countries. It is common, asymptomatic, readily detectable, easily treatable. Burden of hypertension increases with age among individuals aged above 60 years, the prevalence is 65.4%. Left ventricular hypertrophy has been shown to be a common and surprisingly early finding in hypertension even in patients without the evidence of coronary artery disease. Studies have also shown that aggressive control of hypertension not only reduces the hypertrophy but also reduces the long term cardiovascular morbidity and mortality. **Objectives:** this study was undertaken to find out the incidence of left ventricular hypertrophy in hypertension. **Materials and Methods:** After careful exclusion of patients with secondary hypertension, valvular heart disease, Diabetes mellitus, gross congestive heart failure and ischemic heart disease, 85 patients were considered for the study. Data was collected by history, clinical examination, ECG, X-ray and echocardiography. Coronary angiography was done in selected patients to rule out ischemic heart disease. **Statistical analysis:** Analysis was done using Chi square test. descriptive data are presented as mean standard deviation and range values. Pearson's correlation coefficient was used to measure the relationship between the measurements. P value of 0.05 was considered for statistical significance. **Results: Of the 85 patients, 60 were males and 25 were females. 18 patients showed the ECG evidence of LVH, 40 patients had echocardiographic evidence of LVH. All had concentric hypertrophy. LV mass index in patients with LVH was 226.22±51.18/m² and is statistically significant (P<0.001). 54% showed increased LV mass index. LV relative wall thickness was 0.61±0.09 which is again statistically significant (P<0.001). **Conclusions:** In the present study the incidence of LVH was 47%, all had concentric hypertrophy. **LV mass index was determined by Pen's formula. The LV mass index in patients with hypertrophy is 226.22±51.58gms/m² and 118.43±22.72 in patients without hypertrophy and this marked increase in LV mass is statistically significant (P<0.001).** Echocardiography can detect LVH even before patients develop ECG evidence of LVH. studies shows that early and aggressive treatment of hypertension with drugs like angiotensin converting enzyme inhibitors and angiotensin receptor blockers not only reduces hypertension but also reduce left ventricular hypertrophy there by reduces the morbidity and mortality.**

Index Terms- Hypertension, left ventricle, hypertrophy, LV mass index

I. INTRODUCTION

Increased arterial pressure is one of the most important public health problem in developed as well as in developing countries. It is common, asymptomatic, readily detectable, easily treatable(1). In spite of increasing awareness in public and rapidly expanding array of antihypertensive drugs, hypertension remains one of the major causes of cardiovascular morbidity and mortality(2). Burden of hypertension increases with age among individuals aged above 60 years, the prevalence is 65.4%(19). Incidence of hypertension is 8-18% of adult population in developed countries and in India it is estimated to be between 1-5% in rural and 3-15% in urban population.(3). Heart was traditionally regarded as a target organ adapting to the increased pressure load by hypertrophy and eventually failing if the load continues unremitting or was suddenly aggravated particularly if complicated by the advent of coronary disease.(4).

Most patients with hypertension, the heart becomes secondarily involved in response to the progressively increasing LV afterload. The heart does this through two mechanisms, ie by increasing contractile function and second by undergoing structural adaptation. This structural adaptation is primarily achieved through Left ventricular hypertrophy(5).

Left ventricular hypertrophy has been shown to be a common and surprisingly early finding in hypertension even in patients without the evidence of coronary artery disease. It has been described not only in adolescents with borderline hypertension but also in the offspring of hypertensive patients(4).

Prevalence of hypertrophy increase with the duration of hypertension and is also influenced by gender, obesity and age factors(6,7). Echocardiography is the most sensitive technique that can identify left ventricular hypertrophy at early stage. LVH is both a target organ response to hypertension as well as a factor responsible for other cardiovascular events.(8,9,10)

Studies have also shown that aggressive control of hypertension not only reduces the hypertrophy but also reduces the long term cardiovascular morbidity and mortality.

II. OBJECTIVES

This study was undertaken to find out the incidence of left ventricular hypertrophy in hypertension.

III. MATERIALS AND METHODS

After careful exclusion of patients with secondary hypertension, valvular heart disease, Diabetes mellitus, gross congestive heart failure and ischemic heart disease, 85 patients were considered for the study. Data was collected by history,

clinical examination, ECG, X-ray and echocardiography. Coronary angiography was done in selected patients to rule out ischemic heart disease.

Patients who fulfilled the inclusion criteria were subjected to ECG and X-ray and later to 2-D, M-mode and Doppler echocardiography. LV internal dimensions were obtained by M-mode echocardiography, End diastolic volume(EDV), end systolic volume(ESV) and ejection fraction were taken from parasternal short axis view by 2-D echocardiography. LV internal dimension can also be obtained by 2-D echo from apical as well as parasternal windows. LV mass index and relative LV wall thickness were calculated using the Penn's formula.

LV mass index= $1.04[(LVIDD+IVS+LVPWd)^3-LVIDd^3]-13.6$
in gms/sq.m

$$\text{Relative wall thickness} = \frac{2 \times \text{LV Pwd}}{\text{LVIDd}}$$

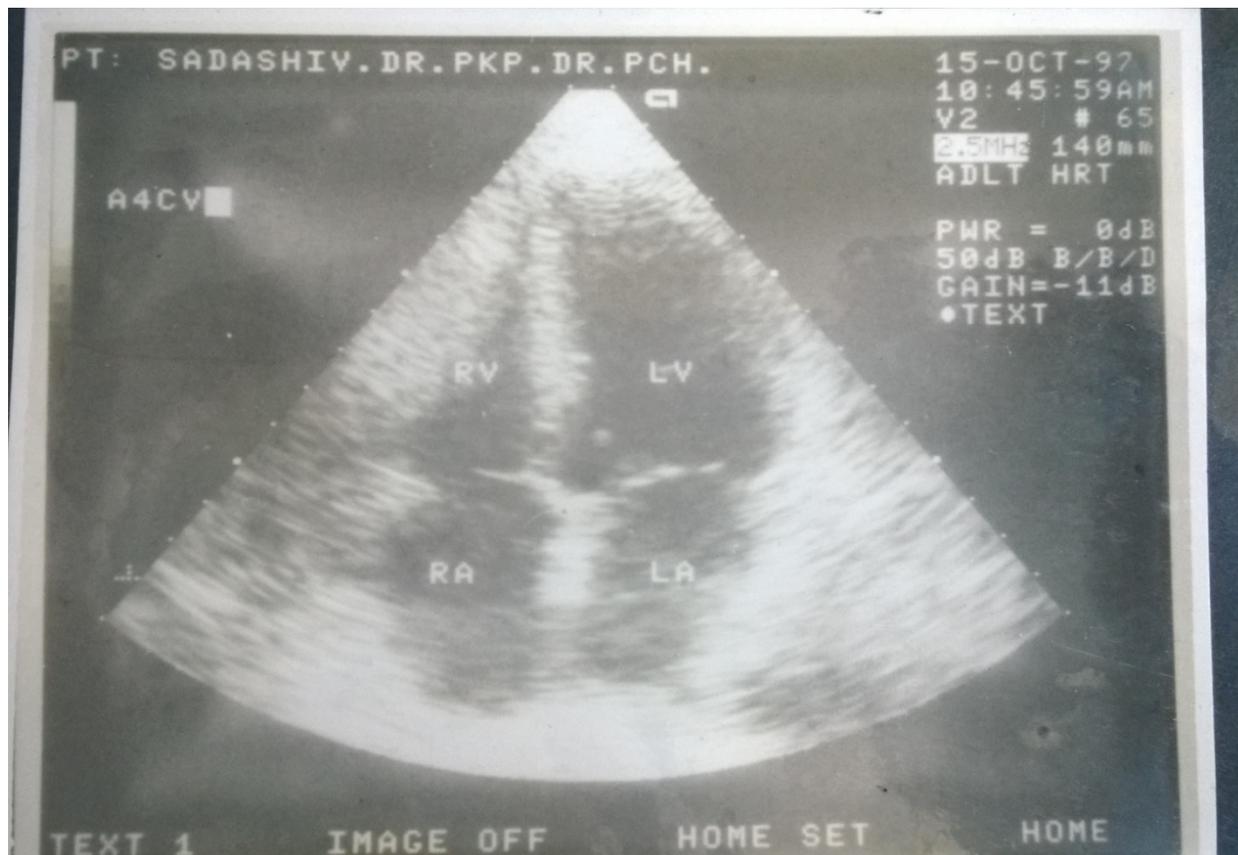
IV. STATISTICAL ANALYSIS

Analysis was done using Chi square test. descriptive data are presented as mean standard deviation and range values.

Pearson's correlation coefficient was used to measure the relationship between the measurements. P value of 0.05 was considered for statistical significance.

V. OBSERVATIONS

Of the 85 patients, 60 were males and 25 were females. The age range was 25 to 75 years with a mean age of 54.42±10.96 years. 41 out of 85 patients had mild symptoms at time of entry into the study. 10 had exertional dyspnea, 5 had fatigue and 31 had chest pain. It means 52% were asymptomatic, only 4 patients had clinically detectable cardiomegaly. The average blood pressure of the subjects were 155.83±17.81mmhg systolic and 94.8±6.74mmhg diastolic, the range was 140/90 to 210/120mmhg. Duration of hypertension ranged from 1 month to 20 years. 18 patients showed the ECG evidence of LVH, 40 patients had echocardiographic evidence of LVH. All had concentric hypertrophy, 62 patients had diastolic dysfunction.



2-D Echo showing concentric LVH

Table I

Table showing distribution of LV hypertrophy in different age group.

Age Group	Male		Female		Total	
	Total	Cases	Total	Cases	Male+ Female	Cases
35-45	18	10	5	1	23	11
46-55	13	7	10	2	23	9
56-65	19	10	6	1	25	11
66-75	10	7	4	2	14	9
Total					85	40

average interventricular septal thickness was 1.18±0.14cms in patients with LVH, posterior wall thickness was 1.30±0.13cms, EDV was 4.23±0.48cms, LV mass index in patients with LVH was 226.22±51.18/m² and is statistically significant (P<0.001). 54% showed increased LV mass index. LV relative wall thickness was 0.61±0.09 which is again statistically significant (P<0.001). The range of 0.45-0.50 was considered normal.

VI. CONCLUSIONS

Since in the introduction of non-invasive methods such as radionuclide ventriculogram and doppler echocardiography, these techniques have become the modalities of choice for the assessment of left ventricular diastolic dysfunction. These have advantages of ease of performance and repeatability (14). Presence of ischemic heart disease, valvular lesions, hypertrophic cardiomyopathy and pericardial disease by 2-D and doppler echocardiography and other parameters such as ECG excluded patients from the study. 30 patients had chest

pain. 18 out of 30 of these patients had ECG evidence of ischemia and they were subjected to coronary angiogram and angiogram was normal, rest 12 were considered noncardiac chest pain. In the present study the incidence of LVH was 47%, all had concentric hypertrophy. **LV mass index was determined by Pen's formula. The LV mass index in patients with hypertrophy is 226.22±51.58gms/m² and 118.43±22.72 in patients without hypertrophy and this marked increase in LV mass is statistically significant (P<0.001)**

Echocardiography can detect LVH even before patients develop ECG evidence of LVH. According to the literature the incidence of LVH is 20-60% by echocardiography in referral centres (13). Savage D, Daniel et al (22) who assessed the prevalence of anatomic functional abnormalities of the heart in hypertension concluded that 61% of asymptomatic subjects had LVH in the form of increased interventricular and posterior wall thickness. LVH delays the active relaxation of the myocardium and also alters the chamber compliance. This results in altered flow velocity across mitral valve. Jian Fang Ren et al (20) had showed in their study that the incidence of LVH with abnormal

filling was 54%. Frank R Bauwens et al (21) conducted a study to know the influence of the arterial pressure and left ventricular hypertrophy. They conducted a study on untreated hypertensive patients with mild to moderate hypertension, a 24 hour ambulatory BP monitoring and determination of LV mass index was done. LV mass index did not correlate well with the office systolic or diastolic blood pressure, but there was a statistically significant correlation between 24 hour systolic blood pressure and LV mass. In a similar study, Devereux B. Richard et al (14) concluded that hypertensive LVH is poorly related to clinical/home measurement of blood pressure but a substantially close relationship exists between LVH and blood pressure during recurring stress at work.

The present study also showed that 36 patients with LVH had hypertensive eye changes. Literature shows that by the time of echocardiographic evidence of LVH, most patients will have grade II hypertensive changes in eyes (23).

To conclude the incidence of LVH is 47% and all of them had concentric hypertrophy. LVH can manifest as angina due to impaired coronary oxygen reserve. With the increase in LV mass myocardial oxygen demand also increases.

Echocardiography is an easily available noninvasive technique and can be used for early detection of LVH and thus treat these patients with specific medications so as to arrest or reverse the pathological changes.

Recent studies show that early and aggressive treatment of hypertension with drugs like angiotensin converting enzyme inhibitors and angiotensin receptor blockers not only reduces hypertension but also reduce left ventricular hypertrophy thereby reducing the overall morbidity and mortality (19).

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Serum Retinol Level and its Clinical Correlation in Children

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Abstract- Background : Vitamin A is an essential nutrient required for various important body function. Deficiency would affect any and every system including vision. Serum vitamin A level is low in children with protein energy malnutrition.

Objective : to know the serum retinol in different presentation of vitamin A deficiency.

Study design : cross sectional study.

Setting : pediatric clinic at a tertiary centre.

Methodology : 50 cases and 50 controls were chosen. A detailed history, examination and serum retinol level was estimated by modified Carr – price reaction of all the children. The serum retinol level was graded according to WHO classification and was correlated with the manifestations.

Results : of the 50 cases Bitot spots are associated with reduced serum retinol level, while xerophthalmia, night blindness and phrynoderma are usually present when serum retinol level is too low (deficient state i.e. <9µg/dl).

Index Terms- serum vitamin A; malnutrition; xerophthalmia, night blindness, Bitot spots

I. INTRODUCTION

Vitamin A deficiency is a major public health problem among the preschool children, mostly from the world health organisation (WHO) regions of Africa and South East Asia. It is estimated that world – wide 2.8 million children have vitamin A deficiency and another 250 million children have low serum retinol concentration¹, thus are potentially at risk to develop vitamin A deficiency. Infants and young children have increased vitamin A requirements to support growth and to help combat infections. Generally infants are born with low vitamin A stores and are dependent on external sources, most importantly breast milk, for optimization of their vitamin A levels and body stores². Vitamin A deficiency increases the risk of morbidity and mortality in young children and supplementation has been shown to reduce mortality in children by as much as 23%³. Recent evidence showed that subclinical vitamin A deficiency is associated with an increased risk of severe illness and even death, from such common childhood infections as diarrhoea and respiratory infections⁴.

II. METHODOLOGY

Among the children attending to the pediatric OPD 50 children between the age 1 -10yrs were selected who were

malnourished with or without the vitamin A deficiency manifestation in the study group and 50 children of age and sex matched with normal nourishment were taken into the control group. Children who received vitamin A supplementation in past 6 months were not included in the study.

A detailed history, dietic history, socio –economic status was taken as per the preformed questionnaire. The nutritional status was assessed according to the IAP classification for less than 5yrs and according to WHO classification for children between 6 -10yrs. Child was examined for signs of vitamin A deficiency and was noted.

Blood samples of all the children were collected for estimation of vitamin A levels.

Procedure for taking blood sample for estimation of serum vitamin A : After the admission 5 ml of fasting blood drawn in to a plain test tube (sample free from haemolysis and protected from light) and immediately submitted to the laboratory once the serum is separated, samples were processed by modified Carr – price reaction.

Principle of by modified Carr – price reaction : Vitamin A reacts with antimony trifluoroacetic acid to form a blue colored complex, having absorption maxima at 620nm. The intensity of blue color is found to be proportional to vitamin A content of the solution. The resulted serum retinol level was graded according to report of WHO (2011) serum retinol level in excess of 20µg/dl are normal state, values between 10 - 19µg/dl indicates low stores and values less than 10µg/dl of serum retinol as deficient state.⁵

III. STATISTICAL ANALYSIS

Data were expressed in mean ± SD and percentage. Comparison between control and study group was done using student's t-test and relation of serum retinol with parameters was done by using chi-square test. A p-value less than 0.05 were considered as significant. Data analysis were done by software SPSS v16.0

IV. RESULTS

Among the 50 children in both group 25 were girls and 25 were boys. All the children in the study group were malnourished and in control group all children were normally nourished. Among the study group (malnourished children) 31 cases had serum retinol level <10µg/dl indicating deficiency and 19 cases had serum retinol level 10-19µg/dl indicating low stores. While

no case had serum retinol level $>20\mu\text{g}/\text{dl}$, indicating normal levels of serum retinol. (Table 1), and only 4 among the control group (normally nourished) had low stores and none had deficient state.

The mean serum retinol level among the study group was found to be $9.87 \pm 3.9 \mu\text{g}/\text{dl}$ and in control group it was $23.47 \pm 2.54 \mu\text{g}/\text{dl}$. The serum retinol level in the study group was significantly low when compared to children in the control group And was statistically very significant. (Table 2) (fig 1)

Among the 50 cases in study group 26 had conjunctival xerosis, 19 had bitot spots, 2 had night blindness, 12 had phrynoderma and 4 had generalized hyperpigmentation. And among the control 3 children had bitot spots. (Table 3)

Relation with eye manifestation.

In the present study 26 out of 50 cases had xerophthalmia out of which 18 cases had serum retinol level of $<10\mu\text{g}/\text{dl}$ and remaining 8 cases had deficient state i.e. $10-19\mu\text{g}/\text{dl}$ of serum

retinol. 19 out of 50 cases had bitot spots, out of which 10 cases had serum retinol level of $<10\mu\text{g}/\text{dl}$ and remaining 9 cases had deficient state i.e. $10-19\mu\text{g}/\text{dl}$ of serum retinol. 3 out of the 50 control children had bitot spots, the serum retinol level of all the 3 were in the range of deficiency state.

We had two cases of night blindness and both had severe deficient state that is $3.03\mu\text{g}/\text{dl}$ and $2.65\mu\text{g}/\text{dl}$.

Relation with skin manifestation

Among the skin manifestations 12 cases had phrynoderma among which 8 cases had serum retinol level of $<10\mu\text{g}/\text{dl}$ and remaining 4 cases had deficient state i.e. $10-19\mu\text{g}/\text{dl}$ of serum retinol. 4 cases had generalised hyper pigmentation and among which 3 cases had serum retinol level of $<10\mu\text{g}/\text{dl}$ and remaining 1 case had deficient state i.e. $10-19\mu\text{g}/\text{dl}$ of serum retinol

Children with more than 1 manifestation had serum retinol level of less than $10\mu\text{g}/\text{dl}$.

Table 1: Serum retinol status in study group and control group with WHO standard

Group	Serum retinol levels			Total
	$<10\mu\text{g}/\text{dl}$	$10-19\mu\text{g}/\text{dl}$	$>20\mu\text{g}/\text{dl}$	
Study group (n=50)	31	19	-	50
Control group (n=50)	-	4	46	50

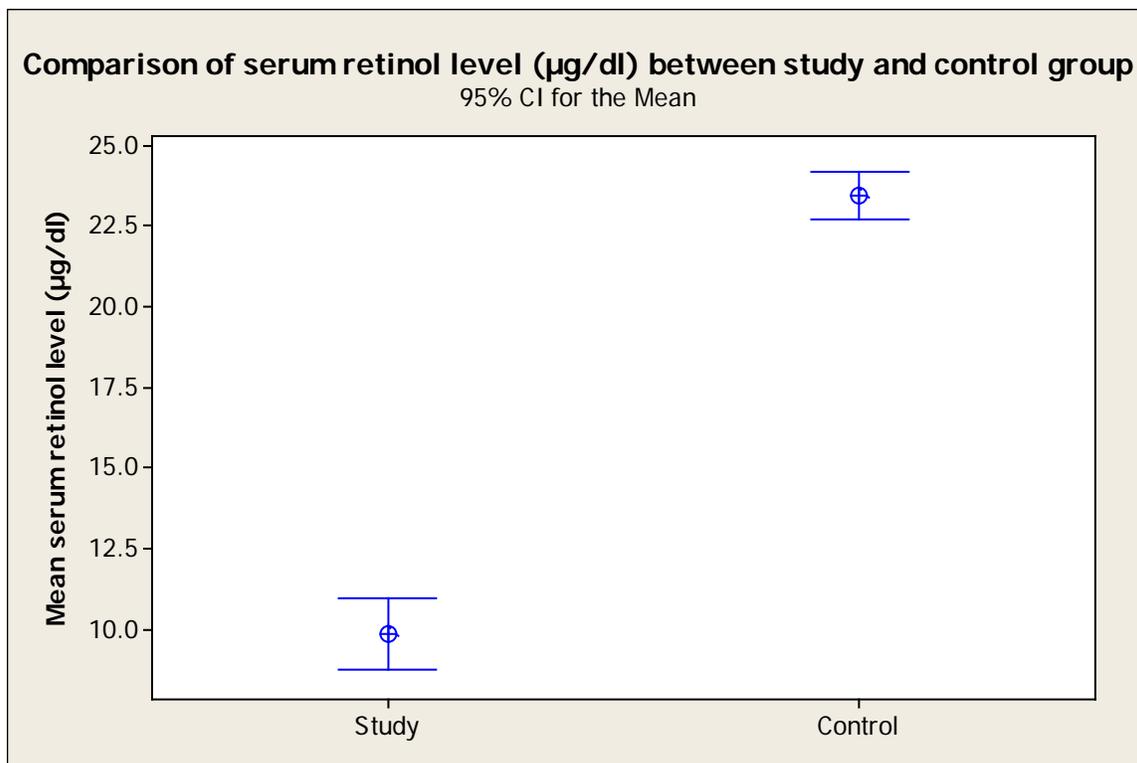
Table 2: Mean Serum retinol levels in the study group and control group

	Study (n=50)	Control (n=50)	Mean difference	p-value
Mean serum retinol level ($\mu\text{g}/\text{dl}$)	9.87 ± 3.9	23.47 ± 2.54	13.59	$P < 0.001$

Table 3 : Relation between serum retinol level and clinical manifestation in the case group

Clinical manifestation	Serum retinol levels		
	$\geq 20\mu\text{g}/\text{dl}$	$10-19.99 \mu\text{g}/\text{dl}$	$\leq 9.99 \mu\text{g}/\text{dl}$
Conjunctiva Xerosis (X1A)	0	8	18
Bitot spots (X1B)	0	9	10
Corneal Xerosis(X2)	0	0	0
Corneal ulceration / Keratomalacia $< 1/3$ rd corneal surface (X3A)	0	0	0
Corneal ulceration / Keratomalacia $> 1/3$ rd corneal surface (X3B)	0	0	0
Night blindness (XN)	0	0	2
Corneal Scar (XS)	0	0	0
Xerophthalmia fundus(XF)	0	0	0
Phrynoderma		4	8
Generalized hyper pigmentation		1	3

Figure 1 :



V. DISCUSSION

In the present study all the malnourished children had serum retinol level $<20 \mu\text{g/dl}$. According to report of WHO (2011) serum retinol level in excess of $20 \mu\text{g/dl}$ are not associated with deficiency state, but the values between $10 - 19 \mu\text{g/dl}$ indicates low stores and values less than $10 \mu\text{g/dl}$ of serum retinol are associated with severe deficiency.⁵ According to Interdepartmental Committee on Nutrition for National Development (ICNND) manual of nutritional survey published in the year 1963, serum retinol has been suggested as per $\mu\text{g/dl}$, normal $>20 \mu\text{g/dl}$, low $10 - 19 \mu\text{g/dl}$ and deficient $<10 \mu\text{g/dl}$. Similarly McLaren in the year 1991 reported that the serum retinol levels falls below normal limits ($20 - 50 \mu\text{g/dl}$) before functional or structural changes occur. Values below $<10 \mu\text{g/dl}$ are strongly suggestive of deficiency, but values between $10 - 20 \mu\text{g/dl}$ are difficult to interpret.⁷

This reduced serum retinol levels is probably due to reduced intake. Infections which causes reduced intake and defective absorption of vitamin A as well as increased renal loss as suggested by Semba R D⁸. Protein energy malnutrition- (Kwashiorkor) Deficiency of proteins leads to impaired synthesis of RBP. This indicates that vitamin A deficiency in serum is due to decrease in RBP and plasma prealbumin. Guillermo Arrova, Dorothy W, Jose M, Moises B and Nevin S S, under the study title 'serum and liver vitamin A and lipids in children with severe protein malnutrition'⁹, studied serum levels of total lipids, phospholipids, cholesterol vitamin A and carotene in children with kwashiorkor on admission to the hospital and at regular intervals during the recovery, their data indicated that total lipids

and vitamin A decrease in liver tissue simultaneously with an increase in the serum components suggesting that an initial impairment in lipid and vitamin A blood transport is possibly associated with decrease in plasma protein fraction to which the lipid compounds are normally bound. In the year 2012, Gopalan C, Venkatachalan, P S Bhavani, in their study 'studies of vitamin A deficiency in children'¹⁰ found that there was a lack of association between the incidence of night blindness and ocular signs of vitamin A deficiency. They also found that by supplementing high protein diet without vitamin A supplementation brought about a significant increase in the levels of vitamin A in the serum of the children with kwashiorkor while not seen who had only vitamin A supplementation. In the study titled 'impaired intestinal localization of mesenteric lymphoblasts associated with vitamin A deficiency and protein calorie malnutrition'¹¹ M R McDermott, D A Mark, A. D. Befus, B.S. Baliga, R M Suskind and J Bienenstock in the year 1981 suggested that the early stages of protein calorie malnutrition or protein calorie malnutrition with vitamin A deficiency interferes with the traffic of immunocompetant lymphocytes between the various anatomical sites included in the common mucosal immunological system.

In a study titled "Vitamin A deficiency and the prevalence of xerophthalmia in southern Rwanda" by Selim Rashed, Henk Renkema, Jose d'Astous, Katherine Gray-Donald, and Jean Lambert found that the serum retinol level was significantly lower than children without bitot spots.

This study was taken up to study the relation of serum retinol level and vitamin A manifestation. As majority of the studies have found out the various vitamin A deficiency manifestation, few extensive studies have been able to find the

serum retinol level and have graded as normal (20µg/ dl, low stores (10 - 19µg/dl) and deficient state (less than 10µg/dl).

In our study we found 69% of children with xerophthalmia had deficiency state. 53% of the children with bitot spots had low stores of retinol level and the remaining 47 % of the children had other manifestations along with bitot spots . 3 out of the 50 control children had bitot spots , and all the 3 children had low stores of retinol with normal nourishment.

We had two cases of night blindness and both had severe deficient state that is 3.03µg/dl and 2.65µg/dl.

Among the skin manifestations 67% of children with phrynoderma had low serum retinol level indicating deficiency state.75% of the children with generalised hyper pigmentation had deficiency state i.e. 10 -19µg/dl of serum retinol.

Children with more than 1 manifestation had serum retinol level of less than 10µg/dl.

VI. CONCLUSION

The serum retinol level is lower than normal level in malnourished state. In our study children with normal serum retinol level had no manifestation, children with low stores presented mainly with bitot spots, xerophthalmia, phrynoderma in the order. All other manifestation were seen when the serum retinol level is in the deficiency state. more than one manifestation is an indication of very low serum retinol level (deficiency state).

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Low Power Techniques for High Speed FPGA

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Abstract- The motive of this work is to design on chip efficient low power techniques using VHDL coding. Serial links in network on chip provide many advantages in terms of crosstalk, skew, area cost, clock synchronization, and wiring difficulty when compared to multi-bit parallel data transmission. The proposed a novel coding technique reduces the number of transitions and hence reduces transmission energy on the serial wire. Also low power consumption is achieved by using the mux-tree based round robin scheduler. A scheduler (or arbiter) is needed when more than two input packets from different input ports are destined for the same output port at the same time.

Index Terms- FPGA, mux tree based round robin scheduler, parallel to serial transmission, low energy coding on chip serial link,

I. INTRODUCTION

The on chip inter-modular communications become congested, as Systems-on-Chip (SoC) integrate an ever growing number of modules and modules may require serial interfaces, similar to the parallel to serial inter-chip interconnects. A multi-bit bus with a global common clock has been widely used as communication architecture for the most of VLSI designs. However, in a high performance SoC and deep-submicron, multi-bit and long bus lines have several problems such as crosstalk, skew, large area and, wiring difficulty. It is difficult to increase the frequency of global clock due to jitter or skew on multi-bit lines because of data on the bus must be synchronized with the common clock. In multimedia SoC the area cost of the wide-bit bus is serious. However the noise and data dependent signal delay is occurred because of the crosstalk between adjacent bus lines. Multi bit bus communication performance is bounded by available clock rate, delay uncertainty, and clock skew due to layout geometries, process variations, and crosstalk noise. Therefore parallel link with a global clock will reach its limit and make expensive further performance enhancement.

To overcome such problems, source synchronous serial communication is one of the key technologies. In serial communication due to less communication lines it occupies less area. The source-synchronous serial communication uses a sideband strobe signal along the serial data line. The strobe signal is a clock signal but it is activated only when the serial data line is valid. It has an identical wire delay and load with the data line, so that the skew between data and clock is get reduced. Moreover the crosstalk problem can be mitigated by wide spacing of serial lines. In this paper, a serialized low-energy

transmission coding method is proposed for on-chip serial communication. This technique is used in a on-chip inter-connection networks, and also high-performance memory I/O recently.

There were many researches on low-power bus coding but they are mostly for parallel bus. As the number of subsystems on a chip and the die sizes increase, the power consumed by the interconnection structures takes significant portion of the overall power-budget. A pro-posed serialized low-energy transmission (SILENT) coding technique decreases the number of transitions on a serial data wire to reduce the power consumption of wire and transmitter.

In proposed work mux tree based round-robin scheduler and serialized low-energy transmission coding technique are used. A scheduler is needed when more than two input packets from different input ports are destined for the same output port at the same time. Among a number of scheduling algorithms, a mux tree based round-robin algorithm is most widely used in on-chip networks due to its lightness and fairness.

II. SYSTEM DESIGN

The proposed project consist of mux tree based round robin scheduler, serialized low-energy transmission coding technique, serial memory, parallel memory and peripheral unit. fig 1 illustrates the block diagram of proposed project.

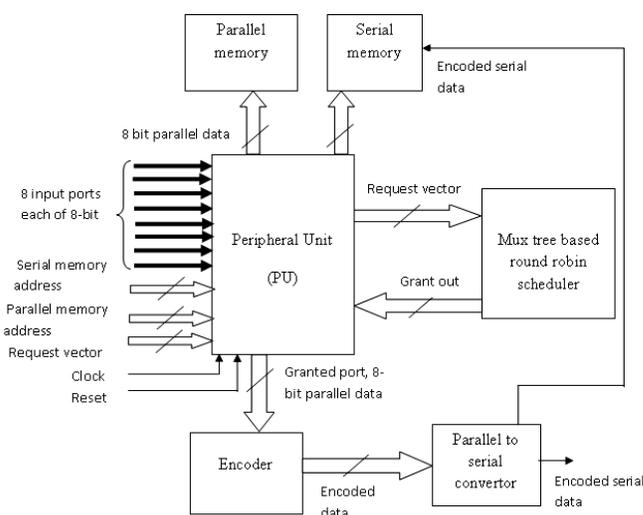


Fig. 1. Block diagram of proposed project

The request vector and eight input-ports are given as an input to the peripheral unit. Peripheral unit take input data of the system and it gives to the respective blocks. Also it provides handshaking signal to the remaining blocks of the system. A request vector is given as an input to the peripheral unit it gives to mux tree based round robin scheduler. The output of scheduler is grant out. Scheduler grants one of the input port if there is multiple input port wants the same output port. The granted input port data is a eight bit parallel data. The granted input port eight bit parallel data is given to the encoder of SILENT coding. The SILENT coding block consists of encoder and serial to parallel converter. The output of encoder is given as an input to the serial to parallel converter. The out of serial to parallel converter is encoded SILENT serial data. The granted input port data is stored in parallel memory at respective given input parallel memory address. Also the encoded serial data is stored at respective given input serial memory address location.

III. MUX TREE BASED ROUND-ROBIN SCHEDULER

The round robin scheduler has rotating pointer that indicates the most recently granted port. A port next to the pointer has the highest priority to be grant. The block diagram of mux tree based round robin scheduler is shown in fig. 2.

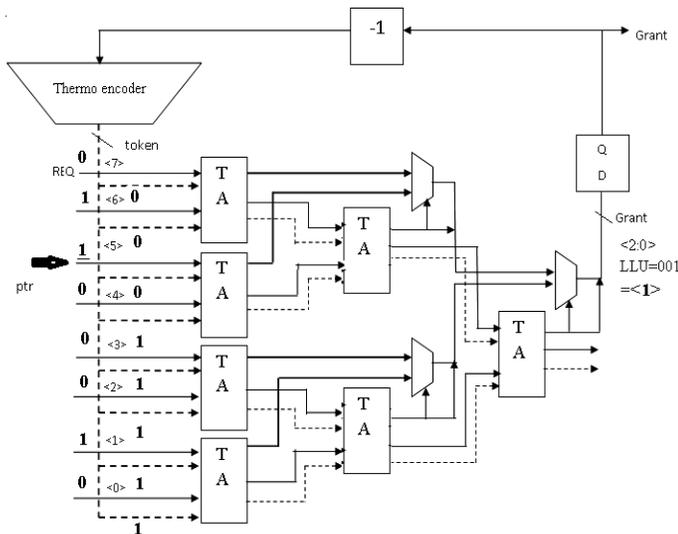


Fig. 2 Block diagram of mux tree based round robin scheduler

TABLE 1
 TINY ARBITER (TA)

Upper		Lower		U or L
RQ	TK	RQ	TK	
0	X	0	X	U
1	X	0	X	U
0	X	1	X	L
1	1	1	0	U
1	0	1	1	L
1	0	1	0	U
1	1	1	1	U

The mux tree based round robin scheduler is design for eight input request, as in the proposed project we are using eight input ports. A request from a port having a token acquires higher priority than others. These request and token vectors are inputs of the binary mux tree which is composed of tiny arbiters (TA) at each node. Each tiny arbiter selects one of two ports, upper one or lower one, based on a table I. The fig. 3 shows the RLT schematic of mux tree based round robin scheduler. For example, request vector<7:0> = 01100010 is shown in Fig. 2 where underline means a current position of the pointer. Then, port<4> has the highest priority and the lower group of port<4:0> has higher priority than upper group of port<7:5>. This information is given by a thermo-encoder whose output becomes token <7:0> = 00011111. Therefore, ports <4:0> have their tokens while ports <7:5> do not. A request from a port having a token acquires higher priority than others. These request and token vectors are inputs of the binary Mux-Tree which is composed of tiny arbiters (TA) at each node. Each TA selects one of two ports, upper one or lower one, based on a table shown in table 1. When both of the two requests have no token or both of them have their tokens, TA selects upper port because the pointer rotates in decreasing order. Then, the TA forwards the winners request and token to its parent node. Then one of two children UorL bits is selected by 2:1 MUX based on their parents UorL bit. The selected child-UorL bit and its parent-UorL bit are concatenated and propagate to its grandparent node. By the successive propagation up to the root node, the granted port number, grant<2:0> is determined finally.

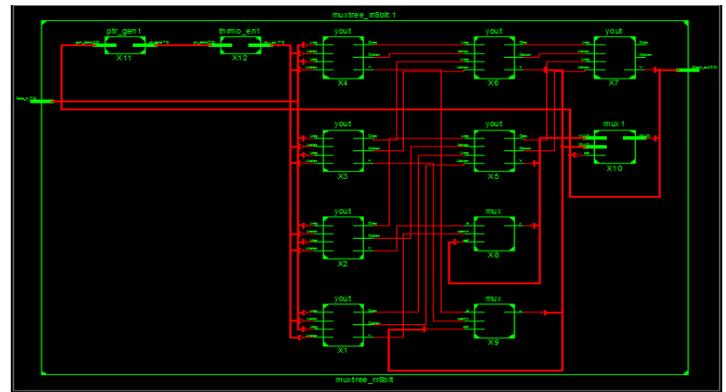


Fig. 3 RTL schematic of mux tree based round robin scheduler



Fig. 4 the input/output waveform of round robin scheduler.

The fig. 4 shows the input/output waveform of round robin scheduler.

IV. LOW ENERGY CODING ON ON-CHIP SERIAL LINK

Many parallel bus coding methods have been proposed to reduce the switching power on the data or address bus between memories and a processor. However, such conventional parallel bus coding methods cannot be employed in the serial bus. Therefore, we propose a serialized low-energy transmission (SILENT) coding technique to minimize the transmission energy on the serial wire by using the data correlation properties. We first introduce Many parallel bus coding methods have been proposed to reduce the switching power on the address or data bus between a processor and memories [5-6]. However, such conventional parallel bus coding methods cannot be employed in the serial bus. Therefore, we propose a serialized low-energy transmission (SILENT) coding technique to minimize the transmission energy on the serial wire.

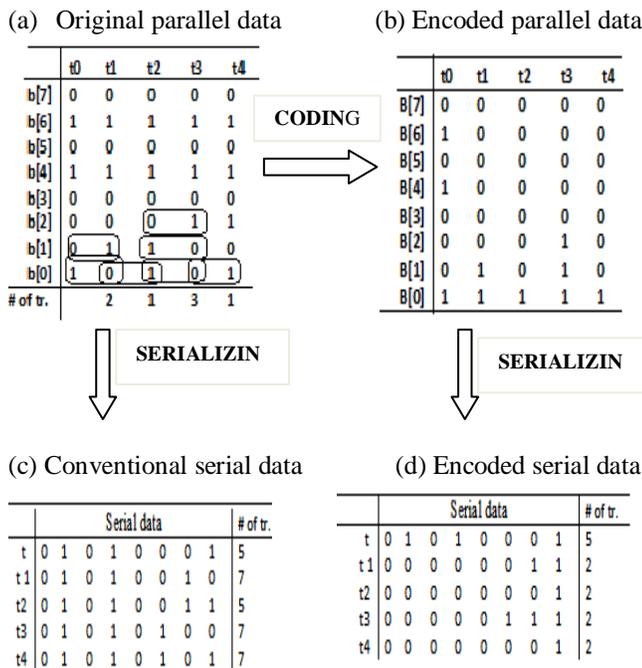


Fig. 5. (a) original data words; (b) encoded data words; (c) conventional serial data with 31 transitions; (d) encoded serial data with 13 transitions.

In serial communication, the switching activity factor of a serial wire is different from that of parallel wires. The difference in activity factor strongly depends on the transacted data patterns. In this coding, only the differences between successive parallel data words are encoded as 1's. The encoding algorithm is expressed as follows:

$b(t) [n-1:0]$: n-bit data word from a sender at time t
 $B(t) [n-1:0]$: n-bit encoded data word at time t

The encoder works as follows:

$$B(t) [i] = b(t)[i] \oplus b(t-1)[i] \quad \text{for } i = 0 \sim n-1 \quad (1)$$

The encoded words, $B(t)$, are equivalent to the displacement or the difference between successive data words. By serializing the encoded data words, the frequency of the appearance of zeros on the wire increases because of the correlation between the successive data words, $b(t)$

Figure 4 shows an example for the advantage of this coding method. All bits from $B[7]$ to $B[3]$ become zeros after these data words are encoded because those bits do not change with time. Serializing these encoded words reduces the number of transitions of the serial wire as shown in Figure 4(d) and the wire looks silent

In this example, a conventional serial wire without the SILENT coding, shown in Figure 4(c), has three times as many transitions from $t+1$ to $t+4$. By reducing the number of transitions on the serial wire, the transmission energy can be saved proportionally. After deserialization at the receiver end, the decoder works as follows:

$$b(t)[i] = B(t)[i] \oplus b(t-1)[i] \quad \text{for } i = 0 \sim n-1 \quad (2)$$

The original data word from a sender unit, $b(t)$, can be recovered by XORing the encoded word, $B(t)$, and a previously decoded word, $b(t-1)$.

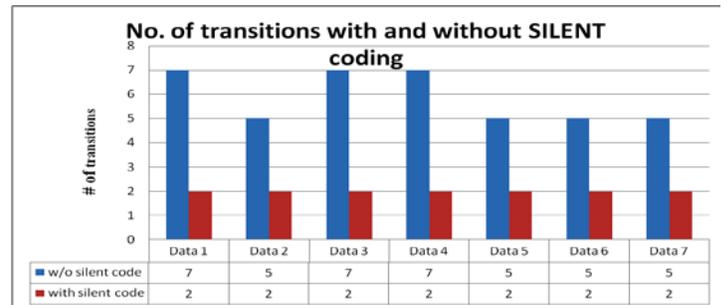


Fig. 6. Number of transitions with and without SILENT coding

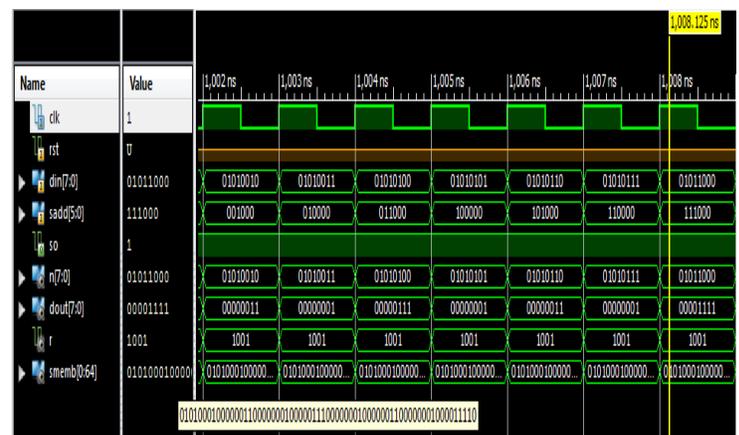


Fig. 7. Input / output waveform of proposed work.

V. CONCLUSION

In this paper, we have proposed a mux tree based round robin scheduler and low-energy on chip serial communications technique for high speed fpga. The on chip serial coding technique reduces the number of transitions on serial wires using the data correlation between successive data words. We show that the coding method saves significant amount of the communication energy by reducing the number of transitions. Mux tree based round robin scheduler is also reducing the power consumption in network layer. We implemented a low power technique for high speed fpga.

ACKNOWLEDGMENT

I would like to express my true sense and sincerest gratitude, to our principal, Dr.S.D.Lokhande, for providing necessary facilities towards carrying out this work. We acknowledge the diligent efforts of our Head of the Department Dr. M.B. Mali for his dynamic and valuable guidance and keep interest in the project and I am grateful to him for his constant encouragement in the project work.

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DEVELOPMENT OF WOUND HEALING HERBAL FORMULATION

“HERBAL WOUND GUARD”

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Abstract The present study was to evaluate the wound healing activity of developed polyherbal formulation in the form of ointment by using hydroalcoholic extracts of leaves of *Ficus religiosa*, *Mentha arvensis* and roots of *Rauwolfia serpentina* with excipients. The phytochemical studies revealed the presence of alkaloids, phytosterol, tannins, flavonoids and protein. The developed polyherbal ointment was examined for wound healing activity in two types of wound models on rats; the excision and incision wound model. The polyherbal formulation was applied once daily until complete healing of wound and it was noted that the period of epithelization significantly ($P < 0.05$) reduced when compared with vehicle control group (15 ± 0.34) which was nearly comparable with standard drug group. The tensile strength of healed wound was significantly increased ($P < 0.05$) as compared to vehicle control group. Hence the developed polyherbal formulation showed significant ($P < 0.05$) wound healing activity as compared to control group. The obtained results were nearly compared with standard drug group betadine ointment in terms of contractibility, wound closure time and tensile strength.

Index Terms- Polyherbal formulation, Ointment, Hydroalcoholic extracts.

I. INTRODUCTION

Wound is a physical trauma where the skin is torn, cut or punctured. On exposure to air, on microorganism enter the wound which leads to wound contamination and finally development of infection¹. Dermal wound is a common pathologic condition and may be defined as any break in the integrity of the skin. It is associated with high degree of morbidity due to blood loss, pain, edema, inflammation and loss of functionality. Cut wound are characterized by migration and proliferation of fibroblasts, endothelial cells, deposition of connective tissue, angiogenesis, re-epithelization and finally contraction of wound². Presently the scientists are keen to evaluate drugs from plant origin. It is due to their specific healing properties, healing action and non-toxic effects. Several plants and their products are used in folk medicine to treat wound, and the plants like Ginseng, Sunflower, Brahmi etc. have been reported to promote the healing³.

The leaves of the *Ficus religiosa* belonging to family Moraceae have purgative properties and are also recommended for wounds and skin infection⁴, anticancer activity⁵, antiulcer activity⁶, anti-diabetic activity⁷. The leaves of *Mentha arvensis*, Lamiaceae

known as “Pudina” acrid, aromatic, thermogenic, stimulant, anodyne, deodorant, antiseptic, vulnerary, anthelmintic, carminative, digestive, stomachic, antiemetic, cardiotoxic, expectorant, diuretics, depurative, dentifrice, antispasmodic, febrifuge and contraceptive. They are useful in vitiated condition of vata, arthralgia, halitosis, indolent ulcers, wounds, cuts, helminthiasis, dyspepsia, flatulence, colic, peptic ulcer, vomiting, diarrhea, cardiac debility, cough, asthma, bronchitis, strangury, skin disease, amenorrhoea, fever and general weakness⁸. It is also have antimicrobial activity⁹, antiulcer activity¹⁰, antifungal activity¹¹, anti-bacterial activity¹². Roots of *Rauwolfia serpentina*, Apocynaceae, are bitter, acrid, laxative, anthelmintic, thermogenic, diuretic and possess sedative properties. It is highly reputed for hypertension and is useful in strangury, fever, wound, colic, insomnia, epilepsy, giddiness, dyspepsia and vitiated conditions of kapha and vata. The decoction of the root is used to increase uterine contractions¹³. Roots of the plant also used as antidiabetic¹⁴ and antiarrhoeal drug¹⁵.

The objective of the present study was to investigate wound healing activity of developed polyherbal formulation in form of suspension by using combined herbal extracts.

II. MATERIALS AND METHODS

Plant Material:

Leaves of *Ficus religiosa*, *Mentha arvensis* and roots of *Rauwolfia serpentina* were procured from local market and same were authenticated by Dr. Seema Bhadhauria, Head of Department of Botany, R.B.S. College, Agra and sample specimen (Voucher No. of the Specimen: RBSC/2014/196) were deposited in the herbarium of the Department of Pharmacognosy, Anand College of Pharmacy, Agra for future reference.

Extraction:

Two hundred gram each, standardized powder of leaves of *Ficus religiosa*, *Mentha arvensis* and roots of *Rauwolfia serpentina* in the ratio of 1:2:1 were subjected to extraction with 60% hydroalcohol by maceration for seven days at room temperature¹⁶. After extraction, the extract was filtered and concentrated at room temperature. The extract was subjected to qualitative chemical tests adopting standard procedure.^{17,18}

Development of Polyherbal Formulation (PHF):

The polyherbal formulation was prepared by using 6% hydroalcoholic extracts as bioactive ingredient and formulated in the form of simple ointment base BP¹⁹. Dissolve above specified quantity of extract in 7.75 ml of water and added remaining ingredients in water and heat the solution to 70 °C in a beaker. Melt the stearyl alcohol and white petrolatum on a hot plate. Heat this mixture to 70 °C. Add the oleaginous phase slowly to the

aqueous phase with constant stirring. Remove from the heat and stir the mixture until it congeals. The ingredients and their quantity were used to prepare formulation or ointment specified in Table I.

Table I: Formula for Formulation

Sr. No.	Name of Ingredients	Quantity in percent	Quantity Taken
1	Hydroalcoholic extract	6%	1.5g
2	Sodium Lauryl Sulphate	1%	0.25g
3	Propylene Glycol	12%	3.0ml
4	Stearyl Alcohol	25%	6.25g
5	White Petrolatum	25%	6.25g
6	Purified Water	31%	7.75ml

Standardization of polyherbal formulation (PHF):

Standardization of developed polyherbal formulation in the form of ointment was done by using different organoleptic characters (color, odor and taste) as well as physicochemical parameters like pH, loss on drying, spreadability, diffusion study, skin irritation study²⁰. The results of the studies were shown in Table II.

pH: The pH of the formulation was recorded by using a digital pH meter of Systronic, Ahmedabad. Weighted quantity of the sample was dissolved in distilled water and stored for two hours. The measurement of pH was done in triplicate and average values were considered.

Spread-ability: The spread ability was expressed in terms of times in seconds taken by two slides to slip off from ointment placed in between the slides under the direction of certain load. Spread ability was calculated by using the formula.

$$S = (M \times L \div T)$$

Where,

- S=Spreadability
- M=Weight tied to upper slide
- L=Length of glass slides
- T=Time taken to separate the slide

Diffusion study:

The diffusion study was carried by preparing agar nutrient medium of known concentration. It was poured into a petridish and allowed to set. A hole was bored at the center of the petridish and the prepared formulation was placed in it. The time taken for the ointment to get diffused was noted.

Skin irritation study:

Healthy rabbits were selected and were shaved in two different areas of the dorsal side, each about 500mm. The rabbit was kept in rabbit holder and the first area was kept as control, to which emulsifying ointment base was applied, the second area was treated with polyherbal ointment. After 48 hrs the skin was observed and compared with control.

Table II: Physicochemical properties of the formulation

Sr. No.	Physicochemical parameters	Formulation
1	Color	Light skin color

2	Odor	Sweetish with bitter characteristic
3	Loss on drying	9.6 % w/w
4	pH	7.0
5	Spreadability (seconds)	18
6	Diffusion study	0.68 cm
7	Skin irritation study	No skin irritation was observed

CHROMATOGRAPHY STUDIES:

Chromatography study through Thin Layer Chromatography was done to evaluate the developed formulation for the presence of different chemical constituents which is responsible for wound healing activity and compare it with extracts. The obtained results were shown in Figure 1 and Table III.

Experimental condition:

TLC glass plate: Silica gel G
Solvent system: Chloroform: Acetone (9.5: 0.5)

Figure 1: Thin Layer Chromatography Profile of Extract and Formulation

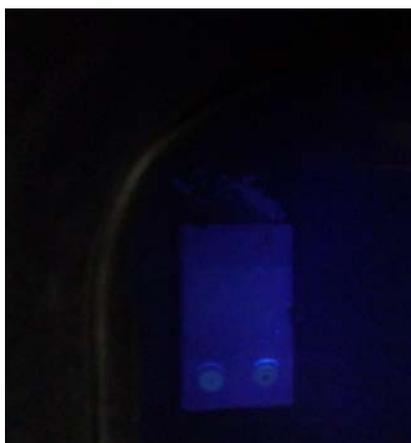


Table III: Results of TLC Profile of Extracts and Formulation

Name of compounds	Rf values	Presence possibility	of Standard of Rf values

		compounds	
1.Extracts and Formulation	0.285	Myrecetin hexaacetate	0.1
		Dimethoxycinnamic acid	0.20
		Trimethoxycinnamic acid	0.30
		Catechin Penta acetate	0.40
		Khellin	

STABILITIES STUDIES:

The purpose of it to find out the quality of product during storage at Room temperature, 4 °C and 45 °C due to environmental factor’s effect.

Method:

The formulation means ointment was packed in white colored glass bottle, which are tightly capped. They were then stored for three months and evaluated for various parameters at Room temperature, 4 °C and 45 °C. The obtained results were shown in Table IV.

Table IV: Stability data of the formulation (Ointment)

S r. No	Mo nth	Temper ature	Physic al appearance	p H	Spreada bility
1	1 st	4 °C	Skin color	6.9	13
		RT	Skin color	6.9	13
		45 °C	Skin color	6.9	13
2	2 nd	4 °C	Skin color	6.7	19
		RT	Skin color	6.7	15
		45 °C	Skin color	6.7	13
3	3 rd	4 °C	Skin color	6.6	19
		RT	Skin color	5.6	16
		45 °C	Skin color	6.6	20

WOUND HEALING ACTIVITY:

Toxicity studies:

Toxicity studies were done as per the Organization for Economic Co-operation and Development (OECD), revised 423 guidelines²¹. Albino mice were kept overnight fasting prior to extract administered in suspension form. A total 6 animals of two groups three in each group received formulation from 300 mg/kg to 2000 mg/kg body weight. After each administration of dose food was withheld for further 3-4 hours. Animals were observed individually daily for a period of 14 days. Based on these studies the doses were selected for the evaluation of wound healing activities. The LD₅₀ of the extracts falls under the class for values with no signs of acute toxicity till 2000 mg/kg body weight, so that 1/10th was taken as effective therapeutic doses for

formulation. The selected doses for formulation were 200 mg/kg body weight.

Administrations:

Experimental animals were grouped into three, six each and were treated as follow. Group I treated with simple petroleum jelly (Vaseline) served as control or vehicle control group, Group II rats were treated with standard drug betadine serve as positive control or standard group, Group III animals treated with polyherbal formulation (PHF) in the form of ointment serve as treatment or formulation group.

Excision wound model:

An impression was made on the dorsal thoracic region 1cm away from the vertebral column and 5 cm away from the ear of the anesthetized rat. Skin was excised to full thickness to obtain a wound area of about 500 mm². The ointment was applied once daily until complete healing of wound and the wound area was measured on a millimeter scale graph paper on alternate days. The percentage of wound healing was calculated. Falling of scar was taken as the endpoint for complete epithelization and the day taken for this was considered as period of epithelization²¹. The obtained results were shown in Table V.

Incision wound model:

Two paravertebral straight incisions of 6 cm were made on either sides of the vertebral column. Homeostasis was achieved by blotting the wound with a cotton swab dipped in saline and the wound was closed by means of interrupted sutures at equidistance 1 cm apart. Animals were treated daily with formulation, as mentioned above under excision wound model from initial days to 14th post wounding day. The tensile strength in each group is determined on the 15th day by continuous, constant water flow²⁰. The results were shown in Table VI.

Statistical analysis:

Data were analysed using Graphpad Prism Software version 2.01 (GraphPad Software, La Jolla, USA). All the values were expressed as mean ± standard error of mean (SEM). The significance of difference between two groups for antidiarrhoeal activity was analysed using one-way analysis of variance (ANOVA) followed by post hoc Dunnet’s tests. For statistical analysis, P < 0.001 was considered statistically significant.

III. RESULTS

Preliminary phytochemical screening of hydroalcoholic extracts:

The hydroalcoholic extracts was subjected to qualitative method of preliminary phytochemical analysis that showed the presence of tannins, saponins, flavonoids, triterpenoid, alkaloids, glycosides and carbohydrates.

Wound healing activity:

In excision wound model, the fifty percent closure of wound area for the polyherbal ointment was found to be 5.2 ± 0.17, increase significantly (P < 0.05; F=80) when compared with vehicle control group (8.0 ± 0.90) as well as standard drug group(P < 0.05; F=73.84). The obtained data showed that the rate of wound contraction was significantly higher in the animals treated with developed formulation when compared with vehicle control and it was nearly comparable with standard drug group. The ointment exhibited significantly decreased (P < 0.01, P < 0.05; F=0.161) period of epithelization compared to control group.

Table V: Effect of the polyherbal formulation in excision wound models

Sr. No.	Name of groups	50% wound contraction in days	Periods of epithelization in days
1	Control	8.0±0.90	15.0±0.34
2	Standard	4.6±0.98	9.0±0.98**
3	Formulation	5.2±0.17	11±0.15**

All values are mean ± SEM, n=6,*p<0.05 indicates significant compared to the control.

In incision wound model, significantly increase in tensile strength of healed wounds of polyherbal ointment 298 ± 7.90 when compared with vehicle group 200 ± 9.19 and this results was nearly compare with standard drug group 345 ± 6.89.

Table VI: Effects of the polyherbal formulation in excision wound model

Sr No.	Name of groups	Tensile strength
1	Control	200±9.19
2	Standard	345±6.89
3	Formulation	298±7.90**

All values are mean ± SEM, n=6,*p<0.05 indicates significant compared to the control.

IV. DISCUSSION

Wound healing is a complex process. That involves a chain of biochemical and cellular processes. These processes are mainly classified into three phases- inflammation, proliferation and remodeling. The inflammatory cells promote migration and proliferation of endothelial cells, leading to neovascularization. The proliferative phase is characterized by angiogenesis, collagen deposition, granulation tissue formation, epithelization and wound contraction. Finally the fibroblasts grow and form extracellular matrix as part of tissue remodelin²². Healing is delayed and the ability to accelerate the wound healing is highly desirable¹⁹.

In the present study the phytochemical investigation of extracts showed the presence of triterpenoids, saponins, alkaloids, carbohydrates and flavonoids. The literature survey reveals the presence of several phytocostituents like tritepenoids, saponins, alkaloids and flavonoids are known to promote wound healing process due to their antioxidant, anti microbial activities²³ and astringent property²⁴. Furthermore the wound healing effect can be attributed to free radical scavenging activity of flavonoids and triterpenoids. Both these type of phytoconstituents are known to reduce lipid peroxidation, not only by preventing or slowing the onset of cell necrosis, but also improving vascularity. Hence any drug that inhibits lipid peroxidation is believed to increase the viability of collagen fibrils, which in turn results in increase in the strength of collagen fiber by increasing the circulation, preventing the cell damage and promoting the DNA synthesis²⁵. The increase in tensile strength may be due to the promotion of collagen formation which significantly contributes to better and effective healing.

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Constructivism in Science Classroom: Why and How

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Abstract- Constructivism is buzz word widely used in paradigm of teaching-learning. Constructivism emphasises how the learner constructs knowledge from experience, which is unique to each individual. In the present paper the areas of discussion are 1) historical background of constructivism and its importance. 2) Role of mentor and learner in constructivist science classroom. 3) An attempt is made to prepare a lesson plan for science teachers based on 5E's model (one of the model of constructivism) on the topic 'Images formed by concave lenses'. This sample lesson plan will facilitate the science teachers in the implementation of constructivism in their classroom.

Index Terms- Constructivism, 5Es Model, Learning of science

I. INTRODUCTION

As long as there were people asking each other questions, we have had constructivist classrooms. Constructivism, the study of learning, is about how we all make sense of our world, and that rally has not changed. - Jacqueline Gernnan Brooks

Constructivist approach in teaching at all levels of school is needed because the conventional pedagogical practices of teaching emphasize learning of answers more than exploration of questions, memory at the expense of critical thought, bits and pieces of information instead of understanding the context, reading in lieu of doing i.e. not efficient to achieve the objectives of teaching science as prescribed in NCF-2005. The conventional teaching-learning methods used in schools especially in science classroom encourages the students to memorize knowledge generally in the form of laws, formulae or theories and enforces them to reproduce as such in the examination. Thus, there are very less scope for learner for insightful learning and develop skills like problem solving and reflective thinking. Learning in constructivism framework contributes to intellectual, social and psychological development of learners to transmit it in different context (Kim 2006). A constructivist classroom provides opportunities to observe, work, explore, interact, raise question enquiry and share their expectation to all (Kumar and Gupta, 2009). Later in 20011, R.K. Nayak & H.K. Senapaty were conducted a study to find out the effect of constructivist approach in fostering creativity of primary school children and found that this approach is more effective than traditional instruction in promoting creativity and enhancing interest of students in mathematics. As earlier knowledge is considered as objective and inert facts or information the epistemology of Constructivism is a different. According to this emerging philosophy knowledge is subjective, contextual and pluralistic in nature, which is actively constructed by the learner in meaning making process in their social and cultural context. Therefore, in constructive science classroom provide ample opportunities for the students to

learn science as according to nature of science. M.Cakir also suggests that misconception among students can be resolved under constructivist approach. The constructivist approach had positive impact in improving the achievement in science, science process skills, and scientific attitude among VIII standard students (Sridevi, K.V., 2008). In fact traditional classroom also have constructive approach when it provide chance to students/learner to active participation in construction and reconstruction of knowledge. Dogra. B. (2010) discovered the different activities like concept mapping, T-chart etc. that can be used to design constructivist classroom for biology learning. He also emphasised that group discussion and brain storming play a significant role in constructivist classes. From discussion of above mentioned findings of researches (Miha Lee 2006, Dogra. B. 2010, Sridevi, K.V. 2008, , R.K. Nayak & H.K. Senapaty 2009) it can be infer that constructivism has very significant positive role in pedagogy of science teaching which can develop problem solving abilities, critical and reflective thinking, promoting creativity and scientific attitude among the students.

In the following sections of the article we will discuss first the concept of constructivism and historical background of it. Next, we will discuss role of mentors and students in constructivist science classroom. Lastly, we will discuss one of the constructivist model and its application in science classroom teaching. Further we will conclude by summarizing main point of the article.

II. CONSTRUCTIVISM

“Meaning is not given to us in our encounters, but it is given by us, constructed by us, each in our own way, according to how our understanding is currently organized”.

(Duckworth ,1987)

Constructivism is a theory of how the learner constructs knowledge from experience, which is unique to each individual. Constructivism according to Piaget (1971) is a system of explanations of how learners as individuals adapt and refine knowledge. Constructivism is relatively a new paradigm which is based on the assumption that knowledge is subjective, contextual and inherently partial. It loudly denied the traditional objectivist view of knowledge. The traditional teaching-learning practices which are based on *Objectivism*, represent knowledge as authoritarian and certain, whereas constructivism focuses on the resilience of learner beliefs and social construction of reality. Constructivism represents a paradigm shift from behaviourism to cognitive theory. Behaviourist's epistemology focuses on intelligence, domains of objectives, levels of knowledge, and

reinforcement. While the Constructivist epistemology assumes that learners construct their own knowledge on the basis of interaction with their environment. Four epistemological assumptions are at the heart of what we refer to as "constructivist learning." The first one is, knowledge is physically constructed by learners who are involved in active learning. Second is knowledge is symbolically constructed by learners who are making their own representations of action; Knowledge is socially constructed by learners who convey their meaning making to others; and last one is, Knowledge is theoretically constructed by learners who try to explain things they don't completely understand.

III. HISTORICAL BACKGROUND OF CONSTRUCTIVISM

The concept of constructivism has roots in classical antiquity, going back to Socrates's dialogues with his followers, in which he asked directed questions that led his students to realize for themselves the weaknesses in their thinking. The Socratic dialogue is still an important tool in the way constructivist educators assess their students' learning and plan new learning experiences but it became an emerging philosophy of 21st century. Jean Piaget, David Ausubel, Bruner and Lev Vygostky had very significant role in foundation of this philosophy. Jean Piaget, who is considered as a founder of individual constructivism, believed that learning is strongly influenced by learner's developmental stages. Later philosopher considered that knowledge is acquired through social interaction. Learner is subsequently move from definite stages of physical, intellectual, emotional and social development and each stage is associated with specific learning experiences which determine what learner can learn with those experiences and up to what extent. Dewey and later, Vygotsky, recognized that the construction of knowledge was rooted in group context (Oxford, 1997). Vygotsky believed that learning is social in nature, which employs that learning occur via interaction with other people i.e., interaction among learners or peer group and also with teacher. During this interactive process, meaning is shared and information is exchanged and provides opportunity to learner to compare, examined and redefine his/her knowledge with knowledge and understanding of other group members. All these learning theory drastically change the **concept of learner** who was considered as "**subject**" by behaviorist psychologist into "**active participant**" of learning activity who can controlled their own learning by active meaning making process. Modern educators who have studied, written about, and practiced constructivist approaches to education include **John D. Bransford**, **Ernst von Glasersfeld**, **Eleanor Duckworth**, **George Forman**, **Roger Schank**, **Jacqueline Grennon Brooks**, and **Martin G. Brooks**.

IV. ROLE OF MENTOR AND LEARNER IN CONSTRUCTIVIST SCIENCE CLASSROOM

There is paradigm shift in traditional role of teacher as well as students in constructivist science classroom. The teaching methods used in traditional classroom is based on objectivist view of knowledge which is grounded on the assumption that

knowledge is objective, universal and complete and can be transfer from head of teacher to the head of students. While in constructivist classroom role of teacher is shifts from *transmitter* of knowledge to *facilitator* of knowledge construction and role of students changes from *knowledge gainer* to *knowledge constructor*. Classroom environment is not 'authoritarian' where supreme power is vested in the teacher who is considered as expert of knowledge and his duty is to pours knowledge into passive students, who wait like empty vessel to be filled. In this approach classroom environment is much more democratic, students are encourage to ask questions, his/her ideas and previous knowledge is respectfully invited and carefully listen by the teacher. Teacher provides opportunities to learner to discuss and shared their ideas freely to each other, probing, doing own experiments and other problem solving activities. National curriculum framework (2005) also recommends that curriculum should help learner to become constructor of knowledge and emphasises the active role of teachers in relation to process of knowledge construction by engaging the learner in process of learning through well-chosen tasks and questions. In the words of Brooks & Brooks (1999) 'In a constructivist classroom, the teacher searches for student's understanding of the concepts and then structures opportunities for students to refine or revise these understandings by posing contradictions, presenting new information, asking questions, encoring research, and/or engaging students in inquired designed to challenge current concepts.'" Thus in constructivist science classroom, the teacher is not the sage on the stage but *mentor* or *guide* on side of students, who not provide instruction to passive students but designing learning situations for the active learner of science.

There are ten basic guiding principles of constructivist thinking that educators must keep in mind: 1) learning is an active process in which the student constructs meaning, 2) People learn to learn 3) Learning involves language 4) Learning is a social activity 5) Learning is contextual 6) The act of constructing meaning is mental 7) Everyone needs knowledge to learn 8) Learning is not the passive acceptance of knowledge it takes work 9) Motivation is a major aspect of learning and 10) It takes time to learn.

V. CONSTRUCTIVIST MODELS

In the early 1960's, Robert Karplus proposed a teaching/learning model for instruction based upon the work of Piaget which represented a systematic application of psychology to science education materials. There are several constructivist models available that can be used for designing the proper learning experiences to the students. The 5 E's model proposed by Roger Bybee can be conveniently implemented in science classroom. This model was developed under the Biological Science Curriculum Study (BSCS) project. The 5 'Es' employs for Engage, Explore, Explain, Elaborate and Evaluate. The each of the 5 E's describes a phase of learning, and these five "E"s can be further explain as:

Engage: This phase creates a connection between previous and present learning experiences and anticipate activities that focus students' thinking on the learning outcomes of current activities. Students should become mentally engaged in the concept, process, or skill to be learned. Here, the role of the

teacher is to present the situation and identify the instructional task.

Explore:In this phase teacher designed some learning activities so that students have common, concrete experience upon which they continue building concepts, processes, and skills. Engagement brings about disequilibrium; exploration initiates the process of restoring equilibrium. The aim of this phase is to establish experiences that teachers and students can use later for formal introduction and discussion of concepts, processes, or skills.

Explain: This phase of the 5 E's helps students for explaining the concepts they have been explored in previous step. Here, the teacher tries to focus student attention to specific aspects of the engagement and exploration experiences. The key to this phase is to present concepts, processes, or skills briefly, simply, clearly, and directly and move on to the next phase.

Elaborate: This phase of the 5 E's extends students' conceptual understanding and allows them to practice skills and behaviours.

Evaluate: This is the last phase of the 5 E's encourages learners to assess their understanding and abilities and lets teachers evaluate students' understanding of key concepts and skill development.

VI. IMPLEMENTATION OF 5ES MODEL OF CONSTRUCTIVISM IN SCIENCE CLASSROOM

The authors make an attempt to develop a systematic framework/ a draft of lesson plan on 5E model for seven standard students on the topic **“Images formed by concave mirror”** as follows:

Content Area: Science
Grade Level: VII Grade
Topic: Images formed by Concave Mirror

- Objectives:**
- i. Students will observe the images formed by concave mirror.
 - ii. Students will understand the difference between real and virtual images.
 - iii. Students will demonstrate the process of image formation by concave mirror.

Key Idea: children are familiar with the different type of mirrors and enjoy the images formed in them.

Performance Indicator: students will observe and then demonstrate the real, inverted and enlarge images is formed by concave lens.

PHASES	WHAT TEACHER WILL DO	WHAT STUDENT WILL DO
I. ENGAGE	Teacher will provide different kind of mirrors to the students who are already divided into group of 4-5. Teacher asked students to write what differences they observed when they look there face in different type of mirrors. Now, the teacher will performed experiment with concave mirror, candle and needle point to each group asked them to observe the images of candle and needle point by altering the distance between mirror and candle.	Students observed differ type of mirror and enjoy to see their images in it. They became curious while writing their experience and try to find answer of question why did this happen? Students will carefully observe the experiment performed by the teacher and the images formed in the mirror.
I. EXPLORE	Teacher asked to repeat the same experiment as he/she already demonstrated. Teacher provides a cardboard to each group asked them to observe the images of candle on it.	Student will enjoy the activity and discuss on it in their respective group. Then they record their observations and ideas.
II. EXPLAIN	Teacher will asked each group to explain what they observed during experiment. Teacher asked probing questions for the justification of real and virtual images.	The students carefully listen each other observation and explanations about the experiment and attempt to redefine his/her own understanding. Students will provide suitable justification on the basis of their activity on images obtain on cardboard.

	Teacher will clarify the concept nature of images formed by concave mirror is real and inverted and erect and virtual.	
III. ELABORATE	Teacher asked for the other examples from day today life where students can observe the same images. Here, he may prompt the students to give correct responses.	Students can give examples of spoon, head lights of vehicles etc.
IV. EVALUATE	Teacher may use group discussion to discuss how and which type of images is formed from concave mirror.	Students during group discussion self evaluate his/her own progress.

VII. CONCLUSION

In modern era, science education is the key component of curriculum. The traditional methods used for teaching science in contemporary Indian science classroom only transact knowledge from the head of teacher to the head of students. Here science is considered only as a body of knowledge and product end is given more importance than the process aspect of science. These conventional methods are not efficient to develop true knowledge and understanding of science and prove futile exercises to inculcates problem solving abilities, critical and reflective thinking among the children. Therefore, there is urgent need to reform our teaching practices in light of recommendations of NCF-2005. In this framework child is viewed as “discover”, who actively construct his knowledge and build his understanding by meaning making process. Hence, the framework advocates the use of constructivism at every stages of science teaching. Many researches evident that constructivism encourages learner to reflect and question their own understanding via active meaning making process. Thus, constructivism is helpful in learning of science in true sense i.e., not only as a body of knowledge but also as process for making sense of surroundings. In this model emphasis is shifted from “teacher” to the “students”. Teacher is no longer behaving as a sage on stage but has to act as “facilitator” of learning. Students are not just a passive gainer of knowledge but became active learner who themselves construct knowledge through experience, observation, documentation, analysis and reflection. Among the different available models on constructivism, the 5Es model developed by Roger Bybee is most conducive among the several available constructivist models. A typical lesson plan based on this 5Es had been frame by the authors that is an attempt towards design learning strategy

for VII standard science classroom may prove helpful in realizing the primary goal of constructivism i.e.; helping students learn how to learn science in the class and outside the class.

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Laparoscopic splenectomy versus open splenectomy for immune thrombocytopenic purpura

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Abstract- Background: Idiopathic thrombocytopenic purpura (ITP) is an acquired disorder in which there is immune-mediated destruction of platelets. ITP is characterized by mucocutaneous bleeding and a low, often very low platelet count with an otherwise normal peripheral blood cells and smear. Patients usually present either with ecchymoses and petechiae or with thrombocytopenia incidentally found on a routine complete blood count (CBC). Mucocutaneous bleeding, such as oral mucosal, gastrointestinal, or heavy menstrual bleeding may be present. Rarely, life threatening including central nervous system bleeding can occur.

Splenectomy was initially described as a therapeutic measure for idiopathic thrombocytopenic purpura (ITP) by Kaznelson in 1916.¹ This procedure remained the only effective treatment for ITP until 1951, when Harrington and colleagues² discovered the role of plasma immunoglobulin in the induction of thrombocytopenia in ITP. Dameshek et al.³ coined the term hypersplenism and demonstrated a rise in platelet counts with the administration of steroids. Since then, medical management has been the primary treatment for ITP. Today, splenectomy is indicated in (1) refractory symptomatic thrombocytopenia after 4 to 6 weeks of medical therapy, (2) when toxic doses of steroids are required to achieve remission, and (3) for relapse of thrombocytopenia after an initial response to steroid therapy.

Methods

- 54 patients underwent splenectomy for ITP in our hospital were included in the study.
- This is a prospective and retrospective study.

-Study period:

Retrospective study from January 2003- March 2012.

Prospective study from April 2012- July 2014.

- Institutional ethical committee clearance was obtained.

Findings

- From our study it is observed that laparoscopic splenectomy for ITP offers following advantages over open splenectomy:
 1. Lesser intraoperative blood loss.
 2. Lesser intraoperative and postoperative platelet and blood transfusion.
 3. Lesser pain and duration of intravenous analgesia
 4. Lesser duration of nil by mouth and early resumption to general normal diet.
 5. Early drain removal

Interpretation

Laparoscopic approach may be considered as a better choice of approach for splenectomy in patients with ITP in view of less intraoperative blood loss, less post operative pain, lesser time to resume to normal diet and better cosmetic value.

Funding

None

I. INTRODUCTION

Idiopathic thrombocytopenic purpura (ITP) is an acquired disorder in which there is immune-mediated destruction of platelets. ITP is characterized by mucocutaneous bleeding and a low, often very low platelet count with an otherwise normal peripheral blood cells and smear. Patients usually present either with ecchymoses and petechiae or with thrombocytopenia incidentally found on a routine complete blood count (CBC). Mucocutaneous bleeding, such as oral mucosal, gastrointestinal, or heavy menstrual bleeding may be present. Rarely, life threatening including central nervous system bleeding can occur. Splenectomy was initially described as a therapeutic measure for idiopathic thrombocytopenic purpura (ITP) by Kaznelson in 1916.¹ This procedure remained the only effective treatment for ITP until 1951, when Harrington and colleagues² discovered the role of plasma immunoglobulin in the induction of thrombocytopenia in ITP. Dameshek et al.³ coined the term hypersplenism and demonstrated a rise in platelet counts with the administration of steroids. Since then, medical management has been the primary treatment for ITP. Today, splenectomy is indicated in (1) refractory symptomatic thrombocytopenia after 4 to 6 weeks of medical therapy, (2) when toxic doses of steroids are required to achieve remission, and (3) for relapse of thrombocytopenia after an initial response to steroid therapy.

Until recently, splenectomy had been performed exclusively as an open surgical procedure. In 1991, Delaitre and Maignien⁴⁻¹⁰ reported the first successful laparoscopic splenectomy (LS). Since then, multiple studies have suggested that LS is effective, feasible, safe, and provides clinical and economic benefits such as shorter hospital stay, less postoperative pain, and fewer complications over open splenectomy (OS). Because laparoscopic splenectomy is associated with less abdominal trauma, operative platelet consumption and therefore need for platelet transfusion may be reduced during laparoscopy compared with open surgery.

II. MATERIALS AND METHODS

- 54 patients underwent splenectomy for ITP in our hospital were included in the study.
- This is a prospective and retrospective study.

-Study period:

Retrospective study from January 2003- March 2012.

Prospective study from April 2012- July 2014.

- Institutional ethical committee clearance was obtained.

- **Inclusion criteria:**

1. All patients who underwent splenectomy for ITP in Kasturba Hospital, Manipal from January 2004 to July 2014.
2. Age >18years.

- **Exclusion criteria**

1. Laparoscopy converted to open splenectomy
2. Age < 18years.
3. Patients undergoing any other surgery concomitantly with laparoscopic/open splenectomy.
4. Patients with co-existing myeloproliferative diseases.

- All patients were referred from medicine department for splenectomy. Medical therapy with steroids and other immunomodulatory agents constituted the initial treatment option. However, when the disease was refractory to medical therapy or the toxicity of the medication was unacceptable, splenectomy was offered.
- Type of procedure (laparoscopic/open splenectomy) was based on the preference of the operating surgeon. All successful laparoscopic splenectomies for ITP, were done by a single surgeon. Open splenectomies were by random surgeons in the department of General surgery.
- Nature of procedure and complications associated with the procedure has been explained to the patient. Outcome of splenectomy for ITP has been explained.
- All patients received immunization against pneumococcus and H. influenza at least 2 weeks before surgery.
- Patients with severe anaemia and very low platelet counts were optimized before surgery either with IVIG and or blood and platelet transfusion, so the platelet count reached at least 10,000/ μ L.
- All clinical and laboratory data were collected from the medical records of the patients.
- Patients were shaved from nipples to mid thigh in night before surgery. Ryles tube was placed in all patients and urinary catheter was placed as per surgeon's choice on the day of surgery under anaesthesia.

- Antibiotic was given at the time of induction of anaesthesia and were continued for 3-5 days depending on the surgeon's choice.
- Intraoperative/postoperative platelet and blood transfusions were given depending on the individual patient's blood loss intraoperatively.
- Postoperative pain was evaluated by using Visual analogue scale (VAS) in the immediate postoperative period usually in the postoperative ICU (0 hours), after 12 hours and 24 hours.
- Nature of parenteral analgesic was of surgeon's choice usually opioid congeners/NSAIDs at the standard dose required. Duration of analgesics was depending on the pain experienced by the patient. Oral analgesics were given as and when required after stopping parenteral analgesics.
- Duration of nil by mouth is calculated from the time patient reaches post operative ICU to the time when patient tolerates liquids usually water. This time is usually 6 hrs for laparoscopic splenectomy group and 24 hrs for open splenectomy group. In case of intolerance to liquids at 6 hrs/ 24 hrs in the respective groups the time at which patient tolerates liquids was taken in to account. Similarly tolerance to general normal diet is calculated.
- Platelet counts were repeated on the following day and subsequently daily till it stabilized.
- Patients were categorized into responders, complete responders and refractory based on the classification described by International Working Group (Vicenza Consensus Conference) in 2009 (mentioned above).
- Patients were discharged once platelet count stabilized in case of responders incase of persistent low platelet counts post surgery which required treatment they were considered refractory and started on immunosuppressants and are evaluated for accessory spleens by sulphur colloid scans/denatured red blood cell scintigraphy.
- Antiplatelets and anticoagulants were started if platelet counts are >10,00,000/ μ L.
- Patients were followed up regularly and frequency depending on the platelet count.
- Most of the patients had to be kept in the ward due to mounting platelet count.
- Abdominal drain was put in all patients and criteria for drain removal was drain out put less then 20ml for 24 hrs.
- Final analysis was made.

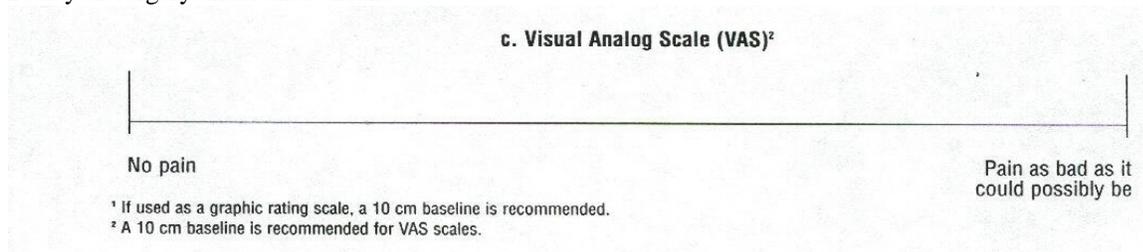
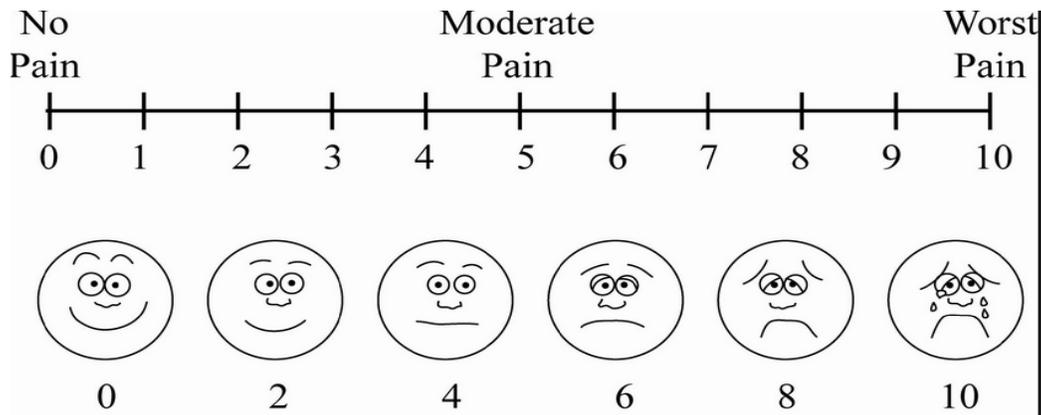


Figure 1: Visual analogue scale



III. OBSERVATIONS AND ANALYSIS

Total 54 patients underwent splenectomy for ITP in the given time period. Laparoscopic splenectomy was attempted in 32 patients and in 4 patients procedure had to be converted in to open splenectomy due to varied reasons. Hence, those 4 patients were excluded in the analysis.

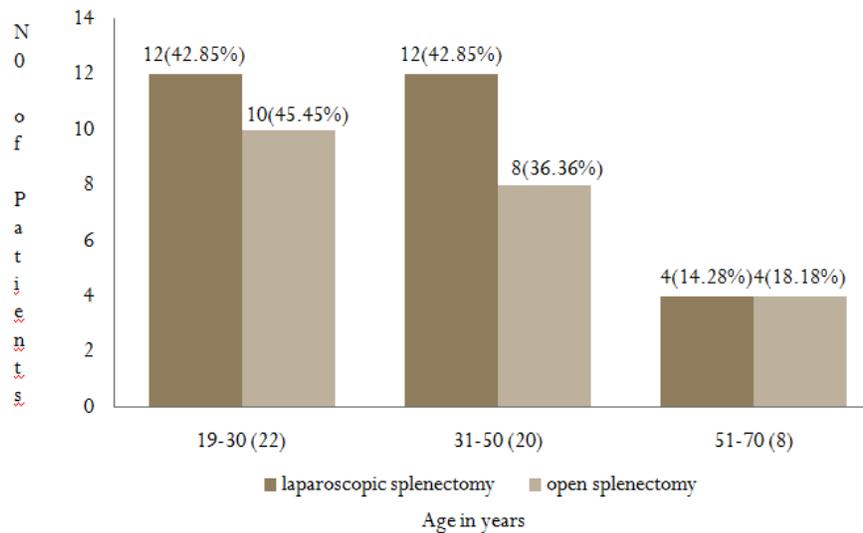
- **Laparoscopic splenectomy group:**

- 28 patients underwent laparoscopic splenectomy and were followed up within a range of 1-60 months.

- **Open splenectomy group:**

- 22 patients underwent open splenectomy and were followed up within a range of 2-40 months.

Patient's parameters:



- **Age distribution**

- In this study, the range of age in laparoscopic splenectomy group is 19-57 years with mean age of 34.36 years (SD =1.16). Range of age in open splenectomy group is 19-66 years with mean age of

36.77 years (SD = 1.39). p value is 0.507 which is statistically not significant.

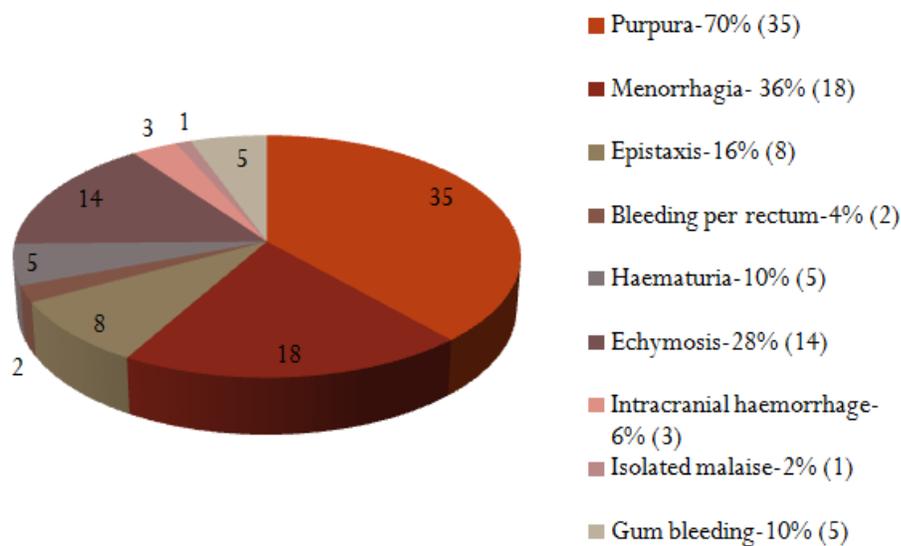
- Maximum number of patients are within 19-30 years.

- **Sex distribution**

Study group	Males	females	Ratio
Laparoscopic splenectomy (28)	5	23	1:4.6
Open splenectomy (22)	8	14	1:1.75
Total (50)	13	37	1:2.85

- In this study, 5/28 patients were males and 23/28 patients were females in the laparoscopy group with a ratio of 1:4.6. In open splenectomy group 8/22 patients

were males and 14/22 patients were females with a ratio of 1:1.75.



○ **Chief complaints**

- Majority of the patients in the study had purpura 35 (70%) followed by menorrhagia in 18 (36%) patients, epistaxis in 8 (16%) patients, bleeding per rectum in 2 (4%) patients, haematuria in 5 (10%) patients,

ecchymosis in 14 (28%) patients and 5 (10%) patients presented with bleeding gums.

- Interestingly 3 (6%) patients presented with intracranial haemorrhage, 1 (2%) presented with isolated generalized weakness without any other complaints.

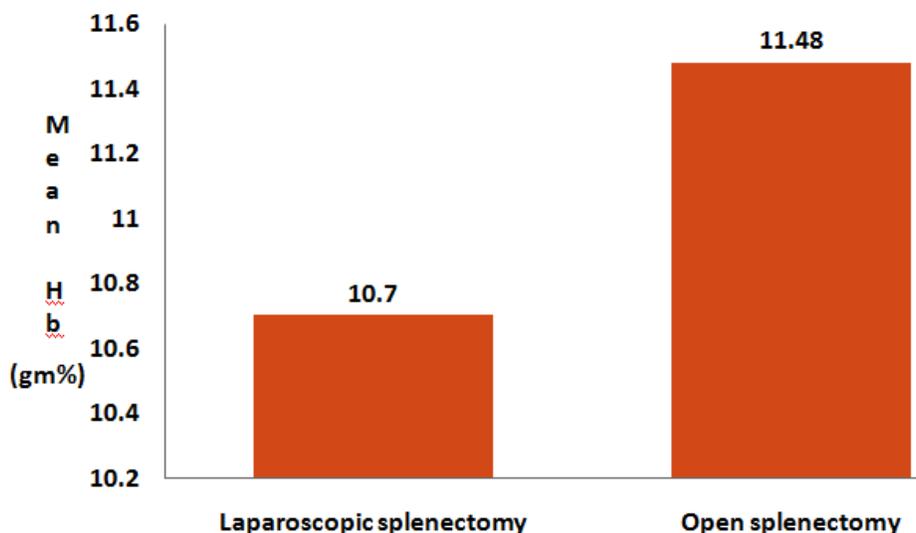
Preoperative platelet count	Laparoscopic splenectomy	Open splenectomy	p value
Mean (per μL)	31178 (SD=29298)	25209 (SD=27118)	0.465
Range (per μL)	2000-100000	3000-116000	-

○ **Preoperative platelet count**

- The mean preoperative platelet count in laparoscopic splenectomy group is 31178 (SD=29298) per μL and is

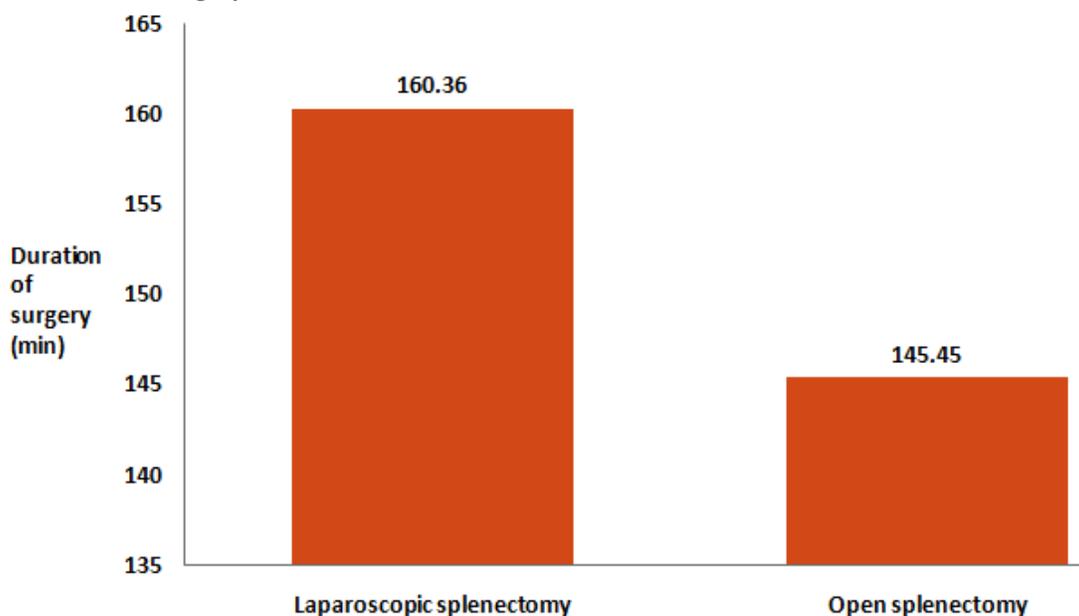
open splenectomy group is 25209(SD=27118) per μL . p value is 0.465 which is statistically not significant.

○ **Preoperative Haemoglobin**



- The mean preoperative haemoglobin in laparoscopy group is 10.7gm% and in open splenectomy group is 11.48gm%. p value is 0.207 which is statistically not significant.

o **Duration of surgery**



- Mean duration of surgery in the laparoscopic splenectomy group is 160.36 (SD=50.95) and in open splenectomy group is 145.45 (SD=41.60). p value is 0.99 and is statistically not significant.
- The mean duration of surgery in the prospective group ie., 15 patients in laparoscopic splenectomy group and 7 patients in open splenectomy group is 125.4 min(SD=30.4) and 110.6 min (SD=27.5) respectively. P value is 0.97 and is statistically not significant.

- Intraoperative blood loss**

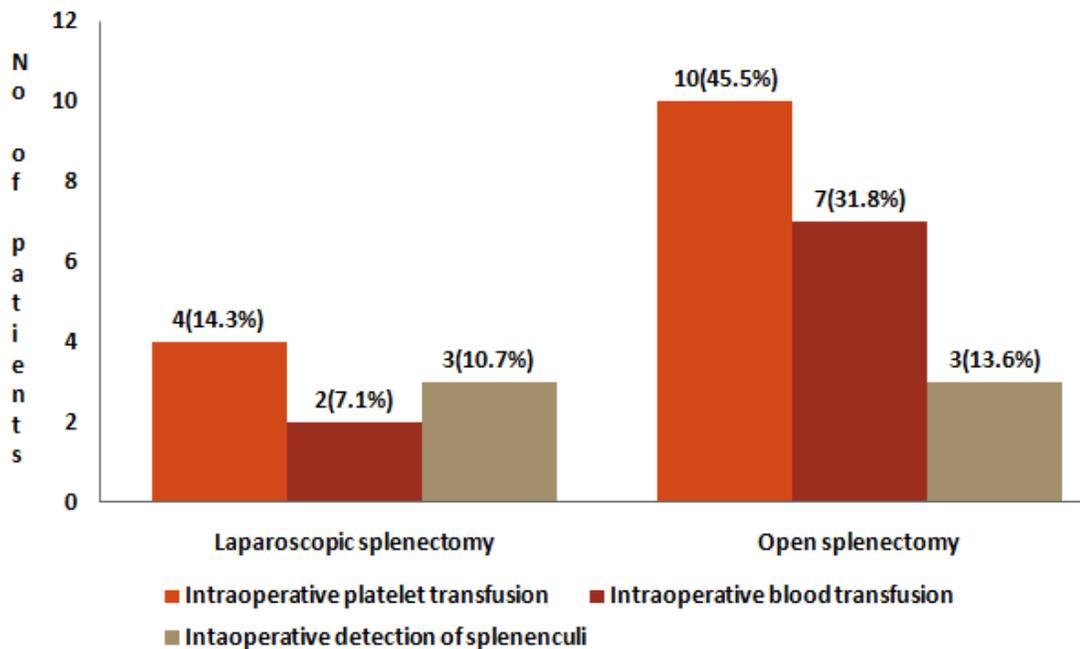
Intra operative blood loss (ml)	Laparoscopy splenectomy	Open splenectomy	p value
Mean	130.6(SD=379.5)	450 (SD=287.2)	0.001
Range	15-1500	100-1000	

Intraoperative blood loss was quantified in 15 patients in laparoscopic group 7 patients in open splenectomy group (prospective group of patients). The mean blood loss in laparoscopic splenectomy group is 130.6ml (SD=379.5) and 450ml (SD=287.2) in open splenectomy group. p value is 0.001 and is statistically significant.

• **Intraoperative platelet/blood transfusion and intraoperative detection of splenenculi**

	Laparoscopic splenectomy	Open splenectomy	p value
Intraoperative platelet transfusion	4 (14.3%)	10 (45.5%)	0.015
Intraoperative blood transfusion	2 (7.1%)	7 (31.8%)	0.032
Intraoperative detection splenenculi	3 (10.7%)	3 (13.6%)	1

○ **Intraoperative platelet/blood transfusion and intraoperative detection of splenenculi**

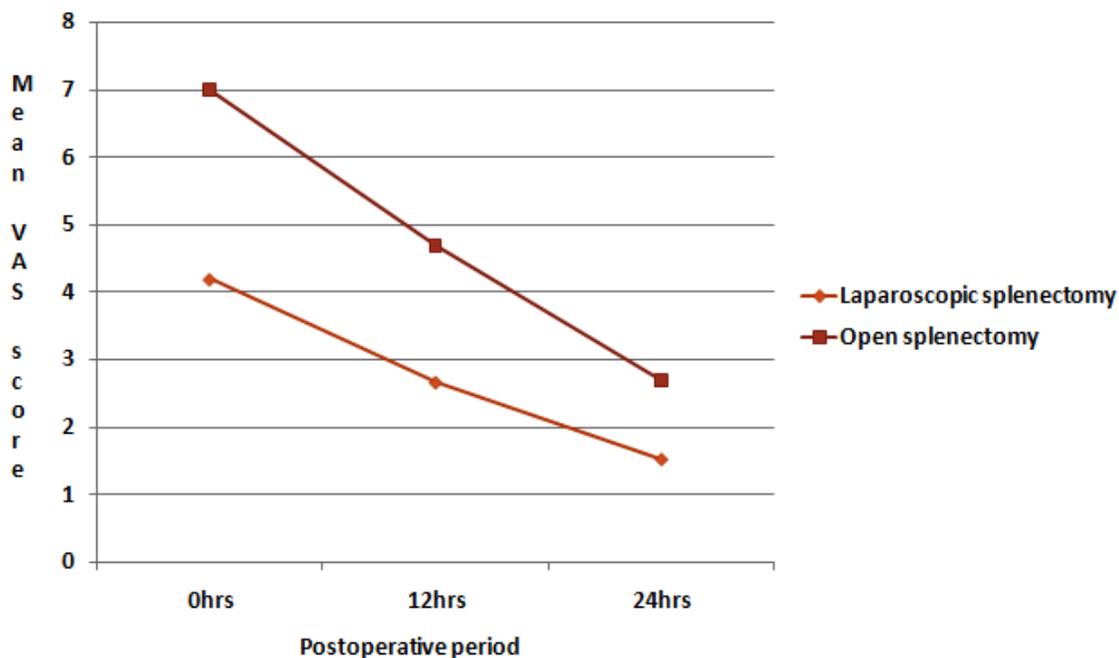


- Intraoperatively 4 (14.3%) patients in the laparoscopy group and 10 (45.5%) in the open splenectomy group required platelet transfusion. p value is 0.015 which is statistically significant.
- Intraoperatively 2 (7.1%) patients in the laparoscopy group and 7 (31.8%) in the open splenectomy group

required blood (packed red blood cells) transfusion. p value is 0.032 which is statistically significant.

- Intraoperatively 3 (10.7%) patients in the laparoscopy group and 3 (13.6%) in the open splenectomy splenenculi were detected. p value is 1 which is statistically not significant.

Postoperative pain



- VAS score could be calculated in 15 patients who underwent laparoscopic splenectomy and in 7 patients who underwent open splenectomy at 0hrs, 12hrs and 24 hrs post surgery.
- At 0hours post surgery mean VAS score was 4.20 (SD=0.77) in 15 patients under laparoscopic splenectomy group and 7.01 (SD=0.90) in 7 patients who underwent open splenectomy group. p value is 0.001 which is statistically significant.
- At 12hours post surgery mean VAS score was 2.67 (SD=0.81) in 15 patients under laparoscopic

- splenectomy group and 4.71 (SD=0.75) in 7 patients who underwent open splenectomy group. p value is 0.001 which is statistically significant.
- At 24hours post surgery mean VAS score was 1.53 (SD=0.51) in 15 patients under laparoscopic splenectomy group and 2.71 (SD=0.75) in 7 patients who underwent open splenectomy group. p value is 0.005 which is statistically significant.
- **Duration of parenteral analgesia**

Duration of parenteral analgesia	Laparoscopic splenectomy	Open splenectomy	p value
Mean (days)	1.32 (SD=0.66)	3.63 (SD=0.72)	0.001
Range (days)	1-3	2-6	-

- The mean duration of parenteral analgesia use in laparoscopic splenectomy group is 1.32 (SD=0.66) and
- **Duration of nil by mouth**

in open splenectomy group is 3.63 (SD=0.72). p value is 0.001 which is statistically significant.

	Laparoscopic splenectomy	Open splenectomy	p value
Mean duration of nil by mouth (hours)	7.50 (SD=4.79)	22.91 (SD=7.32)	<u>0.001</u>
Range of duration of nil by mouth (hours)	(6-24)	(12-48)	-

- The mean duration of nil by mouth in the laparoscopic splenectomy group is 7.50 (SD=4.79) hours and in open

splenectomy group is 22.91 (SD=7.32) hours. p value is 0.001 which is statistically significant.

Postoperative platelet/blood transfusion

	Laparoscopic splenectomy	Open splenectomy	p value
Post operative platelet transfusion	1 (3.6%)	5 (22.7%)	<u>0.039</u>
Post operative blood transfusion	0 (0%)	5 (22.7%)	<u>0.008</u>

- In laparoscopic splenectomy group 1 (3.6%) patient required postoperative platelet transfusion and in open splenectomy group 5 (22.7%) patients required the same. p value is 0.039 which is not statistically significant.

- In laparoscopic splenectomy group none required postoperative blood transfusion and in open splenectomy group 5 (22.7%) patients required the same. p value is 0.012, which is statistically significant.

o Complications

Complication	Laparoscopic splenectomy	Open splenectomy	p value
Surgical site infection	1 (3.6%)	4 (18.2%)	0.15
Wound gaping	1 (3.6%)	3 (13.6%)	0.31
Postoperative pneumonia	1 (3.6%)	1 (4.5%)	1
Postoperative pleural effusion	1 (3.6%)	2 (9.1%)	0.57
Postoperative haemorrhage	0 (0%)	1 (4.5%)	0.44
Left subphrenic collection	1 (3.6%)	2 (9.1%)	0.57
Pancreatic injury	0 (0%)	0 (0%)	-
Portal vein thrombosis	1 (3.6%)	0 (0%)	0.44
Death	0 (0%)	0 (0%)	-
Total	6	13	0.078

- In this study surgical site infection was noted in 1 (3.6%) patient in the laparoscopy group and 4 (18.2%) patients in open splenectomy group.

- 1 (3.6%) patient in laparoscopy group and 3 (13.6%) patients in open splenectomy group developed wound gaping.

- 1 (3.6%) patient in laparoscopic splenectomy group and 1 (4.5%) patient in open splenectomy group developed post operative pneumonia.
- 1 (3.6%) patient in laparoscopic splenectomy group and 2 (9.1%) patients in open splenectomy group developed post operative pleural effusion and left subphrenic collection.
- 1 (4.5%) patient in open splenectomy group developed post operative haemorrhage.
- Among one patient who developed left subphrenic collection in laparoscopic splenectomy group had developed gastrocutaneous fistula due to an iatrogenic gastric injury during pig tail drain insertion. Food particles were noted in the drain and on performing upper gastro-intestinal endoscopy pig tail drain tip was seen inside the stomach.

- 1 (3.6%) patient in laparoscopic splenectomy group had portal vein thrombosis.
- 1 patient in open splenectomy group developed OPSI six months after splenectomy and died in spite of treatment.
- There is no pancreatic injury in either group.

○ **Duration of postoperative hospital stay**

- The mean duration of postoperative hospital stay in laparoscopic splenectomy group is 10.11 (SD=4.84) days and in open splenectomy group it is 12.23 (SD=3.89) days. p value is 0.10 which is statistically not significant.

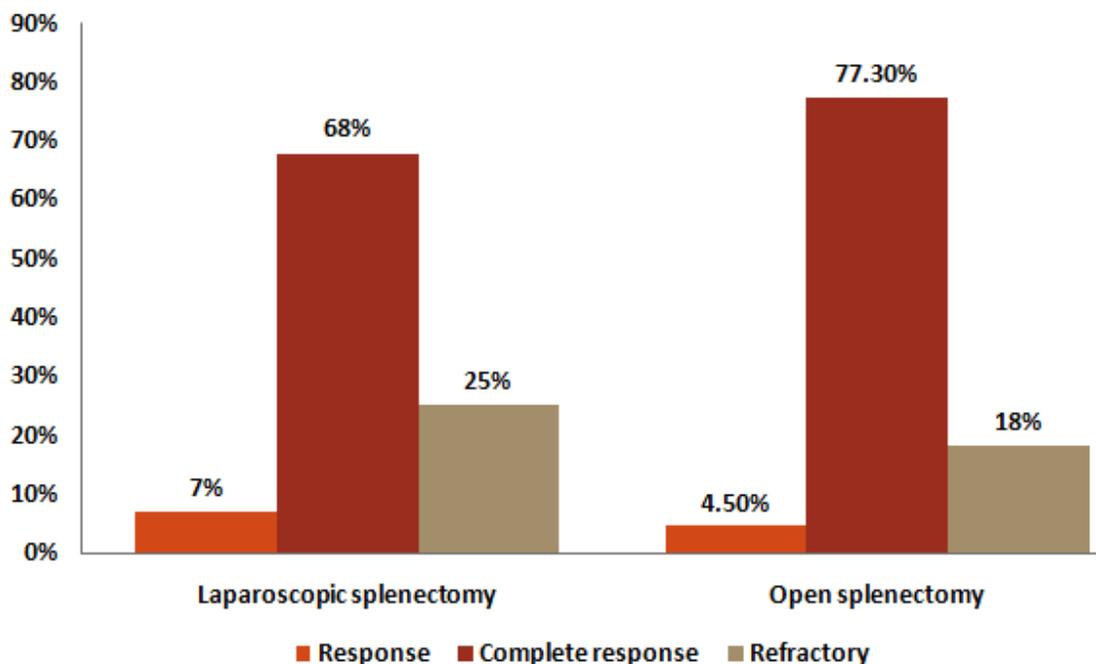
○ **Duration of abdominal drain in situ**

Duration of abdominal drain in situ	Laparoscopic splenectomy	Open splenectomy	p value
Mean (days)	1.75 (SD=0.89)	3.59 (SD=1.01)	<u>0.001</u>
Range (days)	1-4	2-7	-

- In laparoscopic splenectomy group mean duration of abdominal drain in situ was 1.75 (SD=0.89) days and in

open splenectomy group it was 3.59 (SD=1.01) days. p value is 0.001 which is statistically significant.

○ **Outcome of splenectomy**



- Complete response was seen in 19 (67.9%) patients in laparoscopic splenectomy group and in 17 (77.3%) patients of open splenectomy group. p value is 0.537, which is statistically not significant.

- Response was seen in 2 (7.1%) patients in laparoscopic splenectomy group and in 1 (4.5%) patients of open splenectomy group. p value is 0.701 which is statistically not significant.

- Refractory ITP was seen in 7 (25%) patients in laparoscopic splenectomy group and in 4 (18.2%)
-

patients of open splenectomy group. p value is 0.734 which is statistically not significant.

- **Duration of follow up**

Duration of follow up	Laparoscopic splenectomy	Open splenectomy	p value
Mean (months)	17.4 (SD=16.52)	19 (SD=12.43)	0.708
Range (months)	1-60	2-40	-

- The mean duration of follow up in laparoscopic splenectomy group was 17.36 (SD=16.52) months and in open splenectomy group was 18.95 (SD=12.43) months. p value is 0.708 which is statistically insignificant.

- The mean duration of follow up in laparoscopic splenectomy group was 17.36 (SD=16.52) months and in open splenectomy group was 18.95 (SD=12.43) months. p value is 0.708 which is statistically insignificant.

- **Normalization of platelet counts**

Platelet count normalized on	Laparoscopic splenectomy	Open splenectomy	Combined
Day 1	11 (39.3%)	6 (27.3%)	17 (34%)
Day 2	8 (28.6%)	5 (22.7%)	13 (26%)
Day 3	4 (14.3%)	5 (22.7%)	9 (18%)
Day 4	1 (3.6%)	1 (4.5%)	2 (4%)
Day 5	0 (0%)	2 (9.1%)	2 (4%)
Day 7	1 (3.6%)	2 (9.1%)	3 (6%)
Never	3 (10.7%)	1 (4.5%)	4 (8%)
Total	28 (100%)	22 (100%)	50 (100%)

- Platelet count was normalized within 2 days of splenectomy in 60% of the patients. Platelet counts

never reached normal level in 8% of patients in the immediate postoperative period.

- **Thrombocytosis**

Thrombocytosis	Laparoscopic splenectomy	Open splenectomy	Total
Present	9 (32.1%)	4 (18.2%)	13 (26%)
Absent	19 (67.9%)	18 (81.8%)	37 (74%)
Total	28 (100%)	22 (100%)	50 (100%)
Required antiplatelet/ anticoagulant	7 (25%)	3 (13.6%)	10 (20%)

- Thrombocytosis is present in 9 (32.1%) patients in laparoscopic splenectomy group and in 4 (18.2%) patients in open splenectomy group.
- Seven (25%) of the patients required antiplatelet/ anticoagulant in laparoscopic splenectomy group and 3 patients (13.6%) patients required the same in open splenectomy group.
- Accessory spleens were identified in 6 (12%) patients three in either group. The locations being hilum of

spleen and gastrosplenic ligament in one patient, gastrosplenic ligament in one patient, splenic hilum in 3 patients and in splenocolic ligament in one patient.

- Thirty two patients were attempted for laparoscopic splenectomy, 4 patients required conversion to open procedure reasons being intraoperative bleeding in three cases and failed to dissect splenic vessels in one patient.

IV. DISCUSSION

- **Age and sex distribution**

	Sampath S et al		Cordera F et al		Mohamed SY et al		Current study	
Group	LS	OS	LS	OS	LS	OS	LS	OS
Mean age (years)	43	46	52.5	49.9	31	38	34.4	36.8
Sex distribution (M:F)	1:1.5	1:1	1:2.2	1.3:1	1:4.3	1.8	1:4.6	1:1.7

- The mean age of patients undergoing surgery for ITP is less in our study as compared to studies of Sampath S et al and Cordera F et al. However, it is similar when compared to Mohamed SY et al.

- **Presenting complaints**

- The percentage of females is more in our study which is comparable with other studies.

Presenting complaints	Cordera et al	Current study
Purpura	38.37%	70%
Ecchymosis	51.16%	28%
Menorrhagia	NA	36%
Epistaxis	NA	16%
Bleeding per rectum	NA	4%
Haematuria	NA	10%
Intracranial bleed	NA	6%
Gum bleeding	NA	10%
Isolated malaise	NA	2%
Haemorrhage	53.48%	-
Fever	2.32%	-
Thrombosis	5.81%	-

NA- Details not available

- The predominant presenting complaints in the both studies are similar however there is higher incidence petechiae in the current study as compared to Cordera et al.
- Fever and thrombosis were presenting complaints in 2.32% and 5.81% in Cordera et al study which were not present in the current study.
- Preoperative haemoglobin/platelet count**

Preoperative test	Mohamed SY et al			Cordera et al			Sampath S et al			Current study		
	LS	OS	P value	LS	OS	P value	LS	OS	P value	LS	OS	P value
Mean Hb (gm%)	12.3	13.1	-	12.4	13	0.148	-	-	-	10.7	11.48	0.207
Mean platelet count ($\times 10^3/\mu\text{L}$)	48	18	0.28	58.4	65.4	0.130	56	60	0.8.8	31.2	25.2	0.465

- In the current study patients who underwent laparoscopic splenectomy had less mean haemoglobin and less mean platelet count. However, the difference in means is statistically not significant as compared to Cordera et al and Sampath S et al.
- Mean platelet count is higher in laparoscopy group than open group in Mohamed SY et al.
 - Duration of surgery**

Duration of surgery	Mohamed SY et al			Cordera et al			Sampath S et al			Current study		
	LS	OS	P value	LS	OS	P value	LS	OS	P value	LS	OS	P value
Mean (minutes)	175	185	-	167.07	119.21	0.001	156	103	0.001	160.36	145.45	0.708
Range (minutes)	(140-230)	(110-210)	-	-	-	0.130	-	-	-	(60-270)	(60-240)	-

- The mean duration of surgery is more in laparoscopic splenectomy group than open splenectomy group in the current study group as compared to Cordera et al study and Sampath S et al study.
- In Mohamed SY et al study mean duration of surgery in open splenectomy group is higher than laparoscopic splenectomy group.

Intraoperative platelet/blood transfusion and splenunculi detection

	Laparoscopic splenectomy	Open splenectomy	p value
Intraoperative platelet transfusion	4 (14.3%)	10 (45.5%)	<u>0.015</u>
Intraoperative blood transfusion	2 (7.1%)	7 (31.8%)	<u>0.032</u>
Intraoperative detection splenunculi	3 (10.7%)	3 (13.6%)	1

- Intraoperative platelet and blood transfusion requirements are significantly less in the laparoscopic splenectomy group when compared to open splenectomy group as compared to other studies.
- Intraoperative detection of splenunculi is more frequent in open splenectomy group than laparoscopic splenectomy group as compared to Cordera et al. study. However, this doesn't carry any significance.

Duration of nil by mouth, resumption of general oral diet and duration of parenteral analgesia

	Cordera et al			Current study		
	LS	OS	p value	LS	OS	p value
Mean duration of nil by mouth (hours)	-	-	-	7.5	22.91	0.001
Mean duration for resumption of general oral diet (days)	2.33	4.02	0.001	2.1	4.2	0.001
Mean duration of parenteral analgesia	1.24	2.42	0.001	1.32	3.63	0.001

- In the current study patients in laparoscopic splenectomy group had less mean duration of nil by mouth and less mean duration for resumption of general normal diet both of them are statistically significant and the later one is comparable with Cordera et al study.
- In the current study, patients in laparoscopic splenectomy group had significant less mean duration of parenteral analgesia which is comparable with Cordera et al study.
- Post operative complications**

	Cordera et al			Sampath S et al			Current study		
	LS	OS	P value	LS	OS	P value	LS	OS	P value
Surgical site infection (%)	0	4	0.494	1.96	1.85	-	3.6	18.2	0.15
Post operative pneumonia(%)	0	2	1	1.96	3.7	-	3.6	4.5	1
Post operative pleura effusion(%)	-	-	-	-	-	-	3.6	9.1	0.57
Post operative haemorrhage(%)	-	-	-	1.96	1.85	-	0	4.5	0.44
Left subphrenic collection(%)	-	-	-	1.96	3.70	-	3.6	9.1	0.57
Pancreatic injury(%)	-	-	-	1.96	0	-	0	0	-
Thrombosis	2	4	1.000	0	1.85	-	3.6	0	1
Death (%)	0	0	-	0	0	-	0	0	-
Total	-	-	-	-	-	-	7	13	0.12

- In the current study patients in laparoscopic splenectomy group had less number of complications statistically insignificant.

○ **Duration of postoperative stay**

Duration of postoperative stay	Sampath S et al			Cordera et al			Watson DI et al			Current study		
	LS	OS	p value	LS	OS	p value	LS	OS	p value	LS	OS	Pvalue
Mean (days)	3	10	0.001	3.31	5.34	0.001	2.1	13.4	0.001	10.11	12.23	0.1

- The mean duration of postoperative stay is lesser in laparoscopic splenectomy group when compared to open splenectomy group. However, when compared to other studies duration of postoperative stay in either group is higher because of the concern of

thrombocytosis and delay in patients clearing hospital bills.

- **Conversion of laparoscopic splenectomy to open procedure**

	Mohamed SY	Sampath S et al	Cordera et al	Current study
Conversion to open surgery(%)	14	9.8	21.4	12.5

- In the current study 4 cases were converted to open procedure that is 12.5% which is comparable with the Mohamed SY et al study.

- However, a single unit where laparoscopic splenectomy is done regularly there was 0% conversion rate.

Duration of follow up and percentage of patients with refractory ITP

	Watson DI et al			Sampath S et al			Cordera et al			Current study		
	LS	OS	Pvalue	LS	OS	Pvalue	LS	OS	Pvalue	LS	OS	P value
Mean duration of follow up (months)	14	60	-	18	44	-	-	-	-	17.4	19	0.708
Refractory (%)	7.7	17	-	15	28	0.222	9	12	-	25	18.2	0.734
% of patients found to have splenunculi upon investigating refractory ITP	100 (1/1)	100 (2/2)	-	NI*	NI*	-	50 (2/4)	NI#	-	20 (1/5)	100 (2/2)	-

#refractory group not investigated.

*peripheral smears demonstrated asplenicism, follow-up imaging and consequently re-exploration were not indicated in any cases of complete recurrence.

- There was no statistical difference in the mean duration of follow up between the two groups in the study.
- When compared to open splenectomy group, laparoscopic splenectomy group has more number of refractory ITP however it is not statistically significant.
- Missed splenunculi are more in open splenectomy group.

- ✓ Laparoscopic splenectomy duration of surgery was more when compared to open splenectomy. However, mean duration of surgery decreased significantly in the prospective group of patients probably due to improvement in learning curve.
- ✓ Total numbers of postoperative complications are less in laparoscopic splenectomy group.
- ✓ Duration of post operative hospital stay is more in open splenectomy group.
- ✓ Complete response and response rates are marginally higher in open splenectomy group and refractory rates are marginally higher in laparoscopic splenectomy group.

V. CONCLUSION

- Most common age group who underwent splenectomy for ITP is 19-30 years in either group.
- Females commonly underwent splenectomy for ITP in either group.
- Most often encountered complaint is purpura.
- From our study it is observed that laparoscopic splenectomy for ITP offers following advantages over open splenectomy:
 - ✓ Lesser intraoperative blood loss.
 - ✓ Lesser intraoperative and postoperative platelet and blood transfusion.
 - ✓ Lesser pain and duration of intravenous analgesia
 - ✓ Lesser duration of nil by mouth and early resumption to general normal diet.
 - ✓ Early drain removal
- Though not statistically significant the following observations were made in our study:
 - ✓ Patients in open splenectomy group underwent surgery with less platelet counts.
 - ✓ Patients in laparoscopic splenectomy group underwent surgery with less haemoglobin.

- Missed splenunculi are more in open splenectomy group.
- To conclude laparoscopic approach may be considered as a better choice of approach for splenectomy in patients with ITP in view of less intraoperative blood loss, less post operative pain, lesser time to resume to normal diet and better cosmetic value.

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Comparability and Validity of Clinical Scorings in Differentiating Cerebral Infarct and Hemorrhage

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Abstract- AIM: To study the validity of, Siriraj and Allen's clinical scores for the differential diagnosis of cerebral ischemia and hemorrhage in acute stroke patients.

Methods: 100 cases of acute stroke admitted in Government General Hospital, Kurnool were included in the study. All the patients were examined clinically and CT scan brain done and they were validated according to Siriraj and Allen's clinical scores.

Results: In this study group 69 were male patients and the rest were females. According to Siriraj score 51 patients were classified as having cerebral infarct and 23 patients as having hemorrhage and 26 patients as equivocal. Out of 51 patients who were classified as cerebral infarct 49 had infarct and 23 patients who were classified as having cerebral hemorrhage 16 patients showed cerebral hemorrhage by CT scan. Out of 26 patients who were classified as equivocal, 19 had cerebral infarct and 7 had cerebral hemorrhage.

Allen's score classified 48 patients as having cerebral infarct and 19 patients as having hemorrhage and 33 patients as equivocal. Out of 48 patients who were classified as cerebral infarct 46 showed infarct and 19 patients who were classified as having cerebral hemorrhage 15 patients showed cerebral hemorrhage by CT scan. Out of 33 patients who were classified as equivocal, 25 had cerebral infarct and 8 had cerebral hemorrhage.

Conclusion: Our study showed that overall sensitivity of Allen's score and Siriraj score for hemorrhage is same and the overall sensitivity of Allen's score for cerebral infarct is slightly better than Siriraj score. Siriraj and Allen's scores are well accepted simple screening diagnostic tools at bed side.

Index Terms- Siriraj score, Allen's score, CT scan Brain, Cerebral Infarct, Cerebral Hemorrhage.

I. INTRODUCTION

Stroke is a major cause of morbidity and mortality worldwide and it is the leading cause of death and disability in India. The estimated adjusted prevalence rate of stroke is 84-262/100,000 in rural and 334-424/100,000 in urban areas. The incidence rate is 119-145/100,000 based on the recent population based studies.⁽¹⁾

Stroke is a medical emergency. Diagnosis of the acute stroke syndrome is relatively easy, but diagnosis of stroke subtype in the acute setting is certainly difficult. The management of acute stroke depends entirely on the correct differentiation of cerebral

infarction from cerebral hemorrhage. Despite the growing burden of stroke, there are very few computed tomography centers in Rural India and the vast majority of patients with stroke do not have access to brain imaging.⁽²⁾ Because of this shortage of brain imaging centers, it is of importance to know if clinical stroke scorings improve the physicians' assessment of pathologic stroke type.

There are many stroke scores which can guide the treating physician in clinical distinction of hemorrhagic and ischemic stroke. Siriraj Scoring System and the Allen's Scoring System have been studied at various centers in India for efficacy.

Our study aimed to compare and to determine the sensitivity, specificity and accuracy of Siriraj scoring and Allen' scoring system in distinguishing between Cerebral Hemorrhage and Cerebral Infarct in stroke patients in South Indian setup.

II. MATERIALS AND METHODS

Hundred patients of acute cerebro vascular accidents, admitted in Government General Hospital, Kurnool, Andhra Pradesh, India were enrolled in this study. Patients who were aged 18 years or more with acute stroke whose neurological deficit lasted for more than 24 hours and CT scan showing cerebral infarct or hemorrhage were included in the study. Patients with transient ischemic attack and stroke due to other causes like Trauma, Sub arachnoid hemorrhage, Intra cranial Tumors and Tuberculosis were excluded from the study.

Detailed history was taken and clinical examination done in all the patients. Variables like age, sex, date of admission, presence of headache, vomiting, loss of consciousness, the level of blood pressure, history of hypertension, transient ischemic attacks, diabetes mellitus, obesity, angina pectoris, intermittent claudication, atrial fibrillation and level of consciousness were recorded initially and after 24 hours. These patients were subjected to CT Scan Brain and stroke type was noted and validated according to Siriraj and Allen's scores.

Variables included in Siriraj score⁽³⁾ are Consciousness, Vomiting, Headache within two hours Diastolic blood pressure, Atheroma Markers like Diabetes, Angina, and Intermittent Claudication.

The Siriraj stroke score was calculated as (2.5 x level of consciousness) + (2 x vomiting) + (2 x headache) + (0.1 x diastolic blood pressure) - (3 x atheroma markers) - 12. A score above +1 indicates intracerebral hemorrhage, while a score below -1 indicates infarction. A score between -1 and +1

represents an equivocal result needing a CT scan to verify the diagnosis.

Variables included in Allen score ⁽⁴⁾ are Apoplectic onset (Loss of consciousness, Headache within two hours, Vomiting, Neck stiffness), Level of consciousness (24 hours after admission), Plantar responses, Diastolic blood pressure, (24 hours after admission), Atheroma markers (Diabetes, angina, intermittent Claudication), History of hypertension, Previous event of Transient ischemic attack, Heart disease.

Allen score calculated as number of points = Apoplectic onset + level of consciousness + plantar response + [diastolic blood pressure (24 hrs after admission) × 0.17] + Atheroma markers + history of hypertension + previous event (Transient ischemic attacks) + Heart disease + constant (-12). Score < 4 indicates Infarct, > 24 Hemorrhage and 4 -24 Equivocal.

The classification of the stroke subtypes using Siriraj and Allen's scores were compared with the CT scan diagnosis, which was taken as the gold standard. Data analysis for sensitivity, specificity of individual scores was calculated by using kappa statistics and by standard statistical methods.

III. RESULTS

In this study group, 69 were males and 31 were females out of 100 patients. Their age ranges between 26 and 80 years, with mean age of 56.41 yrs. According to Siriraj score out of 100 cases with acute stroke, 51 patients were classified as cerebral infarct and 23 patients as hemorrhage and 26 patients as equivocal. Allen's score classified 48 patients as cerebral infarct and 19 patients as hemorrhage and 33 patients as equivocal. They were all subjected to computerized brain scanning; it showed cerebral infarction in 75 patients and cerebral hemorrhage in 25 patients.

Out of 51 patients who were classified according to Siriraj score as cerebral infarct 49 had infarct and 23 patients who were classified as having cerebral hemorrhage 16 patients showed cerebral hemorrhage by CT scan. Out of 26 patients who were classified as equivocal, 19 had cerebral infarct and 7 had cerebral hemorrhage. Out of 48 patients who were classified as cerebral infarct by Allen's score 46 showed infarct and 19 patients who were classified as having cerebral hemorrhage 15 patients showed cerebral hemorrhage by CT scan. Out of 33 patients who were classified as equivocal, 25 had cerebral infarct and 8 had cerebral hemorrhage, nearly a quarter of the Siriraj score and about one third of the Allen's score found to be equivocal. 100 cases with acute stroke Siriraj score classified 51 patients as cerebral infarct and 23 patients as hemorrhage and 26 patients as equivocal. Allen's score classified 48 patients as cerebral infarct and 19 patients as hemorrhage and 33 patients as equivocal.

Table1: Validation of Siriraj score :⁽⁵⁾

Siriraj score	True hemorrhage	True infarct	Total
Below -1	2	49	51
-1 to 1	7	19	26
Above 1	16	7	23

Table 2: Validation of Allen score :⁽⁴⁾

Allen's score	True hemorrhage	True infarct	Total
Below 4	2	46	48
4 to 24	8	25	33
Above 24	15	4	19

The sensitivity of Siriraj Stroke Score was 88.88% for hemorrhage; 87.5% for infarction (equivocal cases were excluded); over all accuracy was 87.83%. The sensitivity of Allen's score was 88.23% for hemorrhage; 92% for infarction (equivocal cases were excluded); and overall accuracy was 91%.

Table 3: Comparison of Siriraj & Allen scores in Infarctions

Clinical scores	True positives	False positives	Total
Allen's score	46	2	48
Siriraj score	49	2	51
Total	95	4	99

Applying the Chi square test, Chi square value (X²) is 0.0042. On referring to x² table with 1 degree of freedom, the value of x² for a probability of 0.05 is 3.84. since the observed value (0.0042) is much lower, we conclude that null hypothesis is true and there was no significant difference between two scores.

Table 4: Comparisons of Siriraj & Allen scores in Hemorrhages

Clinical scores	True positives	False positives	Total
Allen's score	15	4	19
Siriraj score	16	7	23
Total	31	11	42

Applying the Chi square test, Chi square value (X²) is 0.473. On referring to x² table with 1 degree of freedom, the value of x² for a probability of 0.05 is 3.84. since the observed value (0.473) is much lower, we conclude that null hypothesis is true and there was no significant difference between two scores.

On applying Kappa statistics the overall Kappa value is 0.46, there is moderate agreement between two scores inferring no statistical significance.

IV. DISCUSSION

The objective of clinical scorings is to improve accuracy in diagnosing the acute stroke syndrome based on clinical variables which are simple, reliable, and safe diagnostic model at bedside. This can enable us to benefit from new developments in the management of acute stroke. The risk factors for stroke are increasing age, male sex, hypertension, atheroma markers and atrial fibrillation. It is well known that some risk factors are specific to either cerebral infarction or cerebral hemorrhage.

Among the 100 cases in the present study ischemic strokes were more common as compared to the hemorrhagic strokes.

Hypertension is a potent risk factor for both brain infarction and hemorrhage⁽⁶⁾. History of hypertension is 57% in our study group. It correlated well with higher incidence of stroke, but not with the stroke types. The level of admitting blood pressure especially diastolic blood pressure was more elevated in patients with hemorrhage in the present study. There are 8 patients with diastolic blood pressure between 120 and 150 mm Hg and among them 7 patients had hemorrhage.

In our study 29% of patients were having one or more atheroma markers. Among these patients 75.86% of patients had infarct, which is more consistent with the fact that atheroma markers predispose to infarct.

Diabetes and coronary artery disease were strongly associated with infarction, which has also been depicted in numerous studies.⁽⁷⁾

Among 79 patients with the apoplectic onset (Headache /loss of consciousness/ vomiting/ Neck stiffness) with one or none of the above features 71 patients had infarct. Among 21 patients of two or more features 17 patients had hemorrhage. Clinical features at the onset may also help to discriminate between infarction and hemorrhage. The high frequency of severe headache at onset noted in brain hemorrhage has also been reported by others.⁽⁸⁾

Vomiting, decreased consciousness and coma were also found to be more predictive of hemorrhage than infarct. History of Transient ischemic attack and stroke has more often preceded a brain infarction than hemorrhage.

Table: 5: Comparison of this study with previous studies on Siriraj score

Author	Settings	n	Haemorrhage sensitivity (%)	Infarction sensitivity (%)	Equivocal results (%)
Weir et al ⁽⁹⁾	Glasgow	991	68	not available	not available
Wadhvani et al ⁽¹⁰⁾	Indore	152	66	93	8
Badam et al ⁽¹¹⁾	Sevagram	134	44	52	28
Kochar ⁽¹²⁾	Bikanir	240	85	73	33
Poungarin et al ⁽¹³⁾	Bangkok	174	89	93	not available
Present study		100	87.5	87.23	26

Hemorrhage sensitivity in Kochar study is 85%, in Poungarin et al study 89%. The result of the present study is consistent with the above studies and the sensitivity for infarction

in Poungarin et al and Wadhvani et al is 93%. In present study it is around 87%.

Table: 6: Comparison of this study with previous studies on Allen's score

Author	Settings	n	Haemorrhage sensitivity (%)	Infarction sensitivity (%)	Equivocal results (%)
Sandercock et al ⁽¹⁴⁾	Oxford	228	81	78	not available
Weir et al ⁽⁹⁾	Glasgow	991	70	not available	not available
Wadhvani et al ⁽¹⁰⁾	Indore	152	66	93	0
Badam et al ⁽¹¹⁾	Sevagram	134	35	52	41
Kochar ⁽¹²⁾	Bikanir	240	60	91	39
Present study		100	88.23	92	33

The sensitivity for hemorrhage Sandercock et al is 81% but in other Indian studies like Wadhvani et al, Badam et al is very low, where as In present study it is 88.23%. But the sensitivity for infarction is more than 90% in Wadhvani et al and Kochar study group. Present study's results are consistent with these studies.

The Allen's score included 8 variables that were obtained not only by clinical history but also using clinical examination and chest X-rays. In addition, some variables can only be calculated 24 hours after the stroke, such as level of consciousness and diastolic blood pressure and also Calculating Allen's score at bed side is not easy. The Siriraj Hospital Stroke score is simpler and can be calculated immediately after stroke at bedside, because it involves fewer variables with the greater possibility of having more complete data to calculate the score in this study. Moreover, it would be easier to apply in a busy, less well-equipped clinical setting,

Small deep hemorrhage may mimic the clinical features of infarct and large infarcts may simulate hemorrhage. Due to this fact, Allen's and Siriraj scoring systems have created an equivocal group that will effectively increase the sensitivity and specificity of the final calculation. Though both scores showed high sensitivity for both infarct and hemorrhage in Asian setup, about a quarter of patients in Siriraj score and one third of patients in Allen's score are falling into equivocal category which weakens the utility of the scores. In Allen's score some variables can only be calculated 24 hours after the stroke, so it cannot be used in acute stroke management. Siriraj score having fewer variables, it is easier to apply in a busy, less equipped clinical setting. There is greater possibility of complete data to calculate the score as inferred from this study.

In conclusion, the overall sensitivity of Allen's score and Siriraj score for hemorrhage is same and the overall sensitivity of

Allen's score for cerebral infarct is slightly better than Siriraj score which is not having any statistical significance. Hence Siriraj and Allen's scores are well accepted simple screening diagnostic tools at bed side.

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Digitalization: The impact on traditional retail and the future model of multichannel

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I. CONSEQUENCES OF DIGITALISATION FOR THE TRADITIONAL RETAIL

There is no doubt that social and mobile technologies are profoundly changing consumers' shopping habits and expectations, and the pace of change is impressive. Even in a struggling economy, online shopping in 2011 grew 15% over the previous year. Retail giant Amazon sold \$1B through its e-commerce site and mobile applications in 2010, and that figure was forecasted to double in 2011.

Currently, 35% of Americans own web-enabled smartphones, a number which is expected to skyrocket in the coming years. On Christmas day 2011 alone, 6.8 million iOS and Android devices were activated. Interestingly, from this rather large sample, half of smartphone owners say they have made some form of purchase using their mobile phone, highlighting the power of the mobile device in today's retail landscape.

This purchasing behavior represents a change that empowers not only consumers but online retailers, who enjoy numerous economic and logistical advantages over mall stores and mom and pop shops. Lower overhead costs and tax advantages enable online merchants to offer sometimes significantly reduced prices on everything from apparel to appliances. Because of this, it's no wonder people are beginning to ask if retail stores can survive in this increasingly tech-powered environment.¹

[Retailers must catch up with multi-channel consumers.](#) The PWC study shows consumers are leading and shaping the move to online, with retailers lagging behind. We found that the majority of consumers behaviour is consistent across regions and demographics, as well as between developed and developing countries and markets.

The global consumer is becoming increasingly sophisticated and retailers cannot adapt their operating models at the same pace. Closing the gap requires a significant increase in agility and flexibility by retailers, driven by a better understanding of their customers. This means changing the way they track and measure consumer behaviour, market their products, run their stores, and manage their supply chains.

The winners will be those who have recognised these trends and are building agile organisations capable of delivering a consistent profitable proposition in a multi-channel way.²

A long time before the tremendous development of the Internet and digital convergence, Jeff Besos founded the first online bookstore „Amazon“ in 1994.³

With the digital convergence (in reality starting with the introduction of the iPhone) the search and purchase behaviour drastically changed and as the greek philosopher Heraklit said „Nothing is more constant than change“ which is as true today as in the past.⁴

The change of the global consumer, the retail landscape and the markets in general in the last decade threaten to provoke a chaos for established business models and marketing approaches. For those able to adapt and anticipate these changes, there are great possibilities and chances ahead.⁵

In the business world, we often speak of disruption. Traditional businesses being shaken to their cores by factors like technology, being forced to rethink their businesses, approaches, or products. Perhaps this is nowhere truer than in the retail industry – more precisely brick and mortar retail. While business prognosticators have been saying “retail is dead” for years, with no true apocalypse to fulfill their claims, they might be on the brink of vindication. After earnings dropped by 19 percent, Radio Shack, which has one of the largest footprints of any American retailer with more than 5,200 stores in the U.S., announced it will close up to 1,100 stores. Staples will close 225 of its 1,846 stores in North America by the end of 2015. And it appears to be only the tip of the iceberg: consumer perceptions of traditional retail are declining as well. Is there any solution to the fact, that brick and mortar stores keep declining and consolidating? Letting go of the notion that a store is a mechanism to deliver goods from buyer to seller allows great brands to use the physical space to create a journey into the

² PriceWaterhouseCoopers, „Global retailers must catch up with multi-channel consumers“, <http://www.pwc.co.uk/retail-consumer/issues/global-retailers-must-catch-up-with-multi-channel-consumers.jhtml>

³ Wikipedia, <http://de.wikipedia.org/wiki/Amazon.com>

⁴

http://www.aphorismen.de/suche?f_autor=1710_Heraklit+von+Ephesus&seite=2

⁵ McKinsey Consumer Package Goods Practice, „A decade ahead: Trends that will shape the Consumer Goods Industry“, December 2010, Page 6

¹ Retail Touchpoints, <http://www.retailtouchpoints.com/executive-viewpoints/1622-is-traditional-retail-dying> „Is traditional Retail Dying?“, Will Smith, May 2012, page 1

brand's universe. Retailers that understand this, the ones who understand the power of the shopping experience, are actually thriving by leveraging their understanding of what consumers want. Apple is probably a good example: The stores were a space for customers to interact with the brand. Dedicating an entire wall of a high street emporium to a free service in the Genius Bar was seemingly inefficient and overly costly, but revolutionized the way that the Apple brand engaged with its customer.⁶ Apple Stores, which have annual sales averaging \$40 million per store in a category that in 2000 everyone said would move entirely to the internet. Today the Apple Stores are the highest performing stores in the history of retailing. Physical stores are still the primary way people acquire merchandise, and I think that will be true 50 years from now Apple Stores have annual sales averaging \$40 million per store in a category that in 2000 everyone said would move entirely to the internet. Today the Apple Stores are the highest performing stores in the history of retailing. Physical stores are still the primary way people acquire merchandise, and I think that will be true 50 years from now.⁷

So in this period of disruption, while many trumpet the death of retail, some clever retailers, who know that the experience they deliver in-store is something that that Amazon can't (yet!) deliver to your door, are thriving. So is retail dead? Perhaps, yes, for those who don't see the true power of the medium. For those that know better, a resurrection is underway.⁸

II. GOOD EXAMPLES/ BAD EXAMPLES FOR ADOPTION TO THE DIGITAL WORLD

„You could argue that Amazon on the e-commerce front and the Apple Store with the customer experience are the major influences in the industry from 2000 to the present“.⁹ Amazon started 20 years ago building up the first bookstore online. It took Amazon quite a long time to get profitable, and even more time to become as dominant as today. It is one of Americas greatest success stories and Amazon shows a fantastic performance: a market capitalisation of 132 billion USD and revenues of 61 billion USD. So on the trade side Amazon is probably the success story for ecommerce.¹⁰ From a german perspective the example of the MediaSaturn Group is quite interesting, as MediaSaturn has been the dominating electrical retailer not only in Germany but in Europe. The business model is focused on large electrical superstores with nearly no service, but always offering the best price. MediaSaturn has been in crisis for some years and is constantly losing market share. The reason ist hat MediaSaturn has so far not been capable to adapt tot he new digital consumer. The Group is additionally under pressure because hughe surfaces where the number of shoppers is

dramatically declining are very expensive. With the advertising slogan „Geiz ist Geil“ MediaSaturn has educated that the most important thing ist he best price. The business model is no longer working as noe the internet dealer took over „the best price“ (see graphic). „the revolution eats his own children.“¹¹

⁶ Forbes Magazine, „The Death of Retail--And Perhaps A Resurrection“, May 2014, page 1

⁷ Harvard Business Review, „Retail isn't broken. Stores are“, Ron Johnson (VP Retail at Apple), December 2011, page 2

⁸ Forbes Magazine, „The Death of Retail--And Perhaps A Resurrection“, May 2014, page 1

⁹ Harvard Business Review, „Retail isn't broken. Stores are“, Ron Johnson (VP Retail at Apple), December 2011, page 3

¹⁰ Forbes Magazine, „How you can use the three big ideas behind Amazon's success“, May 2013, page 1

¹¹ Vgl. NEWS 09/13, „Wie der Elektronikriese MediaMarkt/ Saturn in die Krise schlitterte“, Markus R. Leeb/ Herta Scheidinger, S. 70-71

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		idealo	Comtech	424,00 €* 6,99 €	8,99 €	
Kopfhörer Sony MDR-ZX300	27,99 €	Geizhals	Seven Rabbits	20,16 €	5,99 €	5,99 €
		Guenstiger.at	Redcoon	20,16 €* 5,99 €	5,99 €	5,99 €
		Geizhals	e-tec.at	21,85 €		
Apple iPod iPod touch 16 GB	199,00 €	idealo	comtech	179,00 €* 8,99 €		
		Geizhals	Redcoon	184,51 €* 5,99 €	7,99 €	
		Geizhals	Amazon	187,76 €		
Desktop-PC HP h8-1420eg O113cz IOK	919,00 €	idealo	digitalo	838,56 €* 9,95 €		
		idealo	SMDV	838,56 €* 9,95 €		
		Geizhals	Voelkner.at	845,61 €* 5,95 €		
Notebook HP Pavilion 14-B083 EG 1112AZ 3KM	599,00 €	idealo	notebook.de	499,00 €* 30,00 €		
		Geizhals	BA-Computer	598,00 € 11,50 €		
		Geizhals	D-Tech	599,00 € 7,80 €		
iPad mini Wi-Fi 7,9 Zoll, 16 GB	329,00 €	Geizhals	Cleversparen.at	317,00 €		
		Guenstiger.at	Köck	317,00 € 5,00 €		
		Geizhals	Majdic	317,80 € 6,99 €	6,99 €	

So how can you win the game in the digital world being a consumer goods manufacturer? Which are the big strategic questions you need to ask:

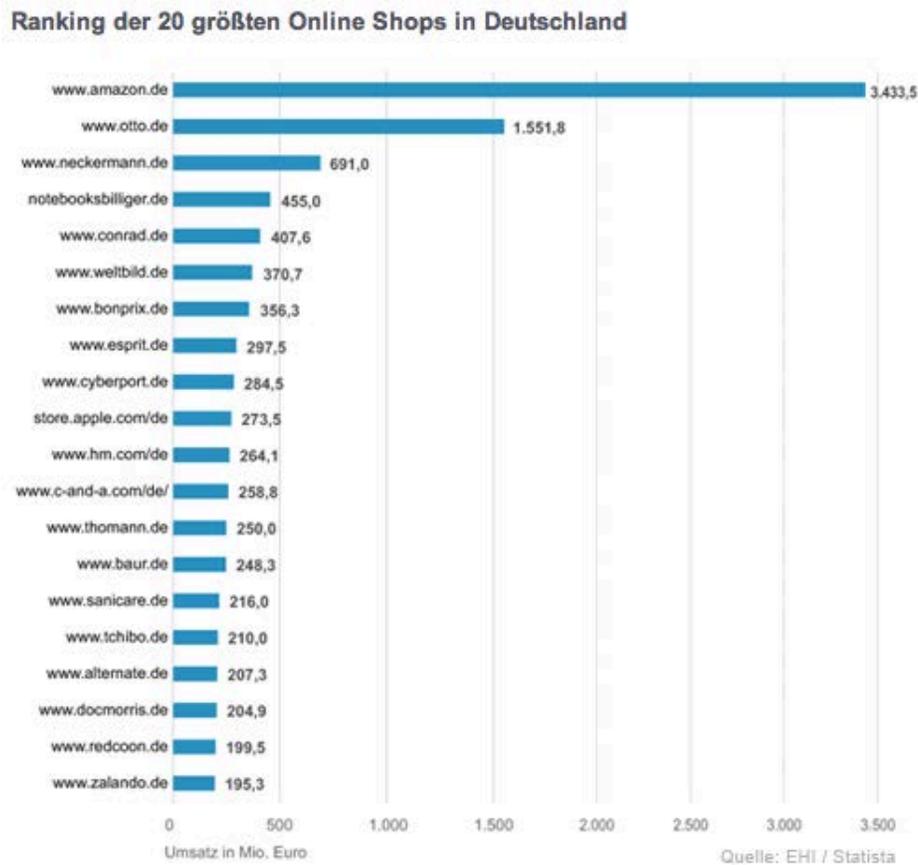
- How do I built up a successful business in online channels
- How do I better understand my customers
- How do I intergrate social channels into my business model
- How to run a multichannel business without “loosing” traditional retailers ¹²

Surely online sales will somehow stabilize on a certain level or even decline again, depending on the category. In the US online retail/ e-commerce is now around 6 of the entire turnover.⁵ In England one third of the population is using constantly only grocery shops.⁶ The same accounts for clothing in Germany,⁷ in China online retail has trippled in the 3 years.

If the traditional retail wants to survive, a cooperation with big pure players like Amazon or himself become a multichannel player. A good example for this is OTTO in Germany: being a classical goods shipper based on a printed catalogue, today OTTO managed to be a relevant competitor to Amazon and ranks as the second most successful online retailer in Germany, behind Amazon.¹³

¹² Vgl. McKinsey Consumer Package Goods Practice, „A decade ahead: Trends that will shape the Consumer Goods Industry“, December 2010, Page 12

¹³ Vgl. <http://www.esales4u.de/2012/studie-ecommerce-deutschland-ehi.php>



Setting up an own online shop is not really cheap and it takes a lot of effort to maintain but even much more effort to bring clients there and make them shop. So for many the economics of launching a branded e-commerce site will prove unfavorable.¹⁴ Alternatively a cooperation with the “big ones” makes more sense.

III. SHOPPER EXPERIENCES/ VALUE CREATION

For traditional stores to compete, they need to use technology to improve aspects of the in-store shopping experience that consumers care about, like:

- Quality of customer service
- What the store looks and feels like
- How products are displayed
- The experience of trying and buying a product¹⁵

Seemingly, online retailers have an unfair advantage when it comes to using technology to improve their businesses. They are powered by sophisticated analytics and tracking tools that provide deep and useful insights into online behaviors and patterns. For example, online retailers know, in near real-time, how many folks have visited their store and how many have been

there before. They know specifically which sections of the site have been visited and what and brands are of interest. Additionally, online retailers know how long consumers shopped, when they visited, how frequently they visited, and whether or not certain deals or ads attracted them to the store. In exchange, the consumer gets lower prices, greater selection, and a more convenient shopping experience that can be endlessly improved.

In comparison, offline retailers simply haven’t had the analytical tools at their disposal to understand customer movement at this level to deliver a tailored, personal shopping experience. And delivering this top-notch, physical experience is key to retail success in the future.

This physical experience cannot be duplicated on the web (no matter how social it gets) and is only possible through visiting the store. If we empower physical retailers with tools to better to understand their customers, I believe they will respond with innovations that delight consumers and distinguish the real world shopping experience from the online world. In other words, they won't die, but in fact thrive.

By implementing a very simple technology to monitor shopping behavior via wifi, smartphone signals, physical retailers can successfully bridge the gap between the online and offline world. By utilizing this mobile phone technology, retailers have the ability to view anonymous, aggregated shopper traffic data that will help them make data-driven business decisions to better serve their customers. I think that the sustainable advantage of a retailer or a digital-commerce business is data. What data can do is to allow you to connect this exploding inventory, exploding

¹⁴ Vgl. Forrester Research, US Online Retail Forecast, March 2010

¹⁵ Retail Touchpoints, <http://www.retailtouchpoints.com/executive-viewpoints/1622-is-traditional-retail-dying> „Is traditional Retail Dying?“, Will Smith, May 2012, page 2

selection that we're all seeing, down to be a highly relevant experience for a consumer.¹⁶

With these statistics, retailers can:

- Measure customer loyalty;
- Improve store layouts;
- Make better staffing decisions;
- Reduce wait times in checkout lines;
- Create more attractive window displays;
- Adjust store hours based on actual foot patterns; and
- Make the merchandise people are looking for more accessible.

The smartphones and portable devices many of us carry around act as small radio towers emitting signals into the air. By using in-store sensors that recognize nearby wifi signals retailers can tabulate foot traffic patterns through the physical space. Unlike some analytics tools used by online retailers, the key in malls and physical retail environments is to develop a solution that never collects any personally identifiable information. As shoppers walk by, and then through a store, retailers don't know who they are, rather where they are in the store.¹⁷

Building engaging experiences across channels is incredibly important. Many retailers have spent their entire lives thinking about how to build an engaging experience in one channel, which is the store. But now, understanding how to connect with your core customers across every way they want to connect—not the way you want them to connect but the way they want to connect with you—is a different skill.

It requires design and product management. It requires understanding how to market in a digital world. There are still many instances that I see where it is old-school marketing. It's still about major TV campaigns, get people into the stores. That's still important, and that's not going to go away.

But understanding how to engage in a world of exploding social networks, how to use search, how to use catalog, how to optimize, and how to engage—very different skills. I think that is going to become a core part of the playbook for retailers and merchants of all sizes around the world.¹⁸

To position themselves for success in a multichannel world, retailers would do well to take a disciplined approach that begins with a reassessment of the role of the physical store. McKinsey recommends a five Stepp approach for this, called STORE:

¹⁶ McKinsey & Company, „How digital is transforming retail: The view from eBay“, Devin Wenig, July 2014, page 3

¹⁷ Retail Touchpoints, <http://www.retailtouchpoints.com/executive-viewpoints/1622-is-traditional-retail-dying> „Is traditional Retail Dying?“, Will Smith, May 2012, page 3

¹⁸ McKinsey & Company, „How digital is transforming retail: The view from eBay“, Devin Wenig, July 2014, page 3

- S**tart by redefining the role of the store.
- T**ailor categories accordingly.
- O**ptimize the portfolio using forward-looking analytics.
- R**einvent the in-store experience.
- E**xecute systematically across all channels.

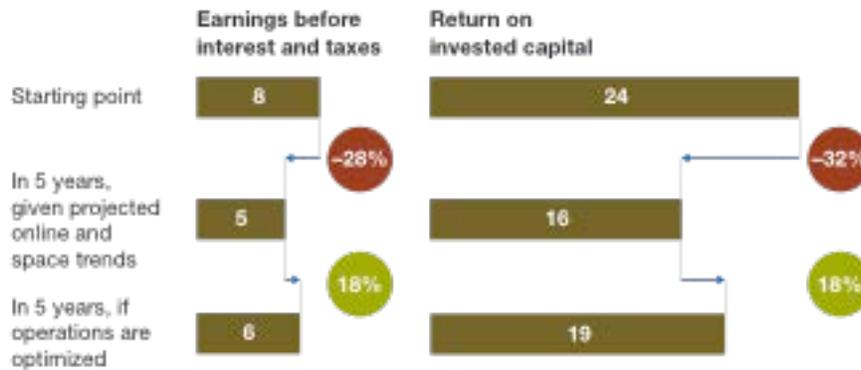
The effects of online migration in the retail industry are evident in every category. But it is not at all the only problem traditional retailers are confronted with: floor space. Apart from this we are talking about a strong and powerful competitive environment from e-commerce champions like Amazon, lack of shopper experience, lack of multi-channel integration etc.¹⁹

The traditional retail is suffering especially by the big e-commerce players like Amazon making pressure on prices and margins.

¹⁹ McKinsey & Company, „Making stores matter in a multichannel world“, Louise Herring, Tobias Wachinger, Chris Wigley, December 2014, page2

Exhibit Online migration is hurting store economics, and there are no quick fixes.

Estimates for US retail company, assuming a 5% decline in sales per square foot over 5 years, % of sales



Source: Forrester Research; Internet Retailer; Kantar Retail; retail benchmarks; store plans; 10-K filings; McKinsey analysis

Shifting from a store-focused approach to a multichannel mind-set requires retailers to change their traditional frames of reference and ways of working. The brick-and-mortar store is not dead; it just plays a different role now. In fact, in a multichannel world, physical stores can provide a competitive advantage. Some multichannel retailers have seen growth in their online sales and penetration among consumers who live near their stores.

In light of rapidly evolving technology and consumer behavior, McKinsey believes retailers that take a forward-looking view and heed the following five imperatives can position themselves for multichannel success.

The first question that retailers should ask themselves at the beginning of their store-network transformation journey is, “What role will my brick-and-mortar stores play in a multichannel world?” To answer the question, retailers must find out what their customers truly care about.²⁰

²⁰ McKinsey & Company, „Making stores matter in a multichannel world“, Louise Herring, Tobias Wachinger, Chris Wigley, December 2014, page 3

- *Convenience and proximity.* Do they value the ease and speed of being able to visit a store and get what they need?
- *Efficiency.* Do they see the store as a place that helps them make better use of their time—for example, by enabling them to make faster decisions or by serving as a pickup location for something they ordered online?
- *Inspiration.* Are they looking to discover—and be surprised by—new ideas and products?
- *Instant gratification.* Do they look forward to store visits as a chance to make impulse purchases and get things they want immediately?
- *Discovery of a solution, information, or service.* Are they seeking knowledge and expertise above and beyond what they can find via an Internet search?
- *Entertainment and social interaction.* Do they see stores as places where they can be entertained and have fun with family and friends?
- *Experiencing brands and products.* Do they visit stores for a chance to touch, feel, and be won over by products and brands?

Reinvent the in-store shopping experience: Creating the store of the future will mean overhauling the in-store customer journey, in part by using new technology to make the shopping experience as seamless and easy as possible. Some retailers simply copy the in-store moves of multichannel champions such as Apple and Burberry or equip sales staff with iPads to give their stores an updated, high-tech look. But cosmetic changes alone won't result in lasting impact. A multichannel mind-set must be embedded in the store design and in employees' new ways of working.²¹

Strategically, retail leaders should keep a close watch on their performance in the six dimensions of retail excellence: customer focus, merchandising, operations, infrastructure, people and most important: customer proposition (graphic 1). Material underperformance in any of these dimensions can be deeply problematic, but if a retailer doesn't have a compelling customer proposition it simply won't survive.

²¹ McKinsey & Company, „Making stores matter in a multichannel world“, Louise Herring, Tobias Wachinger, Chris Wigley, December 2014, page 6

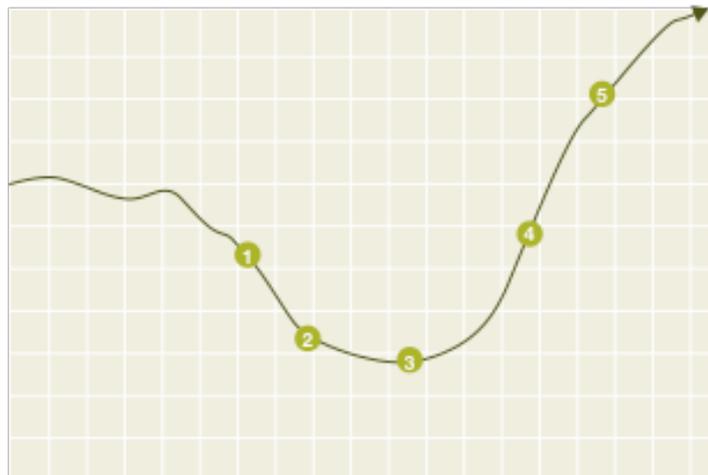
Retailers should monitor their performance in the six dimensions of retail excellence.



How do you turn the company around? The experiences of distressed retailers that have successfully turned around their business, either during or since global financial crisis, have shown that a five-stage approach to retail turnarounds can lead to a sustained success.²²

²² McKinsey & Company, „In need of a retail turnaround? How to know and what to do“, Peter Breuer, Thierry Elmalem, Chris Wigley, March 2014, page 2

A successful retail turnaround typically undergoes five stages.



- 1 Wake up**
 - Examine total returns to shareholders and business performance
 - Bear in mind that up to 15% of large companies are in distress at any given time
- 2 Believe nothing, prove everything**
 - Diagnose strengths and weaknesses
 - Conduct "clean sheet" due diligence
- 3 Act early and aggressively**
 - Build the new team
 - Set aggressive cost targets
- 4 Fire on all cylinders**
 - Survive: create a "cash runway"
 - Fix it: address the root causes
 - Take a new approach: change the business model
- 5 Make it stick**
 - Appoint a chief restructuring officer
 - Create a "control tower"

A last aspect in order to transform classical retail into multichannel retailers during restructuring is to understand which of the existing stores are prepared for the future and which need to be closed down.

„A chief restructuring officer should spur a radical rethink of the companies operating model and challenge managers assumptions about what is possible.“²³

²³ McKinsey & Company, „In need of a retail turnaround? How to know and what to do“, Peter Breuer, Thierry Elmalem, Chris Wigley, March 2014, page 7

Stores should be categorized by profitability and ease of exit.



With this in place, everyone stands to win — consumers get a better shopping experience and retailers are able to compete with the online world by making their customers happy.

When the video cassette recorder (VCR) became commercially popular in the 1980s, many predicted movie theaters would be put out of business. In the end, the film industry was strengthened by the new technology and the demand for films it created. I predict the same will be true for retail stores. Though we cannot know all the ways the technologies we are creating today will change the industry, I believe we will come to appreciate and value the physical shopping experience even more, and retail will thrive.²⁴

IV. CONSEQUENCES AND IMPLICATIONS FOR BtoB COMPANIES

To successfully acquire and retain customers, organisations must recognize these new dynamics, adapt and evolve to become more flexible and responsive.²⁵ It is evident that the emergence of the digital consumer has staggered implications for businesses. The new trends in consumer behaviour require organisations to re-look at company processes, product design, quality of experience, pricing configuration, delivery mechanism and medium of marketing.²⁶

Companies are faced with opportunities and challenges as tech-savvy, on-the-go consumers use a mix of digital channels to move from browse to purchase. eCommerce, eCoupons, social networks and mobile applications provide more opportunities

²⁴ Retail Touchpoints, <http://www.retailtouchpoints.com/executive-viewpoints/1622-is-traditional-retail-dying/>, Will Smith, May 2012, page 4

²⁵ Deloitte, „Customer service in the digital age. Responding to digital disruption and rising customer expectations“, Scotte Wheatley, 2013, page 2

²⁶ Infosys, „Digital Consumers“, September 2011, page 3

than ever to learn about, engage with and deliver the goods to consumers. Yet, the expanding number of touch points and channels increases the difficulty of finding the right combination to serve them efficiently and consistently

Consumers are using digital channels to make more informed decisions and making purchases through multiple channels. Their experiences with Amazon, Google and iTunes have increased their expectations that companies will use the gigabytes of personal data surrendered to curate and deliver targeted offers. Frankly, today’s digital consumers are baffled by, if not frustrated with, fragmented cross-channel efforts and irrelevant offers and campaigns.

Which brings us to the question at hand: Given what we know about consumers and how they use digital channels, how should companies prioritize their investments to attract, engage, sell to and retain digital consumers?²⁷

Think—and operate—with multichannel in mind

Our research shows that consumers use a variety of channels as they move along the path toward purchase (see Figure 1), yet many companies do not move to meet them where they are swiftly or fluidly. In part, this is a product of organizational structure, when separate channels are managed by largely separate teams. But companies need to tear down those barriers if they are to serve the multichannel consumer well and compete. They also may need new capabilities to understand how consumers are using each channel so that they can react appropriately and move them along the path to purchase.

When managed independently, single channels—even if executed superbly—have limited impact and provide just a slice of insight into consumer behavior, and it is a potentially misleading one given that consumers use a variety of channels. A true multichannel strategy integrates, leverages, measures and optimizes the unique properties and advantages of each channel.

²⁷ Accenture, Data Transformation: Winning and retaining the consumer, page 3

Consumer behaviors displayed on websites, social networks, mobile apps, emails and in stores should all be considered in prioritizing multichannel investments.

CPG companies are finding that the best multichannel marketing is one that promotes an ongoing, synchronized dialogue with consumers. But, like all dialogues, it requires companies to pay constant attention to the flow of information received, and be agile enough to adapt to changes so they can deliver relevant, customized messages at the right time.

Employ data analytics to move through the marketing and sales cycle with consumers

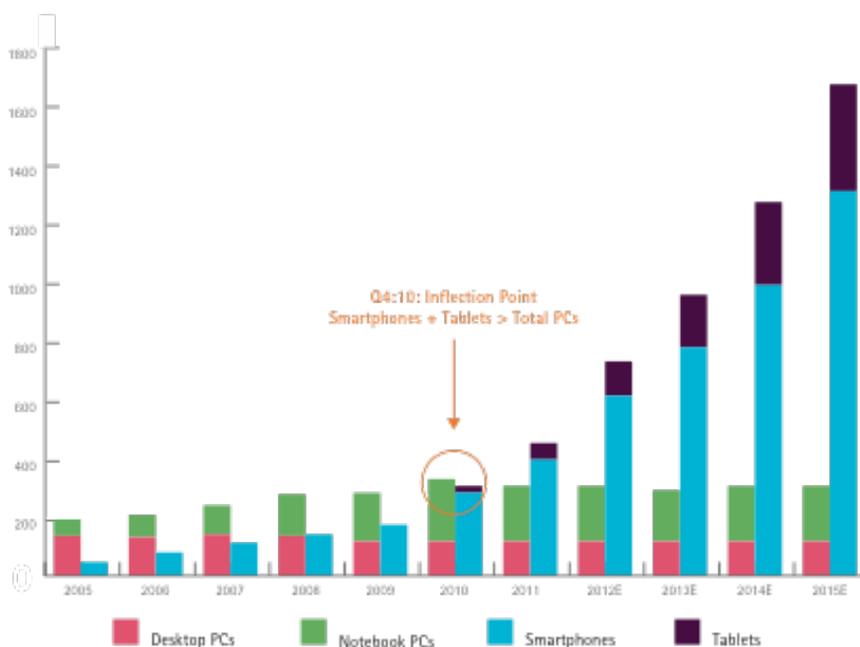
Companies develop a cross-functional, integrated analytics vision, as well as invest in the technology, processes and topflight analytic talent needed to identify target consumer segments and tailor marketing and sales strategies and offers. Delivering personalized, performance-based messages has never

been easier given the access that digital channels provide. The companies that use analytics systematically to understand consumers better and act on that understanding will reap the rewards of big data.

Embrace the small screens and the mobile consumers so attached to them

They're everywhere and sometimes in the way: slowly walking while scrolling through texts and emails, clogging store aisles as they scan bar codes, or tinkering with their new mobile payment app to pay for the skinny latte at the coffee shop. In many markets, more than half the population has mobile devices or smartphones, and over 10 percent have more than one mobile device.

Figure 2: Global Unit Shipments of Desktop PCs + Notebook PCs vs. Smartphones + Tablets, 2005–2015E



Source: Kleiner Perkins Caufield & Byers Internet Trends @ Stanford - Bases 2012 December 3, 2012.
<http://www.slideshare.net/kleinerperkins/kpcb-internet-trends-2012>.

Mobile is the most intensely personal channel for many consumers, and a successful mobile strategy requires a mindset shift that reflects this sensitivity.

At the beginning of the digital age, many companies set up a separate unit to manage the “e-commerce” website—separate staff, separate budget, maybe even a separate location. Now, the complexity of executing marketing operations increases significantly as the number of digital touch points and channels multiplies, demanding a new level of integration.

Marketers need cost-effective and efficient integrated technology platform and services processes to help manage and consistently evaluate their ever-expanding mix of digital and non-digital assets, and to ensure that they complement one another effectively to deliver consistently relevant consumer experience.

As channels multiply and companies seek to enter more markets more efficiently, it's imperative to integrate marketing channels and operations more effectively.

Taking such steps not only benefit the consumer by delivering more consistent experiences, they deliver financial and competitive benefits to CPG companies as well.

Recognize that “winning the digital consumer” is an enterprise responsibility

Many companies still operate as if serving the digital consumer is primarily the purview of marketing and sales teams, with perhaps a hefty assist from the technology team. Gaining alignment between marketing and technology is crucial.

In addition to executive leadership, new organizational structures and talent management processes that facilitate and reward sharing consumer insights are good first steps. Without such actions companies will lose the ability to effectively cross-sell brands or increase the lifetime value of consumers.

Today's digital consumers present companies with more information, opportunities to connect and challenges than ever.

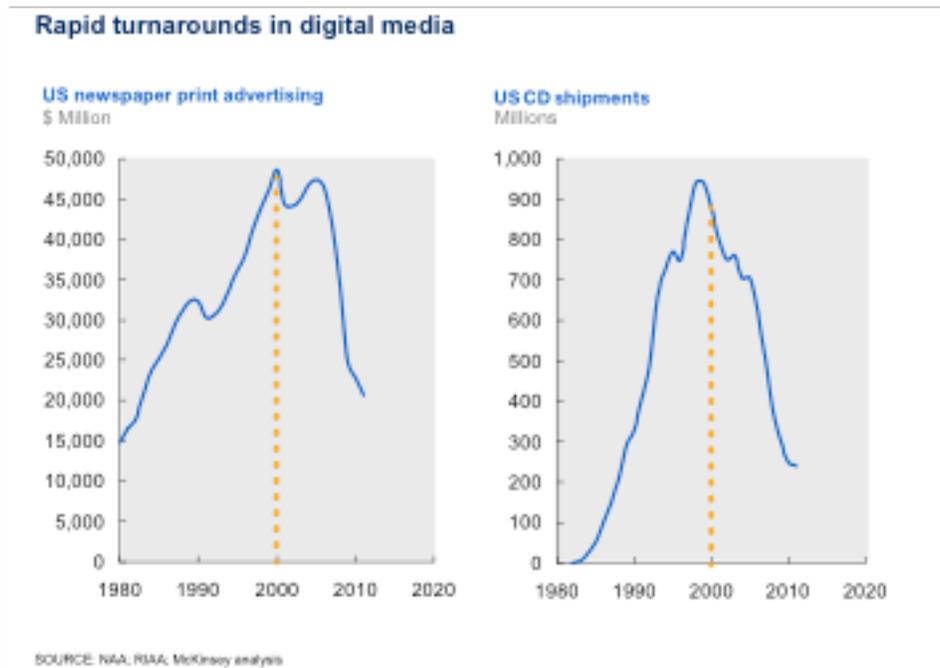
With loyalty and sales on the line, companies need to be strategic in how they invest in building their understanding of and relationships with consumers. More focused use of data analytics, better social listening and a comprehensive mobile strategy can all aid in deeper understanding and connection. Optimizing websites to facilitate commerce, and experimentation with digital coupons can also generate insight and sales. Finally, consumers who use multiple channels to make their purchases expect companies to deliver a high-quality, consistent multichannel approach as well. Companies that execute on these dimensions could remain relevant, win sales in the short term, and the loyalty of digital consumers in the long run.

Structural changes (especially declines) often happen quite slowly ... until they happen very quickly.

Hemingway's observation on how people go broke is as relevant today as after the Great Crash. Short-term economic and industry factors often mask long-term structural problems that lead to gradual – and then very sudden – reversals. Consider that the newspaper industry enjoyed its most profitable decade in the late '90s and early 2000's, even as online-only competitors for classified and display advertising grew in scale and market power. Similarly, the recording industry shipped a record number of CDs during the very dot-com boom that paved the way for digital music's eventual takeover (See Exhibit 4).²⁸

²⁸ McKinsey & Company, „iConsumer: Digital Consumers Altering the Value Chain“, Ewan Duncan, Eric Hazan, Kevin Roche, April 2013, page

EXHIBIT 4: Rapid changes in market structures



This describes also the way how iconic brands in sectors most hidden by digitalisation like Nokia and Kodak failed:

4.1 BAD EXAMPLES FOR DIGITAL ADAPTATION

Not that long ago Nokia was the world's dominant and pace-setting mobile phone company and today it only holds 3% of the worldwide market. Nokia is a good example in the sense, that their products and brand have been part of the category that most pushed digitalization: mobile devices. One reason was clearly that Apple and Android put huge pressure on Nokia, but one of the real reasons was, that Nokia had much more product competence than Software competence. Nokia clearly underestimated the rising importance of Software and Apps that run on Smartphones. It also underestimated how important the transition to Smartphones would be. To end it up, another reason was the overestimation of its brand value.

Finally the worldwide most dominant player in the mobile business and top ten worldwide brand failed to see the trends coming and therefore got bankrupted in a very short time.²⁹ „From making rubber boots in a pulp mill to leading the world in mobile phones, Nokia failed to meet the challenge of the iPhone.“³⁰

Another hitting example is Kodak. Kodak once was an iconic brand, dominating the worldwide camera film market. It used to have 140.000 employees and a turnover of 20 billion USD. There are few corporate blunders as staggering as Kodak's missed opportunities in digital photography, a technology that it invented. This strategic failure was the direct cause of Kodak's decades-long decline as digital photography destroyed its film-

based business model. Kodak management's inability to see digital photography as a disruptive technology, even as its researchers extended the boundaries of the technology, would continue for decades.³¹

What the biggest producer of foto films didn't even think about was that right after the introduction of the digital foto technology by Kodak, the core business would be redundant.

Kodak realized this quite late. In order to protect his core business of analog photography Kodak didn't push a lot on digital photography. Instead of massively investing into digital camaras Kodak launched the chip based cameras together with Nikon. Very soon competitors like Canon, Sony, Panasonic and others from Asia took over and offered to a significantly lower price.

Together with Kodak the big players in the foto film business declined dramatically in a very short time. Especially AGFA got bankrupted completely. Kodak's stock value quickly dropped below one dollar („penny stock“) and was then removed from New York Stock Exchange.³² This example shows very dramatically how a global industry icon like Kodak falls into complete insignificance for ignoring digitalization, especially having products in his hand that are part of digitalization.

It's evident that digitization has become a critical asset in many companies' quest for growth. More than three-quarters of executives say the strategic intent behind their digital programs is either to build competitive advantage in an existing business or to create new business and tap new profit pools.

To further underscore digitization's strategic importance, it is top of mind for many company leaders. CEOs and other C-level executives—chief

²⁹ The New Yorker, „where Nokia went wrong“, James Surowiecki, Septemern 2013, page 1-3

³⁰ The Guardian, „Nokia, the rise and fall of a mobile giant“, Angela Monaghan, September 2013, page 1

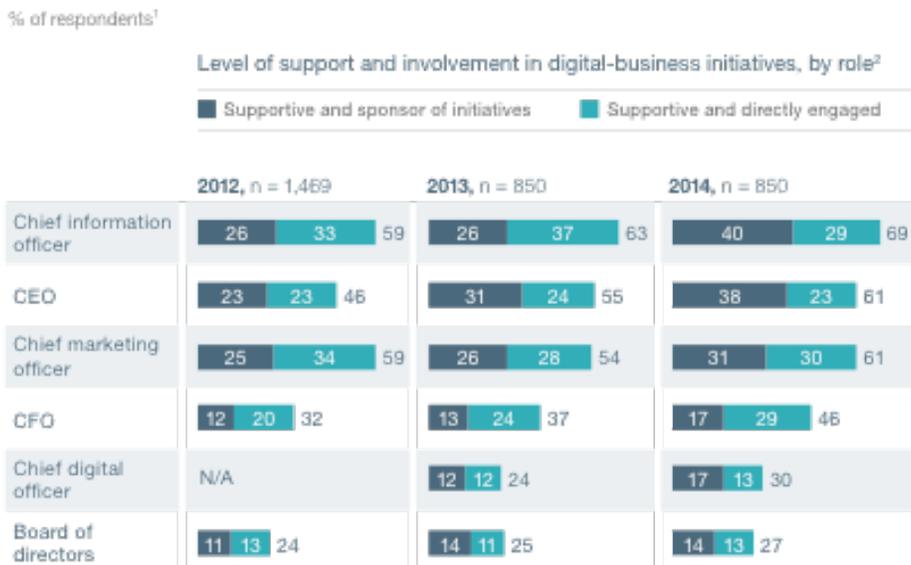
³¹ The Forbes Magazine, „How Kodak failed“, Chunka Mui, September 2011, page 1

³² Handelsblatt, „Kodak droht der Untergang“, Christoph Schlautmann, January 2012, page 1-2

information officers (CIOs) in particular—are devoting more of their personal attention and are more directly involved in digital initiatives now than ever before (Exhibit 1). Company leaders are also spearheading digital strategy: 41 percent of respondents say their CEOs are responsible for their organizations' overall digital agendas.³³

³³ McKinsey & Company, „The digital tipping point“, Paul Willmott, 2014, page 2

Both CEOs and CIOs play an important, direct role in digital initiatives.



¹ Respondents who answered "supportive and not directly engaged," "neither unsupportive nor supportive," "not at all supportive or engaged," "don't know," or "not applicable" are not shown.

² In 2012 and 2013, we did not ask about business-unit heads and their support or involvement in digital initiatives, so the 2014 results are not shown. The largest shares say their business-unit heads are either supportive and directly engaged (39 percent) or supportive but not directly engaged (21 percent).

Regardless of the industry, we believe that most organizations will need to strengthen and renew some of their core capabilities to continue to prosper in an all-digital world. This is as true for those currently on top of their industries as for laggards. Both will also need to prepare for the generational, transformative changes in the market as maturing Millennials replace retiring Baby Boomers as decision-makers for household spending (and business investments, for that matter). A few imperatives for all executives:

Stay close to users by investing in customer insight. Customer behavior is rapidly changing, demanding strong market intelligence and customer insight functions. Innovative teams will integrate emerging digital, social and mobile tools into more traditional 'voice of the customer' processes, and effectively build feedback loops into key business functions such as product development and sales. Never before has this been easier.

Build an edge with deep analytic skills. Especially as segments get smaller and more precise, the need to use data to optimize product development and marketing will only grow. Leading players will test and measure just about everything – and, 'big data,' systems will support and guide them.

Make your business models more robust to reflect consumer diversity.

Focus and breadth are both needed. In other words, focus on the 20% or 2% that drive the economics; and build a diversity in business models to address the remaining 80-98%.

Ensure investments are clearly aligned with consumer shifts. Executives need to clearly communicate the 'what' and the 'why' of strategy and operations and tie it to current opportunities. However, most companies will also need to make sure legacy platforms and businesses get the management attention they deserve.

Place a premium on and reward superb execution skills. A potential downside of 'big data' and analytics is that the analysis goes on too long and the market opportunity evaporates or is seized by a competitor. To avoid this trap top management focus needs to be on delivering the products and services that will serve and delight its customers – today and tomorrow.³⁴

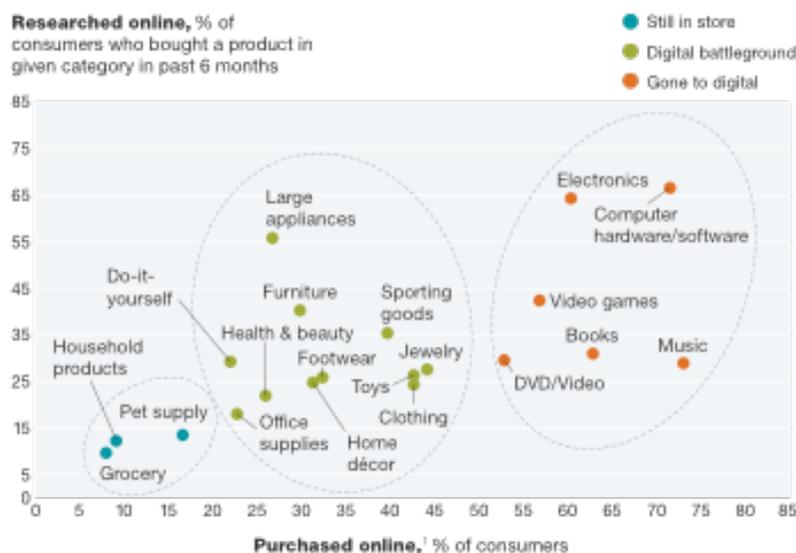
4.2 CORRELATION BETWEEN IMPACT OF DIGITALIZATION AND MARKET SECTORS

Companies are not equally impacted by digitalisation. In terms of online search and online purchase (ROPO) there are huge differences (see graphic below). Surely the share online purchasers will keep growing, but there will always be products people prefer to buy in a store than via online.³⁵

³⁴ McKinsey & Company, „iConsumer: Digital Consumers Altering the Value Chain“, Ewan Duncan, Eric Hazan, Kevin Roche, April 2013, page 10

³⁵

Digital technology is shaping all markets and categories.



Source: 2012 McKinsey iConsumer survey; McKinsey analysis

To stay competitive, companies must stop experimenting with digital and commit to transforming themselves into full digital businesses. Here are seven habits that successful digital enterprises share:

1. Be unreasonably aspirational

Leadership teams must be prepared to think quite differently about how a digital business operates. Digital leaders set aspirations that, on the surface, seem unreasonable. Being “unreasonable” is a way to jar an organization into seeing digital as a business that creates value, not as a channel that drives activities. Some companies frame their targets by measures such as growth or market share through digital channels. Others set targets for cost reduction based on the cost structures of new digital competitors. Either way, if your targets aren’t making the majority of your company feel nervous, you probably aren’t aiming high enough.

2. Acquire capabilities

The skills required for digital transformation probably can’t be groomed entirely from within. Leadership teams must be realistic about the collective ability of their existing workforce. Leading companies frequently look to other industries to attract digital talent, because they understand that emphasizing skills over experience when hiring new talent is vital to success, at least in the early stages of transformation. The best people in digital product management or user-experience design may not work in your industry. Hire them anyway.

3. ‘Ring fence’ and cultivate talent

A bank or retailer that acquires a five-person mobile-development firm and places it in the middle of its existing web operations is more likely to lose the team than to assimilate it. Digital talent must be nurtured differently, with its own working patterns, sandbox, and tools. After a few false starts, Wal-Mart Stores learned that “ring fencing” its digital talent was the only

way to ensure rapid improvements. Four years ago, the retail giant’s online business was lagging. It was late to the e-commerce market as executives protected their booming physical-retail business. When it did step into the digital space, talent was disbursed throughout the business. Its \$5 billion in online sales in 2011 paled next to Amazon’s \$48 billion.

4. Challenge everything

The leaders of incumbent companies must aggressively challenge the status quo rather than accepting historical norms. Look at how everything is done, including the products and services you offer and the market segments you address, and ask “Why?” Assume there is an unknown start-up asking the exact same question as it plots to disrupt your business. It is no coincidence that many textbook cases of companies redefining themselves come from Silicon Valley, the epicenter of digital disruption. Think of Apple’s transformation from struggling computer maker into (among other things) the world’s largest music retailer, or eBay’s transition from online bazaar to global e-commerce platform.

5. Be quick and data driven

Rapid decision making is critical in a dynamic digital environment. Twelve-month product-release cycles are a relic. Organizations need to move to a cycle of continuous delivery and improvement, adopting methods such as agile development and “live beta,” supported by big data analytics, to increase the pace of innovation. Continuous improvement requires continuous experimentation, along with a process for quickly responding to bits of information.

6. Follow the money

Many organizations focus their digital investments on customer-facing solutions. But they can extract just as much value, if not more, from investing in back-office functions that drive operational efficiencies. A digital

transformation is more than just finding new revenue streams; it's also about creating value by reducing the costs of doing business.

Investments in digital should not be spread haphazardly across the organization under the halo of experimentation. A variety of frequent testing is critical, but teams must quickly zero in on the digital investments that create the most value—and then double down.

7. Be obsessed with the customer

Rising customer expectations continue to push businesses to improve the customer experience across all channels. Excellence in one channel is no longer sufficient; customers expect the same frictionless experience in a retail store as they do when shopping online, and vice versa. Moreover, they are less accepting of bad experiences; one survey found that 89 percent of consumers began doing business with a competitor following a poor customer experience. On the flip side, 86 percent said they were willing to pay more for a better customer experience.¹

A healthy obsession with improving the customer experience is the foundation of any digital transformation. No enterprise is perfect, but leadership teams should aspire to fix every error or bad experience. Processes that enable companies to capture and learn from every customer interaction—positive or negative—help them to regularly test assumptions about how customers are using digital and constantly fine-tune the experience.³⁶

"It is not the strongest specimen that survives, even not the most intelligent one, it is the specimen that can adapt to change most."

Charles Darwin

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Child Labour; the Indian Scenario – A Brief Communication

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Abstract- A Child is defined as a every human being below the age of 18 years. Human rights begin with child rights. These rights are : 1. Subsistence rights 2. Development rights 3. Protection rights 4. Participation rights. But, in India, many of these feeble hands, instead of carrying books are often bruise in factories of pan, bidi, cigarettes (21%), construction (17%), domestic workers (15%), spinning & weaving (11%), apart from brick kilns (7%) dhabas (6%) auto workers (4%) ,paddy-fields and football making etc. Punjab has an alarmingly low under-5 sex ratio(846:1000) and the lowest sex ratio at birth(832:1000). It also has 1,77,268 child laborers. Among all reported feticides, 56% are registered in Madhya Pradesh, Chattisgarh and Punjab. Crime against children saw a 24% increase; from 26,694 cases in 2010 to 33,098 cases in 2011. Rape cases increased by 30%, feticide by 19% while buying of girls for prostitution declined by 65%. There is an increase of 10.5% in juvenile crimes from 2010(22,740) to 2011(25,125). As a result of such forced labor, children are often subjected to malnutrition, impaired vision, deformities and easy victims of deadly diseases like Tb, Cancer and AIDS.

Index Terms- Child Labor, Child Rights, India, Crime against Children, Juvenile Crimes

I. INTRODUCTION

A Child is defined as a every human being below the age of 18 years.” [Article 1, UNCRC 1990]. In India, various legal provisions define a child as anyone less than 14 years. However, recently some Acts like Juvenile justice Act 2000 or Prohibition of Child Marriage Act 2006 raised the upper age limit of girl child to 18 years.

Human rights begin with child rights. These rights are : 1. Subsistence rights; i.e., right to food, shelter and health care. 2. Development rights; i.e., right to education and freedom. 3. Protection rights; i.e., right to life and protection from abuse. 4. Participation rights in community activities. Child labour is the most gruesome violation of these rights. Child labor is a reality groomed under the stark negativities of abject poverty, injustice, inaccessible health care and educational facilities.

A child is an equal and inalienable member of human family. However, often they are the most silent and innocent sufferers. The feeble hands, instead of carrying books are often bruise in factories of pan, bidi, cigarettes (21%), construction (17%), domestic workers (15%), spinning & weaving (11%),

apart from brick kilns (7%) dhabas (6%) auto workers (4%) ,paddy-fields and football making etc.

The constitution guaranteed right of education as a fundamental right in its 93rd amendment. It has directed the states to ensure free and compulsory education of all children between 6 to 14 years. But mother India has failed to deliver its best to its children. 50,000 village are without any school (UNICEF data) . The school dropout rate is 28.86% (class1to5) and 42.4%(class1to8).Gross literacy rate is 74% while female literacy rate is 65.46%.Today there are only 436 universities,3357 teacher- training colleges and 6936 professional colleges for a population of 121,01,93,000[Planning commission 2011].Inequality of socioeconomic growth combined with unjust colonization of health and educational facilities are the causes. The EWS and LIG population has little access to these basic amenities and need more earning hands, engaging the most young and vulnerable ones.

The participation of child in labor declines steadily with enhancement in mother’s education, father’s education and family income. The impact of education, urbanization and income on child rights can be gauged from following data of Ministry of Statistics.

TABLE 1
PERCENTAGE OF WORKING CHILDREN IN 5-14 YEARS OF AGE, AS PER BACKGROUND CHARACTERISTICS

Background	Paid work (%)	Unpaid work (%)
Male	2.4	3.2
Female	2.0	2.6
Mother’s education		
NO education	2.8	2.6
<5yrs	1.8	3.5
5-7yrs	1.3	3.6
8-9yrs	1.1	3.6
10-11yrs	0.8	3.1
>12yrs	0.8	3.1
Father’s education		
No education	3.2	2.6
>12yrs	0.7	2.8
Religion		
Hindu	2.2	3.1

Muslim	2.8	2.1
Sikh	1.2	4.1
Jain	0.0	3.3
Christian	1.3	1.5
Buddhist	2.6	1.5
SC	2.6	2.8
ST	3.6	3.3
Lowest Income	3.1	2.2
Highest Income	0.9	3.3

It is praise worthy that Punjab has achieved 100% registration at birth level. But in spite of its laudable heritage and 29,41,570 child population, Punjab lags behind in many aspects. It has an alarmingly low under-5 sex ratio(846:1000) and the lowest sex ratio at birth(832:1000) [SRS 2008-10].Among all reported feticides,56% are registered in Madhya Pradesh, Chattisgarh and Punjab. It also has 1,77,268 child laborers [Census 2001].

TABLE 2

	Literacy Rate	Dropout rate[1 to 10]	Children with severe Anaemia[<7g%]	Neonatal Mortality Rate	Infant Mortality Rate	% of low weight for age children	Immunization Coverage[12-23 mth]
India	74%	52.7%	2.9%	33	47	19.8	61%
Kerala	93.9%	-4%	0.5%	7	13	15.9	81.5%
Punjab	76.7%	40.4%	6.6%	25	34	9.2	83.6%

Immunization coverage is higher in urban (67.4%) than rural (58.5%).It increases with mother’s education. It is 76.6% where mothers have education of 12 years or more and only 45% where mother’s are illiterate.

In spite of National Policy on Child Labor 1987 and Commission of Protection of Child Rights Act 2005, India has the highest number of child labors in the world. There is an increase from 11.28 million in 1991 to 12.6 million in 2001. Approximately 45 million children, most of whom are undetected, work for 12 to 18hrs of a day at Rs.250/- per month, and sometimes with no wages at all, i.e. as bonded labour.78% male child labors are employed in agriculture.3 lakh children work as rag-pickers in Delhi alone. There are 4.2 million street children in the 6 metro cities engaged as thieves, beggars, prostitutes and domestic workers [UNICEF data 2004].UP has the highest share of child labor [15.22%],followed by Andhra Pradesh [10.76%], Rajasthan [9.97%] and Bihar [8.82%].

Nearly 11.8%children aged 5 to 14years, work either at their own or in some other house[NFHS 3 data 2006].Rural children aged 5 to 14 years[12.9%] are more likely to be engaged than urban [8.6].

There exist a number of acts to abolish this menace, e.g., Children (Pledging and Labor) Act 1933, Bonded Labour Act 1976, Child Labour (Prohibition & Regulation) Act 1986, Juvenile Justice Act 2000,Hindu Succession (Amendment) Act 2005, Prohibition of Child Marriage At 2006 etc. However, the laws are biased towards the employer and are toothless. Most of the offences are not cognizable. Most of the occupations do not come under the purview of any act. Social indifferences and low political commitment result in non-implementation of existing acts.

Alarmingly, crime against children saw a 24% increase; from 26,694 cases in 2010 to 33,098 cases in 2011. Rape cases increased by 30%, feticide by 19% while buying of girls for prostitution declined by 65%.However, while the charge-sheeting rate in all crimes against children is 82.5%, the conviction rate is merely 34.5% [Ministry of Statistics].

Indian Penal code states that nothing is an offence which is done by a child less than 7years. The upper age of criminality is increased to 12 years when a child has not attained the ability to understand the nature or consequences of his act. Although crimes done by children account for 1% of all crimes, there is an increase of 10.5% in juvenile crimes from 2010 (22,740) to 2011 (25,125). Major juvenile crimes are theft (21%), hurt (16%), burglary (10%) and gambling. Cases of immoral Traffic Act increased by 50%. Out of all juvenile criminals, 18% are illiterate, 37% had primary & 31% had less than secondary level education. Total annual family income is less than 25,000 in 57% & less than 50,000/ in 27%. Among total juvenile arrested, 5.8% were girls.

Human rights violations are there for all age groups. The global slavery index report 2013 shows that India has highest number of slaves [13.9 million] among the worlds total slaves[30 million] population . In the slave per population concentration, India is 4th, just after Mauritania [1st] Haiti[2nd] & after Pakistan [3rd]

The 2013 international labor organization (ILO) report shows that the Asia –Pacific region has the maximum prevalence of domestic labor (about 41%). In Asia, only 3% of domestic workers are entitled to a weekly day off as compared to the global average of 50%. Just 1% of the world’s domestic workers. Rights to minimum wages and maternity benefits are a far-cry in India. Attempts for legal protection to this sector date back to a private member’s bill in parliament in 1950s. But the closest any legislature has moved to realize these objectives is the recent inclusion of this category in the Tamil Nadu Manual Workers Act, besides legally guaranteed minimum wages in Kerala & Karnataka.

As a result of such forced labor, children are often subjected to malnutrition, impaired vision, deformities and easy victims of deadly diseases like Tb, Cancer and AIDS. They are often forced to lead solitary lives, deprived of education or training, perpetuating the cycle of poverty by driving down the wages. 85% of these child labors are invisible or hard-to-reach, as they work in unorganized sectors or house-based units.

Now it is the turn of those with political power to empower every child with her birth right, i.e., health, education and protection. Say “Yes” for children.

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Yield and Yield Contributes of Coriander (*Coriandrum Sativum L.*) as Influenced by Spacing and Variety

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Abstract- The study was conducted at the Sher-e-Bangla Agricultural University farm, Dhaka, Bangladesh during the *rabi* season of 2011-2012 to find out the Yield and yield contributes of coriander (*Coriandrum sativum L.*) as influenced by spacing and variety. The experiment consisted varieties, spacing and their combination viz., spacing of 30 cm x 10 cm produced the maximum seed yield (2.01t ha⁻¹) which was statistically similar with 20 x 15 cm (1.99 t ha⁻¹), 25 cm x 10 cm (1.94 t ha⁻¹) and 20 x 10 cm spacing (1.95 t ha⁻¹) following randomized complete block design (RCBD) with three replications. The variety BARI Dhonia 1 gave higher values compared to Faridpur local. The variety Faridpur local in combination with 30 x 10 cm spacing gave the highest seed yield (2.16 t ha⁻¹) identical with 25 cm x 10 cm spacing with the same variety Faridpur local (2.10 t ha⁻¹).

Index Terms- Coriander (*Coriandrum sativum L.*), Yield, Spacing and variety.

I. INTRODUCTION

Coriander (*Coriandrum sativum L.*) belonging to the family *Apiaceae* is an important spice crop in Bangladesh which is normally cultivated in winter (*rabi*) season. In Bengali it is known as 'Dhonia'. Coriander is native to South Europe and the Mediterranean region, and is extensively grown in Russia, Bulgaria, Mexico, USA, Argentina, China, Romania, Italy, Japan, Hungary, Poland, Czech, Morocco and India and has been cultivated since human antiquity (Tiwari and Agarwal, 2004). It is also described as a native to southern Europe and Asia Minor. Precisely Italy is presumed as the native place of coriander (Thumburaj and Singh, 2004). The entire plant of young coriander is used as appetizer in preparing fresh chutneys and sauces, leaves are used to flavour food, curries, soups, fish sauce, and cream sauce for chicken, tomato soup, pickling sausages, bakery preparations, liqueurs, gins and meat. Seeds are used in pastry, cookies, cakes, soups, sausage, pickles, curries, in preparation of curry powder. Essential oil like oleoresin is used for flavouring beverages, pickles, chocolates, sauces etc. Seeds and essential oils are used to scent perfumes, deodorants and soaps. They are also used in seasonings for sausage and other meat products. (Janardhanan and Thoppil, 2004; Tiwary and Agarwal, 2004).The seeds are also used in medicine as a carminative, refrigerant, diuretic and aphrodisiac. It is used in the preparation of many household medicines to cure bed cold, seasonal fever, nausea, vomiting and stomach disorder. Pharmaceutical use of coriander is to mask the taste of other

medicinal compounds or to calm the irritating effects on the stomach that some medicines cause (Sharma and Sharma, 2004).Coriander leaves and seeds are valued as food mainly for its high Vit. A and Vit. C. Its leaves contain 88% water, 32 kcal, 6.0 g CHO, 2.7 protein, 0.5 g fat, 1.0 g fiber and 1.7 g ash , 150 mg. C, 0.01 mg B1, 0.01 mg B2, 1.0 mg Niacin, 150 mg Ca, 55 mg P, 540 mg K, 6 mg Fe per 100 g fresh weight of leave and 10, 000 I.U. Vit. A (Rubatzky *et al.*, 1999). On the contrary coriander seed contains 11.4% water, 22.7 g CHO, 11.5 g protein, 19.1 g fat, 28.4 g fiber, 500 mg P, 12 mg Vit. C per 100 g of fresh seed, 175 IU Vit. A (Pruthi, 1998). It is well known that establishment of an optimum plant density per unit area is one of the most important factors contributing to the increased productivity of a crop. Plant spacing controls the plant density of the crop. Wider or too low spacing beyond the optimum can affect the yield of crop. Besides cultivar itself plays a great role in cultivation of the crop. Before reaching the hand of the farmers, the cultivars/varieties must be tested for its yield potential.

II. MATERIALS AND METHODS

The experiment was conducted at the Sher-e-Bangla Agricultural University (SAU), Dhaka, Bangladesh during Rabi (November – February), 2012 to study the yield performance of Coriander in response to plant spacing and variety. The experiment consisted six levels of spacing and two varieties and their interaction were used in the experiment viz. 20 x 10 cm(S₁), 25 x 10 cm(S₂), 30 x 10 cm (S₃), 20 x 15 cm (S₄), 25 x 15 cm (S₅), 30 x 15 cm (S₆) and two varieties viz. BARI Dhonia-1 (V₁) and Local (Faridpur) (V₂) followed by randomized complete block design (RCBD) having twelve treatments with 3 replications. The size of unit plot was 3 m x 1.8 m. The total number of treatments was (6 Levels of population density × 2 varieties) 12 and the number of plots were 36. The land was opened by disc plough 15 days before seeding. Thereafter, the land was prepared thoroughly by ploughing and cross ploughing followed by laddering and harrowing to have good tilth.

Fertilizer application

Manures and fertilizers were applied at the following doses as par Anon., 2001:

Nutrient/Fertilizer	Dose/ha
Cowdung	10 ton
Nitrogen	80 kg
Phosphorus	35 kg

Potassium	60 kg
Sulphur	20 kg

The entire amount of Cowdung, phosphorus from TSP, and potassium from MP, Sulphur from Gypsum with one-half of nitrogen and applied during final land preparation. The rest of the nitrogen was applied in two equal splits at 30 and 60 days after sowing of seeds as top dress.

Sowing: The seeds were sown in rows 20 cm apart continuously by hand @ 40 kg/ha. To allow uniform sowing in rows seeds were mixed with some loose soil (about four to five times of weight of seeds). The sowing was done on November 14, 2012 with slight watering just to supply sufficient moisture needed for quick germination.

Intercultural operations: The desired population density was maintained by thinning plants 15 days after emergence. Irrigation, mulching, weeding and plant protection measures etc. were performed as needed to uniform germination, better crop establishment and proper plant growth. The field was kept free by hand weeding. First weeding was done after 25 days after sowing (DAS). Four irrigations were given at 20, 30, 60 and 90 days after sowing.

Harvesting: Seeds were harvested when half of the fruits on the plant changed from green to brown colour as suggested by Singhania *et al.* (2006). To avoid shattering of fruits, harvesting of seed plant was cut to the base by sickles in the early morning. seeds (grains) were separated by beating with sticks and cleaned by winnowing and dried properly (10% moisture of seed).

Collection of data:

Plant height at bolting (cm): Plant height was measured at bolting in centimeter from the base (rosette) of the plant up to the tip of the longest leaf with the help of a meter scale from randomly selected 10 plants from each plot. The mean of 10 plants were counted as plant height.

Number of primary branches plant⁻¹: Average number of branches produced by randomly selected 10 plants per unit plot.

Number of secondary branches plant⁻¹: Average number of branches which were developed from primary branches, from randomly selected 10 plants per unit plot.

Number of umbels plant⁻¹: Average number of umbels produced by 10 plants per unit plot.

Umbel circumference and diameter (cm): Five umbels were considered for recording this data. At first circumference of umbel at flower condition was circled by a piece of thread and then the length of thread was measured by meter scale. The half

of this measurement was taken and the average data was taken and the average data was taken as umbel diameter.

No. of umbellates umbel⁻¹: Five umbels of each of selected plants were considered for recording this data.

No. of seeds umbel⁻¹: Five umbels of each of selected plants were considered and then seeds per umbel were counted from all the umbels and the average data were taken as number of seeds/umbel.

No. of seeds umbellate⁻¹: Five umbels of each of selected plants were considered and then seeds per umbellate were counted from all the umbellate and the average data were taken as number of seeds/umbellate.

No. of seeds plant⁻¹: Average number of seeds produced by 10 plants.

Dry seed yield plant⁻¹ (g): The average weight of dry seeds harvested from 10 randomly selected plants per unit plot.

Dry seed yield plot⁻¹ (g): The average weight of dry seeds harvested from per unit plot.

Thousand seed weight (g): At first 1000 dry seeds were randomly counted from each treatment. Then weight of 1000 seeds was recorded with the help of an electric balance in the laboratory from the collected dry seeds.

Dry seed yield (t/ha): After maturity seeds of all plots were harvested, cleaned and dried. First seed weight plant was measured with an appropriate spring scale balance and thus plot yield was converted to yield per hectare in tons.

Stover yield (straw yield) plot⁻¹ (g): The average weight of straw harvested from per unit plot.

Stover yield (straw yield) (t/ha): After seed harvested all plant stalks per plot were dried and weight was taken. Then plot stover yield was converted to per hectare yield.

Collected data were analyzed statistically by F-test to examine whether the treatment effects were significant. The mean comparisons of the treatments were evaluated by DMRT (Duncan's Multiple Range Test). The analysis of variance (ANOVA) for different parameters was done by a computer package programme 'MSTAT'C.

III. RESULTS AND DISCUSSION

Plant height

Plant height was not significantly varied by varieties. Though the highest plant height was obtained by BARI Dhonia 1 (81.853 cm) while for Faridpur local it was recorded 80.367 cm (Table 1). Bhandari and Gupta (1993) conducted an experiment with 200 hundred genotypes of coriander and reported that plant height ranged from 11.8-86.1 cm. Datta and Choudhuri (2006) reported that 17 germplasm lines of coriander got plant height ranged from 42.87-98.77 cm.

Table 1. Effect of variety on yield attributes of Coriander

Variety	Plant height (cm)	No. of primary branches plant ⁻¹	No. of secondary branches plant ⁻¹	No. of umbels plant ⁻¹
BARI Dhonia-1	81.85	7.06	15.84	32.17 a

Faridpur local	80.37	6.99	15.85	31.64 b
CV (%)	2.88	6.42	3.62	1.89%
Level of significance	ns	ns	ns	*

Level of significance means in a column having different letters are significant by DMRT. ns = Non-significant,* = Significant at 5% probability,

Effect of spacing

The result revealed that the plant height decreased as the plant to plant spacing decreased. The plant height of 15 cm plant

to plant spacing was higher than 10 cm plant to plant spacing. Verzalova et al (1988) reported that row spacing of fennel did not effect on the plant height. Masood et al (2004) investigated that the greatest plant height were obtained with the lowest row spacing.

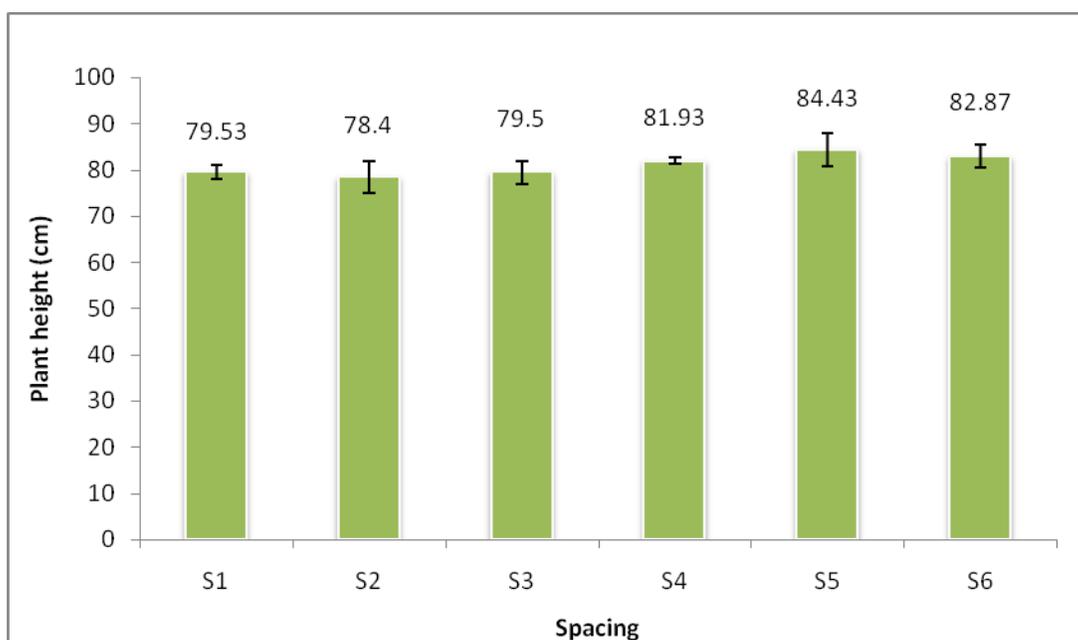


Figure 1. Effect of spacing on the plant height of coriander.

Number of primary branches plant⁻¹

BARI Dhonia 1 produced the highest number of primary branches plant⁻¹ (7.06) and the lowest number of primary branches plant⁻¹ (6.99) was produced by the variety Faridpur local. Bhandari and Gupta (1993) reported that the primary branches per plant ranged from 1.4-8.6 among 200 genotypes. Rahman (2000) also got primary branches per plant which ranged from 6.10-8.02. Datta and Choudhuri (2006) reported that 17 germplasm lines of coriander produced primary branches/plant from 5.37-8.23. Srivastava *et al.* (2000) produced no variability among primary branches.

The maximum number of primary branches plant⁻¹ (7.70) was produced by the interaction effect of BARI Dhonia 1 with 20 cm x10 cm spacing. But it showed similar result with V₂S₁, V₁S₂, V₁S₆ and V₂S₅ treatment. The lowest number of primary branches plant⁻¹ was produced by the interaction effects of BARI Dhonia 1 with 30 cm x10 cm spacing.

Number of secondary branches plant⁻¹

There was no significant variation in number of secondary branches plant⁻¹ among the varieties (Table 1). The variety BARI Dhonia 1 produced secondary branches plant⁻¹(15.84), while the variety Faridpur local produced secondary branches plant⁻¹ (15.85).

Datta and Choudhuri (2006) reported that 17 germplasm lines of coriander produced secondary branches plant⁻¹ from 10.10-16.75. Rahman (2000) reported that secondary branches plant⁻¹ ranged 15.85-25.50 in coriander. The spacing of (30 cm x 15 cm) produced the highest number of branches plant⁻¹ (17.17). The closer spacing (20 cm x10 cm) produced the lowest number of secondary branches plant⁻¹ (14.68). The wider row spacing produced higher number of primary branches plant⁻¹ which might be due to less interplant competition for light, space nutrients and environmental resources.

Number of umbels plant⁻¹

The highest number of umbels plant⁻¹ (32.172) was produced by the variety BARI Dhonia 1 and the lowest by the variety Faridpur local produced (31.64) umbels plant⁻¹. Islam *et al.* (2004) reported that number of umbels plant⁻¹ ranged from 24.10-33.70. Anon. (2002) reported that the range of number of umbels per plant was 24.10-33.70 at Magura and 62.13-69.93 at Gazipur. Maurya (1989) got umbels per plant in the range of 17.00-41.67 while Datta and Choudhuri (2006) obtained from 20.83-34.67. Bhandari and Gupta (1993) reported the range of number of umbels per plant from 3.2-39.3.

The variety had no significant effects on number of umbellates umbel⁻¹ (Table 2). BARI Dhonia 1 produced (4.59) umbellates umbel⁻¹ while Faridpur local produced (4.80) umbellates umbel⁻¹. Both the varieties were statistically similar in umbellates umbel⁻¹.

Islam *et al.* (2004) did not find significant variation among genotypes in respect of number of umbellate per umbel. It was 7.43-7.80 at Gazipur (Anon 2002). Maurya (1989) obtained the number of umbellates per umbel in the range of 4.0-9.40. The result of this investigation corroborates the results of Maurya (1989).

Number of umbellates umbel⁻¹

Table 2. Effect of variety on yield attributes of Coriander.

Variety	No of umbellates umbel ⁻¹	No of Seeds umbel ⁻¹	No of seeds umbellate ⁻¹	Umbel circumference (cm)
BARI Dhonia-1	4.86	37.58 a	6.84 a	21.62
Faridpur local	4.80	35.29 b	6.46 b	21.68
CV (%)	5.51%	4.02%	5.04%	8.02
Level of significance	ns	**	**	ns

Level of significance means in a column having different letters are significant by DMRT, ** = Significant at 1% probability, ns = Non-significant

Number of seeds umbel⁻¹

There was a significant variation in number of seeds umbel⁻¹ between two varieties (Table 2). The number of seeds umbel⁻¹ (37.58) produced by the variety BARI Dhonia 1 was the highest. The minimum seeds umbel⁻¹ (35.29) was produced by the variety Faridpur local. Maurya (1989) recorded 28.00-46.00 seeds per umbel. Datta and Choudhuri (2006) got the seeds per umbel in the range of 33.47-35.57. The result under study is in partial fulfillment of Maurya (1989) and Datta and Choudhuri (2006).

Number of plants plot⁻¹

There was no significant variation in number of plants plot⁻¹ (5.4 m²) (Table 4). In a plot having size of 5.4 m², BARI Dhonia 1 had 179.5 plants while Faridpur local had 176.8 plants. Both varieties are statistically similar in number of plants plot⁻¹.

Table 3: Effect of variety on yield and yield attributes of Coriander

Variety	No. of plants plot ⁻¹	Seed yield plant ⁻¹ (g)	Seed yield plot ⁻¹ (g)	No. of seeds plant ⁻¹
BARI Dhonia-1	179.5	10.75	1028.0	955.7
Faridpur local	176.8	10.67	1053.0	967.5
CV (%)	5.62	7.49	5.37	6.44

Level of significance	ns	ns	ns	ns
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Level of significance means in a column having different letters are significant by DMRT. ns = Non-significant.

1000-seed weight

The highest 1000-seed weight (10.74 g) was produced by the variety BARI Dhonia 1. The lowest 1000-seed weight (8.92 g) was produced by the variety Faridpur local.

Islam *et al.* (2004) obtained 1000-seed weight in the range of 10.25 to 11.73 g. Maurya (1989) got 1000-seed weight from 8.82-18.52g and Datta and Choudhuri (2006) from 9.33-13.82g. The result regarding 1000-seed weight of the present study was in the range of all authors.

Seed yield (t/ha)

The highest seed yield (1.949 t/ha) was recorded from Faridpur local while BARI Dhonia 1 gave seed yield 1.903 t/ha. Rajagopalan *et al.* (1996) obtained seed yield of 13 coriander cultivars in the range of 0.36-0.68 t/ha at the Tamil Nadu Agricultural University, Coimbatore, India. Datta and Choudhuri (2006) reported that seed yields of 17 germplasm lines were in the range of 0.69-1.51 t/ha. Anon (2002) reported that four lines of coriander produced seed yield in the range of 0.98-1.24 t/ha in Gazipur while CR0022 gave highest yield 1.95 t/ha while BARI Dhonia 1 produced 1.80 t/ha, which support the present study result that Faridpur local produce highest result.

IV. CONCLUSION

There was no significant difference between two coriander varieties, BARI dhonia-1 and Faridpur local in respect of most of the yield parameters and seed yield. The spacing of 30 cm x 10 cm gave the maximum coriander seed yield identical with 20 cm x 15 cm spacing. The variety Faridpur local in combination with 30 cm x 10 cm spacing gave the highest seed yield of coriander closely followed by 25 cm x 15 cm spacing with the same variety Faridpur local. The variety BARI Dhonia-1 coupled with spacing of 20 cm x 10 cm produced the identical seed yield.

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Adversity Quotient and Teaching Performance of Faculty Members

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Abstract- This study sought to determine the relationship between adversity quotient and teaching performance of thirty (30) faculty members at West Visayas State University–Lambunao Campus during the first semester of the school year 2008-2009. The researcher utilized to gather data the respondent’s profile, adversity quotient profile, and the performance evaluation sheet. The study revealed that, generally, the faculty members had “high” adversity quotient mean scores and a “very satisfactory” teaching performance. Likewise, it identified some personal variables which may influence the adversity quotient of the faculty members. Further, the results showed that faculty members who were classified according to their age and academic rank had “high” adversity quotient. However, when they were classified according to length of service, those who served the school for more than 20 years have “high” adversity quotient while those who served less than 20 years have “average” adversity quotient. SPSS Computer Software was utilized in the computation of the research data. Results of the t-test showed that there is a significant difference in the adversity quotient of faculty members when they were classified according to their academic rank and length of service. Results of Pearson’s r showed that there is a significant relationship between adversity quotient and teaching performance of faculty members at WVSU-LC.

Index Terms- Adversity, Adversity Quotient, Teaching Performance

I. INTRODUCTION

The common thinking of the people of long ago is that one’s intelligence quotient can foretell his success in his field of endeavor. The higher the intelligence quotient, the higher is the success expectation from an individual. However, researches recently have shown that measurement of adversity quotient (AQ) is a better index in measuring success.

According to Stoltz (1997), adversity quotient is the science of human resilience wherein people perform skills in the face of adversity of challenges. This explains why some people survive better than others while facing some adverse situations. In this fast growing world, teachers are greatly exposed to the demands of speed, capacity, and capabilities in the performance of multifaceted tasks. It is inevitable that they will encounter difficulties, demands, complexities, and adversities. These adverse situations are encountered by teachers in their personal challenges, school, and in the community.

Thus, there is a need to determine the adversity quotient of every faculty member so that it can tell how one withstands

adversity and how one overcomes it while performing his teaching duties.

II. RESEARCH ELABORATIONS

This present study determined the relationship between adversity quotient and teaching performance of faculty members at West Visayas State University – Lambunao Campus during the first semester of the school year 2008 – 2009. Specifically, it answered the following questions: 1) What is the adversity quotient of faculty members as a whole and when classified according to their a) age, b) academic rank, and c) length of service? 2) Is there a significant difference in the adversity quotient of faculty members when they are classified according to a) age, b) academic rank, and c) length of service? 3) What is the teaching performance of faculty members as a whole and when classified according to a) age, b) academic rank, and c) length of service? 4) Is there a significant difference in the teaching performance of faculty members when they were classified according to a) age, b) academic rank, and c) length of service? 5) Is there a significant relationship between adversity quotient and teaching performance of faculty members?

This study used a quantitative approach in determining the relationships that exist between adversity quotient and some antecedent variables and between adversity quotient and teaching performance of faculty members at West Visayas State University – Lambunao Campus. This study was conducted among thirty (30) faculty members of West Visayas State University – Lambunao Campus during the first semester of the school year 2008 – 2009. They were classified according to age, academic rank, and length of service. There were sixteen (16) faculty members who have ages thirty five years (35) and below and fourteen (14) have ages above thirty (35) years. There were twenty (20) who were instructors and ten (10) who were either assistant or associate professors. There were eleven (11) faculty members who have served for twenty (20) years and less and nineteen (19) who had served more than twenty (20) years.

There were three instruments used to gather data for the study. They were: a) Faculty member-respondent profile – this instrument provided information about the respondents’ personal background such as age, academic rank, and length of service. b) Adversity quotient profile – this instrument was developed by Dr. Paul Stoltz and was adopted for this study. c) Faculty performance evaluation sheet – this instrument measured the teaching performance of faculty members. This was an evaluation tool which consolidated the focus of performance appraisal form for teaching effectiveness. It was composed of four components namely: a) commitment, b) knowledge of the

subject matter, c) teaching for independent learning, and d) management of learning.

The necessary permits to conduct the study were secured. The instruments were given to the teacher – respondents during their free time and were gathered by the researcher the next day. To determine the adversity quotient score, the researcher summed up the score then multiplied by 2. The performance rating of faculty members were taken from the office of the Dean of Instruction and were held with utmost confidentiality.

To describe the variables like age, academic rank, and length of service, the statistical tools used were frequency, percentage, mean, and standard deviation. To determine the significant difference of faculty members when they were classified according to age, academic rank and length of service, t-test was used. And to determine the relationship between adversity quotient and teaching performance of faculty members, Person’s r was used.

III. RESULTS

Table 1
Demographic Profile of Respondents

Variables	Frequency (f)	Percentage (%)
Age		
35 years old and below	16	53
Above 35 years old	14	47
Academic Rank		
Instructor	20	67
Professor	10	33
Length of Service		
20 years and below	11	37
More than 20 years	19	63
Total	30	100

As a whole faculty members exhibit a high score in their Adversity Quotient with a mean of 168.63. Faculty members who had academic ranks of professors have the highest mean with 155.30 and a standard deviation of 3.9735. This shows that

there is homogeneity in the scores of faculty members. Those who hold instructor positions have scores of 140.00 with a high standard deviation of 11.5166 showed heterogeneity in scores.

Table 2
Adversity Quotient * Age

Age	N	Mean	Std. Deviation	Description
35 years old and below	16	136.3750	9.5000	High
Above 35 years old	14	155.0714	4.4629	High
Total	30	168.63	14.90	High

Table 3
Adversity Quotient * Academic Rank

Academic Rank	N	Mean	Std. Deviation	Description
Instructor	20	140.000	11.5166	High
Professor	10	155.300	3.9735	High
Total	30	168.63	14.90	High

Table 4
Adversity Quotient * Length of Service

Length	N	Mean	Std. Deviation	Description
20 years and below	11	133.364	6.5310	Low
More than 20 years	19	151.895	8.8311	High
Total	30	168.63	14.90	High

Table 5
(a) t-test Results for Differences in Adversity Quotient as to Age.

Category	Mean	df	t-value	t-sig
35 years old & below	.95714	28	-9.993	.008
Below 35 years old				

The probability level of ratio is less than 0.05. This indicates that the age of the faculty members does differ significantly in terms of their adversity quotient. The results imply that they have the ability to handle and overcome difficult circumstances that they encountered while teaching. The results of this study do not agree with the findings of Lucero (2005) that there is a significant difference on the adversity quotient level of grade school teachers when they were categorized according to age.

Likewise, it is supported by the study of Capones (2004) where the results showed that the computed chi square value of 7.609 which is than the critical value of 15.507 for the variable age tested at 0.05 level of significance. Thus, the null hypothesis which states that there is a significant difference between age and adversity quotient is rejected. This means that age is a determinant of adversity quotient.

Table 6
(a) t-test Results for Differences in Adversity Quotient as to Academic Rank

Category	Mean	df	t-value	t-sig
Instructor	-.75500	28	4.633	.005
Professor				

There is a significant difference in the adversity quotient and faculty members in their academic rank. The p-value 0.005 is less than 0.05. It means that faculty members who have higher academic ranks such as assistant and associate professors have become well-versed on strategies and ways to cope with various

complexities in teaching. These are the people who have made themselves to higher positions through hard work and perseverance. They became more vulnerable to stress reactions, tensions, and depression (Bandura, 1986).

Table 7
(a) t-test Results for Differences in Adversity Quotient as to Length of Service.

Category	Mean	df	t-value	t-sig
20 years and below	-.78062	28	-5.132	.014
More than 20 years				

The results showed that there is a significant difference in the adversity quotient of faculty members when classified according to length of service. The t-value = 0.014 is less than

0.05, thus the hypothesis stating that there is no significant difference in the adversity quotient when teachers were classified according to length of service, is rejected.

Table 8.
Teaching Performance * Age

Age	N	Mean	Std. Deviation	Description
35 years old and below	9	4.6122	.18492	Very satisfactory
Above 35 years old	21	4.5429	.24757	Very satisfactory
Total	30	4.5637	.22967	Very satisfactory

The results showed that the performance rating of faculty members is “very satisfactory” regardless of their age. This result is not in agreement with the study of Kinny (1912) which states

that older individuals are provided protection from discrimination on the basis of age. Hassan (2012) also said that older teachers easily “burn out”. They easily get tired in teaching.

Table 9
Teaching Performance * Academic Rank

Academic Rank	N	Mean	Std. Deviation	Description
Instructor	21	4.5205	.24283	Very satisfactory
Professor	9	4.6144	.16576	Very satisfactory
Total	30	4.5637	.22967	Very satisfactory

Table 10
Teaching Performance * Length of Service

Length of Service	N	Mean	Std. Deviation	Description
20 years and below	7	4.5357	.23344	Very satisfactory
More than 20 years	23	4.5722	.23312	Very satisfactory
Total	30	4.5637	.22967	Very satisfactory

The results showed that length of service of faculty members make them have “very satisfactory” teaching performance. Studies of Simkin (2006) and Hassan (2012) showed that pupils will likely get better results if a teacher is new to the profession. It is more difficult for an older teacher to establish rapport with

his class. It is also quite probable that a young graduate has more up to date knowledge and enthusiasm for the subject. Working experience showed a positive influence on teaching performance.

Table 11

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
	Lower	Upper	Lower	Upper	Lower			
Pair 1 age performance rating	-2.86367	.54784	.10002	-3.06823	-2.65910	-28.631	29	.000

Table 12

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper	Lower	Upper	
Pair 1	Length of service performance rating	-2.79700	.47362	.08647	-2.97385	-2.62015	-32.347	29	.000

Table 13

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper	Lower	Upper	
Pair 1	Academic Rank-performance rating	-3.26367	.45545	.08315	-3.43374	-3.09360	-39.248	29	.000

Since the results showed that the sig. values are less than 0.05, then there is a significant difference in the teaching performance of faculty members when they were classified according to their age, academic rank, and length of service.

Table 14

(a) Relationship between Adversity Quotient and Teaching Performance.

		Adversity Quotient	Teaching Performance
Adversity Quotient	Pearson Correlation	-	.835**
	Sig (2-tailed)		.000
Teaching Performance	Pearson Correlation	.835**	-
	Sig (2-tailed)	.000	

Since the significance value is less than 0.05, there is a significant relationship between adversity quotient and teaching performance of the respondents in the study. This confirms the findings of Stoltz (2000) where was found that there is a significant relationship between adversity quotient and school performance of secondary school teachers.

Several studies on Adversity Quotient and performance initiated by PEAK Learning Inc. (2000) revealed that adversity quotient correlated positively and was a predictor of performance and promotion. These findings further signify that higher AQ individuals outperform and will be more likely promoted than their lower AQ counterparts. Stoltz (2000) believes that the higher one's AQ, the more likely one will not tap his full potential because people with high AQ embrace challenges, and they live with a sense of urgency.

IV. CONCLUSIONS

Generally, the adversity quotient of faculty members is "high" and their teaching performance is "very satisfactory".

There was a significant difference in the adversity quotient of faculty members when classified according to their academic rank and length of service.

There was a significant difference in the teaching performance of faculty members when they were classified according to their age, academic rank, and length of service.

There was a significant relationship between adversity quotient and teaching performance of faculty members at West Visayas State University-Lambunao Campus.

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Chelating Agent Mediated Enhancement of Phytoremediation Potential of *Spirodela polyrhiza* and *Lemna minor* for Cadmium Removal from the Water

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Abstract- Free floating aquatic macrophytes, *Lemna minor* and *Spirodela polyrhiza*, were exposed to graded concentration of cadmium in a concentration range 1 to 10 mg L⁻¹ for a period of one month to evaluate cadmium accumulation in the presence of EDTA. The EDTA was added at the rate of 1, 2 and 3 mg L⁻¹ separately and the experiment was conducted in triplicate. The water and plant samples were collected at fortnightly interval for analysis of cadmium. At higher concentration of cadmium and EDTA, complete discoloration of plants was observed on the 30th day in the treatment with *L. minor* compared to *S. polyrhiza*. There was a significant difference in the cadmium uptake by the plants in the presence of EDTA when compared to the control (P<0.05). Cadmium removal from the water by the macrophytes showed significant difference (P<0.05) in the presence of EDTA compared to the control. Based on the result obtained during the study, it is concluded that, the uptake of cadmium by both the species showed a considerable extent of enhancement in the presence of EDTA. Overall observation reveals that a chelating agent such as EDTA can be used as an additive for enhanced phytoremediation potential of *S. polyrhiza* and *L. minor*.

Index Terms- Phytoremediation, EDTA, *Spirodela polyrhiza*, *Lemna minor*, Cadmium

I. INTRODUCTION

Heavy metal pollution of the biosphere has increased rapidly since 1900 (Nriagu, 1979), and aquatic ecosystem are directly affected by heavy metal pollution. The major sources of metal pollution are municipal wastes, burning of fossil fuel, fertilizer, sewage, mining and smelting of metalliferous ores and pesticides (Pendias & Pendias, 1989; Rai, 2008). In India, the major sources of heavy metals in the industrial areas are coal mining (Finkelman & Gross, 1999), thermal power plants and chemical industries. High levels of cadmium, copper, lead and Iron act as ecological toxins in

both aquatic and terrestrial ecosystem (Balsberg, 1989; Guilizzoni, 1991). Cadmium has become a serious problem because of its high toxicity. The major sources of cadmium pollution are industrial wastes from metallurgical plants, plating works, cadmium pigment manufacturing plants, textiles industries, nickel cadmium batteries etc. The conventional method used for remediation of cadmium contaminated water bodies are costly and time consuming. Phytoremediation is an alternative method to remove the toxic metals from the waste water. It is cost effective and environment friendly, in which hyper accumulating plants are used in order to extract and accumulate contaminants to the harvestable part of plants to clean up the contaminated area (McGrath *et al.*, 2002; Salt *et al.*, 1998). Uses of hyper accumulating plants are important in the process of phytoremediation. Duckweeds are floating aquatic macrophytes belonging to family *Lemnaceae* and normally found on the surface of nutrient rich fresh and brackishwaters (Zimmo, 2005). Chelating agents such as Ethylene Diamine Tetra Acetic acid (EDTA), citric acid, Ethylene Diamine Di Succinate (EDDS), Nitrilotriacetic acid (NTA) etc. are used in order to enhance the heavy metal uptake from the contaminated area. These chelating agents can make complex with metals thereby increase the bioavailability of metal in the contaminated sites. Therefore the plants can easily uptake the metal from the water. The objective of the study was to evaluate the efficacy of EDTA in the phytoremediation of cadmium contaminated water using *L. minor* and *S. polyrhiza*

II. MATERIAL AND METHODS

In the study, both the plants were collected and acclimatised for about 10 days under natural condition of cultivation site; the plants were kept in an aquarium tank containing 100 L of freshwater. Cadmium was added at the rate of 1, 5 and 10 ppm in triplicate for a period of one month. EDTA was added in each aquarium at a concentration of 1, 2 and 3 ppm separately in triplicate. Water with plants and

cadmium but without chelating agents in triplicate served as control. In each aquarium 60 L of tap water was maintained. The plants were added into each tank at the rate of 60 g fresh weight.

The plant and water samples were collected at fortnightly interval. The water samples for metal analysis were collected in polypropylene bottles and in which concentrated nitric acid was added to lower the pH to less than 2.0. After acidification, the water samples were also stored in a refrigerator for further use of digestion. Water samples were also collected in sample bottles for the analysis of water quality parameter such as water temperature, dissolved oxygen, ammonia, nitrite, nitrate, and phosphorus (APHA, 2005) which were carried out on the same day of sample collection. The plants were collected from each tank randomly and debris attached to the plants were removed by washing with distilled water and thereafter were air dried for 2 days or till constant weight was attained. The samples were powdered well and kept at room temperature for wet digestion.

Analysis of cadmium in water and plants: Water samples were subjected to suprapure nitric acid digestion (6 ml) using microwave-assisted Kjeldhal digestion unit (Anton Parr, USA). The digested samples were diluted to 50 ml using distilled water and subjected to heavy metal analysis by atomic absorption spectrophotometer (AAnalyst 800, Perkin Elmer, USA) using flame atomization.

The dried plant samples were digested with a mixture (3:1) of concentrated nitric and hydrofluoric supra pure acids (Merck, Germany) in a microwave-assisted Kjeldhal digestion unit (Anton Parr, USA). Each microwave extraction vessel was added with 8 ml of the acid mixture together with 0.50 g of plant sample. The vessels were capped and heated in the microwave unit at 1200 W to a temperature of 190°C for 25 minutes at a pressure of 25 bar. The digested samples were diluted to 50 ml using distilled water and subjected to heavy metal analysis by Atomic Absorption Spectrophotometer (AAnalyst 800, Perkin Elmer, USA) using flame atomization.

Statistical analysis: For all the experiments, the data were analysed by SPSS, 16. Both one-way and two-way analyses were carried out for each experiment to find out the significance between treatments with EDTA and control between 15 days of interval.

III. RESULTS AND DISCUSSION

The result indicated that both *L. minor* and *S. polyrhiza* can effectively remove the cadmium from the contaminated water. Rhizofiltration is a type of phytoremediation in which the heavy metal can be removed from the contaminated water using hydroponically green plants (Raskin et al., 1994). The chelating agent can play a major role in order to enhance the heavy metal uptake from the contaminated area. EDTA is one of the easily available chelating agents which enhance the metal bioavailability in the water, therefore the plant can uptake maximum amount of metal from the surrounding area. Fig.1 indicate that the accumulation of cadmium is higher in the treatment with *S. polyrhiza* than *L. minor* and also greater accumulation was observed in the presence of EDTA at different concentration. EDTA is reported to be the most

effective amendment in the phytoremediation process which has been successfully utilized to enhance phytoextraction of Pb and other metals from the contaminated area (Cunningham and Ow, 1996; Chen *et al.*, 2004). *L. minor* can uptake cadmium and copper from the contaminated water (Kara, 2004; Hou *et al.*, 2007). Cadmium accumulations by the plant were increased as the concentration of EDTA increased from 1 to 3 mg L⁻¹. The well-developed root system can absorb and accumulate water, nutrients and other non-essential contaminants such as Pb and Cd (Arthur *et al.*, 2005). The graphical representation clearly indicate that the removal of cadmium is higher in all the treatment with *S. polyrhiza* compared to *L. minor*.

The cadmium level (mg L⁻¹) in the water after 15 and 30 days of experiments was given in the Table No. 1. The concentration of cadmium in the water decreased significantly in the presence of EDTA compared to other treatments. There was a significant difference between EDTA 1, 2 and 3 ppm on the 15th and 30th day. In the presence of EDTA (3 ppm), concentration of Cd in the treatment with *L. minor* decreased to 0.202±0.008, 1.181±0.005 and 4.335±0.010 mg L⁻¹ with a removal efficiency of 80, 76 and 57% from the treatment containing 1, 5 and 10 mg Cd L⁻¹, respectively. In the presence of EDTA (3 ppm), concentration of Cd in the treatment with *S. polyrhiza* significantly decreased to 0.164±0.006, 1.004±0.004 and 3.147±0.008 mg L⁻¹ with a removal efficiency of 84, 80 and 69 % in the treatment containing 1, 5 and 10 mg Cd L⁻¹, respectively. The results show that concentration of cadmium in the water decreases in the presence of chelating agents significantly as compared to the control. The minimum level of cadmium in the water observed in the treatments with 3 mg EDTA L⁻¹ at the end of 30 days. The overall cadmium accumulation in the plant shows that there is an increase in uptake of cadmium from 15 to 30 days and the accumulation at different concentration of cadmium (1, 5 and 10 mg L⁻¹) indicated that *S. polyrhiza* can accumulate higher amount of cadmium at different level of concentrations. Similar findings were reported earlier by Hamizah *et al.* (2011) found that, for containers containing *Eichhornia crassipes*, the concentrations of copper decreased from 5.5 to 2.1, 2.5 to 0.11 and 1.5 to 0.04 mg L⁻¹ and for containers containing *Centella asiatica*, the concentrations of copper decreased from 5.5 to 0.92, 2.5 to 0.01 and 1.5 to 0.03 mg L⁻¹.

Percentage of cadmium removed from water showed that maximum removal was observed in the treatment with EDTA 3 on 30th day. Earlier studies by Devaleena *et al.* (2013) found that *S. polyrhiza* and *L. minor* could remove 52-75 % and 42-78 % of cadmium from the contaminated water. As the concentration of EDTA increased from 1 to 3 mg L⁻¹, the percentage of cadmium removed from water increased (Fig. 2). The Cd removal in terms of percentage was maximum in the presence of *S. polyrhiza* than *L. minor* using EDTA. The application of 0.1M Na₂EDTA solution at pH 4.5 showed a removal of 85.26% of lead from the contaminated soil (Ayejuyo., 2012). The total Bio concentration Factor (BCF) value of cadmium indicated that higher BCF was observed in the treatment with *S. polyrhiza* and maximum concentration was observed in the presence of EDTA compared to the control (Fig. 3). According to Dipu *et al.* (2012), BCF of

cadmium was more in the presence of EDTA compared to the control by using aquatic macrophytes. BCF of cadmium indicated that the *S. polyrhiza* can accumulate high amount of cadmium in the presence of EDTA compared to *L. minor*.

The water quality parameters indicated that dissolved oxygen, pH, and available phosphorous and ammonia-N level varied among the treatments with EDTA and control (Table No. 2). The dissolved oxygen levels in the water decreased after the treatment with EDTA (Satyakala and Jamil, 1992). The chlorophyll-a decreased in the treatment with increase in concentration of cadmium and chelating agent. Growth rate of *L. minor* and *S. polyrhiza* decreased with increased Pb concentrations and chlorophyll content was negatively correlated with Pb exposure (Leblebici and Ahmet, 2011). In

this study, the chlorophyll-a decreased significantly as the concentration of Cd increased from 1 to 10 mg L⁻¹. Leblebici and Ahmet (2011) found that *S. polyrhiza* when exposed to Pb concentration of 5 mg L⁻¹ or higher, a decrease in chlorophyll pigments of the plants were observed with minimum chlorophyll-a value being 0.414 mg g⁻¹ fresh weight on day 7 at 50 mg L⁻¹ compared to 1.601 mg g⁻¹ in the control. The morphological parameters indicated that discoloration of the plant appeared at high concentration of cadmium (10 mgL⁻¹) and EDTA (3 mgL⁻¹). Nitrate and phosphorus content decreased with increase on concentration of cadmium. Nitrate, phosphate and sulfate concentration in water decreased with time in the nutrient enriched treatments in *L. minor* and *S. polyrhiza* (Leblebici and Ahmet, 2011).

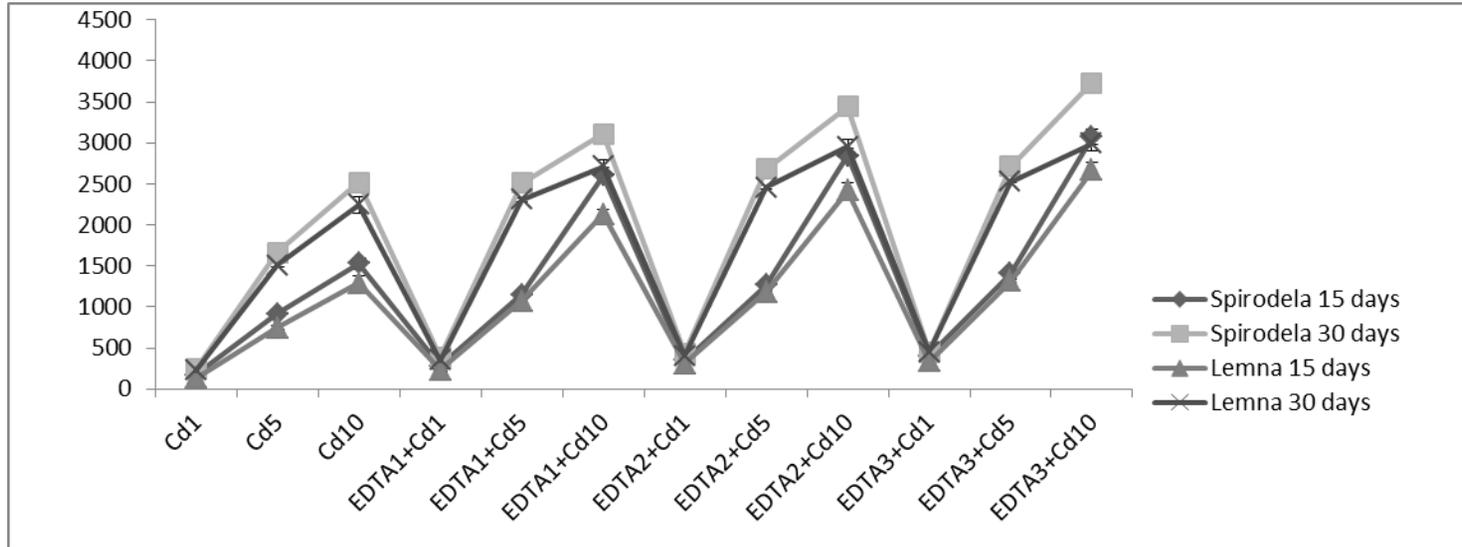


Fig. 1: Cd concentration ($\mu\text{g g}^{-1}$) in *S. polyrhiza* and *L. minor* on 15 and 30th day (Mean \pm SE)

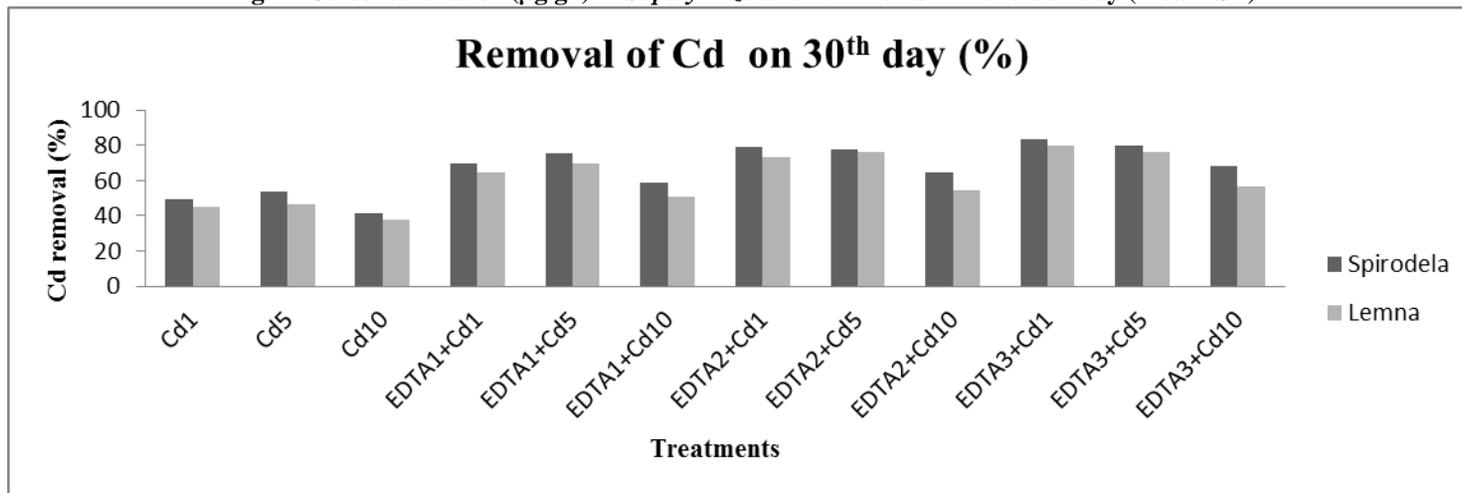


Fig. 2: Percentage of cadmium removed from water on 30th day with *S. polyrhiza* and *L. minor* (Mean \pm SE)

Table No. 1: Concentration of cadmium in water (mg L^{-1}) after phytoremediation by *S. polyrhiza* and *L. minor* (Mean \pm SE)

Treatment	<i>Spirodela polyrhiza</i>		<i>Lemna minor</i>	
	15 th Day	30 th Days	15 th Day	30 th Day
Cd1	0.805 ^d \pm 0.006	0.504 ^f \pm 0.035	0.845 ^e \pm 0.007	0.550 ^e \pm 0.009
Cd5	3.976 ^c \pm 0.017	2.301 ^d \pm 0.005	4.209 ^c \pm 0.005	2.673 ^c \pm 0.014
Cd10	8.312 ^a \pm 0.014	5.828 ^a \pm 0.017	8.624 ^a \pm 0.014	6.229 ^a \pm 0.005
EDTA1+Cd1	0.701 ^d \pm 0.008	0.301 ^g \pm 0.004	0.740 ^f \pm 0.009	0.353 ^f \pm 0.006
EDTA1+Cd5	3.699 ^c \pm 0.006	1.208 ^e \pm 0.007	3.798 ^d \pm 0.007	1.510 ^d \pm 0.007
EDTA1+Cd10	7.314 ^a \pm 0.009	4.113 ^b \pm 0.012	7.654 ^b \pm 0.009	4.938 ^b \pm 0.016
EDTA2+Cd1	0.648 ^e \pm 0.006	0.212 ^h \pm 0.007	0.679 ^f \pm 0.010	0.265 ^g \pm 0.016
EDTA2+Cd5	3.597 ^c \pm 0.006	1.109 ^e \pm 0.003	3.615 ^d \pm 0.006	1.201 ^d \pm 0.006
EDTA2+Cd10	7.009 ^b \pm 0.009	3.525 ^c \pm 0.007	7.398 ^b \pm 0.003	4.553 ^b \pm 0.008
EDTA3+Cd1	0.595 ^e \pm 0.009	0.164 ^h \pm 0.006	0.644 ^g \pm 0.010	0.202 ^h \pm 0.008
EDTA3+Cd5	3.514 ^c \pm 0.006	1.004 ^e \pm 0.004	3.528 ^d \pm 0.003	1.181 ^d \pm 0.005
EDTA3+Cd10	6.830 ^b \pm 0.010	3.147 ^c \pm 0.008	7.254 ^b \pm 0.011	4.335 ^b \pm 0.010

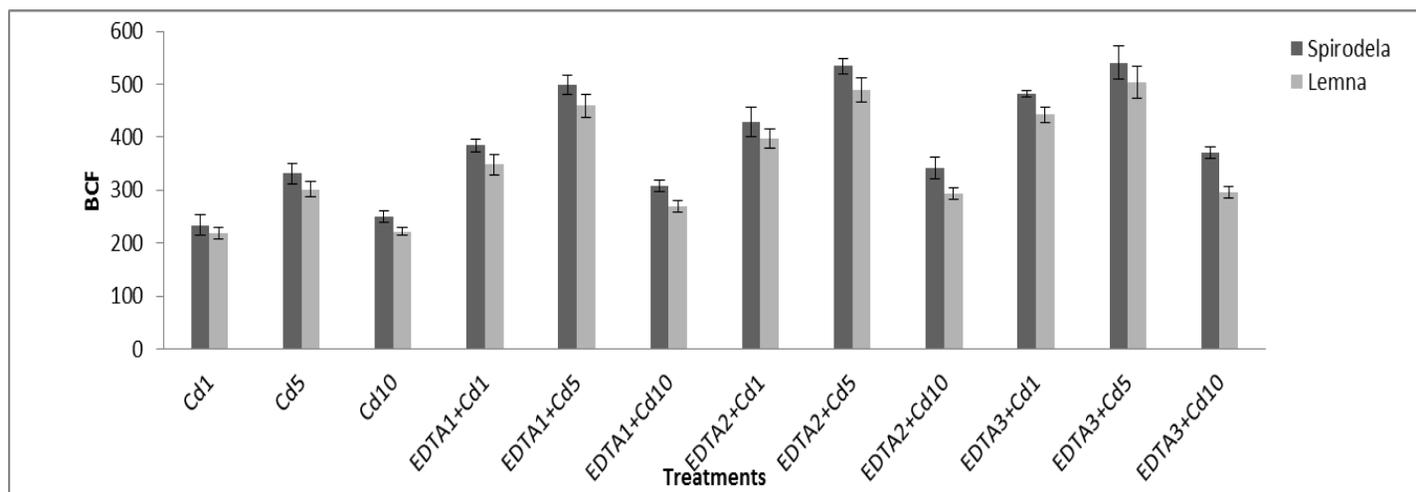


Fig. 3: Bioconcentration factor (BCF) of cadmium in *S. polyrhiza* and *L. minor* (Mean \pm SE)

Table No. 2: Water quality parameters (Range) in the different treatment with *L. minor* and *S. polyrhiza*

Parameters	Cd (mg L ⁻¹)							
	<i>L. minor</i>				<i>S. polyrhiza</i>			
	control	EDTA1	EDTA2	EDTA3	control	EDTA1	EDTA2	EDTA3
DO	5.53- 6.07	5.08-5.40	4.76-5.02	4.37-4.77	5.23-5.60	5.22-5.86	4.87-5.24	4.75-5.06
pH	7.9-8.2	7.4-7.8	7.2-7.4	7.1-7.3	7.4-8.1	7.6-7.8	7.1-7.4	7.0-7.3
AP	0.33-0.41	0.21-0.30	0.20-0.29	0.16-0.30	0.21-0.36	0.17-0.38	0.18-0.35	0.15-0.30
NO₂-N	0.25-0.28	0.26-0.33	0.25-0.26	0.20-0.26	0.37-0.46	0.47-0.48	0.39-0.40	0.48-0.51
NO₃-N	0.08-0.16	0.17-0.23	0.40-0.45	0.42-0.53	0.15-0.33	0.13-0.26	0.30-0.33	0.25-0.26
NH₃-N	0.06-0.11	0.08-0.12	0.09-0.16	0.08-0.19	0.02-0.09	0.09-0.11	0.08-0.16	0.08-0.24
Chlorophyll-a	0.42-0.54	0.27-0.28	0.17-0.25	0.14-0.21	0.44-0.54	0.34-0.36	0.22-0.26	0.19-0.30
Chlorophyll-b	0.04-0.06	0.05-0.06	0.05-0.07	0.03-0.05	0.07-0.08	0.09-0.11	0.09-0.10	0.09-0.11

DO: Dissolved Oxygen (mg L⁻¹); pH (no unit); AP: Available phosphorus (mg L⁻¹); NO₂-N: Nitrite-N (mg L⁻¹); NO₃-N: Nitrate- N (mg L⁻¹); NH₃-N: Ammonia-N (mg L⁻¹); Chlorophyll-a,b (mg g⁻¹)

IV. CONCLUSION

Based on the result obtained during the study, it can be concluded that,

- The free floating plants such as *L. minor* and *S. polyrhiza* are very effective in accumulation of cadmium from contaminated water.
- The cadmium accumulation of *S. polyrhiza* is higher compared to *L. minor*.
- The efficiency of plant can be increased by adding EDTA as chelating agent.
- Maximum accumulation was observed in the presence of EDTA at 3 mgL⁻¹.

ACKNOWLEDGEMENT

We express our sincere thanks to Dr. W. S. Lakra, Director/ Vice Chancellor, CIFE, Mumbai for the financial support and co-operation extended during the study.

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Influence of seed fatty acids on seed viability and corky tissue development in sapota (*Manilkara achras*) fruits cv. “Cricket ball”

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Abstract- Corky tissue (CT) is a major physiological disorder adversely affecting fruit quality in sapota (*Manilkara achras*) cv. Cricket ball in India. Corky tissue affected fruits are characterized by a dry acidic flesh and hard lump in the pulp, without showing external symptoms. Loss of seed viability during fruit growth has been found to cause the formation of the disorder. However, the exact process which triggers CT development remains unclear. It has been frequently observed that seed fat content in seeds from CT affected fruits remains significantly lower in comparison with that of seed in healthy fruit. Since seed fats play a major role in determining seed viability, the purpose of the present study was to determine the possible association between seed fats and seed viability in the development of corky tissue. The study found that the seed moisture content, total dehydrogenase activity (TDH), fat content and percent seed germination in seeds of CT affected fruits were significantly lower compared to healthy seed. There was an excessive production of free radicals in seeds of CT affected fruit while the activities of antioxidative enzymes like peroxidase (POD), catalase (CAT) and superoxide dismutase (SOD) were markedly lower. Consequently, the extent of lipid peroxidation was significantly higher in seed from CT affected fruit compared to seeds in healthy fruit. There was a significant rise in the level of iron content in seed from CT affected fruit which possibly accounted for the disproportionate production of free radical and substantially higher levels of lipid peroxidation. There was a marked decline in the level of VLCFAs and the contents of linoleic acid and oleic acid associated with an increase of EC and a fall in the pH of seed indicating a loss of seed viability. Analysis of results suggested that the reduced fat content of seed accompanied by changes in the composition of fatty acids coupled with an enhanced production of free radicals resulted in increased lipid peroxidation and membrane damage leading to a loss of seed viability and culminating in the development of corky tissue in sapota fruit cv. Cricket ball.

Index Terms- Corky tissue, sapota, *Manilkara achras*, physiological disorder, seed viability, germination, seed fatty acids, VLCFAs, free radical, lipid peroxidation

I. INTRODUCTION

Corky Tissue (CT) of sapota fruit, *Manilkara achras* (Mill.) Fosberg, cv. Cricket ball is a physiological disorder distinguished by the presence of a semi-dehydrated hard lump/s

embedded inside the soft pulp tissue of ripe fruits, slightly sour to taste and located near the peel. The rate of incidence of the disorder shows wide variations within and among trees, locations and seasons even within the same orchard. Fruits harvested in summer season display higher incidence of CT compared to winter crop and thus present a major challenge for the production of consistently high quality fruits. A unique characteristic of the disorder is that the CT affected fruits do not show external symptoms and are identified only after cutting the fruits open.

Past work based on measurements of seed dehydrogenase activity had shown that the incidence of corky tissue in ‘Cricket ball’ sapota occurred due to a reduction in seed viability (Shivashankar *et al.*, 2013). Subsequent work showed that changes in seed viability influenced the metabolism of fruit pulp resulting in CT formation and the associated deterioration of fruit quality in affected fruits (Shivashankar *et al.*, 2014)

Among the numerous varieties of sapota being grown commercially, cv. “Cricket ball” is worst affected by the CT disorder. A preliminary examination of sapota varieties for fat content showed that “Cricket ball” contained significantly higher level of fats in its seed compared to other varieties. However, the CT affected sapota seed contained less fats compared to the seed from healthy fruit (Shivashankar *et al.*, 2007). Changes in fat metabolism producing differences in the composition of fatty acids of seed is reported to cause a loss of viability in some plants (Lin and Pearce, 1990) as fatty acid composition is the most important factor which determines its susceptibility to oxidation. As the biosynthesis of fats in plant cells occurs from a supply of carbohydrates at the expense of high energy input, we speculated that the lower level of fat content in CT seed could arise from a competition for assimilates among fruits on the same panicle which might in turn, influence seed viability and cause the disorder. In order to test this hypothesis, the present work was initiated with the objective of determining the possible association between seed fats and seed viability and its influence on the development of corky tissue in sapota cv. Cricket ball.

II. MATERIAL AND METHODS

II.1. Material

“Cricket ball” sapota fruits were collected during the 2013–14 season from 10-year-old trees receiving the recommended supply of fertilizers and plant protection measures and maintained under uniform growth conditions in the experimental orchard of IIHR, Bangalore.

II.2. Moisture content

Moisture contents of seed tissue samples were determined gravimetrically immediately after cutting the fruit open.

II.3. Seed germination

Seeds were sown on moist filter paper in closed petri dishes and placed in an incubator in darkness at 28°C. The number of germinated seeds was recorded daily up to 120 days. Seeds were considered as germinated when the radicle length was more than 2 mm (ISTA, 1993). Seed germination tests were performed on 10 seeds each replicated ten times.

II.4. Seed viability

Seed viability was measured by assay of total dehydrogenase (TDH) activity using triphenyl tetrazolium chloride (TTC) test (ISTA, 1985). After removal of the seed coat; the embryo was soaked overnight in water. To 100mg of embryo, 3mL of 1% TTC reagent was added and incubated for 24 hours at a constant temperature of 37°C in a water bath. The tissue was homogenized with 10mL of methanol, centrifuged at 3000 rpm for 10 min and the absorbance of the clear supernatant was read in a spectrophotometer at 485 nm. A standard curve prepared from known concentrations of triphenyl formazan was used to express dehydrogenase activity in terms of µg formazan produced per gram of fresh tissue

II.5. Fat content

Total fat content in tissue samples was extracted using Soxhlet extractor as described by Osborne and Voogt (1978) and estimated gravimetrically. 1g of dry tissue powder packed in a thimble was placed in a Soxhlet extractor and extracted under reflux on a steam bath for 3 hrs using petroleum ether as solvent (bp.40°-60°C). The solvent containing the dissolved fats was quantitatively transferred to a clean and dry pre-weighed flask (W_1), evaporated to dryness on a boiling water bath and weighed again (W_2). The difference in weights was used to calculate the percent of fat in sample using the formula, $(W_2 - W_1) / \text{Weight of sample} \times 100$

II.6. Extraction and methylation of fatty acids

Healthy and spongy affected fruit tissues were homogenized in a mixture of chloroform-methanol (2:1 v/v) and filtered through Whatman no.1 filter paper. The chloroform phase containing the lipids was separated, dried in a rotary vacuum evaporator at 40°C and stored at -20°C until further used (Folch *et al.*, 1957). The extracted lipids were methylated by dissolving in methanol and refluxed for 10 min at 70°C, followed by addition of 14% BF_3 in methanol. The mixture was further refluxed for 30 min at 70°C according to the modified method of Morrison and Smith (1964). Methyl esters of fatty acids (FAME) were subsequently extracted in heptane and dried on anhydrous sodium sulfate and filtered through 0.2 µm nylon membrane.

II.7. GC-FID analysis

GC-FID analysis of fatty acid methyl esters was carried out using a Varian-3800 Gas chromatograph system equipped with flame ionization detector (FID) on a fused silica capillary column (VF-5 Factor Four, Lake Forest, CA, USA), 30 m × 0.25 mm i.d and 0.25µm film thickness. The temperature program for the column was as follows: Initial oven temperature was set to 100°C for 4 min, increased by 3°C per min up to 220°C and held for 4 min. The temperature was further increased to 260°C at the rate of 5°C per min and held for 10 min. Injector and detector temperatures were maintained at 250°C and 260°C respectively.

Helium at a flow rate of 1 mL/min was used as the carrier gas. Flow rates of H_2 and air were maintained at 20 mL/min and 250 mL/min respectively. Injection was initially done in split-less mode followed by split mode (1:30) after 1.5 minutes.

II.8. Gas chromatography-mass spectrometry (GC-MS)

GC-MS analysis was performed on Varian-3800 gas chromatograph coupled with Varian 4000 GC-MS-MS ion trap mass selective detector. Fatty acids were separated on VF-5MS fused silica capillary column (Varian, USA) (30 m × 0.25 mm id with 0.25 µm film thickness) by applying the same temperature program as described above for GC-FID analysis. The carrier gas was helium at a flow rate of 1ml/min; injector temperature, 260°C; ion source-temperature, 220°C; trap temperature, 200°C and transfer line temperature, 260°C. Mass detector conditions were: EI-mode at 70 eV with full scan range, 50–450 amu. Fatty acids were identified by comparing the relative retention times of FAME peaks with those of reference standards (Sigma-Aldrich, USA) and also by comparing the spectra with those available in Wiley and NIST-2007 spectral libraries (Liu, 1994). The total quantity of FAME was estimated as the sum of all GC-FID peak areas in the chromatogram and individual compounds were quantified by comparing the known individual FAME procured as standard. All the analyses were performed on three samples run separately.

II.9. Free radical production

Superoxide anion ($\text{O}_2^{\cdot -}$) levels were estimated following Doke (1983). The levels of hydroxyl radicals ($\cdot\text{OH}$) were determined as described by Von Tiedemann (1997), using 2-deoxyribose as the scavenger molecule. Hydrogen peroxide (H_2O_2) content was measured according to Schopfer *et al.* (2001) and expressed as ng H_2O_2 generated /g FW of tissue.

II.10. Lipid peroxidation

Lipid peroxidation was monitored by measuring the conversion of lipids to malondialdehyde (MDA), using the thiobarbituric acid reactive substances (TBARS) assay, as described by Draper and Hadley (1990). TBARS reagent (1 mL) was added to a 0.5 mL aliquot of tissue homogenate and heated for 20 min at 100 ° C. The antioxidant, butylated hydroxy-toluene, was added before heating the samples. After cooling on ice, samples were centrifuged at 840g for 15 min and absorbance of the supernatant was read at 532 nm. Blanks for each sample were prepared and assessed in the same way to correct for the contribution of A_{532} to the sample. TBARS results were expressed as MDA equivalents using 1,1,3,3- tetraethoxypropane as standard.

II.11. Electrolyte leakage and pH

One g of pulp tissue was suspended in 10 mL of distilled water and electrolyte leakage was measured as conductance using a conductivity bridge (ELICO model CM-180) and expressed as dS/ m. pH was recorded using a combination electrode.

II.12. Enzyme assays

Peroxidase and catalase enzymes were extracted by homogenizing 1g fresh tissue in a chilled mortar and pestle in an ice bath in 100 mM sodium phosphate buffer (pH 7.0). The homogenate was centrifuged at 18 000g for 15 min at 4°C and the supernatant was used as enzyme source.

II.12.1. Peroxidase (POD)

POD (EC 1.11.1.7) was assayed in a reaction mixture (5 mL) containing 50 mM sodium phosphate buffer (pH 7.0), 20 mM guaiacol and 100 μ L enzyme extract. The reaction was initiated by the addition of 0.042% (v/v) H₂O₂ and the increase in absorbance at 420 nm was monitored for 3 min at 30 sec intervals with a Beckman Model DU 64 UV-Visible spectrophotometer. The activity was expressed as (nmol. min⁻¹ mg⁻¹ protein) (Saroop *et al.*, 2002)

II.12.2. Catalase (CAT)

CAT (EC 1.11.1.6) was assayed in a reaction mixture (3 mL) containing 100mM Tris-HCl buffer (pH 7.0), 0.1 mL exudates and 200 mM H₂O₂. CAT activity was determined using the molar extinction coefficient of H₂O₂ at 240nm (= 43.6 M⁻¹ cm⁻¹) and expressed as nmoles mg protein⁻¹ min⁻¹ (Luck, 1965)

II.12.3. Superoxide dismutase (SOD)

SOD enzyme (EC. 1.15.1.1) was extracted by homogenization of 1g fresh tissue in 50 mM sodium phosphate buffer pH 7.8 and centrifuged at 10,000 \times g for 10 min at 4°C. The clear supernatant containing the enzyme was used for assays. SOD was assayed based on its ability to inhibit the photochemical reduction of nitro blue tetrazolium (NBT) following Beauchamp and Fridovich (1971). The reaction mixture in a final volume of 3.0 ml, contained 50 mM sodium phosphate buffer pH 7.8, 100 μ M EDTA, 130 mM methionine, 0.75 mM NBT, 20 μ M riboflavin and enzyme extract. The reaction was started by illuminating the tubes under four 40 W fluorescent lamps for 8 min at the end of which time absorbance was recorded at 560 nm against a blank maintained in dark. One unit of SOD activity was defined as the amount of enzyme required to inhibit the photoreduction of NBT by 50% of that caused by the superoxides generated from the reaction between photoreduced riboflavin and oxygen under the assay conditions. SOD enzyme activity was expressed in units mg⁻¹ protein.

II.13. Iron content

One g of oven-dried seed was digested with 10 ml of 9:4 (v/v) mix of 16 M nitric acid: 11.6 M perchloric acid. Iron concentration was estimated using an AAnalyst-200 atomic absorption spectrometer (Perkin-Elmer, Waltham, MA, USA; Jones *et al.*, 1991).

II.14. Statistical analysis

Experimental data were subjected to ANOVA adapting the Fisher's analysis of variance technique (Panse and Sukhatme, 1978) and mean values were tested for significance using student's t-test. The results were expressed as mean \pm standard error (SE).

III. RESULTS

Results presented in Table 1 showed that the total fat content of seed decreased from 15.76% in H seed to 11.12% in CT seed. Moisture content also declined from 43% in H seed to 40% in CT seed. The rate of germination in CT seed was lower at 48% compared to 94% in H seed while TDH activity was also lower (12.8) in CT seed compared to 27.9 in H seed (Figure 1).

The rate of production of free radicals was significantly higher in CT seed as compared to H seed. The generation of hydroxyl radical in CT seed was 5.8 times higher than that in H seed while the superoxide production was 4.3 times higher (Figure 2). The activity of POD showed a reduction to an extent

of 35.3% in CT seed compared to H seed. Similar trend was noticed in the activities of both CAT and SOD which showed a decline of 12.5% and 17.4% respectively in CT seed in comparison with H seed (Figure 3)

There was a 62.6% increase in the rate of generation of MDA in CT seed compared to H seed. The pH of CT seed was lower (6.40) as against 6.51 in H seed (Figure 3). The electrical conductivity was significantly higher in CT seed compared to H seed. The iron content showed a four-fold increase in CT seed as compared to H seed (Table 1).

The H seed was found to contain a higher level of fatty acids (305.13) compared to CT seed (259.74) (Table 2). Of the 18 fatty acids detected in seed, four fatty acids viz, palmitic, linoleic, oleic and stearic acids constituted 94.8% of the total fatty acid content of the H seed and 93.3% in CT seed. Palmitic acid, the single largest fatty acid present in seed, constituting 47.5% of the total fatty acids in H seed increased to 50.9% in CT seed, although the total content fell by 8.93%. Linoleic acid constituted the second major fatty acid component of seed with 62.3% in H seed. The short chain fatty acids, caprylic acid and lauric acids were present in only H seed at a low level while capric acid was marginally higher in H seed. Tridecanoic acid was present in CT seed at 0.70 but not in H seed. Myristic acid registered a rapid increase of 315.3% from 0.72 to 2.99 in CT seed compared to H seed, while pentadecanoic acid showed a marginal rise in CT seed. Heptadecanoic acid increased by 43.4% in CT seed while eicosanoic, arachidic and behenic acids decreased by 4.8%, 19.9% and 67.9% respectively. Oleic acid content reduced by 25.8% in CT seed compared to H seed. The total content of VLCFAs, eicosanoic, arachidic, and behenic acids decreased from 9.76 in H seed to 7.00 in CT seed. The content of linoleic acid (18:2) reduced by 40.5% in CT seed as against a drop of 1.26% in the case of linolenic acid (18:3). Fe content increased four-fold in CT seed compared to H seed.

IV. DISCUSSION

IV.1. Reduced seed germination in corky tissue affected fruits:

Seed from CT affected fruits showed a reduction in moisture content associated with a significant fall in the rate of germination. Moisture content of seed affords the medium for the hydrolytic breakdown of storage reserves and is essential for solubilization and transportation of metabolites in germinating seeds (Bewley and Black, 1994) (Figure 1). Therefore, it was apparent that the reduction in moisture content of seed resulted in a reduced germination rate. A number of reports have established that the rate of germination which represents a true measure of seed viability is strongly and positively correlated with TDH activity (Reuzeau and Cavalie, 1995; Bettey and Finch-Savage, 1996). The marked decline in TDH activity of CT seed in this study, therefore, confirmed the loss of seed viability compared to H seeds.

IV.2. Generation of free radicals, lipid peroxidation, MDA synthesis and membrane damage:

One of the major causes of seed deterioration is lipid peroxidation (Da Costa and Huang, 2007; McDonald, 1999) which is initiated by the action of free radicals on the unsaturated

fatty acids of membrane phospholipids. Data presented in Figure 2 showed that there were significantly higher levels of $\bullet\text{OH}$ and $\text{O}_2^{\bullet-}$ radicals generated in CT seed compared to healthy seed. Hydroxyl radical is one of the most destructive free radicals in biological systems responsible for modification of macromolecules and cellular damage (Jiang Ming-Yi, 1999). CT seed recorded a remarkably high level of Fe^{2+} , which is reported to cause a rapid production of reactive oxygen species by oxidation to Fe^{3+} species in the Fenton reaction (Table 1). Iron, by its action of generating free radicals, especially hydroxyl radicals, is reported to trigger cell death by a process termed ferroptosis (Dixon and Stockwell, 2014). Thus, an excessive production of reactive oxygen species (ROS) could contribute to the destruction of cellular membranes if these are not controlled effectively in time (Lamb and Dixon, 1997). In order to counter the damaging and destructive effects of the free radicals on cell membranes, anti-oxidative enzymes such as, catalase (CAT), peroxidase (POX) and superoxide dismutase (SOD), which together constitute a mutually supportive defence system against ROS are also produced by plants. These antioxidant enzymes are known to provide the most sophisticated, effective and efficient protective mechanism against ROS (Monk *et al.*, 1989; Halliwell and Gutteridge, 2002). SOD is involved in lowering the steady-state level of superoxide radicals while CAT and POX lower the level of H_2O_2 in higher plants. Data presented in Figure 3 showed that the activities of POD, CAT and SOD were markedly lower in CT seed compared to H seed. Hence, it was apparent that the greatly increased production of $\bullet\text{OH}$ and $\text{O}_2^{\bullet-}$ radicals in CT seed coupled with a reduction in the activities of anti-oxidative enzymes implied destruction of membranes through increased peroxidation of lipids. Malondialdehyde (MDA) is the end product in the peroxidative decomposition of polyenic fatty acids and its accumulation in tissues is indicative of the extent of lipid peroxidation. Results presented in Figure 3 showed that the amount of MDA produced was significantly higher in CT compared to H seed. From this, it was evident that the production of high levels of free radicals together with lower activities of anti-oxidative enzymes contributed to increased rate of lipid peroxidation leading to a large accumulation of malondialdehyde in CT seed. Past work by other investigators showing a similar increase in lipid peroxidation during different forms of stress like, ozone injury, anoxia, drought stress and wounding (Kepler and Novacky, 1986) supported the present findings.

IV.3. Changes in the composition of VLCFAs, loss of seed viability and CT formation:

A perusal of data presented in Table 2 showed that there was a significant decline in the levels of very long chain fatty acids (VLCFAs) from 9.76 in H seed to 7.00 in CT seed. Besides, the content of linoleic acid (18:2) and oleic acid reduced by 40.5% and 25% respectively in CT seed. VLCFAs have been found to be crucial for many vital processes such as cell expansion, cell proliferation, differentiation (Bach and Faure, 2010) and are essential for cell viability (Bach *et al.*, 2008). The rapid loss of linoleic acid in seeds has been strongly correlated with ageing and viability loss in bean (*Phaseolus vulgaris*) (Lin and Pearce, 1990), and Norway maple (*Acer platanoides*) seeds (Pukacka, 1991). As stated earlier, lipid peroxidation is a major cause of seed deterioration in which free radicals attack the

unsaturated fatty acids of membrane phospholipids and lead to membrane damage resulting in a decline of seed viability. Since polyunsaturated fatty acids are more susceptible to peroxidation compared to monounsaturated and saturated fatty acids, the preferential loss of polyunsaturated fatty acids like, linoleic acid and oleic acid is considered as an indication of lipid peroxidation. Considering the fact that linoleic acid and oleic acid contents registered a reduction of over 40% from 62.28 to 37.26 and 25% respectively, it was obvious that the extent of peroxidation was enormous generating a massive 62.6% increase in the rate of generation of MDA in CT seed. As a result, there was a rapid increase in electrical conductivity of CT seed signifying loss of membrane integrity (Bewley, 1986). Considering the striking reduction in the contents of linoleic acid, oleic acid and VLCFAs in CT seed compared to H seed, it was evident that viability was severely affected in CT seed due to which germination was reduced. Thus, the results of the study showed a loss of seed viability and cell death in CT seed resulting in development of CT symptom.

V. CONCLUSION

To sum up, the body of evidence presented in this paper supported the conclusion that a reduced rate of fat synthesis in the seed during fruit growth was accompanied by changes in the profile of fatty acids, especially long chain unsaturated fatty acids and VLCFAs. Concurrently, a large increase in the production of free radicals far exceeding the cellular antioxidant capacity contributed to a rapid increase of lipid peroxidation involving the long chain unsaturated fatty acids resulting in oxidative injury and consequently to destruction of cell membranes. The above sequence of events led to loss of seed viability culminating in the development of corky tissue in sapota fruits. Thus, the present study highlighted for the first time, the crucial role played by seed fatty acids in corky tissue formation in sapota fruit.

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Table 1: Biochemical composition of seeds of healthy and Corky tissue affected fruits

Parameters	Seed	
	H	CT
Moisture (%)	43±2.021	40±1.155
pH	6.51±0.292	6.4±0.231
Electrical conductivity (ds m ⁻¹)	0.128±0.006	0.183±0.008
Total fat (g 100g ⁻¹ FW)	15.76±0.778	11.12±0.198
Iron (ppm)	71±1.732	287±4.070

Table 2: Composition of fatty acids in seeds of healthy and Corky tissue affected fruits

Fatty acid	Content in seed (mg 100g ⁻¹ FW)	
	H	CT
Caprylic acid	0.43 ± 0.046	ND
Capric acid	0.02 ± 0.004	0.01 ± 0.003
Lauric acid	0.03 ± 0.003	ND
Tridecanoic acid	ND	0.70 ± 0.061
Myristic acid	0.72 ± 0.049	2.99 ± 0.243
Pentadecanoic acid	0.26 ± 0.046	0.28 ± 0.046
Palmitic acid	145.8 ± 4.042	132.8 ± 1.648
Heptadecanoic acid	1.80 ± 0.088	2.58 ± 0.165
Linoleic acid	62.28 ± 1.010	37.06 ± 0.709
Oleic acid	32.38 ± 0.867	24.03 ± 0.716
Linolenic acid	2.38 ± 0.090	2.35 ± 0.061
Stearic acid	49.18 ± 1.447	49.93 ± 0.979
Nonadecanoic acid	0.07 ± 0.004	ND
Eicosanoic acid	2.47 ± 0.121	2.35 ± 0.087
Arachidic acid	4.82 ± 0.164	3.86 ± 0.098
Behenic acid	2.47 ± 0.200	0.79 ± 0.046
Total	305.13	259.74

Values are the means ±SE of three replicates. ND= Not detected

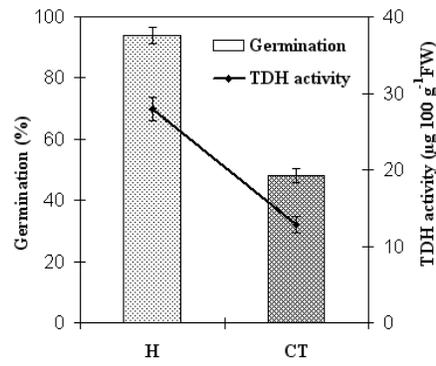


Figure 1: Relationship between germination and total dehydrogenase activity in seeds of healthy and CT affected fruits. Values are the means \pm SE of eight replicates

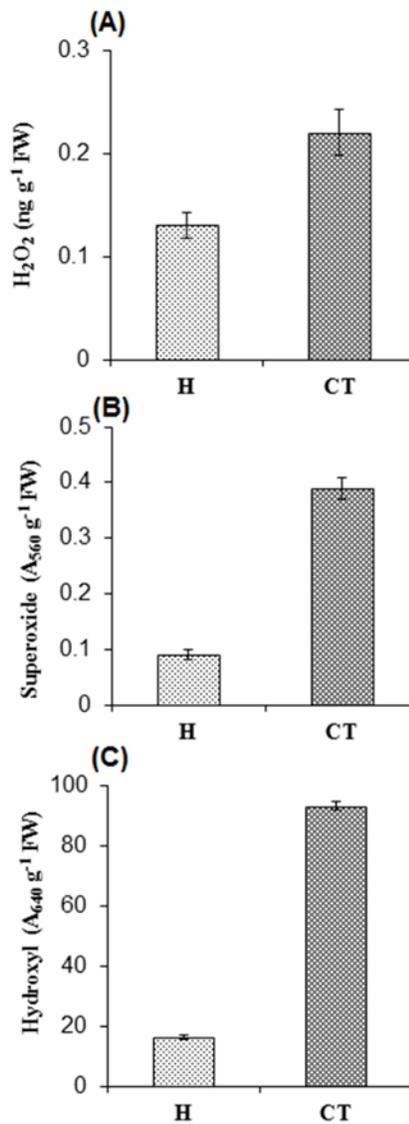


Figure 2: Free radical production in seeds of healthy and CT affected fruits. Values are the means \pm SE of eight replicates

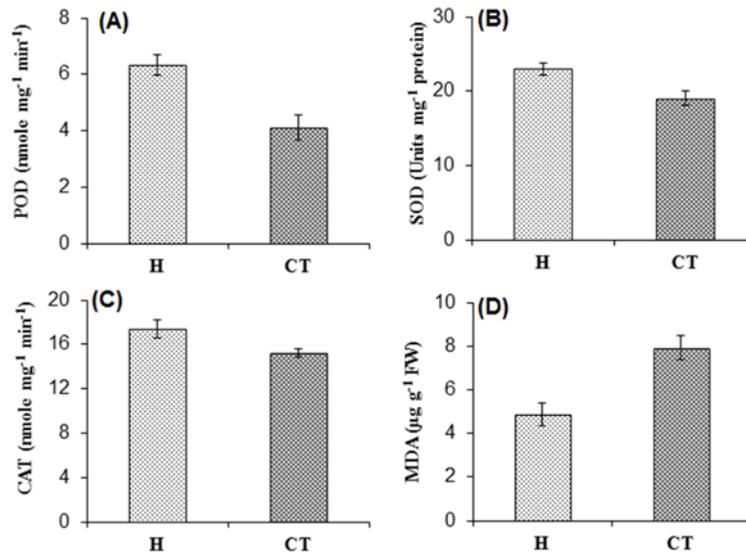


Figure 3: Changes in the activities of antioxidant enzymes and generation of MDA in seed of healthy and CT affected fruits. Values are the means \pm SE of eight replicates

An Econometric Model of Inflation in India

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Abstract- The paper verified that the inflation model in India is cointegrated in the order I(1) considering GDP growth rate, degree of openness, growth rate of money supply, nominal exchange rate of Rupee with respect to US\$, fiscal deficit as per cent of GDP, interest rate (lending rate), and crude oil price US\$/barrel respectively as the determinants during the study period of 1970-2013. Johansen cointegration test showed that there is one cointegrating vector as shown by trace statistics and there are two cointegrating vectors as shown by λ_{max} statistics. VECM showed that the inflation rate is associated with interest rate in one period lag and previous period inflation rate is associated with GDP growth rate and growth of money supply significantly. VECM states that the estimated equation 1 is adjusting its error by 23%, equation 2 is adjusting by 14% equation 3 by 34% and equation 7 by 71% respectively within one year but others equations are adjusting negligibly. There are six AR polynomial unit roots and all others roots lie inside the unit circle which proves that the model is unstable where the impulse response functions are diverging.

Index Terms- Inflation rate, Cointegration, VECM

I. INTRODUCTION

The determinants of inflation is very much important in building economic forecast in planning models and in several sectors although the factors change from country to country instead of some general variables. Even the relationship changes from one period to other which was found in many econometric studies. We tried to endeavour to locate some determinants of inflation in India such as GDP growth rate, degree of openness, growth rate of money supply, nominal exchange rate of Rupee with respect to US\$, fiscal deficit as per cent of GDP, interest rate (lending rate), and crude oil price US\$/barrel respectively by applying cointegration and VECM methodology to relate growth of Consumer Price Index with above factors during 1970-2013.

II. EARLY STUDIES

There are many econometric models on the determinants of inflation. Some of which are country specific which are quite similar to my model. Bayo (2005) studied that fiscal deficit, money supply, interest rate and exchange rate are positively impacted on inflation rate in Nigeria during 1981-2003. Explanatory variables accounted for 72% and error term captured 28% of variation. Basir (2011) showed that determinants of long run inflation in Pakistan is related with money supply, gross GDP, government expenditure and government revenue during 1972-2010 by applying

cointegration and VECM. Lim and Papi (1997) found that money supply, exchange rate, public sector deficit are the determinants of Turkish inflationary pressure as measured by a multisector macro economic model during 1970-95. Anderson, Masuch and Schiffbovuer (2009) observed that price level and inflation differentials of euro area in the long run depends on GDP per capita or productivity and consumption in country specific stationary cointegration relation during 1999-2006. Kim (2007) verified by using cointegration and error correction model during 1990-1999 in Poland that inflation was determined by increase in wage rate, appreciation of real exchange rate, excess supply of money respectively. Lim and Sek (2015) verified with the data of 28 high and low inflation countries during 1970-2011 in which the VECM and ARDL models indicate that GDP growth and imports of goods and services have significant long run impact on inflation in low inflation countries but money supply, national expenditure and GDP growth rate are determinants of inflation in the long run in high inflation countries. Laryea, and Sumaila (2001) estimated Tanzania's inflation during 1992:1 -1998:4 by using ECM and showed that monetary factors are responsible for more than depreciation of exchange rate or volatility of output. 5 empirical results indicate that money supply, interest rate and riyal depreciation with respect to US\$ are main causes of inflation in Saudi Arabia during 1986-2007. Dua and Gaur (2009) found that output gap is significant in explaining the inflation rate using quarterly data from 1990 to 2005 in 8 Asian countries by applying Phillips curve method and instrumental variable technique. Jaradat, AlZeaud and Rawahneh (2011) showed that inflation in Jordan affected positively by increased credit, transfer of staff, external shock and negatively by GDP growth rate and affected insignificantly with money supply by applying cointegration and Error Correction Model during 2000-2010. Moretti (2013) studied by using 11 countries samples during 1990-2007 in Euro Area, and found that after the adaptation of the euro, product market deregulation has a significant effect in reducing the inflation rate while higher labour market regulation increases inflation persistence and it reduces the responsiveness of inflation to the output gap.

All those models have great role in Indian context in framing the macro econometric model of inflation in the dynamic process of adjustment although all determining variables in those countries are not synonymous with India but much similar studies were done in India to find the macroeconomic determinants of inflation. It is true that some micro determinants of inflation in India are rather different from Euro area and OECD countries. Therefore, some of the important studies in India have been discussed here. Using cointegration method, Ashwani (2014) studied that there is a long run relationship between inflation, money supply, private and social spending and exchange rate during 1981-2011 in India. Mohanty (2010) finds a long run equilibrium relationship among inflation, non

agricultural GDP and money supply during 1952-2010 in a cointegration framework in India which showed output has highly significant and negative relationship with inflation and money supply has a highly significant and positive relationship with inflation. Deviation from the long run equilibrium is found to be statistically significant. Using an augmented Phillips curve framework in India Kapur(2012) showed that non food manufactured products inflation is a core measure of inflation as demand conditions vis-à-vis WPI inflation. Even inflation in non fuel commodities is seen as important driver of domestic inflation rather than fuel inflation. Non food manufactured product inflation is found to be more persistent than headline inflation. He found that the modest exchange rate pass through coefficient but sharp depreciation occurred inflationary pressure during July-September 2011. His estimated equation were found to be satisfactory and forecasting challenges emanates from volatility in international oil and other commodity prices and domestic food supply dynamics. The supply factors exhibited significant volatility in recent years. Patra and Ray(2010) employed Phillips Curve framework in the context of modeling inflation expectations and find support in favour of the relationship using monthly data for the period 1997-2008. Using the quarterly data for 1996-2009 in India Patra and Kapur(2010) found some supports for the New Keynesian Phillips Curve but the estimated equations suffered from the serial correlation but in hybrid New Keynesian Phillips curve the coefficient on lagged inflation was found to be higher than that of the expected inflation. Gulati and Saini (2013) using a linear regression framework showed that the fiscal deficit, rising farm wages and transmission of the global food inflation together accounted for 98% of the food inflation in India during 1995-96 to December 2012. Of them, fiscal deficit with the coefficient of 0.46 with one year lag was the most prominent followed by farm wages with the coefficient of 0.32 with one year lag and 0.30 for global food prices respectively. Saxena and Bhadanriya(2013) showed by applying Johansen Co-integration and VECM taking data during April 2001-March 2011 in India and found a positive relation between GDP and CPI and a high degree of interdependence between money supply, crude oil prices and inflation in India. Jha and Kulkarni (2012) employed method of OLS and ARDL(1,1) and ECM to estimate inflation and expected inflation volatility as well as their changes which showed that actual inflation volatility rises with expected inflation and falls when the level of inflation goes up although output gap has no significant impact. Patnaik(2010) showed that inflation in Indian Economy is a mix of both demand and supply factors. GDP and broad money supply has positive effect on inflation while exchange rate and interest rate have negative association with inflation using VAR, ECM and cointegration model taking data of 1991Q2 to 2008Q2 in India. He found that ECM is highly significant, impulse response function implies that CPI responds to shock after a long where CPI is influenced by index of industrial production, reserve money and import index.

Kishore(2009) studied that real money gap is the predicator of inflation in India by using quarterly data on manufacturing inflation from 1982 to 2007 and is also a reliable for predicator of future inflation. Taking data for 1973-1991 of GDP deflator of India, Chand (1996) estimated inflation equation which was the source of fiscal and monetary instrument and showed that fiscal action is the dominant influence and monetary action do matter to combat inflation in short and long run.

III. ECONOMETRIC MODEL: A CASE STUDY OF INDIA

[1] Methodology and data

The co-integrating model of inflation rate in India measured by consumer price index has been illustrated by the following manner,

$$x = f(y_1, y_2, y_3, y_4, y_5, y_6)$$

Where x= growth rate of consumer price index

y₁= GDP growth rate per cent per year

y₂= the growth rate of money supply (M2)

y₃= nominal exchange rate of rupee with US dollar

y₄= fiscal deficit as percent of GDP

y₅= interest rate (lending rate per cent per year)

y₆= crude oil price measured by US\$ per barrel

Data have been collected from the International Financial Statistics of IMF, World Bank, Reserve Bank of India, and inflationindia.com for the year from 1970 to 2013. For co-integration analysis, the Engle and Granger(1987), and Johansen (1988) and for VECM Johansen (1991,1996) and Johansen and Juselius (1990) methodologies have been applied.

[2] Co-integration analysis

Following Engle and Granger (1987), the estimated co-integrating equation for the level series (growth rate of consumer price index) becomes,

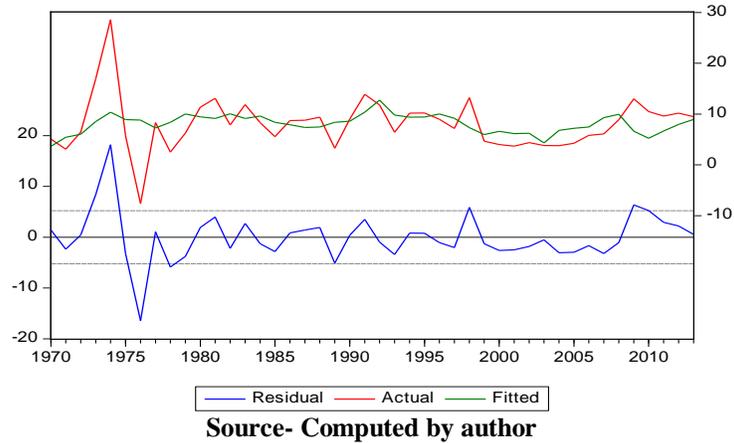
$$x_t = 1.1170 + 0.1458y_{1t} + 0.000595y_{2t} + 0.0866y_{3t} + 0.7596y_{4t} + 0.7617y_{5t} + 0.00246y_{6t} + e_t$$

(0.2032) (0.5013)(0.0042) (1.114) (1.264) (2.061)*
(0.0700)

R²=0.122, F(6,44)=0.8607, DW=1.62, *=significant at 95% confidence level.

The ADF test for the residuals is, ADF statistic=-3.930758 which is greater than the critical value of 95% (-2.998) and τ_{c(7)} = -5.77479 which is greater than critical value of 95% level (-2.93). So, residuals is stationary and has unit root and the variables are I(1). In the Fig-1, it is seen that the actual and fitted lines crossed more than once and the interest rate and the growth of CPI is positively related significantly.

Fig-1: The Equilibrium



Now , following Johansen (1988), the Johansen test of co-integration for the level series of growth rate of CPI finds out the following Trace Statistics and Maximum Eigen values,

Table-1: Johansen test of growth of CPI (level series)

Hypothesised No. of CE(s)	Eigen value	Trace test	P value	5% C.V	λmax	P value	5%CV
None *	0.798488	162.0402	0.0001	125.6154	67.28007*	0.0001	46.23142
At most 1	0.624537	94.76017	0.0584	95.75366	41.14300*	0.0378	40.07757
At most 2	0.389570	53.61718	0.4782	69.81889	20.73083	0.7042	33.87687
At most 3	0.307083	32.88634	0.5631	47.85613	15.40750	0.7154	27.58434
At most 4	0.215708	17.47884	0.6046	29.79707	10.20491	0.7252	21.13162
At most 5	0.157484	7.273926	0.5460	15.49471	7.197230	0.4661	14.26460
At most 6	0.001824	0.076696	0.7818	3.841466	0.076696	0.7818	3.841466

Source- Computed by author

The values of the Trace test indicate that there is 1 cointegrating vector and λmax statistic has two cointegrating vectors which are significant at 95% level of confidence.

[3] Analysis of VECM of the growth of CPI (level series)

The estimates of the VECM have been given in the following six equations.

$$\begin{aligned}
 \text{[i]} \Delta x_t = & -4.3663 - 0.2640\Delta x_{t-1} - 0.05961\Delta y_{1t-1} - 0.2415\Delta y_{2t-1} - 0.6393\Delta y_{3t-1} + 0.6502\Delta y_{4t-1} \\
 & (-1.77)^* \quad (-1.69)^* \quad (-0.2004) \quad (-1.156) \quad (-1.386) \quad (0.7571) \\
 & + 0.4976\Delta y_{5t-1} + 0.0098\Delta y_{6t-1} - 0.2330EC1 \\
 & (0.6457)^* \quad (0.1274) \quad (-2.2279)^* \\
 R^2 = & 0.3210, DW = 2.098, * = \text{significant at 95\%}
 \end{aligned}$$

$$\begin{aligned}
 \text{[ii]} \Delta y_{1t} = & -3.2426 + 0.16907\Delta x_{t-1} - 0.1918\Delta y_{1t-1} - 0.07218\Delta y_{2t-1} + 0.01981\Delta y_{3t-1} + 0.4219\Delta y_{4t-1} \\
 & (-2.676)^* \quad (2.202)^* \quad (-1.31) \quad (-0.702) \quad (0.087) \quad (0.997) \\
 & - 0.4827\Delta y_{5t-1} + 0.05806\Delta y_{6t-1} - 0.1418EC1 \\
 & (-1.272) \quad (1.533) \quad (-2.7529)^* \\
 R^2 = & 0.619, DW = 1.97, * = \text{significant at 95\%}
 \end{aligned}$$

$$\begin{aligned}
 \text{[iii]} \Delta y_{2t} = & 7.412 - 0.5348\Delta x_{t-1} - 0.7982\Delta y_{1t-1} + 0.08589\Delta y_{2t-1} + 0.1546\Delta y_{3t-1} \\
 & (2.751)^* \quad (-3.133)^* \quad (-2.451)^* \quad (0.375) \quad (0.306) \\
 & + 0.7190\Delta y_{4t-1} + 0.9366\Delta y_{5t-1} + 0.03344\Delta y_{6t-1} + 0.3392EC1 \\
 & (0.764) \quad (1.110) \quad (0.397) \quad (2.962)^* \\
 R^2 = & 0.521, DW = 2.0, * = \text{significant at 95\%}
 \end{aligned}$$

$$\begin{aligned}
 \text{[iv]} \Delta y_{3t} = & 0.1109 - 0.00195\Delta x_{t-1} + 0.0419\Delta y_{1t-1} - 0.0943\Delta y_{2t-1} + 0.3049\Delta y_{3t-1} \\
 & (0.1117) \quad (-0.031) \quad (0.349) \quad (-1.119) \quad (1.637)
 \end{aligned}$$

$$\begin{aligned}
 & -0.48813\Delta y_{4t-1} + 0.1866\Delta y_{5t-1} + 0.01669\Delta y_{6t-1} - 0.03793EC1 \\
 & (-1.407) \quad (0.599) \quad (0.537) \quad (0.375) \\
 & R^2=0.182, DW=1.93, *= \text{significant at 95\%}
 \end{aligned}$$

$$\begin{aligned}
 [v] \Delta y_{4t} = & -0.2521 - 0.03464\Delta x_{t-1} - 0.03364\Delta y_{1t-1} - 0.05706\Delta y_{2t-1} + 0.043\Delta y_{3t-1} \\
 & (-0.252) \quad (-1.116) \quad (-0.5685) \quad (-1.373) \quad (0.4688) \\
 & -0.1394\Delta y_{4t-1} - 0.08505\Delta y_{5t-1} + 0.02224\Delta y_{6t-1} - 0.01197EC1 \\
 & (-0.816) \quad (-0.5548) \quad (1.453) \quad (-0.572) \\
 & R^2=0.231, DW=1.90, *= \text{significant at 95\%}
 \end{aligned}$$

$$\begin{aligned}
 [vi] \Delta y_{5t} = & -0.03513 + 0.03009\Delta x_{t-1} - 0.0734\Delta y_{1t-1} - 0.0133\Delta y_{2t-1} - 0.1765\Delta y_{3t-1} \\
 & (-0.0684) \quad (0.925) \quad (-1.183) \quad (-0.3070) \quad (-1.83)* \\
 & -0.0357\Delta y_{4t-1} + 0.0279\Delta y_{5t-1} + 0.02605\Delta y_{6t-1} - 0.01016EC1 \\
 & (-0.199) \quad (0.173) \quad (1.622) \quad (-0.4657) \\
 & R^2=0.297, DW=2.09, *= \text{significant at 95\%}
 \end{aligned}$$

$$\begin{aligned}
 [vii] \Delta y_{6t} = & 20.339 + 0.186\Delta x_{t-1} - 1.816\Delta y_{1t-1} + 1.2727\Delta y_{2t-1} - 2.3035\Delta y_{3t-1} \\
 & (4.568)* \quad (0.660) \quad (-3.373)* \quad (3.367)* \quad (-2.75)* \\
 & -1.0245\Delta y_{4t-1} + 2.0119\Delta y_{5t-1} - 0.265\Delta y_{6t-1} + 0.715EC1 \\
 & (-0.659) \quad (1.442) \quad (-1.905)* \quad (3.777)* \\
 & R^2=0.48, DW=1.655, *= \text{significant at 95\%}
 \end{aligned}$$

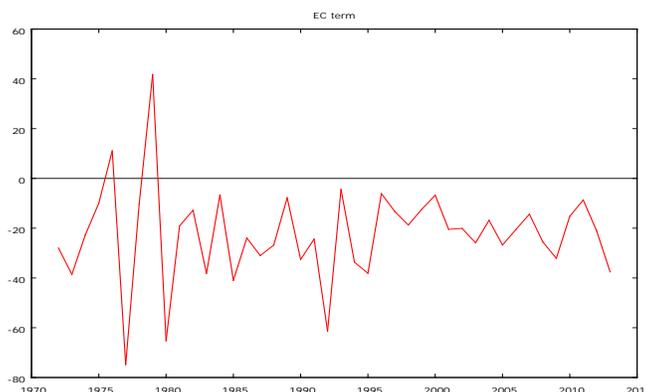
In equation 1, the growth of CPI of the current period is associated with its previous period and it is significantly related with previous period interest rate positively and the equilibrium error is adjusted by 23% within one year. In equation 2, GDP growth rate of current year is positively associated with previous period growth of CPI and 14% error is corrected in a year. Equation 3 notes that the growth of money supply of the current period is significantly associated with previous period's growth of CPI and GDP respectively and 34% error is corrected in a year.

The equation 4 expressed that no variable is significantly related and only 3% error is corrected in a year. The equation 5

explained that no variable is significantly related and only 1% error is corrected in a year. The equation 6 expressed that exchange rate is positively related with crude oil price significantly and only 1% error is corrected in a year. In equation 7, it is clear that GDP growth rate, money supply, exchange rate and crude oil price of the previous years are significantly related with oil price of the current year and 71% error is corrected in a year. The adjustment vector α is thus shown as follows: $[x, y_1, y_2, y_3, y_4, y_5, y_6] = [-0.23310, -0.14181, 0.33928, -0.037930, -0.011907, -0.010169, 0.71511]$.

The Error correction term is not approaching to zero but adjusting the errors slowly. It is shown in Fig-2.

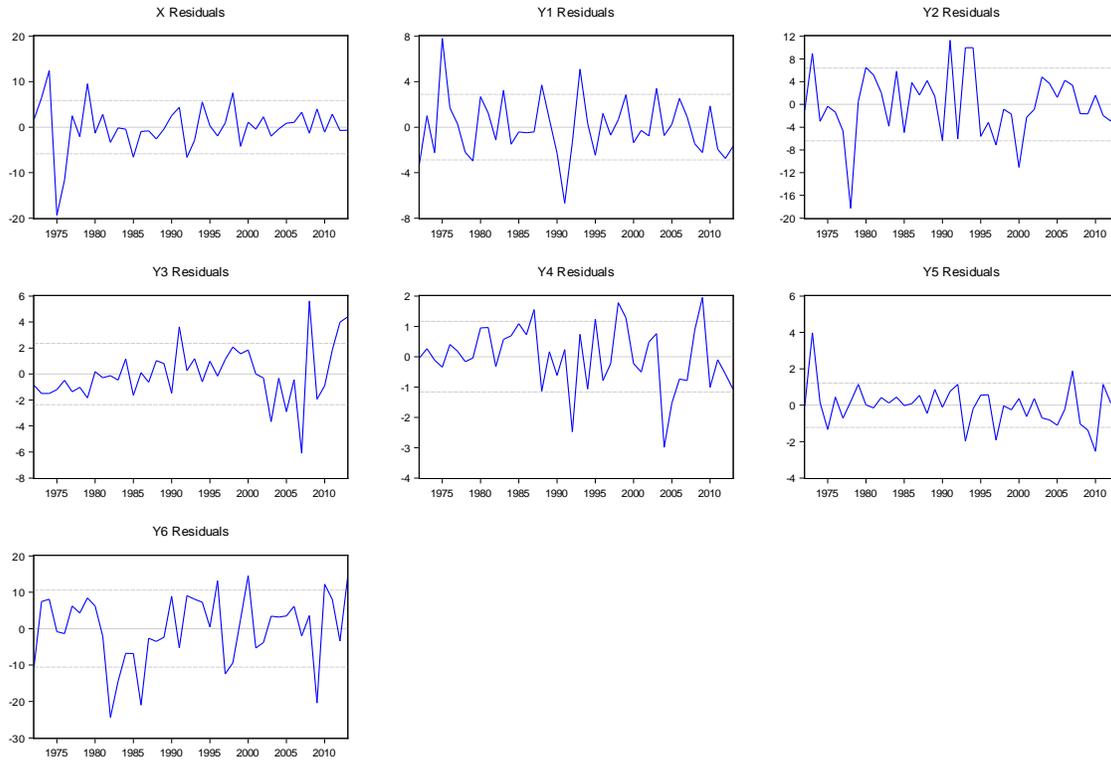
Fig-2: Patterns of error correction



Source-Computed by Author

The residuals of the estimated VECM do not tend to zero or to equilibrium which are shown in the Fig-3.

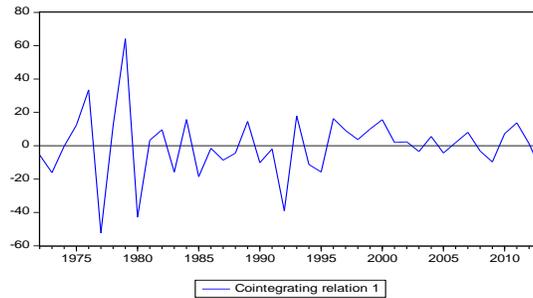
Fig-3 :The estimated residuals



Source- computed by author

Lastly, it is estimated that the cointegrating relation is stable but diverging away from the equilibrium which is shown in Fig-4.

Fig- 4 : Cointegrating relation



Source- computed by author

Table -2: Roots of AR characteristic

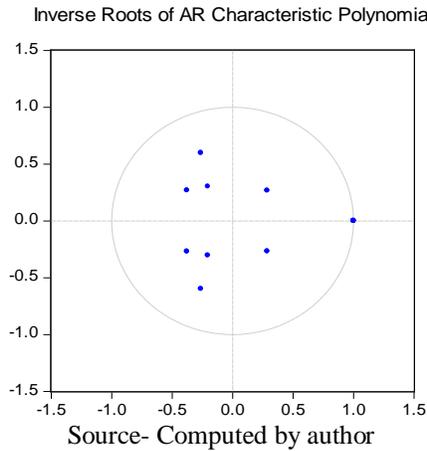
Root	Modulus
1.000000	1.000000
1.000000	1.000000
1.000000	1.000000
1.000000	1.000000
1.000000	1.000000
1.000000	1.000000
-0.261440 - 0.598096i	0.652740
-0.261440 + 0.598096i	0.652740
-0.375946 - 0.268363i	0.461902
-0.375946 + 0.268363i	0.461902

$0.286630 - 0.266579i$	0.391435
$0.286630 + 0.266579i$	0.391435
$-0.204058 - 0.303524i$	0.365741
$-0.204058 + 0.303524i$	0.365741

Source-Computed by author

In the Table-2, the roots of characteristic polynomial of the variables of the level series are given where it confirmed 6 unit roots and others are less than one and all lie inside the circle which are plotted in Fig-5.

Fig-5: Inverse roots of AR characteristic polynomial



All of the roots lie inside the circle and 6 roots are equal to 1 and others are less than one ,and therefore, the variables are cointegrated in the order of CI(1,1).

[4]Diagnostic test

[A] Autocorrelation test (χ^2 distribution)

In the Table-3,the values of the Q stat and adjusted Q stat with their probabilities have been arranged through autocorrelation test and it was found that the series suffer from autocorrelation.

Table-3:Autocorrelation

lags	Q stat	prob	Adj.Q stat	prob	df
1	16.75212	NA*	17.16071	NA*	NA*
2	52.99813	0.9995	55.21901	0.9989	91
3	96.34930	0.9981	101.9049	0.9935	140
4	127.2175	0.9998	136.0224	0.9986	189
5	168.3027	0.9998	182.6596	0.9969	238
6	208.2031	0.9999	229.2101	0.9949	287
7	249.6670	0.9999	278.9667	0.9896	336
8	283.3185	1.0000	320.5362	0.9927	385
9	318.3614	1.0000	365.1364	0.9929	434
10	353.5821	1.0000	411.3635	0.9920	483
11	384.0734	1.0000	452.6744	0.9945	532
12	410.2039	1.0000	489.2571	0.9977	581

Source-Computed by author

Thus, no residual autocorrelation =H0 is rejected as had been found in VEC residual Portmanteau test.

[B] VEC Residual Serial Correlation LM test

The serial correlation LM test showed that the values of LM stat for lag 1 to 12 are all insignificant which are listed in the Table -4.

Table-4: Serial correlation

lags	LM stat	prob
1	45.37751	0.6208
2	46.86352	0.5602
3	43.99376	0.6758
4	34.25353	0.9456
5	41.20095	0.7781
6	44.66739	0.6493
7	49.52719	0.4521
8	37.01788	0.8957
9	38.90505	0.8487
10	48.33030	0.5002
11	39.80976	0.8226
12	30.58030	0.9819

Source- Computed by author
 The test confirmed that it has serial correlation.

[C] Normality test

The orthogonalized residuals are obtained by a principal component decomposition of the original residual correlation. The orthogonalised residuals are uncorrelated by construction and independent under assumption of normality. Since asymptotic normality and independence of skewness and kurtosis

is distributed as $\chi^2(2)$, then the χ^2 tests of skewness, Kurtosis, of those residuals showed insignificant at 95% confidence limit except component 1 and 7 in Skewness and components 1,2,3,4,and 6 in kurtosis which are given in details in the Table-5. But the joint skewness and kurtosis are significantly distributed as $\chi^2(2)$.

**Table-5: Orthogonalisation: Residual correlation (Doornik-Hansen)
 H0= residuals are multivariate normal**

Component	Skewness	Chi-square	df	prob
1	-0.694639	3.796883	1	0.0513
2	-0.040409	0.014641	1	0.9037
3	-0.333998	0.967558	1	0.3253
4	0.073968	0.048998	1	0.8248
5	-0.594961	2.874613	1	0.0900
6	0.611442	3.020887	1	0.0822
7	-0.840195	5.281959	1	0.0215
Joint		16.0055	7	0.0251
Component	Kurtosis	Chi-square	df	Prob.
1	5.452279	7.823882	1	0.0052
2	3.880177	4.751193	1	0.0293
3	4.283114	5.714082	1	0.0168
4	3.744590	3.907915	1	0.0481
5	3.525785	0.240024	1	0.6242
6	6.230771	15.32592	1	0.0001
7	3.227003	1.910615	1	0.1669
joint		39.67	7	0.00

Source-Computed by author
 Thus, the Doornik-Hansen test is not rejected for normality.

[D]The Impulse Response Functions

In Fig-6, the impulse response functions have been plotted where the functions tend away from zero i.e. diverging which means the model is unstable.

Fig-6: Impulse Response Functions

Response to Cholesky One S.D. Innovations



Source- Computed by author.

IV. SOME POLICY ISSUES

As far as this econometric model is concerned, the policy implications should lie on the appropriate monetary policy, flexible interest rate policy and achieving higher growth rate which might be brought out to come down inflation in the long run. Moreover, oil price stability and exchange rate stability should be significant policy targets to control inflation in India. According to Raghuram Rajan, minimum support price, rural wage rate including female wage rate, food prices and inflation expectations are the crucial variables that may determine Indian inflation although he confessed that interest rate cut would not be able to come down inflation rate in India in recent times. But he was not in favour of target rate of inflation which require financial stability in the economy. Therefore, medium term or long term inflation targets will be suitable policy measures to control inflation for India.(Rajan,2014)

V. CONCLUSION

The paper concludes that the inflation model in India is cointegrated in the order I(1) during 1970-2014. Johansen cointegration test showed that there is one cointegrating vector as shown by trace statistics and there are two cointegrating vectors as shown by λ_{max} statistics. VECM showed that the change in growth of CPI in previous period is negatively related with the change in growth of money supply significantly and the change in growth of CPI is related negatively with previous period significantly. But the change GDP growth rate is positively related with previous period change in growth of CPI significantly. In the VAR model same conclusion was observed but in double log linear model it was observed that 1% increase in CPI per year would reduce the growth rate of GDP by 0.058% per year during 1961-2011 in India in the current year (Bhowmik,2013). Moreover, the change in previous period growth of CPI is positively related with change in crude oil price, interest rate insignificantly and negatively related with the

change in exchange rate and fiscal deficit insignificantly. VECM states that the estimated equation 1 is adjusting its error by 23%, equation 2 is adjusting by 14% equation 3 by 34% and equation 7 by 71% respectively within one year significantly but others equations are adjusting negligibly. There are six AR polynomial unit roots and all others roots lie inside the unit circle which proves that the variables are co-integrated but the impulse response functions are diverging.

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Potential of Urban Forest as an Alternative Substitution of Air Conditioner Case Study in IPB Darmaga Campus and Surabaya

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Abstract- Most of the societies used the air conditioners to reduce overwarming. However, besides apart from costly, air conditioner can increase global warming. One attempt to control temperatures in urban areas is to develop urban forest. The purpose of this research was to assess the ability of urban forest vegetation in absorbing heat in replacing air conditioner, hence the efficiency of urban forest. The research was conducted in Bogor Agricultural University Darmaga Campus and the city of Surabaya. The research was initiated by performing measurements at room with Room Air Conditioner methods. The potential of urban forest made through measuring the heat flux density on vegetation. Based on data analysis, in IPB Darmaga Campus, it is known that the trees had the capability of heat absorption on average by 3.192 KJ/hour. Thus an air conditioning unit 1 PK (capacity 9.495 KJ/h) can be substituted by three trees, while one unit of AC 1,5 PK (capacity 18.990 KJ/h) can be substituted with six trees and one air conditioning unit 2 PK (capacity 28.485 KJ/h) can be substituted with nine trees. The efficiency of urban forest for the room that is 2-9 times cheaper than the use of air conditioning. While the total efficiency of the eight rooms studied is Rp 44.765.259,-/year. Then in Surabaya, the result show that the heat absorption ability of the trees was 2958.7 KJ/h (Bratang urban forest) and 2589 KJ/h (Wonorejo urban forest). One unit of 1 PK air conditioner (capacity of 9495 KJ/h) can be substituted by 3-4 trees, one unit of 1.5 PK air conditioner (capacity of 18990 KJ/h) can be substituted by 6-7 trees and one unit 2 PK of air conditioner (capacity 28458 KJ/h) can be substituted with 9-10 trees. The total efficiency of the eight rooms studied was found token Rp 22.811.042,-/year (Bratang Urban Forest) and Rp.20.365.265,-/year (Wonorejo Urban Forest). Thus, The development of urban forests to replace air conditioner is rational because it could significantly save the cost of a room spending.

Index Terms- air conditioner, IPB Darmaga campus, substitution, Surabaya, urban forest

I. INTRODUCTION

Background of the Study

One of the changes of the quality of environment is the increasing air temperature in urban area. Fluctuation of the temperature tends to increase each year. Between 1950 and 2000, the air temperature in Indonesia has increased as much as

0.3°C (Hulme and Sheard, 1999). The Meteorology, Climatology, and Geophysics Agency--BMKG (2010) conveyed that between 2001 and 2010, there had been an increase of air temperature as much as 0.25°C around the environment of the Bogor Agricultural University (IPB), Darmaga. The air temperature in Surabaya during day was approximately 33-35°C. The BMKG at Juanda explained that the highest temperature could reach up to 35°C (BMKG, 2010).

In general, to overcome the increasing temperature of the environment, the society uses air conditioner (AC) in houses and offices. AC truly increases comfort for the people, but the charge needed to obtain and operate the cooling device is costly. The benefit gained is limited to size and room (indoor), while the heat blown will raise the temperature outside of the room.

One attempt to control the temperature in urban areas is by developing an urban forest. The research conducted by Yamada (1993) referred in Fatimah's (2004) had proven that urban forest could decrease the temperature in urban area in Kurihashi in the province of Saitama, Japan. Nevertheless, a study should be conducted in advance on the ability of urban forest in stabilizing the micro climate therefore able to replace the function of the AC. In addition, economic calculation should be performed in relation to the development and conservation of urban forest, as well as the purchase and operational cost of AC, so as to figure out the efficiency of urban forest in replacing AC.

Objective of the Study

The objective of this research is to study the ability of urban forest in substituting the function of Air Conditioner (AC) as well as to compare the cost of the urban forest development with the AC utilizing.

Benefits of the Study

The benefits of the study expected are as follows:

1. To provide information regarding the ability of trees in the urban forest as a substitution for the room air conditioner, in order to decrease the usage level of the air conditioner.
2. To provide information for the society about the values of the urban forest, in order to open their minds to participate in keeping and improving the forest.
3. To provide a foundation for the decision-making in the environment-based urban management.

II. METHOD OF THE STUDY

Location and Time of the Research

The research was conducted at IPB Darmaga campus, Bogor in February-May 2011, and in Surabaya, East Java in August-December 2012. The data of the research were acquired in the Arboretum of the Faculty of Forestry at IPB and the Tropical Forest Germ Plasm Arboretum which is also located in Bratang Urban Forest and Wonorejo Urban Forest. Moreover, the data

acquisition was conducted in several offices, department stores, and housing complex around the locations of the research.

Tools and Materials

The tools and materials used in the research are air conditioners, rooms, thermometers, cameras, calculators, measuring instruments, raffias, ladders, compasses, and stationery.

Data Analysis Procedure

Tabel 1: Research Methodology Systematics

Data variant	Acquirement method	Data analysis
Primary data:		
a. Room measurement and description (including the usage level of AC and electricity)	a. Room measurement and check list	a. Quantitative description (calculation of the room air conditioner) (Handoko, 1979)
b. Temperature under the tree canopy	b. The measurement of difference on vertical temperature (1m-6m)	b. Calculating H (the heat transfer coefficient; Fourier Law)
c. Area of the tree canopy (L) and density	c. Measurement of canopy areal	c. $R_n = a \times i \times L$
Secondary Data:		
a. Surface latent heat (λ)	a. Literature	([a.] to [d.]) $G = R_n - H - \lambda E$ (Campbell and Norman, 2000)
b. Evapotranspiration (E)	b. Literature	
c. Sunlight intensity (i)	c. BMKG data	
d. Forest albedo (a)	d. Literature	
e. Urban forest cost	e. Literature	
f. General condition	f. Literature	

Measurement on the Requirements of Air Conditioning of Room(s)/Building(s)

The measurement to obtain the data on the requirements of air conditioning level of a room is conducted by using the instrument in the form of check list and the calculation of room air conditioner (RAC) loads as according to Handoko (1979). The calculation of RAC loads is carried out through these steps:

- 1) $A = (a) \times (b)$
- 2) $C = (c) \times (b)$
- 3) $D = (d) \times (b)$
- 4) $E = (e) \times (b)$
- 5) $F = (f) \times (b)$
- 6) $G = (g) \times (b)$
- 7) $H = (h) \times (b)$
- 8) $I = (i) \times (b)$
- 9) $J = A+C+D+E+F+G+H+I$
- 10) Approximate total value of air conditioning loads (BTU/hour) = $J \times (b)$

Description:

- (a) = area of the window from every side
- (b) = total length of the walls facing outward
- (c) = total length of the walls facing inward
- (d) = total roof area
- (e) = total floor area
- (f) = total person(s) in the room
- (g) = total power of the lamps and electrical device used in the room

(h) = width of the door or wall opened or constantly opened and connected to the other room of which air is not conditioned

(i) = correction factor of each part of the room of which value is adjusted as according to Handoko (1979).

The next step is calculating the electricity and purchasing cost, as well as the sum of AC(s) in the room. The calculation of the cost on the AC usage is conducted using equation 1.

$$BAC = BU + BL \quad (1)$$

Description:

- BAC = Cost of AC usage in a room
- BU = Cost of AC unit purchasing
- BL = Cost of electricity power covering the device usage (AC usage level assumption is for eight hours/day).

Vegetation Potential Ability of Urban Forest

The potential ability of urban forest in decreasing the temperature is known through the estimation using the secondary data, which are the rate of surface latent heat, sunlight intensity, albedo, the rate of evapotranspiration, and the evapotranspiration latent heat. Based on the calculation, the quantity of trees needed to create a comfortable temperature regarding the loads measurement of the RAC can be revealed. Nonetheless, a calculation on the heat flux density in the vegetation should be conducted initially. The data of temperature difference is used to

calculate the heat transfer coefficient, H, (Fourier Law), in order to transfer heat calculated using equation 2.

$$H = -k A \frac{\Delta T}{\Delta Z} \quad (2)$$

Description:

- H = heat flux density (W/m²) in the vegetation
- A = canopy area (m²)
- ΔT = temperature (°C)
- ΔZ = height (meter)
- k = Air conductance (-5,7 x 10⁻⁵ Cal/cm.sec.⁰C) (Sears and Zemansky, 1960)

The result of the calculation above and the field data is in the form of energy absorption through photosynthesis, of which the secondary data is later used to calculate the thermal storage ability of trees/vegetation. According to the principle of energy balance on the vegetation surface which shows the input, output, or storage energy using equation 3 (Campbell and Norman, 2000).

$$G = R_n - H - \lambda E \quad (3)$$

Description:

- G = the rate of thermal storage in vegetation and soil,
- R_n = radiation absorption flux density by the surface or sunlight net intensity received by the tree
- H = the rate of heat release (heat flow through the convection or conduction determined by temperature difference),
- λE = the rate of the surface latent heat,
- E = the rate of water evapotranspiration,
- λ = the evapotranspiration latent heat (the heat absorbed 1 gram of water evaporated).

Urban Forest Efficiency

The calculation of the value on the urban forest efficiency is analyzed by comparing and finding the difference between the costs needed to use air conditioner and the cost of urban forest development on air conditioning fulfillment of the same room. Thereby, the cost comparison of the both object studied should be revealed. The economic value of the urban forest is calculated using equation 4.

$$NHK = BAC - BHK \quad (4)$$

Description:

- NHK = Economic value of the urban forest
- BAC = Cost of AC usage (purchasing and electricity cost)
- BHK = Cost of urban forest development (trees to fulfill the needs for air conditioner based on the calculation of RAC loads)

III. RESULTS AND DISCUSSION

Requirements of Air Conditioning in Room/Building

The calculation of the air conditioning requirement is conducted in eight rooms in every location, which are situated in IPB Darmaga Campus and Surabaya. Based on the measurement using Room Air Conditioner method, the air conditioning requirements varied for each room.

The calculation result shows that the library room in the Faculty of Agriculture of IPB Darmaga campus requires the most air conditioning as much as 141.059 KJ/hour. Whereas, the room which requires the least air conditioning is the room in Soil Science Department of the Faculty of Agriculture, that is 22.771 KJ/hour. In Surabaya, the ground floor of the Moslem Department Store “Bibah Dibah” requires the most air conditioning, that is 156316.11 KJ/hour. Whereas, the bedroom in the Rungkut Harapan Housing Complex G/31 requires the least air conditioning, that is 4738.64 KJ/hour. It shows that the measurement of air conditioning requirement of a room is determined by the size of the room, walls, the quantity and area of window(s), room capacity, and the electrical devices used.

The Ability of Trees to Absorb Heat

Sunlight is one of factors that trigger overwarming, including the ambient air. The trees in urban forest are able to absorb heat through the sunlight absorption mechanism which is applied in the process of photosynthesis. Thereby, the heat radiation of the sun does not warm up the ambient air in the coverage of the trees. The air conditioning effect occurs due to the heat (radiation of the sun) absorption, often namely as endothermic (absorbing heat). Based on the measurement and secondary data, as well the analysis using the equation presented by Campbell and Norman (2000), the vegetation ability in absorbing heat is revealed (Table 1 and Table 2). The density of the vegetation, variant, and the rate of evapotranspiration of the trees will affect the individual ability of a tree.

Table 1: Summary of the calculation on the tree ability of absorbing heat in IPB Darmaga campus

No.	Location	Canopy area	Density	A Set of Trees Ability to Absorb Heat	Individual Tree Ability to Absorb Heat
1.	Arboretum in Faculty of Forestry	400 m ²	19 trees/400 m ²	51.455,72 KJ/hour	2.708 KJ/hour
2.	Tropical Forest Germ Plasm Arboretum	400 m ²	14 trees/400 m ²	51.455,72 KJ/hour	3.675 KJ/hour

Table 2: Summary of the calculation on the tree ability of absorbing heat in Surabaya

No	Location	Canopy area	Density	A Set of Trees Ability to Absorb Heat	Individual Tree Ability to Absorb Heat
1	Bratang Urban Forest	400 m ²	14 trees/ 400 m ²	41421.86 KJ/hour	2958.7 KJ/hour
2	Wonorejo Urban Forest	400 m ²	16 trees/ 400 m ²	41422.82 KJ/hour	2589 KJ/hour

The individual tree ability obtained is the calculation result based on the assumption that the ability of vegetation set in the urban forest and is also the combination of the abilities of the trees as the constituent components of the urban forest vegetation. Based on the calculation, the values of heat absorption among the urban forest vegetation have differences depends on the density of the vegetation. The ability of heat absorption that belongs to the trees in the Arboretum in the Faculty of Forestry is lesser than the trees in the Tropical Forest Germ Plasm Arboretum. It is due to the trees in the Arboretum of Faculty of Forestry have the lesser canopy areal, that is 21 m²/tree, whereas the trees in the Tropical Forest Germ Plasm Arboretum have the approximately greater canopy areal, that is 28 m²/tree.

The ability of heat absorption belongs to the trees in the Bratang Urban Forest is greater than of the trees in Wonorejo Urban Forest. The difference is because the trees in Bratang Urban Forest have greater approximate canopy areal, that is 28.6 m²/tree, whereas the trees in Wonorejo Urban Forest have canopy areal as wide as 23.5 m²/tree. Regarding on that fact, the greater canopy area is able to absorb greater radiation heat of the sun.

The Potential Ability of Trees Substituting the Air Conditioner (AC)

Based on the calculation result of the tree ability in absorbing heat, it is revealed that trees are able to substitute the functions of Air Conditioner. It is supported by several results of the research, one of whom is Fandeli *et al.* (2004), stated that hot air is able to

decrease by planting trees in the area as the source of the heat pollution. The result of the research shows that the existence of the urban forest vegetation is able to substitute or decrease the usage of air conditioner. Based on the data analysis result, the trees have the ability of heat absorption for as much as 3.192 KJ/hour in IPB Darmaga campus, therefore a single unit of AC 1 PK (with the capacity of 9.495 KJ/hour) can be substituted by three trees, while a single unit of AC 1,5 PK (with the capacity of 18.990 KJ/hour) can be substituted by six trees, and for a single unit of AC 2 PK (with the capacity 28.485 KJ/hour) can be substituted by nine trees. Based on the research in Bratang and Wonorejo Urban Forests, 1 unit of AC 1 PK (with the capacity of 9.495 KJ/hour) can be substituted by 3-4 trees, 1 unit of AC 1.5 PK (with the capacity of 18.990 KJ/hour) can be substituted by 6-7 trees, 1 unit of AC 2 PK (with the capacity of 28.485 KJ/hour) can be substituted by 9-10 trees. Thus, it can be said that the existence of the urban forest is able to decrease the usage quantity of AC(s).

The quantity of trees to fulfill the requirement of a room is based on this calculation should be adjusted with the density of the vegetation in the urban forest measured. In addition, trees that are able to well absorb heat generally are the ones which aged 10 years or more, with a shady and dense canopy. To fulfill the air conditioning requirement of a room, the trees should be planted around the area. The quantity of trees required to substitute the AC(s) depends on the amount of the air conditioning requirement of the room (Table 3 and Table 4).

Table 3: The potential ability of tree(s) substituting Air Conditioner (AC) in IPB Darmaga campus

No.	Room Name	Requirements of Air Conditioning (KJ/hour)	Tree(s) required
1.	Auditorium 1, Faculty of Forestry	86.648	27 Trees
2.	Silva Thesis Defence Room, Faculty of Forestry	106.881	34 Trees
3.	Soil Science Department Room, Faculty of Agriculture	22.771	7 Trees
4.	Library, Faculty of Agriculture	141.059	44 Trees
5.	Lecture Hall B1, Faculty of Agriculture Technology	133.050	42 Trees
6.	Lecture Hall H101, Faculty of Agriculture Technology	103.771	33 Trees
7.	RK OFAK B11, Faculty of Agriculture	133.050	42 Trees

Table 4: The potential ability of tree(s) substituting Air Conditioner (AC) in Surabaya

No	Room Name	Requirements of Air Conditioning (KJ/hour)	Tree(s) required	
			Bratang UF	Wonorejo UF
1	WG (Working Group) Room, Surabaya	48.752,9	17	19
2	PKK (Family Welfare Movement) Chief Room, Surabaya	12.764,6	5	5

3	Department of General Development Meeting Room, Surabaya	117.023	40	45
4	Moslem Department Store "Bibah Dibah", Floor 1	156.316	53	60
5	Moslem Department Store "Bibah Dibah", Floor 2	124.914,4	42	49
6	BMKG Employee Room	72.085	25	28
7	Principal Chief of BMKG Room, Juanda	10.519,1	4	4
8	Bedroom, Rungkut Harapan Housing Complex G/31	4.739	2	2

Urban Forest Development Efficiency

1. AC Usage Cost

The surplus value of the urban forest can be known by comparing the cost needed for the AC usage and for the

provision of the trees as the urban forest components. The AC usage cost can be calculated by observing the cost of AC unit and electricity in the operation (Table 5 and Table 6).

Table 5: The AC usage cost in IPB Darmaga campus

No.	Room	AC used	Wattage (1 unit AC)	Electricity cost (1 unit AC for 1 month)	AC Price(s) (1 unit)	Total Cost (10 years)
1.	Auditorium 1, Faculty of Forestry	2 units AC 1,5 PK (18000 BTU/hour)	1.170 watt	Rp207.376,-	Rp3.443.000,-	Rp56.656.240,-
2.	Silva Thesis Defence Room, Faculty of Forestry	6 units AC 1,5 PK (18000 BTU/hour)	1.150 watt	Rp204.928,-	Rp3.712.000,-	Rp169.820.160,-
3.	Soil Science Department Room, Faculty of Agriculture	2 units AC 1,5 PK (18000 BTU/hour)	1.420 watt	Rp 241.638,-	Rp3.170.000,-	Rp64.333.120,-
4.	Library, Faculty of Agriculture	4 units AC 2 PK (27000 BTU/hour)	1.650 watt	Rp266.110,-	Rp7.340.000,-	Rp157.092.800,-
5.	Lecture Hall B1, Faculty of Agriculture Technology	2 units AC 1,5 PK (18000 BTU/hour)	1.170 watt	Rp207.376,-	Rp3.443.000,-	Rp56.656.240,-
6.	Lecture Hall H101, Faculty of Agriculture Technology	4 units AC 1,5 PK (18000 BTU/hour)	1.170 watt	Rp207.376,-	Rp3.443.000,-	Rp106.426.480,-
7.	RK OFAK B11, Faculty of Agriculture	2 units AC 1,5 PK (18000 BTU/hour)	1.170 watt	Rp207.376,-	Rp3.443.000,-	Rp56.656.240,-
8.	RK OFAK B12, Faculty of Agriculture	2 units AC 1,5 PK (18000 BTU/hour)	1.170 watt	Rp207.376,-	Rp3.443.000,-	Rp56.656.240,-
Total cost for eight rooms						Rp724.297.520,-

Table 6: Air Conditioner (AC) usage cost in Surabaya

No	Room	AC used	Wattage (1 unit AC)	Electricity cost (1 unit AC for 1 month)	AC Price(s) (1 Unit) (Rp)	Total Cost (10 years) (Rp)
1	WG (Working Group) Room, Surabaya	2 units AC 1 PK (9000 BTU/hour)	1,450 watt	389,719	3,650,000	50,416,280
2	PKK (Family Welfare Movement) Chief Room, Surabaya	1 units AC 1 PK (9000 BTU/hour)	1,450 watt	389,719	3,650,000	50,416,280
3	Department of General Development Meeting Room, Surabaya	4 units AC 1 PK (9000 BTU/hour)	1,450 watt	389,719	3,650,000	50,416,280
4	Moslem Department	4 units AC 2 PK	1,650 watt	558,682	4,700,000	71,741,840

	Store “Bibah Dibah”, Floor 1	(27000 BTU/hour)				
5	Moslem Department Store “Bibah Dibah”, Floor 2	3 units AC 2 PK (27000 BTU/hour)	1,650 watt	558,682	4,700,000	71,741,840
6	BMKG Employee Room	1 units AC 1 PK (9000 BTU/hour)	1,170 watt	322,163	3,443,000	42,102,560
7	Principal Chief of BMKG Room, Juanda	1 units AC 1 PK (9000 BTU/hour)	1,170 watt	322,163	3,443,000	42,102,560
8	Bedroom, Rungkut Harapan Housing Complex G/31	1 units AC 1 PK (9000 BTU/hour)	1,150 watt	313,414	3,170,000	40,779,680

Based on the calculation of purchasing and electricity costs, it can be known that the AC usage spends a lot of expenses. The AC usage cost is calculated for 10 years usage due to the fact that AC can endure in 10 years and also due to the consideration that the trees as the comparison can also endure in 10 years after the planting. It is due to the fact that the approximate age of the tree is 20-30 years old (Widiarti, 2003).

A room which is rendered with two units of AC 1.5 PK required the cost for as much as 50 million to 60 million rupiahs in 10 years period. A room which is rendered with four units of AC 1.5 PK required the cost for as much as 150 million rupiahs in 10 years period. A room which is rendered with six units of AC 1.5 PK required the cost for as much as 170 million rupiahs in 10 years period. Whereas a room which is rendered with four units of AC 2 PK required the cost for as much as 160 million rupiahs in 10 years period. The total cost for the AC operation in eight rooms in IPB Darmaga campus in 10 years period is Rp724,297,520,- or worth of Rp72,429,752,-/year. While in

Surabaya, a room which is rendered with 2 units of AC 1 PK required the cost for as much as 50 million to 60 million rupiahs in 10 years period. A room which is rendered with 4 units of AC 2 PK required the cost for as much as 70 million rupiahs in 10 years period. The AC usage cost is calculated for 10 years usage due to the fact that AC can endure approximately in 10 years and also due to the consideration that the trees as the comparison can also endure in 10 years after the planting. It is due to the fact that the approximate age of the tree is 20-30 years old (Widiarti, 2003).

2. Urban Forest Development Cost

The trees which are able to decrease air temperature, does not grow by itself, although there are these trees that does. The variants of cost for a tree to grow are the seedling provision cost, planting cost, replantation cost, fertilization cost, watering and monitoring cost adjusted with the Gerhan Standard which is referred by Asyrary (2008) (Table 7 and Table 8).

7: Plantation and conservation cost of a tree in 10 years period in IPB Darmaga campus

Year	Kinds of Activity	Units of measurement	Volume	Unit(s) cost	Total Cost	Description
0	Planting	HOK	1	Rp 50,000,-	Rp 50,000,-	
	Watering	HOK	1	Rp 2,270,-	Rp 2,270,-	
1	Watering	HOK	48	Rp 2,270,-	Rp 108,960,-	Every week
	Fertilization	HOK	12	Rp 10,000,-	Rp 120,000,-	12 times/year
	Weeding	HOK	12	Rp 25,000,-	Rp 300,000,-	12 times/year
2	Fertilization	HOK	12	Rp 10,000,-	Rp 120,000,-	12 times/year
	Weeding	HOK	1	Rp 25,000,-	Rp 25,000,-	Once/year
3	Fertilization	HOK	12	Rp 10,000,-	Rp 120,000,-	12 times/year
	Weeding	HOK	1	Rp 25,000,-	Rp 25,000,-	Once/year
	Monitoring	HOK	12	Rp 1,000,-	Rp 12,000,-	12 times/year
4-10	Monitoring	HOK	72	Rp 1,000,-	Rp 72,000,-	72 times
	Seedling provision	Seedling	1	Rp 26,000,-	Rp 26,000,-	Once
	Fertilizer provision	Kg	36	Rp 1,100	Rp 39,600	12 times/year for the 1st, 2nd, and 3rd year
Total Cost					Rp 1,020,830,-	

Table 8: Plantation and conservation cost of a tree in 10 years period in Surabaya

Year	Kinds of Activity	Units of measurement	Volume	Unit(s) cost	Total Cost	Description
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0	Planting Watering	HOK	1	Rp50,000	Rp 50,000		
		HOK		Rp2,270	Rp 2,270		
1	Watering Fertilization	HOK	48	Rp 2,270	Rp 108,960	Every week	12
	Weeding	HOK	12	Rp 10,000	Rp 120,000	times/year	12
		HOK	12	Rp 25,000	Rp 300,000	times/year	
2	Fertilization Weeding	HOK	12	Rp 10,000	Rp 120,000	12	times/year
		HOK	1	Rp 25,000	Rp 25,000	Once/year	
3	Fertilization Weeding	HOK	12	Rp 10,000	Rp 120,000	12	times/year
	Monitoring	HOK	1	Rp 25,000	Rp 25,000	Once/year	12
		HOK	12	Rp 1,000	Rp 12,000	times/year	
4-10	Monitoring	HOK	72	Rp 1,000	Rp 72,000	72 times	
	Seedling provision	Seedling	1	Rp 26,000	Rp 26,000	Once	
	Fertilizer provision	Kg	36	Rp 1,100	Rp 39,600	12 times/year for the 1st, 2nd, and 3rd year	
Total Cost				Rp 1.020.830,-			

The development and conservation cost for the trees to contribute ecological benefits requires 10 years period as assumed. During the 10 years period, it will cost from year 0 until year 10. Based on the calculation on tree(s) provision cost above, therefore the cost to spend for the air conditioning requirement for a room can be revealed. The Auditorium 1 in the Faculty of Forestry which requires 27 trees spends Rp27,562,410, the Silva Thesis Defence Room in the Faculty of Forestry which requires 34 trees spends Rp34,708,220, the Soil Science Department Room in the Faculty of Agriculture which

requires 7 trees spends Rp7,145,810, the Library in the Faculty of Agriculture which requires 44 trees spends Rp44,916,520, Lecture Hall B1 in the Faculty of Agriculture Technology, RK OFAK B11, RK OFAK B12 which require 42 trees spend Rp42,874,860, and the Lecture Hall H101 in the Faculty of Agriculture Technology which requires 33 trees spends Rp33,687,390. Based on the calculation on tree(s) provision cost in Surabaya, therefore the cost to spend for the trees fulfillment in Surabaya can be revealed (Table 9).

Table 9: Trees fulfillment cost in Surabaya

No	Room Name	Tree(s) required		Price of 1 tree for 10 years period (Rp)	Price of all trees	
		Bratang UF	Wonorejo UF		Bratang UF	Wonorejo UF
1	WG (Working Group) Room, Surabaya	17 Trees	19 Trees		16,821,044	19,223,029
2	PKK (Family Welfare Movement) Chief Room, Surabaya	5 Trees	5 Trees		5,104,150	5,104,150
3	Department of General Development Meeting Room, Surabaya	40 Trees	45 Trees		40,833,200	46,141,595
4	Moslem Department Store "Bibah Dibah" Floor 1	53 Trees	60 Trees		54,103,990	61,634,632
5	Moslem Department Store "Bibah Dibah" Floor 2	42 Trees	49 Trees	1,020,830	43,098,782	49,253,135
6	BMKG Employee Room	25 Trees	28 Trees		25,520,750	28,583,240
7	Principal Chief of BMKG Room, Juanda	4 Trees	4 Trees		4,083,320	4,083,320
8	Bedroom, Rungkut Harapan Housing Complex G/31	2 Trees	2 Trees		2,041,660	2,041,660

3. Urban Forest Development Rationality

The expenditure efficiency of the urban forest improvement can be known by comparing the cost needed for the AC usage and for the provision of the trees as the urban forest components

(Table 10 and Table 11). Thereby, the cost usage difference can be known, as well as the efficiency.

Table 10: The comparison of the AC usage cost with the trees provision cost in IPB Darmaga campus

No.	Room	AC cost (A)	Tree(s) cost (P)	Difference (A – P)
1.	Auditorium 1, Faculty of Forestry	Rp 56.656.240,-	Rp 27.562.410,-	Rp 29.093.830,-
2.	Silva Thesis Defence Room, Faculty of Forestry	Rp 169,820,160	Rp 34,708,220	Rp 135,111,940
3.	Soil Science Department Room, Faculty of Agriculture	Rp 64,333,120	Rp 7,145,810	Rp 57,187,310
4.	Library, Faculty of Agriculture	Rp 157,092,800	Rp 44,916,520	Rp 112,176,280
5.	Lecture Hall B1, Faculty of Agriculture Technology	Rp 56,656,240	Rp 42,874,860	Rp 13,781,380
6.	Lecture Hall H101, Faculty of Agriculture Technology	Rp 106,426,480	Rp 33,687,390	Rp 72,739,090
7.	RK OFAK B11, Faculty of Agriculture	Rp 56,656,240	Rp 42,874,860	Rp 13,781,380
8.	RK OFAK B12, Faculty of Agriculture	Rp 56,656,240	Rp 42,874,860	Rp 13,781,380
Total Cost		Rp724,297,520	Rp 276,644,930	Rp47,652,590

Table 11: The comparison of the AC usage with the trees provision cost in Surabaya

No	Room	AC cost (A) (Rp)	Tree(s) cost in Bratang UF (P) (Rp)		Difference (A-P) (Rp)	
			Bratang UF	Wonorejo UF	Bratang UF	Wonorejo UF
1	WG (Working Group) Room, Surabaya	50,416,280	16,821,044	19,223,029	33,595,236	31,193,251
2	PKK (Family Welfare Movement) Chief Room, Surabaya	50,416,280	51,04,150	5,104,150	45,312,130	45,312,130
3	Department of General Development Meeting Room, Surabaya	50,416,280	40,833,200	46,141,595	9,583,080	4,274,685
4	Moslem Department Store	71,741,840	54,103,990	61,634,632	17,637,850	10,107,208
5	Moslem Department Store	71,741,840	43,098,782	49,253,135	28,643,058	22,488,705
6	BMKG Employee Room	42,102,560	25,520,750	28,583,240	16,581,810	13,519,320
7	Principal Chief of BMKG Room, Juanda	42,102,560	4,083,320	4,083,320	38,019,240	38,019,240
8	Bedroom, Rungkut Harapan Housing Complex G/31	40,779,680	2,041,660	2,041,660	38,738,020	38,738,020
Total Cost		419,717,320	191,606,896	216,064,761	228,110,424	203,652,559

The calculation result above shows that the urban forest development cost is smaller compared to the AC usage cost, thus the urban forest development as an alternative substitution for AC is rational indeed. The trees usage in air conditioning for a room is more efficient in suppressing the level of expenditure compared to the AC usage. The owner of the rooms in IPB Darmaga campus can save as much as Rp447,652,590 in 10 years period or worth of Rp44,765,259/year if the AC usage is substituted by the trees. Apparently, the quantity of AC unit(s) in the Auditorium 1 in the Faculty of Forestry, Lecture Hall B1 in the Faculty of Agriculture Technology, Lecture Hall H101 in the Faculty of Agriculture Technology, RK OFAK B11 in the Faculty of Agriculture, and RK OFAK B12 in the Faculty of Agriculture are insufficient to fulfill the air conditioning of the rooms. The owner of the rooms in Surabaya can save as much as

Rp228,110,424/10 years (based on the calculation in Bratang UF) or Rp203,652,559/10 years (based on the calculation in Wonorejo UF), or Rp22,811,042/year (based on the calculation in Bratang UF) or Rp20,365,256/year (based on the calculation in Wonorejo UF). The trees usage in air conditioning for a room is more efficient in suppressing the level of expenditure compared to the AC usage.

IV. CONCLUSION

Trees have the heat absorption ability from 2,589 KJ/hour to 3,192 KJ/hour. Therefore, one unit of AC 1 PK (with the capacity of 9,495 KJ/hour) can be substituted by three trees, while one unit of 1.5 PK AC (with the capacity of 18,990

KJ/hour) can be substituted with six trees, and for one unit of 2 PK AC (with the capacity of 28,485 KJ/hour) can be substituted by nine trees. The result of the research shows that the existence of the urban forest vegetation is able to substitute or decrease the usage of air conditioner which requires a greater cost and has various kinds of deficiency. The urban forest efficiency for a room with an appropriate installment of the AC, that is twice, even nine times less expensive than the sole usage of the AC. The substitution efficiency usage of the AC replaced by the urban forest is about Rp203,652,559/10 years to Rp447,652,590/10 years or Rp20,365,256/year to Rp44,765,259/year.

ACKNOWLEDGMENT

The author particularly grateful for the assistance especially the collection of data given by Dahlan and Gita Nathalia my students and extend my thanks to my son Ronggur Habibun Mangaraja for his assistance in translation.

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‘My social network, my choice’: User gratification factors influencing choice of online social network sites among teenagers

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Abstract- Teenagers are considered the most prolific users of social network sites (SNSs), where they spend a considerable amount of time. The growth of these online communities has skyrocketed with familiar examples being Facebook, Twitter and MySpace. Although research on young people’s use of SNSs is emerging, questions remain regarding exactly what motivates them to choose specific sites. This review outlines the theoretical framework and gratifications that researchers have used to understand teenagers’ interactions with SNSs. It brings together work that examines gratifications sought, such as diversion, personal identity, surveillance, and social capital. These gratifications point to a growing demand for more user-generated media and offers insights into potential areas for further research.

Index Terms- new media, social network sites, teenagers, uses and gratifications

I. INTRODUCTION

The use of social media, from blogging, to online social networking, to creation of all kinds of digital material, is central to many teenagers’ lives (Ahn, 2011a; Lenhart, Madden, Macgill & Smith, 2007). Greenhow and Robelia (2009) posit that popular media accounts tend to portray young people’s media practices as “deficient or deleterious to academic learning” (p. 1130). This is manifested by the choice of SNSs as a major communication medium among teenagers. Teenagers are considered among the most prolific users of SNSs as illustrated by Ahn:

Teenage youth are a unique population of SNSs users. They are among the first to have grown up entirely surrounded by communication technologies. Teenagers are also in a period of rapid development, growth, and maturation. Research about social media effects on youth promises to contribute significantly to the concerns of adults who mediate access to these online communities (Ahn, 2011a, p. 1435).

Although research on young people’s use of SNSs is emerging, questions remain regarding exactly what young people do on these sites, whom they interact with, and how their SNSs use relates to their other online and off-line activities (Baker & White, 2010; Boyd & Ellison, 2008; Subrahmanyam, Reich, Waechter & Espinoza, 2008; Ahn, 2011a). According to Boyd and Ellison (2008) SNSs are the latest online communication tool

that allows users to create a public or semi-public profile, create and view their own as well as other users’ online social networks. That teenagers are connected to these global online communities is both a frightening prospect for parents and educators and an intriguing area for social science research (Ahn, 2011a).

Several studies have been carried out concerning the use of SNSs among the youth. In a study conducted among Michigan State University undergraduate students, Ellison, Steinfield and Lampe (2007) examined the relationship between the use of Facebook and maintenance of social capital. Their findings suggested the existence of an association between use of Facebook and social capital, with the strongest relationship being the bridging of social capital. In another study, Wyche, Schoenbeck and Forte (2013) examined Facebook use in rural Kenya. Their findings suggest a high level of awareness among the respondents concerning the use of Facebook where they argued that the high costs associated with Facebook access in rural Kenya, limited Bandwidth and power outages impede the growth of SNSs. Although these two studies exemplify the attempts made at furthering research on SNSs, there are glaring gaps in their approach. There lacks a theoretical underpinning in the studies thus making it difficult to explain the studied phenomenon. The studies also tend to focus on selected SNSs, which leave us in doubt as to the user gratification factors influencing choice of specific SNSs.

Statement of the problem

The popularity of social network sites (SNSs) among teenagers has grown exponentially, with little accompanying research to understand the influences on adolescent engagement with this technology (Ahn, 2011b; Baker & White, 2010). Ahn (2011b) further argued that there have been few studies that consider systematic differences in user characteristics of SNSs. Dunne and Lawlor (2010) contend that the growth of the online phenomenon of SNSs and its growing popularity among teenagers has not captured the attention of academia. Today’s adolescents are depicted as ‘digital natives’ and ‘millennial learners’ who are constantly online, perceive themselves as Internet-savvy, and prefer technology-enhanced communication channels (Greenhow & Robelia, 2009).

The proliferation of SNSs presents a major challenge to both parents and policy makers in as far as adopting effective communication strategies targeting teenagers are concerned. The adoption of effective communication strategies (Kiragu, Sienché,

Obwaka & Odallo, 1998) will inevitably stem the social, cultural and economic repercussions of uninformed behavior by teenagers. However, despite the growth of social media, and more specifically the adoption of SNSs by teenagers, little has been done to investigate the user gratification factors influencing the choice of specific SNSs among this group. Interestingly, Internet usage among the youth is perceived negatively considering elements such as pornography and indecent exposure. This is despite the fact that Internet represents a fantastic world of opportunity for children and youth, filled with both good and bad consequences (Chan & Fang, 2007). Among the negative consequences of the Internet include; cyber bullying, sexting, online harassment, and Facebook depression. The positive consequences include socialization and communication, enhanced learning opportunities, and access to health information (O'Keefe et al., 2011). It is therefore worth noting that with new forms of media emerging and the convergence of media technology, the patterns of media usage will inevitably undergo rapid changes thus presenting a major challenge to policy communication strategies targeting teenagers. The danger here is that ineffective communication strategies may be adopted thus excluding teenagers, whose Internet use is considered undeveloped. The purpose of this review is to address this gap by investigating the user gratification factors influencing teenagers' choice of SNSs.

Objective(s)

The general objective of this review is to investigate user gratification factors influencing teenagers' choice of SNSs. Specifically, the review investigates how 'gratifications sought' influence teenagers' choice of social network sites.

II. LITERATURE REVIEW

The teenage youth segment

The UNFPA (2011) defined the youth as people within the age bracket of 15 to 24 years. The UNFPA (2011) report states that "although people 24 years old or younger make up almost half of the world's 7 billion population (with 1.2 billion between the ages of 10 and 19), their percentage of the population in some major developing countries is already at its peak" (p. 10). The Global Roundtable Working Group on the Youth (2011) affirmed these statistics by stating that the number of youth between the ages of 15 and 24 is 1.1 billion; youth constitute 18 percent of the global population. Youth and children together, including those aged 24 and younger, account for nearly 40 percent of the world's population. Geographically, the largest population of youth is concentrated in Asia; 15 percent, in Africa; 10 percent, in Latin America and the Caribbean; and the remaining 15 percent, in developed countries and regions. Such statistics demonstrate that:

In middle income and some rapidly developing lower income countries, the number of years in which a large, young working population can be counted on to fuel development may be fleeting, and governments and the private sector need to act expeditiously to prepare the young for productive roles (UNFPA, 2011, p. 11).

This review focused on teenagers aged between 13 and 19 years.

Many of the youth have been excluded from designing, planning and implementing programs and policies that affect them. Many, who are productive and energetic remain unemployed, continue to suffer from poor health, and lack sufficient support. Some of them have special needs that require attention. These include those living off the streets and those with HIV/AIDS. The responsibility of ensuring that the aspirations and hopes of the youth are met lies with a multiplicity of stakeholders. Among the other issues affecting the youth include: (1) unemployment and underemployment where only about 25 percent of the youth are absorbed leaving 75 percent unemployed, (2) the youth face a myriad of health related problems including STI's, drug and substance abuse as well as poor access to health services. The Global Roundtable Working Group on Youth (2011) attested that millions of adolescents face the prospect of early marriage, early childbearing, incomplete education and the threat of HIV and AIDS. Increasing youth's knowledge, improving services for young people, and encouraging youth's participation in program decisions will help all young people to lead healthier and more productive lives, (3) increasing school and college dropout rates, crime and deviant behavior, limited sports and recreation facilities, abuse and exploitation, limited participation and lack of opportunities, limited and poor housing, and (4) limited access to ICT. These limitations imply that "the youth cannot exploit career, business and education opportunities available because they lack access to ICT due to unavailability especially in rural areas, and high costs" (Global Roundtable Working Group on Youth, 2011, p. 4).

An overview of the new media

The new media is defined broadly and generally refers to a range of applications that merge traditional media such as print, television, film, newspapers and images with digital technology to create interactive and dynamic publications, tools and uses (Conway, 2011). The new media is characterized by elements such as open access, user driven and collaborative content generation, feedback, and digital delivery. Among the common examples of new media include "virtual worlds, collaborative workspaces, social media, and open access journals, applications for smart phones, tablets, and e-readers" (p. 247). The youth form a considerable segment of new media users due to the high levels of interactivity involved. With new forms of media emerging and the convergence of media technology, the patterns of media usage will inevitably undergo rapid changes.

A characteristic of the new Information Communication Technologies (ICTs) is the multifunction capacity. Although research about the Internet has grown exponentially along with the development and spread of ICTs, it still remains a comparatively small body of literature (Kim & Weaver, 2002; as cited in Chan & Fang, 2007). Worldwide, a growing number of individuals are connected through the Internet and related Information and Communication Technologies (ICTs), such as mobile phones, personal computers, Personal Digital Assistants (PDAs), tablets and other networked gadgets and electronic devices, which are themselves converging (Dutta, Dutton, & Law, 2011). The beginning of the 21st century is marked by the rise of ubiquitous technology in everyday life. As more and more people are connected to the Internet, today's networked society

makes it increasingly difficult to remain offline. "As new products, such as the Apple iPad, Samsung Galaxy Tab, and Cisco Cius, entered the market this same year, sales for the reinvented media tablet were forecasted to reach 19.5 million." (Dutta et al., 2011, p. 5). Consequently, individual citizens are becoming more focused on the opportunities and risks electronic devices pose. Among these include the risk of indecent exposure, enculturation, pornography, and anti-social behaviors among others.

Littlejohn and Foss (2008) highlighted the idea of the "Second Media Age", as propounded by Mark Poster in his book "The Second Media Age", which signal important changes in media theory. Three key assumptions of the second media age include: firstly, that the concept of "media" is loosened from primarily "mass" communication to a variety of media ranging from broad to personal in scope. Secondly, the concept evaluates new forms of media use ranging from individualized information and knowledge acquisition to interaction. Thirdly, the power of media comes back into focus including a renewed interest in characteristics of dissemination and broadcast media. The first media age was said to be characterized by "(a) centralized production (one to many); (b) one-way communication; (c) state control for the most part; (d) the reproduction of social stratification and inequality through media; (e) fragmented mass audiences; and (f) the shaping of social consciousness" (Littlejohn & Foss, 2008, p. 292). The second media age, in contrast, and which is the focus of this study is described as being "(a) decentralized; (b) two-way; (c) beyond state control; (d) democratizing; (e) promoting individual consciousness; and (f) individually oriented" (Littlejohn & Foss, 2008, p. 292).

Severin and Tankard, 1998, and Littlejohn and Foss (2008) further argued that the World Wide Web (WWW) is seen as an open, flexible, and dynamic information environment, which allows humans to develop a new orientation to knowledge and thus engage in a more interactive, community-based, democratic world of mutual sharing and empowerment. SNSs constitute this new platform through which teenagers interact. Littlejohn and Foss therefore add that "the Internet provides virtual meeting places that expand social worlds, creates new possibilities for knowledge, and provide for a sharing of perspectives worldwide" (p.292). The new media contain powers as well as limits. Examples include: provision of openness and flexibility of use, can lead to confusion and chaos. New media greatly widen choice. Diversity is one of the great values of new media, but can lead to division and separation. New media may also allow flexibility in how we use time but also create new time demands.

Online Social Network Sites (SNSs)

Closely related to the Internet and most popular among the youth are SNSs. The online phenomenon of SNSs has been consistently growing in popularity over the past five years. SNSs constitute a form of virtual community, with sites such as bebo, Facebook and MySpace commanding a vast global following (Dunne & Lawlor, 2010; Boyd & Ellison, 2008). For example, Facebook and MySpace report in excess of 70 and 50 million visitors, respectively on a monthly basis to their sites (Dunne & Lawlor, 2010). Consequently, a new aspect of new media referred to as 'user-generated media' has emerged. Boyd and Ellison defined a SNS as "a web-based service that allows

individuals to (a) construct a public or semi-public profile within a bounded system, (b) articulate a list of other users with whom they share a connection, and (c) view and traverse their list of connections and those made by others within the system" (p. 211). Boyd and Ellison further argued that SNSs "are increasingly attracting the attention of academic and industry researchers intrigued by their affordances and reach" (p. 210). They posited that since their introduction, SNSs such as Myspace, Facebook, Cyworld and Bebo have attracted millions of users, many of whom have integrated these sites into their daily lives. Boyd and Ellison argued that "SNS researchers' ability to make causal claims is limited by a lack of experimental or longitudinal studies. Although the situation is rapidly changing, scholars still have a limited understanding of who is and who is not using these sites, why, and for what purposes, especially outside the U.S." (p. 224).

Although their influence on the world at large is still unclear, user-generated media (UGM) are fundamentally changing the world of entertainment, communication, and information. This is attributed to their self-sustaining nature and ever growing audience size (Shao, 2009). Historically, UGM can be traced back to the bulletin boards on such portal sites as Yahoo and AOL in the 1990s. Over time, "they have evolved to encompass blogs, wikis, picture-sharing, video-sharing, social networking, and other user-generated web sites" (p. 8). UGM thus refers to "the new media whose content is made publicly available over the Internet, reflects a certain amount of creative effort, and is created outside professional routines and practices" (Shao, 2009, p. 8). The challenge here is in relating the gratifications sought and those obtained through the choice of these new forms of media.

Examples of online Social Network Sites (SNSs)

Ellison and Boyd (2013) argued that the proliferation and evolution of SNSs makes it challenging to give a standard definition. They further defined a social network site as;

A networked communication platform in which participants 1) have uniquely identifiable profiles that consist of user-supplied content provided by other users, and/ or system-provided data; 2) can publicly articulate connections that can be viewed and traversed by others; and 3) can consume, produce, and/ or interact with streams of user-generated content provided by their connections on the site
(Ellison & Boyd, 2013, p. 7).

Examples of popular SNSs among the youth include Facebook, Twitter, LinkedIn, and Google+. Willems (2011) described Facebook as "a social utility which connects people with friends and others" (p. 1322). There are more SNSs, which are ranked based on their popularity as shown in table 1 below.

Table 1: Top ten online social network sites (SNSs)

Rank	Site	Estimated monthly visitors	unique
1	Facebook	800,000,000	
2	Twitter	250,000,000	
3	LinkedIn	200,000,000	
4	Google+	150,000,000	
5	Pinterest	140,500,000	
6	Tumblr	110,000,000	
7	Flickr	67,000,000	
8	VK	65,400,000	
9	Instagram	50,000,000	
10	MySpace	26,500,000	

Source: Top 15 most, 2014

Theoretical framework

This review is premised on the Uses and Gratifications (U&G) theory as propounded by Blumler and Katz in 1974. The uses and gratifications (U&G) theory is based on the notion that media cannot influence an individual unless that person has some use for that media or its messages (Rubin, 2002). This marks a shift from the traditional viewpoint of ‘powerful-media-effects’ theories in which an audience is depicted as passive and easily manipulated by media influences. Quan-Haase and Young (2010) argued that in U&G theory a key distinction is made between gratifications obtained and gratifications sought. Quan-Haase and Young (2010) draw this distinction by arguing that “gratifications obtained (GO) refer to those gratifications that audience members actually experience through the use of a particular medium” (p.352). By contrast, gratifications sought (GS), which are often referred to as “needs’ or “motives” refer to “those gratifications that audience members expect to obtain from a medium before they have actually come into contact with it” (p. 352).

This review focuses on the gratifications sought by teenagers in their choice of SNSs. Dunne, Lawlor and Rowley (2010) reinforce this by classifying GS as “communication, friending, identity creation and management, entertainment, escapism and alleviation of boredom, information search, and interaction’ against GO, which include ‘portrayal of one’s ideal image, peer acceptance, relationship maintenance, safety from embarrassment and rejection, and engagement in playground politics” (p. 51). Song, Larose, Eastin and Lin (2004) found seven gratification factors specific to the Internet. These are; virtual community, information seeking, aesthetic experience, monetary compensation, diversion, personal status, and relationship maintenance. From the foregoing arguments, it is quite clear that teenagers indeed seek a variety of gratifications from SNSs and in turn gain different satisfactions from the same. A further exploration of the U&G approach in the next section will give insight into the user gratification factors influencing teenagers’ choice of SNSs.

The uses and gratifications (U&G) theory

According to Littlejohn and Foss (2008) one of the most popular theories of mass communication is the U&G approach. This approach focuses on the consumer-the audience member

rather than the message. The theory imagines the audience member to be a discriminating user of media. The audience is assumed to be active and goal directed. The audiences are largely responsible for choosing media to meet their own needs. The media are considered to be only one factor contributing to how needs get met, and the audience members are assumed to have considerable agency or in essence know their need and how to gratify those needs.

The U&G approach was propounded by Blumler and Katz in 1974. The underlying assumption is that audiences are active and they seek out that content which provides the most gratification (Fawkes & Gregory, 2001). Fawkes and Gregory further added that “the level of gratification depends on the level of need or interest of the individual” (p. 120). According to Katz, Blumler and Gurevitch (1973-1974), the last few years have witnessed a revival of direct empirical investigation of audience uses and gratifications. Each of these studies attempts to press towards a greater systemization of what is involved in conducting research in this field. Katz, Blumler and Gurevitch added that the U&G approach is concerned with: “(a) the social and psychological origins of, (b) needs, which generate, (c) expectations of, (d) the mass media or other sources, which lead to, (e) different patterns of media exposure (or engagement in other activities), resulting in, (f) need gratifications and, (g) other consequences, perhaps mostly unintended ones” (p. 510). This model informs the present review in the sense that, (a) teenagers have social and psychological needs, which (b) determine the Gratifications Sought (GS) through specific SNSs, and (c) have expectations of the different SNSs available, which (d) enables them to access social media, (e) and engage in different online activities, resulting in (f) gratifications obtained (GO) and, (g) other consequences (both positive and negative), mostly unintended.

User gratification factors

Gratification factors influencing teenagers’ choice of SNSs have been summarized into the following variables; (a) diversion, which is escape from routine and problems; emotional release, (b) personal identity/ individual psychology, which relates to value reinforcement, (c) surveillance, which is information about things which might affect one or will help one do or accomplish something (Severin & Tankard, 1998), and (d) social capital, which captures the benefits accrued from personal relationships, for example, family, friends, classmates, and acquaintances (Vitak, Ellison & Steinfield, 2011, Severin & Tankard, 1998).

Personal identity

Personal identity is a critical variable in this review considering that the importance of presenting a positive self-identity among teenagers cannot be overemphasized. Harrison and Thomas (2009) defined identity as “the way in which users develop their online profiles and lists of friends to carry out important community processes” (p. 114). They further outlined aspects of identity as follows.

- (a) Impression management, which is concerned with personal identity formation,
- (b) friendship management, which is linked to impression management in that users use publicly displayed profiles of others to choose who

they would like to include as friends on their list, (c) network structure, relates to the roles that users play in the social community in which they participate, and (d) bridging of online and offline social networks, which is concerned with the degree to which the SNS becomes an integral part of the users' actual life while offline (Harrison & Thomas, 2009, p. 114).

This is evidenced by Dunne and Lawlor's (2010) study on young people's use of online SNSs. Their study was carried out among girls aged 12 to 14 years and focused on one SNS 'Bebo'. Findings revealed an active use of Bebo for personal motives and gratifications in terms of presenting and managing a certain identity and persona in a social context. One respondent in their findings stated, "sometimes you look at people's profile pictures and go "oh my god", what are they at"? Some of the stuff they say about themselves is exaggerated as well, they are trying to make themselves look cool" (Dunne & Lawlor, 2010, p. 52). Chigona, Kamkwenda and Manjoo (2008) echo this by arguing that among the process gratifications sought by the youth include the need for image, fashion and status.

Social capital

The concept of social capital draws a variety of definitions in multiple fields (Ellison, Steinfield & Lampe, 2007). Broadly though, (Ellison, Steinfield & Lampe, 2007; Valenzuela, Park & Kee, 2009) defined social capital as the resources accumulated through the relationships among people. This definition is reinforced by Williams (2006) assertion that:

It is loosely understood to operate like financial capital in that it creates more of it. However, instead of goods and services, the things being used and created are personal relationships and the benefits that come with them: Some social actors interact and form a network of individuals – a "social network"- resulting in positive affective bonds. These in turn yield positive outcomes such as emotional support or the ability to mobilize others (Williams, 2006, p. 594).

Valenzuela, Park and Kee (2009) argued that unsafe disclosure of information, cyberbullies, addiction, risky behavior, and contact with dangerous communities are among the popular concerns raised about the use of SNSs. They further posit that "other research shows that young people are motivated to join these sites to keep strong ties with friends and to strengthen ties with new acquaintances" (p. 876). This validates Williams (2006) argument that bridging and bonding social capital could be motivating factors influencing choice of SNSs.

Putnam as cited in Williams (2006) splits social capital into 'bonding' and 'bridging'. He argues that bridging and bonding allow for different types of social capital to result when different norms and networks are in place. According to Putnam, these two types of social capital are related but not equivalent. Bridging social capital is inclusive and occurs when individuals from different backgrounds make connections between social networks. By contrast, bonding can be exclusive. It occurs when strongly tied individuals, such as family and close friends, provide emotional or substantive support for one another (Williams, 2006). Papacharissi and Mendelson (n.d) argued that media audiences also seek to maintain social capital. They add that maintained social capital focuses on staying connected to

groups from previous moments in one's life. The question though at this point is whether teenagers' choice of SNSs is motivated by the desire to 'bridge', 'bond' and 'maintain' social capital.

Diversion and surveillance

Severin and Tankard (1998) categorize the variables of diversion and surveillance as gratification factors. They define diversion as escape from routine and problems, and surveillance as seeking information about things, which might affect one or will help in accomplishing given tasks. This is echoed by Johnson (2008) as cited in Quan-Haase and Young (2010) who suggested that 'keeping in touch' dimension of Facebook comprises of surveillance and social searching. Surveillance is further defined as the desire to see what old contacts and friends are upto, how they look, and how they behave. Quan-Haase and Young (2010) further outline the main reasons to use Facebook as (a) to learn about social events, (b) to keep in touch with friends, and (c) as a diversion from school work. These fit in well with the objective of the review, which seeks to investigate user gratification factors influencing teenagers' choice of social network sites. McQuail as cited in Brandtzæg and Heim (2009) argued that there are four main motivations for media use; (a) information, (b) entertainment, (c) social interaction, and (d) personal identity. Leung (2007) echoes this by listing entertainment, surveillance, passing time, and escape as motivations for internet use. Although these motivations are observed from a broad perspective, it is clear that diversion and surveillance act as motivations for internet use. This information could be related to bridging and bonding social capital among teenagers.

Demographic characteristics of gender, age and socioeconomic status

Ahn (2011b) conceded that there have been few studies that consider systematic differences in user characteristics of SNSs. Studies in the United States point to a relationship between socioeconomic status (SES) and Internet access. This could by extension be applied to SNSs. Ahn (2011b) argued that "parents' education beyond a high school diploma, a common indicator of SES, did not have a significant relationship to teens' use of SNSs" (p. 3). Additionally, teenagers who primarily accessed the Internet away from home or school were most likely to be SNSs members (Ahn, 2011b). According to Boyd (2008) gender and age also appear to influence participation on Social Network Sites (SNSs). Boyd (2008) further stated that younger boys are more likely to participate in SNSs than younger girls but older girls are far more likely to participate than older boys. Boyd argued that the motivations for using SNSs are that inherently, "older boys are twice as likely to use the sites to flirt and slightly more likely to use the sites to meet new people than girls of their age" (p. 121). Although Boyd (2008) does not classify specific age categories to these motivations, it is apparent that age and gender are indeed predictive of teenagers' Social Network Sites choices.

Empirical review of literature

Several studies have been carried out relating the U&G theory to SNSs. In one such study, Urista, Doug and Day (n.d) sought to explain why young adults used MySpace and Facebook

through the U&G theory. The exploratory study applied the focus group method to investigate how members of Facebook and MySpace used the sites to fulfill their wants and needs. This qualitative approach was used in order to provide insights into thoughts, ideas, perceptions, and attitudes of individual SNS members who used online sources to fulfill their needs and wants. Findings revealed five themes from the focus group discussions. These included: (a) efficient communication, (b) convenient communication, (c) curiosity about others, (d) popularity, and (e) relationship formation and reinforcement. The findings also suggested that an immediacy driven tendency motivated young people to use SNSs. Members used SNSs to satisfy a specific gratification that they sought. These gratifications fall into the four factors adopted in this review.

In another study, Wyche, Schoenebeck and Forte (2013) examined Facebook use in Kenya, where social media participation is growing but less developed technological infrastructures and uneven access to technology limit use. This study emphasized how the potential for ICT to support economic prosperity, education, and civic engagement had been widely discussed, but lament the scarcity of research on SNSs in such contexts. This was a qualitative study where the researchers conducted observations and interviews at Internet cafés in rural Kenya. Among the key findings of the study included the fact that participants were familiar with Facebook but there were high costs associated with Facebook access in rural Kenya. Cases of limited Bandwidth and power outages were also cited as impediments to Facebook access. Whereas Wyche, Schoenebeck and Forte's (2013) study sets the stage for future research on SNSs, there is a clear gap in the relationship between theory and SNSs use. The study also fails to address a specific segment of the population thus making it difficult to direct communication strategies aimed at segments of the population. This review presents a different perspective to the study of urban populations' choices of SNSs by specifically targeting teenagers.

Ellison, Steinfield and Lampe (2007) examined the relationships between use of Facebook, a popular SNS and the formation and maintenance of social capital. This study employed a survey method where the findings point to an association between use of Facebook and the three types of social capital, with the strongest relationship being to bridge social capital. This compares favorably with Dunne, Lawlor and Rowley's (2010) research, which explored the U&G that young people, specifically girls aged 12 – 14 years, derived from online SNS (Bebo). The study sought to explore the girls' usage of the Internet and more specifically SNSs, and examine the reasons for this behavior. A qualitative methodology was employed in the study involving a total of seven focus groups which were conducted in the setting of an Irish secondary school. Their findings identified gratifications sought (GS) as communication, Friending, identity creation and management, entertainment, escapism and alleviation of boredom, information search, and interaction with boys. The gratifications obtained (GO) included, portraying ones ideal image, peer acceptance, relationship maintenance, safety from embarrassment and rejection, and engaging in playground politics. This study demonstrated how the U&G approach is both appropriate and relevant in the context of the online environment and specifically SNSs.

Rack and Bonds-Raacke (2008) conducted a study to evaluate why people use friend-networking sites, what the characteristics are of the typical college user, and what U&G are met by using these sites. This was an exploratory study, which applied the quantitative method. The questionnaire was employed as the main tool of data collection. In a study examining whether off-line inequalities predict teenagers online social networks, (Ahn, 2011b) analyzed a dataset of 701 U.S. teenagers aged between twelve and eighteen years. This study employed a survey methodology where online questionnaire was the main tool for data collection. Findings suggested that the characteristics of teenagers that use Facebook, Myspace, or both SNSs showed distinct differences. Although Ahn's (2011b) study is closely related to the present review in the sense that teenagers' SNSs choices are under focus, Facebook and Myspace SNSs are used thus locking out those teenagers who might belong to other SNSs. All these studies ideally examine the motivations for using specific SNSs but are deficient in explaining the gratifications that inform the choice of these SNSs. The studies are also methodologically deficient in that the use of one research design may not present accurate findings, which can be generalized to large populations.

III. METHODOLOGY

This article adopted a review methodology based on literature related to social network sites (SNSs) and teenagers. The Uses and Gratifications approach informed the theoretical framework of the review. Empirical studies were reviewed for gratifications sought, which were then grouped into the four variables discussed.

IV. DISCUSSION

This review set out to reveal user gratification factors influencing teenagers' choice of social network sites (SNSs). The results based on existing literature revealed four main classifications of gratification factors that teenagers sought in their interactions with SNSs. The review extends prior scholarship by investigating gratification factors influencing SNSs choice. This coupled with the Uses and Gratifications approach presents a rich foundation for future empirical research into teenagers and SNSs. Previous studies reviewed point to a broad and unstructured classification of gratifications sought by SNSs users. These pose as many questions as they resolve but provide pointers to future directions for research. It is envisaged that this review is a first step in developing a framework through which user gratifications influencing SNSs use can be examined.

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Epitope characterization and docking studies on Chikungunya viral Envelope 2 protein

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Abstract- Pathogenic aspects of Chikungunya virus requires detailed study in order to develop drugs for controlling the outspread of Chikungunya infection. Previously it has been identified that Chikungunya viral envelope 1 and 2 proteins (E1 and E2) and the nonstructural protein 2 (nsP2) are involved in CHIKV pathogenesis. In this study, a reverse vaccinology approach has been used to elucidate the epitopic peptides associated with the envelope protein E2 of CHIKV. The study characterizes as well as maps B cell and T cell epitopes of the protein using various bioinformatics tools. Further, the predicted epitopes were modeled and docked with human receptors (2X40 and 1DLH) to analyze the binding affinities. The epitopes with high binding affinities for human receptors were identified as effective epitopes. We anticipate that the peptides identified as most effective epitopes from this study can be considered for designing epitope-based vaccines against Chikungunya disease.

Index Terms- Chikungunya Virus, Envelope 2 protein, T cell & B cell Epitopes, Epitope modeling, Docking Studies, Binding Affinity

I. INTRODUCTION

Chikungunya is a widespread infectious disease with unpredictable emerging and reemerging disease outbreaks [1]. High fever and joint pain are the common symptoms of the disease, and other symptoms include vomiting, rashes, arthralgia, nausea and swelling of joints [2]. The disease is mainly endemic in Asia, Africa and Indian Ocean Islands. Previous studies have classified Chikungunya viral strains into three major genotypes, Asian, West African and East Central South African (ECSA) [3]. Mosquitoes of *Aedes* genus which include *Aedes aegypti*, *Aedes albopictus*, *Aedes africanus*, *Aedes furcifer*, *Aedes taylori*, and *Aedes luteocephalus* has been well documented as a vector to the pathogen [3]. CHIKV genome is approximately 11.8Kb in length, consisting of two ORFs, coding for structural and non-structural proteins [4]. The 5'end ORF encode structural polyprotein, which later cleaves into four non-structural proteins (nsP1-nsP4) endowed with enzymatic properties. CHIKV nsP1 protein functions as an antagonist for the bone marrow stromal antigen 2, a host defense mechanism and down regulate BST-2 expression [5]. nsP1 also partakes in cytoplasmic capping, where 7-methyl-GMP is covalently bonded to nsP1 to form the m7GMP-nsP1 complex, which is transferred to the mRNA to form the cap structure. nsP2 protein has two domains, N terminal and C terminal domain. The N terminal is found to have

different enzymatic activities, the RNA triphosphatase activity plays a key role in initiating the viral RNA capping reactions, the nucleotide triphosphatase activity triggers the RNA helicase activity of nsP2 C-terminal domain, and the 5'-triphosphatase activity eliminates the 'Y-phosphate from the 5'end of the RNA. The protease activity of the nsP2, C terminal domain cleaves the polyprotein into four nonstructural proteins. nsP2 protein is involved in transcriptional and translational shutoff in infected host cells. (Not required) Recent studies have proved that Chikungunya viral nsP2 has the ability to block JAK-STAT signaling that inhibits viral replication [6]. The nsP3 protein is involved in 26S mRNA synthesis [7]. CHIKV nsP4 protein participates in genome replication, the protein replicates genomic and antigenomic RNA in addition to that nsP4 transcribes a 26S subgenomic mRNA, which codes for structural proteins. The CHIKV structural poly protein cleaves into E1, E2 and E3 envelope glycoproteins, 6k and capsid protein. The envelope protein E1 and E2 are antigenic proteins and enable the viral entry into the host cell. E1 protein is involved in membrane fusion and E2 protein is associated with receptor binding. The genomic organization of Chikungunya virus is as follows; 5'cap-nsP1-nsP2-nsP3-nsP4-(junction region)-C- E3-E2-6K-E1-poly(A) 3'[8].

Antigenic aspects of Chikungunya proteins need to be further explored to develop specific drugs for Chikungunya infection. The antigenicity associated with Chikungunya viral proteins are only poorly studied, however E2, E1 and nsP2 proteins were found to have antigenic properties [9]. The only available treatment of the disease is symptomatic treatment, an effective medicine for the disease has not been developed yet [10]. Antigenic analysis and *in silico* epitope prediction in CHIKV proteins can explore antigenic elements involved in Chikungunya infection. An understanding of the antigenic epitopes is essential for designing peptide-based vaccines [11]. Epitopes are part of the antigen in the pathogen that evokes immune responses in host organisms. Epitopes that interacts with B cell receptors are termed as B cell epitopes and those interact with T cell receptors are called T cell epitopes. B cell epitopes are of two types, Linear (continuous) epitopes and conformational (discontinuous) epitope [12]. T cell epitopes are the antigenic parts that induce immune responses when recognized by T cell lymphocytes [13]. *In vitro* screening of epitopes is time consuming and at the same time expensive too. *In silico* reverse vaccinology approaches can be used to study the antigenic elements in the pathogen [14]. Many immunoinformatics tools are available for analyzing antigenic

properties and epitopes associated with the pathogen. ANTIGENpro, BCPred, SVMTriP, COBEPro and IEDB tools like BepiPred, Ellipro etc are the commonly used immune informatics tools [15-17].

In the present investigation, we have identified B cell and T cell epitopes associated with Chikungunya viral antigenic protein, E2. Epitope mapping was carried out, in order to locate these identified epitopes. The epitopes were modeled and a docking study was performed on these epitopes with human receptors to study the binding affinities of the predicted CHIKV epitopes. The epitopic peptides with higher affinities towards the human receptors were identified as most efficient epitopes that can be considered for epitope based vaccine design.

II. MATERIALS AND METHODS

B cell epitope prediction

The CHIKV E2 protein sequence (Q0JRL8) was retrieved from Uniprot in FASTA format. The possible linear and conformation B cell epitopes of CHIKV E2 protein was identified using various Bioinformatics tools. B cell linear epitopes were predicted using the tools BepiPred, BCPred, SVMTriP, COBEPro and Ellipro which embeds specific algorithm in epitope prediction (15-20).

T cell Epitope prediction

Identification of T cell epitopes is an important step in analyzing disease pathogenesis. In order to predict the T cell Epitopes, the CHIKV E2 (Q0JRL80) protein sequence was given to T cell Epitope prediction tools; IEDB MHC I & II Binding Prediction tool. Different programs have incorporated in IEDB's T cell epitope prediction tools to predict T cell epitopes. MHC I Binding prediction tool has programs such as Consensus,

NetMHCpan, ANN, SMM, SMMPMBEC and CombLib whereas in MHC II Binding Prediction tool, in addition to the above mentioned programs, this also include methods like NN_align, SMM_align, and sturniolo. [21-22].

Epitope Modelling

For further analyzing the predicted epitopes, three-dimensional structures of the epitopes are required. The three-dimensional structures of these predicted CHIKV E2 epitopes were modeled using Pepstr, an effective web server for predicting the three dimensional structures of small peptides [23-24]

Docking

Epitope receptor docking studies were carried out using the docking server, PatchDOCK and further refined the docking results with FireDock [25-28]. The human receptors and the epitopes were imported to patch dock server. The epitopes of MHC I alleles were docked with human receptor 2X40 whereas the MHC II alleles were docked with 1DLH human receptor. Clustering RMSD was given as 4.0 Å, and then the docking jobs were submitted to the Patchdock server. Followed by this the rigid-body protein-protein docking solutions obtained from the PatchDock server were further refined by FireDock, which renders addition refinement to the docking complexes. Fire dock server analyses and sorts the refined complex structures based on energy functions like global energy atomic contact energy, contribution of the hydrogen bonds (HB) van der Waals interactions etc. Lower global energy indicates higher binding affinities with human receptors, the epitopic peptides that were having higher binding affinities were identified as most effective epitopes.

III. RESULTS

B cell epitope prediction of CHIKV E2 protein (Q0JRL8)

The details of B cell linear epitopes of CHIKV E2 protein (Q0JRL8) predicted using five linear B cell epitope prediction tools, BepiPred, BCPred, SVMtriP, COBEpro, and Ellipro were

given in Supplementary Material 1. A graphical representation of B cell linear epitopes of E2 protein is shown in Figure 1.

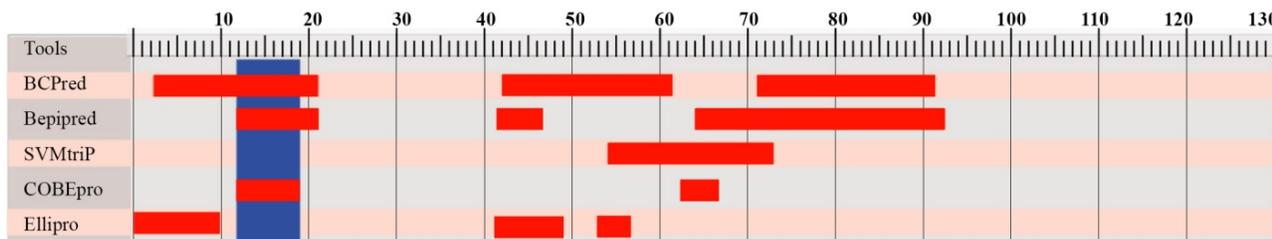


Figure 1: Graphical representation of B cell linear epitopes of CHIKV E2 protein (Q0JRL8) (Give a detailed mention of the picture)

We have identified the most probable epitope by analyzing the results obtained from all the linear B cell epitope prediction tool. The most probable B cell Linear Epitope of E2 glyco protein identified from this study is 'ARNPTV'; Sequence position 12-

19. B cell Discontinuous Epitopes of CHIKV E2protein (Q0JRL8) were predicted using the tool Ellipro. The details of the discontinuous epitopes predicted by Ellipro are shown in Table 1.

Table 1: Details of Discontinuous epitopes of CHIKV E2 protein (Q0JRL8) obtained with Ellipro

No	Residues	Number of Residues	Score
1	_:L4, _:A5, _:N6	3	0.800

Epitope Mapping

Epitope mapping of B cell Liner Epitope of E2 glycoprotein is shown in Figure 2. The space-filled balls indicate the predicted epitope.

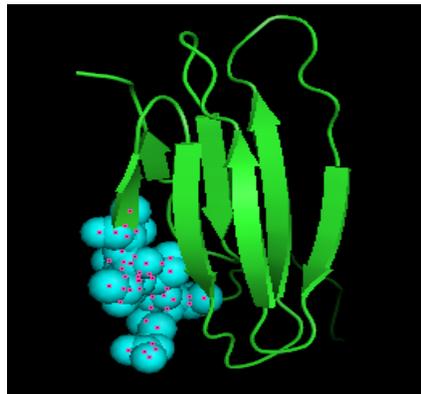


Figure 2: Epitope mapping of B cell Liner Epitope of E2 glycoprotein (please discuss about the picture)

T cell epitopes

The T cell epitope prediction was performed on human MHC class I & Class II alleles. The predicted T cell epitopes of CHIKV E2 protein (Q0JRL8) are given in Table 2 & 3 respectively.

Table 2: Details of MHC-I predicted T cell epitopes of CHIKV E2 protein (Q0JRL8)

Allele	Position	Peptide
HLA-A*01:01	71-79	VTWGNNEPY
HLA-A*02:01	119-127	FILLSMVGV
HLA-A*02:06	119-127	FILLSMVGV
HLA-A*03:01	13-21	KARNPTVTY
HLA-A*11:01	115-123	SVASFILLS
HLA-A*23:01	101-109	YYYELYPTM
HLA-A*24:02	101-109	YYYELYPTM
HLA-A*25:01	97-105	EILYYYEL
HLA-A*26:01	94-102	HPHEILYY
HLA-A*29:02	98-106	IILYYYELY
HLA-A*30:01	13-21	KARNPTVTY
HLA-A*30:02	23-31	KNQVIMLLY
HLA-A*31:01	7-15	VTCRVPKAR
HLA-A*32:01	19-27	VTYGKNQVI
HLA-A*68:01	53-61	WVTHKKEIR
HLA-A*68:02	109-117	MTVVVVVVA
HLA-B*07:02	106-114	YPTMTVVVV
HLA-B*08:01	11-19	VPKARNPTV
HLA-B*14:02	116-124	VASFILLSM

Table 3: MHC-II predicted T cell epitopes of CHIKV E2 protein (Q0JRL8)

Allele	Position	Peptide	Percentile rank
HLA-DRB1*01:01	100-114	LYYYELYPTMTVVVV	2.27
HLA-DRB1*01:02	107-121	PTMTVVVVSVASFIL	0.44
HLA-DRB1*03:01	106-120	YPTMTVVVVSVASFI	0.36
HLA-HLA-DRB1*03:05	114-128	VSVASFILLSMVGVA	0.77
HLA-HLA-DRB1*03:06	24-38	NQVIMLLYPDHPDLL	1.24
HLA-HLA-DRB1*03:07	24-38	NQVIMLLYPDHPDLL	1.24
HLA-HLA-DRB1*03:08	24-38	NQVIMLLYPDHPDLL	1.24
HLA-HLA-DRB1*03:09	47-61	PNYQEEWVTHKKEIR	0.81
HLA-HLA-DRB1*04:01	98-112	IILYYYELYPTMTVV	1.29
HLA-HLA-DRB1*04:02	13-27	KARNPTVTYGKNQVI	2.15
HLA-HLA-DRB1*04:04	24-38	NQVIMLLYPDHPDLL	0.14
HLA-HLA-DRB1*04:05	98-112	IILYYYELYPTMTVV	1.75
HLA-HLA-DRB1*04:08	97-111	EILYYYELYPTMTV	0.89
HLA-HLA-DRB1*04:10	31-45	YPDHPDLLSYRNMGE	0.63
HLA-HLA-DRB1*04:21	54-68	VTHKKEIRLTVPTEG	1.39
HLA-HLA-DRB1*04:23	105-119	LYPTMTVVVVSVASF	0.84
HLA-HLA-DRB1*04:26	25-39	QVIMLLYPDHPDLLS	1.33
HLA-HLA-DRB1*07:01	108-122	TMTVVVVSVASFILL	0.09
HLA-HLA-DRB1*07:03	107-121	PTMTVVVVSVASFIL	0.04
HLA-HLA-DRB1*08:01	97-111	EILYYYELYPTMTV	0.79
HLA-HLA-DRB1*08:02	105-119	LYPTMTVVVVSVASF	1.30
HLA-HLA-DRB1*08:04	105-119	LYPTMTVVVVSVASF	0.74
HLA-HLA-DRB1*08:06	105-119	LYPTMTVVVVSVASF	0.69
HLA-HLA-DRB1*08:13	97-111	EILYYYELYPTMTV	0.30
HLA-HLA-DRB1*08:17	97-111	EILYYYELYPTMTV	0.36
HLA-HLA-DRB1*09:01	100-114	LYYYELYPTMTVVVV	0.20
HLA-HLA-DRB1*11:01	73-87	WGNNEPYKYWPQLST	2.21
HLA-HLA-DRB1*11:02	47-61	PNYQEEWVTHKKEIR	2.80
HLA-HLA-DRB1*11:04	105-119	LYPTMTVVVVSVASF	0.84
HLA-HLA-DRB1*11:06	105-119	LYPTMTVVVVSVASF	0.84
HLA-HLA-DRB1*11:07	114-128	VSVASFILLSMVGVA	0.34
HLA-HLA-DRB1*11:14	47-61	PNYQEEWVTHKKEIR	0.52
HLA-HLA-DRB1*11:20	47-61	PNYQEEWVTHKKEIR	0.14
HLA-HLA-DRB1*11:21	47-61	PNYQEEWVTHKKEIR	2.80
HLA-HLA-DRB1*11:28	105-119	LYPTMTVVVVSVASF	0.37
HLA-HLA-DRB1*12:01	100-114	LYYYELYPTMTVVVV	10.03
HLA-HLA-DRB1*13:01	105-119	LYPTMTVVVVSVASF	0.71
HLA-HLA-DRB1*13:02	108-122	TMTVVVVSVASFILL	1.57
HLA-HLA-DRB1*13:04	105-119	LYPTMTVVVVSVASF	2.60
HLA-HLA-DRB1*13:05	105-119	LYPTMTVVVVSVASF	0.37
HLA-HLA-DRB1*13:07	105-119	LYPTMTVVVVSVASF	0.52
HLA-HLA-DRB1*13:11	105-119	LYPTMTVVVVSVASF	0.84
HLA-HLA-DRB1*13:21	105-119	LYPTMTVVVVSVASF	1.37
HLA-HLA-DRB1*13:22	47-61	PNYQEEWVTHKKEIR	2.80
HLA-HLA-DRB1*13:23	47-61	PNYQEEWVTHKKEIR	0.52
HLA-HLA-DRB1*13:27	105-119	LYPTMTVVVVSVASF	0.71
HLA-HLA-DRB1*13:28	105-119	LYPTMTVVVVSVASF	0.71
HLA-HLA-DRB1*15:01	110-124	TVVVVSVASFILLSM	0.65
HLA-HLA-DRB1*15:02	97-111	EILYYYELYPTMTV	0.11
HLA-HLA-DRB1*15:06	107-121	PTMTVVVVSVASFIL	0.37
HLA-HLA-DRB3*01:01	24-38	NQVIMLLYPDHPDLL	0.01
HLA-HLA-DRB4*01:01	23-37	KNQVIMLLYPDHPDLL	3.33
HLA-HLA-DRB5*01:01	110-124	TVVVVSVASFILLSM	1.28
HLA-HLA-DRB5*01:05	107-121	PTMTVVVVSVASFIL	0.26

Epitope Modeling of MHC epitopes: The modeled three-dimensional structures of CHIKV E2 MHC I & MHC II epitopes were modeled using Pepstr server. As a sample, modeled

structure of CHIKV E2 MHC I HLA-A*02:06 epitope using Pepstr is shown in Figure 3.

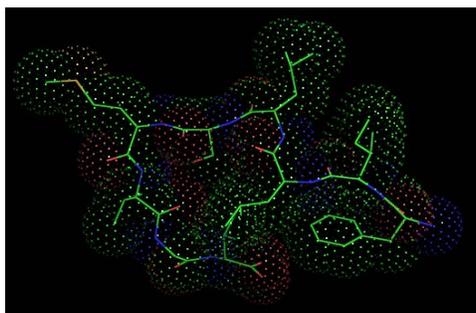


Figure 3: The modeled three-dimensional structures of CHIKV E2 MHC I HLA-A*02:06 epitope

Docking

We have selected the highest ranked candidate from FireDock, which has the lowest global energy, for each of the docking analysis. The details of docking analysis performed with MHC I & II epitopes were displayed in Table 4 and 5

respectively. Here, the global energy indicates binding affinity, lower the global energy higher will be its binding affinity. The epitopic peptides with lower global energies with human receptors were identified as the most effective epitopes.

Table 4: The details of docking studies of CHIKV MHC I epitopes of E2 protein (Q0JRL8)

Epitope	Allele	Receptor	Global energy	Attractive VdW	Repulsive VdW	ACE	HB
VTWGNNEPY	HLA-A*01:01	2X40.pdb	-21.13	-26.13	27.99	-0.94	- 3.13
FILLSMVGCV	HLA-A*02:01	2X40.pdb	-13.79	-18.36	6.93	-2.68	- 0.99
FILLSMVGCV	HLA-A*02:06	2X40.pdb	-13.79	-18.36	6.93	-2.68	- 0.99
KARNPTVTY	HLA-A*03:01	2X40.pdb	-26.10	-16.31	4.82	-5.09	0.00
SVASFILLS	HLA-A*11:01	2X40.pdb	-62.45	-30.31	21.00	- 15.55	- 1.99
YYYELYPTM	HLA-A*23:01	2X40.pdb	-45.89	-26.51	5.50	-7.96	- 0.76
YYYELYPTM	HLA-A*24:02	2X40.pdb	-45.89	-26.51	5.50	-7.96	- 0.76
EIILYYEYL	HLA-A*25:01	2X40.pdb	-30.75	-15.97	8.80	-9.86	0.00
HPHEIILYY	HLA-A*26:01	2X40.pdb	-51.94	-26.43	6.63	-9.21	- 1.35
IILYYEYLY	HLA-A*29:02	2X40.pdb	-52.00	-23.60	23.27	- 13.35	- 2.25
KARNPTVTY	HLA-A*30:01	2X40.pdb	-26.10	-16.31	4.82	-5.09	0.00
KNQVIMLLY	HLA-A*30:02	2X40.pdb	-3.99	-27.19	51.27	-9.08	- 1.69
VTCRVPKAR	HLA-A*31:01	2X40.pdb	-17.00	-19.25	16.21	-2.13	- 1.00
VTYGKNQVI	HLA-A*32:01	2X40.pdb	-19.89	-20.13	7.28	-1.78	- 0.34
WVTHKKEIR	HLA-A*68:01	2X40.pdb	-44.36	-19.21	2.93	-6.26	0.00
MTVVVVVSA	HLA-A*68:02	2X40.pdb	-33.29	-25.37	14.58	-8.38	- 2.40
YPTMTVVVVV	HLA-B*07:02	2X40.pdb	-62.44	-29.51	14.22	- 13.47	- 2.03

VPKARNPTV	HLA-B*08:01	2X40.pdb	-25.54	-25.44	14.94	-1.74	-0.32
VASFILLSM	HLA-B*14:02	2X40.pdb	-33.11	-17.35	8.86	-6.24	0.00

Table 5: The details of docking studies of CHIKV MHC II epitopes of E2 protein (Q0JRL8)

Peptide	Allele	Receptor	Global energy	Attractive VdW	Repulsive VdW	ACE	HB
LYYYELYPTMTVVVV	HLA-DRB1*01:01	1DLH.pdb	-84.98	-36.04	31.40	-16.14	-2.53
PTMTVVVVSVASFIL	HLA-DRB1*01:02	1DLH.pdb	-85.20	-26.31	17.95	-19.39	-0.86
YPTMTVVVVSVASFI	HLA-DRB1*03:01	1DLH.pdb	-70.05	-24.65	14.82	-15.32	-0.38
VSVASFILLSMVGVA	HLA-HLA-DRB1*03:05	1DLH.pdb	-60.96	-26.34	8.82	-7.85	-1.42
NQVIMLLYDPHPTLL	HLA-HLA-DRB1*03:06	1DLH.pdb	-51.03	-33.77	38.54	-10.26	-0.40
NQVIMLLYDPHPTLL	HLA-HLA-DRB1*03:07	1DLH.pdb	-51.03	-33.77	38.54	-10.26	-0.40
NQVIMLLYDPHPTLL	HLA-HLA-DRB1*03:08	1DLH.pdb	-51.03	-33.77	38.54	-10.26	-0.40
PNYQEEWVTHKKEIR	HLA-HLA-DRB1*03:09	1DLH.pdb	-38.45	-37.44	15.42	9.20	-0.32
IILYYYELYPTMTVV	HLA-HLA-DRB1*04:01	1DLH.pdb	-65.79	-42.89	61.36	-20.32	0.00
KARNPTVTYGKNQVI	HLA-HLA-DRB1*04:02	1DLH.pdb	-32.53	-38.37	64.53	-5.14	-3.19
NQVIMLLYDPHPTLL	HLA-HLA-DRB1*04:04	1DLH.pdb	-51.03	-33.77	38.54	-10.26	-0.40
IILYYYELYPTMTVV	HLA-HLA-DRB1*04:05	1DLH.pdb	-65.79	-42.89	61.36	-20.32	0.00
EIILYYYELYPTMTV	HLA-HLA-DRB1*04:08	1DLH.pdb	-48.93	-30.22	31.99	-14.54	-1.20
YDPHPTLLSYRNMGE	HLA-HLA-DRB1*04:10	1DLH.pdb	-18.94	-31.49	37.50	-9.47	0.00
VTHKKEIRLTVPTTEG	HLA-HLA-DRB1*04:21	1DLH.pdb	-28.02	-33.56	27.57	3.88	-3.35
LYPTMTVVVVSVASF	HLA-HLA-DRB1*04:23	1DLH.pdb	-65.37	-45.18	66.30	-17.71	-2.77
QVIMLLYDPHPTLLS	HLA-HLA-DRB1*04:26	1DLH.pdb	-51.13	-32.35	9.55	0.07	-0.58
TMTVVVVSVASFILL	HLA-HLA-DRB1*07:01	1DLH.pdb	-70.05	-24.65	14.82	-15.32	-0.38
PTMTVVVVSVASFIL	HLA-HLA-DRB1*07:03	1DLH.pdb	-85.20	-26.31	17.95	-19.39	-0.86
EIILYYYELYPTMTV	HLA-HLA-DRB1*08:01	1DLH.pdb	-48.93	-30.22	31.99	-14.54	-1.20
LYPTMTVVVVSVASF	HLA-HLA-DRB1*08:02	1DLH.pdb	-65.37	-45.18	66.30	-17.71	-2.77
LYPTMTVVVVSVASF	HLA-HLA-DRB1*08:04	1DLH.pdb	-65.37	-45.18	66.30	-17.71	-2.77
LYPTMTVVVVSVASF	HLA-HLA-DRB1*08:06	1DLH.pdb	-65.37	-45.18	66.30	-17.71	-2.77
EIILYYYELYPTMTV	HLA-HLA-DRB1*08:13	1DLH.pdb	-48.93	-30.22	31.99	-14.54	-1.20
EIILYYYELYPTMTV	HLA-HLA-DRB1*08:17	1DLH.pdb	-48.93	-30.22	31.99	-14.54	-1.20
LYYYELYPTMTVVVV	HLA-HLA-DRB1*09:01	1DLH.pdb	-84.98	-36.04	31.40	-16.14	-2.53
WGNNEPYKYWPQLST	HLA-HLA-DRB1*11:01	1DLH.pdb	-48.71	-36.22	13.91	-1.67	-1.91
PNYQEEWVTHKKEIR	HLA-HLA-DRB1*11:02	1DLH.pdb	-38.45	-37.44	15.42	9.20	-0.32
LYPTMTVVVVSVASF	HLA-HLA-DRB1*11:04	1DLH.pdb	-65.37	-45.18	66.30	-17.71	-2.77
LYPTMTVVVVSVASF	HLA-HLA-DRB1*11:06	1DLH.pdb	-65.37	-45.18	66.30	-17.71	-2.77
VSVASFILLSMVGVA	HLA-HLA-DRB1*11:07	1DLH.pdb	-60.96	-26.34	8.82	-7.85	-1.42
PNYQEEWVTHKKEIR	HLA-HLA-DRB1*11:14	1DLH.pdb	-38.45	-37.44	15.42	9.20	-0.32
PNYQEEWVTHKKEIR	HLA-HLA-DRB1*11:20	1DLH.pdb	-38.45	-37.44	15.42	9.20	-0.32
PNYQEEWVTHKKEIR	HLA-HLA-DRB1*11:21	1DLH.pdb	-38.45	-37.44	15.42	9.20	-0.32
LYPTMTVVVVSVASF	HLA-HLA-DRB1*11:28	1DLH.pdb	-65.37	-45.18	66.30	-17.71	-2.77
LYYYELYPTMTVVVV	HLA-HLA-DRB1*12:01	1DLH.pdb	-84.98	-36.04	31.40	-16.14	-2.53
LYPTMTVVVVSVASF	HLA-HLA-DRB1*13:01	1DLH.pdb	-65.37	-45.18	66.30	-17.71	-2.77
TMTVVVVSVASFILL	HLA-HLA-DRB1*13:02	1DLH.pdb	-70.05	-24.65	14.82	-15.32	-0.38
LYPTMTVVVVSVASF	HLA-HLA-DRB1*13:04	1DLH.pdb	-65.37	-45.18	66.30	-17.71	-2.77
LYPTMTVVVVSVASF	HLA-HLA-DRB1*13:05	1DLH.pdb	-65.37	-45.18	66.30	-17.71	-2.77
LYPTMTVVVVSVASF	HLA-HLA-DRB1*13:07	1DLH.pdb	-65.37	-45.18	66.30	-17.71	-2.77
LYPTMTVVVVSVASF	HLA-HLA-DRB1*13:11	1DLH.pdb	-65.37	-45.18	66.30	-17.71	-2.77
LYPTMTVVVVSVASF	HLA-HLA-DRB1*13:21	1DLH.pdb	-65.37	-45.18	66.30	-17.71	-2.77
PNYQEEWVTHKKEIR	HLA-HLA-DRB1*13:22	1DLH.pdb	-38.45	-37.44	15.42	9.20	-0.32
PNYQEEWVTHKKEIR	HLA-HLA-DRB1*13:23	1DLH.pdb	-38.45	-37.44	15.42	9.20	-0.32
LYPTMTVVVVSVASF	HLA-HLA-DRB1*13:27	1DLH.pdb	-65.37	-45.18	66.30	-17.71	-2.77
LYPTMTVVVVSVASF	HLA-HLA-DRB1*13:28	1DLH.pdb	-65.37	-45.18	66.30	-17.71	-2.77
TVVVSVASFILLSM	HLA-HLA-DRB1*15:01	1DLH.pdb	79.90	-41.02	53.09	-16.97	-4.04
EIILYYYELYPTMTV	HLA-HLA-DRB1*15:02	1DLH.pdb	-48.93	-30.22	31.99	-14.54	-1.20

PTMTVVVVSVASFIL	HLA-HLA-DRB1*15:06	1DLH.pdb	-85.20	-26.31	17.95	-19.39	-0.86
NQVIMLLYPDHTLL	HLA-HLA-DRB3*01:01	1DLH.pdb	-51.03	-33.77	38.54	-10.26	-0.40
KNQVIMLLYPDHTLL	HLA-HLA-DRB4*01:01	1DLH.pdb	-52.05	-33.74	5.64	-6.06	-0.61
TVVVVSVASFILLSM	HLA-HLA-DRB5*01:01	1DLH.pdb	-79.90	-41.02	53.09	-16.97	-4.04
PTMTVVVVSVASFIL	HLA-HLA-DRB5*01:05	1DLH.pdb	-85.20	-26.31	17.95	-19.39	-0.86

Docking studies of CHIKV MHC I epitopes with human receptor 2X40.pdb showed that the epitopes ‘SVASFILLS’ and ‘YPTMTVVVV’ are the most effective epitopes among the predicted MHC I epitopes as they are having highest binding affinities towards the human receptor 2X40.pdb. Similarly, we identified the the most effective of MHC II epitopes through the docking studies with MHC II receptors and human receptor

1DLH.pdb. Here the most effective epitopes identified were ‘PTMTVVVVSVASFIL’ and ‘LYYYELYPTMTVVVV’. The docked complex of most effective CHIKV E2 MHC I epitopes and human receptor 2X40 were displayed in Figure 4a &4b. The docked structures of MHC II epitopes with the human receptor 1DLH are shown in Figure 5a& 5b.

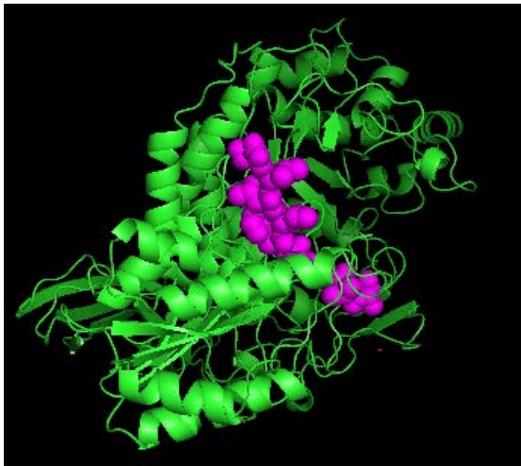


Figure 4a



Figure 4b

Figure 4: The docked complex of most effective CHIKV E2 MHC I epitopes: 4a) ‘SVASFILLS’ and human receptor 2X40, 4b) ‘YPTMTVVVV’ and human receptor 2X40

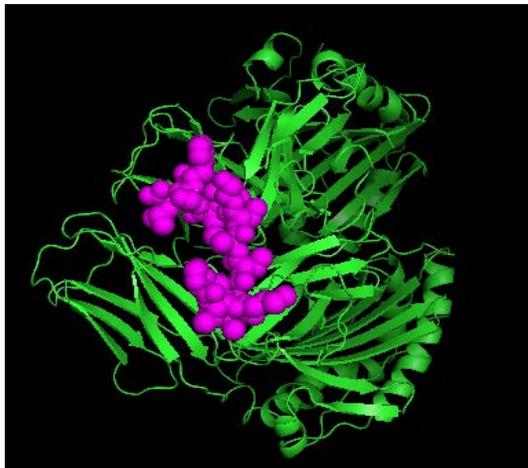


Figure 5a



Figure 5b

Figure 5: The docked complex of most effective CHIKV E2 MHC II epitopes: 5a) ‘PTMTVVVVSVASFIL’ and human receptor 2X40, 5b) ‘LYYYELYPTMTVVVV’ and human receptor 1DLH

IV. CONCLUSION

In this study, E2 envelope glycoprotein protein (Q0JRL8) of Chikungunya virus was analyzed for its antigenic factors. B cell and T cell Epitopes of the protein were identified and mapped using various soft computing tools. Docking studies were also conducted to analyze the binding affinities of the predicted epitopes and the most effective epitopes were identified. This work provides a better understanding of the epitopes in CHIKV E2 protein. The peptides identified as the most effective epitopes from this study can be considered for developing epitope based vaccines against Chikungunya disease.

V. FUTURE DIRECTIONS

Till now, there is no licensed vaccines or antiviral available for treating Chikungunya infection. The only available treatment is symptomatic, with administration of non-steroidal anti-inflammatory drugs. Recently many studies have been carried out to develop specific drugs for the infection. It was observed from a recent study conducted at NIAID that a virus-like particle (VLP) vaccine elicited immune responses in all twenty-five volunteers who participated in an early-stage clinical trial [29]. However, these attempts are its preliminary stages. The quest for the effective medicines demand further researches in this area. This study identifies some antigenic epitopes of E2 glyco protein of CHIKV. In vivo studies are required to study the elicited immune responses of these identified antigenic peptides and also to test the efficacy of these antigenic peptides as vaccine candidates. Moreover, the in vivo pathogenesis of Chikungunya virus is only poorly understood, so future research in this area is sorely needed to elucidate the *in vivo* pathogenicity of Chikungunya virus.

ACKNOWLEDGMENT

The corresponding author acknowledges the funding from Kerala State IT Mission, Govt. of Kerala for the SPEED- IT (Special Postgraduate Education Expansion Drive in IT) Fellowship.

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Production of simulated caviar using Bigeye Tuna (*Thunnus obesus*) roe: Pilot scale study to promote fish roe based value addition sector in Sri Lanka

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Abstract - Simulated caviar also named as imitation caviar, is defined as salted roe that comes from a fish except sturgeon fish. Fish roe is removed as a by-product from processing plants and doesn't have a high demand in Sri Lanka at present. It is essential to add value to fish roe which is of low demand at present and enhance the income of fish processing industries and suppliers. Since Bigeye tuna (*Thunnus obesus*) is one of the most commercially important tuna fishery resources in Sri Lanka, Bigeye tuna was used as the resource species for the present study. Fish roe samples were subjected to "dry salting" method for different treatments with salt (g): fish roe (g) ratios as Treatment 01 - 0.25: 1.00, Treatment 02 - 0.50: 1.00 and Treatment 03 - 0.75: 1.00. Most appropriate treatment was assessed using sensory evaluation, proximate analysis, pH test and microbiological analysis. Highest average ash content (6.95 % \pm 0.06) and maximum lipid content (11.89 % \pm 0.88) were recorded for Treatment 03, while greatest protein value (25.65 % \pm 0.11) was indicated by Treatment 01. Initial average pH values of the 03 treatments varied between 6.00 - 6.39 with significant difference for all 03 treatments. Treatment 03 (0.75 salt: 1.00 fish roe) has recorded lowest Total Plate Count (TPC) value for a period of 02 months with significant difference for all treatments ($P < 0.05$). Results of the sensory evaluation showed that best consumer preference for all parameters (color, texture, aroma, overall acceptability, mouth feel, and saltiness) were for treatment 01. Present study implicated that "dry salting" method with 0.25 salt: 1.00 fish roe by weight (Treatment 01), with proper nutritional quality (highest protein content: 25.65% / lowest lipid level: 11.50%) is most suitable processing method for simulated / imitation caviar production using roe samples of Bigeye tuna. Since Treatment 01 requires lowest salt level to process product, production cost is also minimum compare to other two treatments. Popularization of this edible source is useful to prevent mal-nutrition as nutritional rich source in rural and urban community of Sri Lanka.

Index Terms- Bigeye Tuna (*Thunnus obesus*), Imitation / Simulated Caviar, Dry Salting, Roe, Sri Lanka

I. INTRODUCTION

The roe is considered as an excellent raw material for the production of diverse delicacies that can be sold at good prices in many markets (Johansson, 2006). Caviar is one such delicious product and has a high demand among European countries. The term "caviar" refers to some of the processed fish

roes, and is an expensive product high in nutrients (protein, lipid and ash), particularly B vitamin (Altug and Bayrak, 2003). Caviar is defined as a product made from fish eggs of the Acipenseridae family (*Acipenser sp.*) by treating them with food grade salt (Johannesson, 2006).

Most caviar is produced in Russia and Iran by sturgeon fish harvested from the Caspian Sea, Black Sea, and Sea of Azov. Caviar can be classified as: "Beluga" - Obtained from *Huso huso* and caviar with coarse grained, black or dark gray, "Osetra" - Prepared by *Acipenser gueldenstaedtii colchicus* (Russian Sturgeon) and fine grained gray green or brown color caviar that is lighter than beluga and Sevruga - Product is processed by *Acipenser stellatus*. The sevruga is smallest grains of greenish black (Inanli et al., 2010).

There are more than 20 species of sturgeon harvested for caviar (Al-Holy et al., 2005). Caviar is marketed through buyers who sell to exclusive restaurants, luxurious shops and mail-order retail outlets. The major problem for producers is to protect the raw material (roe samples) from spoilage by following clean working procedures. Freezing, various preservatives and packaging of caviar in anaerobic atmosphere are all methods that can help to limit spoilage of caviar. In addition to the salting process, freezing, smoking, canning, and sausage production technologies are also used in caviar production (Inanli et al., 2010).

According to the literature records, there is a severe depletion of sturgeon stocks due to pollution, overfishing and poaching. Especially over-exploitation of natural and enhanced sturgeon stocks for caviar production has led to drastic decreases in stocks (De Meulenaer and Raymakers, 1996). Therefore, it is advisable to diversify the fish used for producing this healthy, edible and tasty fish roe product using readily available marine and freshwater fish species other than sturgeon fish species.

Simulated caviar also can be named as imitation caviar and it is defined by United States Custom Service as roe that comes from a fish other than the sturgeon. Also it can be classified as a caviar substitute. Simulated caviar is not true caviar. Products from other fish species have to be labeled as "imitation / simulated caviar" or include the name of the fish before the word caviar in most markets, such as "lumpfish caviar" and "capelin caviar" (Sternin and Dore, 1993). There is a

possibility to produce imitation caviar using roe of different fish species that are caught in the spawning season. For example, the eggs of lumpfish, whitefish and salmon may be prepared or preserved as caviar substitutes (Johansson, 2006). Products consumed as caviar but prepared from the eggs of fish other than sturgeon (e.g. salmon, carp, pike, tuna, mullet, cod, and lumpfish) are seasoned and colored to enhance consumer acceptance (Johansson, 2006). The imitation caviar prepared from salmon roe is described as ‘‘keta caviar’’. The product obtained from the roe of trout, carp, and grey mullet fish is known as ‘‘red caviar.’’ Mulletts have gained importance for caviar production in recent years, especially with increased demand from France, Italy and the United States (Çelik *et al.*, 2012). Smoked grey mullet caviar is used as a good appetizer.

Fish roe based aquatic products oriented for export or local market are rare in Sri Lanka. Nowadays, fish roe is removed as a by-product from fish processing plants and sometimes sold in the local market and doesn't have a high demand at present. Development of roe based new products targeting export or local market is important to add value to fish roe which is of low demand at present, to make them as a high demand product. Moreover, there is a potential in increasing the income of producers and farmers by introducing this kind of roe based new product in industrial sector. Popularization of this edible source is also useful to prevent mal-nutrition as nutritional rich source in rural and urban community of Sri Lanka.

Simulated Caviar (processed fish eggs) can be produced using readily available marine and freshwater fish species (Tilapia, Yellow fin tuna, Bigeye tuna, Catla, Common carp, Trevally) which are abundant in Sri Lanka. As literature reveals, several kind of research studies have been conducted related to the production of caviar and imitation caviar in countries such as Turkey, Iran, Russia and Germany, but there is no such research performed related to process of fish eggs in Sri Lanka. This is the first pilot scale study in focusing fish roe based product development using readily available fish species in Sri Lanka.

As resource species (marine) Bigeye tuna (*Thunnus obesus*) was selected for current study. It is a larger pelagic fish species in Family Scombridae. Bigeye tuna is morphologically distinguishable. Its body outline is rounded, forming a smooth dorsal-ventral arc between snout & caudal peduncle and eye diameter & head length is greater compared to other tuna species. Also pectoral fin of Bigeye tuna is thin, pointed and flexible and reaching beyond base of second dorsal fin.

There has a potential to use Bigeye tuna for simulated caviar production in Sri Lanka. Sri Lanka is one of the oldest and most important tuna producing islands in the Indian Ocean (Dissanayaka and Hewapathirana, 2011). The catches of tuna fishery resources of Sri Lanka are mainly, Yellowfin tuna (*Thunnus albacares*), Bigeye tuna (*Thunnus obesus*), Skipjack tuna (*Katsuwonus pelamis*), Kawakawa (*Enthynnus affinis*), Frigate tuna (*Auxis thazard*) and Bullet tuna (*Auxis rochei*) (Dissanayaka and Hewapathirana, 2011). Within them Bigeye tuna plays a major role as one of the most commercially important tuna fishery resource in Sri Lanka. All tuna species are

processed before exporting, meanwhile belly flaps, guts and gonads with eggs are being marketed locally or discarded. Hence current study attempts to produce a nutritious product by adding value to Bigeye tuna gonads with egg (fish roe) which has a low value at present to high priced product. Since the raw material (fish roe) used for simulated caviar production is low demand or discarded fish roe of exploited fish, there will be no threat of overexploitation due to simulated caviar production. Moreover, fish roe is discarded to the environment in some cases. So, imitation caviar production is important alternative to prevent environmental contamination. Our main aim is to develop suitable methodology for simulated caviar (processed fish eggs) production using Bigeye tuna fish roe as an income generating nutritional rich value added product.

II. METHODOLOGY

Research was conducted in the Animal Science Laboratory of Uva Wellassa University, Sri Lanka.

Sample collection

According to the literature review, commercial value and accessibility, Bigeye tuna (*Thunnus obesus*) was selected as the marine finfish species. Egg sac samples of Bigeye tuna was purchased from fishermen in Negombo, Hambantota, Tangalle and Dondra fishery harbors and one processing plant: Ceylon fresh seafood (pvt) Ltd in Ja-Ela which is located between Colombo and Bandaranayke International Air port, as representing western and southern province. The samples were transported to the laboratory using cooler boxes to prevent spoilage of samples by decreasing the temperature.

Sample Pre-preparation

First, egg sacs were rinsed using clean water to remove adherent particles and impurities, prior to preparation of samples. Manual screening was followed to prepare the samples. The eggs were removed from the sac manually and separated from the connective tissue that surrounds them. There after the blood, connective tissues and other wastes on the roe were removed within 15 minutes while keeping eggs in 5% brine solution.

Preliminary trial

Caviar processing was carried out by using ‘dry- salting’ method. Then the surface moisture of the roe was removed with the help of a clean cloth. Iodized powder form salt packets were used in the study. Fish roe samples were put in plastic containers with one layer of salt and one layer of roe alternatively in dry - salting method. The best ratios of salt: fish roe were determined using different ratios in the preliminary study (Table 01). Similar weight of fish roe samples (250 g) were used for each trial and they were put in plastic trays with alternative salt layers keeping top and bottom layers as salt layers.

According to the weight (between 200 g-300 g) of the roe, the samples were let in salt, for 2.5 hours, while fish roe samples with 300g or over were required to keep for nearly 6 hours (Celik *et al.*, 2012). During this period, they were pressed once using fingers and palm for five minutes for effective absorption of salt. Then they were dipped in tap water bath and covered with a wet, white cotton cloth for 4.5 hours to remove excess salt and moisture. After that, samples were left standing in a dry cool

place at approximately 20 °C, to be dried. This procedure allows fish roe to be dried without being directly exposed to sunlight by preventing the oxidation and to be preserved for a longer time. Glass jars were filled manually with approximately 75 g of simulated caviar. Glass jars of caviar samples were kept in a hot water bath at 68 °C for 45 minutes for pasteurizing the product (US Customs and Border Protection, 2008). Processed samples were stored in a refrigerator (at 4±2 °C).

Table 1: Salt: Fish roe ratios used in the preliminary study

Trial No.	Trial 01	Trial 02	Trial 03	Trial 04	Trial 05
Salt proportion by weight	0.25	0.5	0.75	1.0	1.25
Big eye tuna fish roe proportion by weight	1.0	1.0	1.0	1.0	1.0

Sensory (organoleptic) evaluation of Preliminary study

The products were characterized by 30 untrained panelists in terms of color, texture, aroma, salty taste, mouth feel and overall acceptability on a hedonic scale of 1 to 5 points:

- 1 extremely dislikes
- 2 slightly dislike
- 3 neither like nor dislike
- 4 slightly like
- 5 extremely like

03 best ratios were selected for further experiments and analysis based on results of sensory evaluation.

Final experiment

The selected ratios of salt and fish roe (Table 02) were processed again by using same procedure to select most suitable ratio of caviar. 03 replicates were used in each experiment.

Table 2: Salt: Fish roe ratio used in the secondary trial

Treatment No.	Treatment 1	Treatment 2	Treatment 3
Salt proportion by weight	0.25	0.5	0.75
Big eye tuna Fish roe proportion by weight	1.0	1.0	1.0

Analysis of final products for chemical, biological and organoleptic properties

Final products were analyzed for sensory, chemical and microbiological characters to select the best treatment. Sensory evaluation was repeated as previously using 05 Hedonic scales for 30 untrained panelists.

Total Plate Count (TPC) was determined using plate cultures on nutrient agar following incubation at 37 °C for a period of 48 hrs. General Coliform and *E. coli* presence were

examined at incubation temperature of 37 °C. The caviar samples were analyzed once in 14 days for 02 months of storage for their microbiological aspects. Initial pH values of the samples were determined with a pH meter.

Dry matter was determined by drying the samples at 105 °C to a constant weight (AOAC, 1990). The drying cabinet was used to determine the moisture content. Crude protein content was calculated by converting the nitrogen content determined by the Kjeldahl method (6.25xN) (AOAC, 1990). Lipid was determined by using the method described by Bligh and Dyer (1959). Ash was determined by drying sample at 600 °C for 04 hours.

Statistical Analysis

The MINITAB (version 14.0) program was used to test the differences between mean values of the different analyzed parameters. Differences between means of proximate composition, pH values and microbiological factors were analyzed by one-way analysis of variance (ANOVA), followed by Post Hoc test (P < 0.05). Friedman non-parametric test was used to analyze the results of sensory evaluation (P < 0.05).

III. RESULTS

According to the results of the proximate composition (Table 03) of the final products, lowest moisture content was recorded for the Treatment 03, while highest moisture content was recorded in the treatment 01. Maximum average ash and lipid content were detected for Treatment 03, while minimum lipid and ash level was for Treatment 01. Greatest protein value was indicated by Treatment 01.

There was no significantly difference between lipid and protein content of Treatment 02 and 03, while ash and moisture percentage was significantly different for all three treatments.

Table 3: Results of Proximate composition and pH values for treatments

Parameter	Treatment 1 1.0 (Fish roe): 0.25 (Salt)	Treatment 2 1.0(Fish roe) : 0.5(Salt)	Treatment 3 1.0 (Fish roe) : 0.75 (Salt)
Moisture %	52.80 ± 0.02 ^x	51.00 ± 0.13 ^y	50.09 ± 0.05 ^z
Protein %	25.65 ± 0.11 ^d	24.19 ± 0.05 ^c	24.11 ± 0.33 ^c
Lipid %	11.50 ± 0.08 ^a	11.85±0.10 ^b	11.89 ± 0.88 ^b
Ash %	5.57 ± 0.03 ^e	6.48±0.74 ^f	6.95 ± 0.06 ^g
pH	6.39 ± 0.01 ^p	6.00 ± 0.12 ^q	6.13 ± 0.21 ^r

Different superscript letters indicated that results were significantly different at 0.05 level (P < 0.05).

Highest pH value was recorded by Treatment 01. Average pH values of the 03 treatments were varied between 6.00 - 6.39 (Table 03).

Results of the sensory evaluation (Figure 1) showed greatest estimated median values and sum of ranks for all the six parameters for Treatment 01. Treatment 03 was indicated lowest estimated median and sum of ranks for all parameters. Therefore treatment 01 is considered as the best product according to consumer preference. All the parameters were significantly different at 0.05 level.

Total coliform and *E. coli* count were negative in all 03 products. Our research findings indicated that all final products are pathogenic free products up to two month period. Average values of the Total Plate Count (TPC) are given in Figure 2 for approximately 02 months of storage time period. Accordingly Treatment 03 records lowest TPC value for a period of 02 months.

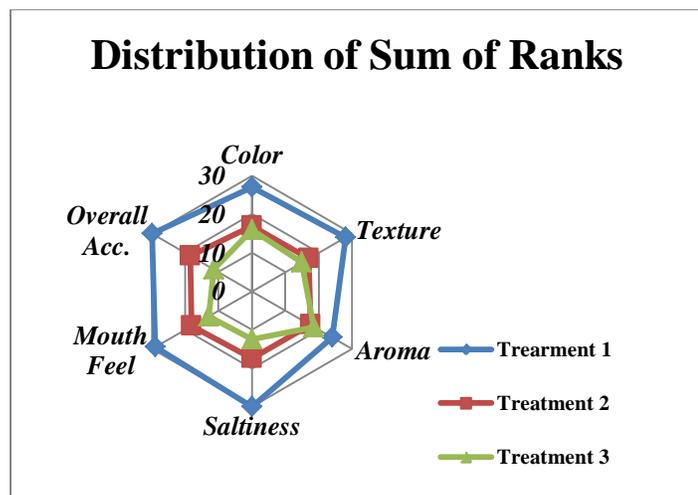


Figure 1: Results of the sensory assessment for organoleptic parameters

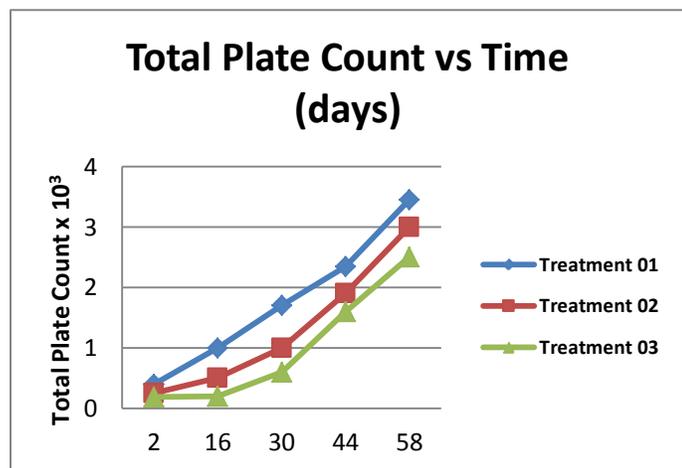


Figure 2: Results of the Total Plate Count (TPC) for final products in 58 days

IV. DISCUSSIONS

Salting is an ancient and popular procedure for preserving fish and it preserves the product by preventing the fish roe spoilage

resulting from three basic mechanisms; enzymatic autolysis, oxidation and microbial growth. Sodium chloride has a capacity to inactivate autolytic enzymes in marine species (Ghaly et al., 2010). Klomklao et al. (2004) has conducted a research on proteolytic activities of splenic extract from three tuna species; skipjack tuna (*Katsuwonus pelamis*), yellowfin tuna (*Thunnus albacares*) and tongol tuna (*Thunnus tonggol*) and revealed that autolytic activities continuously decreased as NaCl concentration increased. Since Bigeye Tuna and previously studied Tuna species belongs to Family Scombridae, previous research findings are applicable to Bigeye Tuna also. Recent research findings suggests (Reddi et al., 1972, Siringan et al., 2006, Yongsawatdigul et al., 2000) that the ability of NaCl as inactivator of autolytic enzymes including proteolytic enzymes in both freshwater and marine fish. So, NaCl can be used as a preservative agent during flesh and by-product processing.

When salt content of the product is increased, water is drawn rapidly out of the product. Therefore, moisture content of the treatment 03 has decreased rapidly compared to the other treatments. The amount of salt applied and the duration of the processing affect the moisture content of the end product (Inanli et al., 2010).

After the salting, the mineral content of caviar increased above the levels in raw roe. Greatest average ash level was recorded for Treatment 03 (Table 03), since ash content is increased with increasing salt level. Inanli et al. (2010) also has revealed same finding. Their study has detected that average ash content as 2.21% in raw roe of Rainbow Trout, and at the end of salting, it was 6.38% in the 4% of salt group and 8.84% in the 8% salt group.

Maximum lipid content was recorded for Treatment 03, while minimum lipid content was Treatment 01. Himelbloom and Carpo (1998) have identified 11.00 % of average lipid content in the salmon caviar. The lipid levels found in the current study for three treatments were slightly similar to his findings. Maximum protein value (Table 03) was recorded for Treatment 01. Wirth, et al. (2000) found that the caviar obtained from sturgeon contained protein between 26.2-31.1%. Protein values of our study were slightly inferior to the protein content recorded for sturgeon caviar. This difference between our results and previous findings could be due to the fish species and processing method used in the present study.

Range of initial average pH values of the 03 treatments was between 6.00 - 6.39. According to research findings of Çelik et al. (2012) pH values of both fresh and dried samples of Flathead Grey Mullet (*Mugil cephalus*, Linnaeus 1758) ranged between 5.79 and 5.96 and did not change significantly with time. Bledsoe, et al. (2003) examined pH values for red caviar and black caviar as 5.80 and 5.45 respectively. There is a difference between pH values of processed products in the current study and previous findings. Inanli et al. (2010) has recorded that the chemical composition of the resulting caviar depends on fish species and processing techniques. Also the difference in chemical composition of various fish roe is mainly attributed to biological factors, including species, maturity

stages, diet, season, harvest area and processing condition (Mahmoud *et al.*, 2008).

According to results of the sensory evaluation, Treatment 01 is considered as the best product according to consumer preferences. The salt used in preparing caviar is a factor affecting flavor of the product. On the other hand, excessive salt disrupts the taste of the product. Therefore, the salt level should be determined with precision (Inanli, *et al.*, 2010).

Coliform bacteria indicate the likely presence of pathogenic (disease-causing) bacteria or viruses, including *E. coli*. They are present in the intestinal tracts of all warm-blooded animals, including humans. Our research findings revealed that all final products are not pathogenic up to two month period. Himelbloom and Crapo (1998) also revealed that coliform contamination in caviar was not detected. It means that results of our study are analogous to their findings.

Microbial growth and metabolism is a major cause of fish spoilage which produce amines, biogenic amines such as putrescine, histamine and cadaverine, organic acids, sulphides, alcohols, aldehydes and ketones with unpleasant and unacceptable off-flavors (Dalgaard, *et al.*, 2006, Emborg, *et al.*, 2005, Gram and Dalgaard, 2002). For the growth of every microorganism, optimum moisture content is an essential factor same like pH and temperature. Salt content declines the moisture level of the product and creates a toxic condition for microbial populations. There is an inverse relationship between applied salt level and moisture percentage of the product. So with increasing salt level, moisture content of the product reduces rapidly and inhibits the favorable condition for microorganisms. Therefore Treatment 03 shows lowest TPC value for a period of 02 months. Total Coliform Count has increased with the time period due to the propagation of coliforms in all treatments within given period. In Sri Lanka, quality standards have not been yet recommended for fish roe based processed products. When compared with the Sri Lanka standard specification (2007) for salted, dried fish, all 03 final products of our study were always at accepted standard level (< 100TPC/ g) for the period of study.

Production cost of Treatment 03 is the highest, since this treatment requires highest salt percentage for processing. Also protein level is the lowest, while lipid content is the maximum for Treatment 03. Also consumer preference is least for all sensory qualities for Treatment 03. Although ash level is highest and microbial count is lowest for storage time period, Treatment 03 is not concerned as the best treatment. Treatment 02 requires intermediate salt amount for processing. Therefore production cost of Treatment 02 can be relatively high. As well as nutritional composition and consumer preference for Treatment 02 is not in satisfactory level, compared with Treatment 01. Treatment 02 is also not accepted as best treatment for processing of simulated caviar.

Consumer preference for all the sensory qualities (color, texture, aroma, mouth feel, overall acceptability and saltiness) is the greatest for Treatment 01 out of all treatments. Moreover nutritional composition of Treatment 01 is within acceptable

level (highest protein percentage and lowest lipid content). Also production cost is the least, since Treatment 01 is required minimum salt content for processing. Therefore it can be recommended, Treatment 01 with 0.25 salt: 1.00 fish roe by weight is best treatment for processing of simulated caviar using Bigeye tuna fish roe. Bigeye tuna fish roe can be used in value addition sector of aquatic products by popularization of the simulated caviar.

V. CONCLUSION

Big eye tuna fish roe is suitable for production of simulated caviar using dry salting method (0.25 salt: 1.00 fish roe by weight). This fish roe based product would be novel approach in roe based value addition sector. This product can popularize among coastal, rural and urban communities as a nutritional rich product with low production cost. Further experiments are needed to determine the shelf life of the products and enhance the product quality.

ACKNOWLEDGMENT

The funds for this research was obtained under the research grant **NARP/11/UWU/ASEA/03** of CARP and sponsored by the Ministry of Agriculture, Sri Lanka. Hence the research team would like to convey the gratitude Ministry of Agriculture, Sri Lanka for funding this research and the committee on livestock and fisheries for the encouragements given to us during the period of study.

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Social Inclusion of Visually Impaired Students Studying in a Comprehensive Secondary Mainstream School in the South of England

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Abstract- This study is an attempt to the exploration of the social inclusion of visually impaired (VI) pupils studying in a Comprehensive Secondary School level in the regular school setting in the south of England which involves the individual, cultural and social factors of a particular society. This school has a very well established VI resource centre which opened in 1996. The pupils enrolled in this school have varying degrees of visual impairment. The lack of sight causes a detachment from the physical and to some extent from the social environment. The pupils studying at secondary school level face difficulties in social inclusion as their behaviour changes at this stage and they strive to adjust with the society. Though there are some biological differences between male and female, they may share some common values, feelings and interests. If the VI pupils are socially accepted in the same way as other children, difficulties around school are then less apparent and they can adjust themselves better in the culture of the mainstream school.

Index Terms- Visual Impairment, Social Inclusion, Mainstream School, etc.

I. INTRODUCTION

Nowadays, there are many children with disability studying in the mainstream education among them visually impaired (VI) children are a lot. The study of social inclusion of visually impaired children in the main school is an interesting one. The literature repeatedly indicates that both visually impaired and non-impaired children become benefited being studied in a mainstream school. Visually impaired pupils want to lead a normal life like any other fully sighted children. Studying in a mainstream school gives them the opportunity to develop harmonious relationships with their peers, friends, teachers, Learning Support Assistants (LSA) and with other staff as well. While studying together, sighted pupils learn to help and accept VI pupils normally; on the other hand, visually impaired children get the opportunity to be well adjusted with other pupils which helps better socialization for both the pupils. Moreover, supporting environment of mainstream education helps VI pupils to work more independently as much as their ability allows.

II. HISTORICAL PERSPECTIVES & INCLUSIVE EDUCATION

Inclusive education has become burning issue in social and educational policy in the United Kingdom and the European Union, the United States and in many other countries as well.

Politicians are looking into their commitment to inclusion and social justice. Villa & Thousand (2005, p. 5) asserts: "Inclusive education is about embracing everyone and making a commitment to provide each student in the community, each citizen in a democracy, with the inalienable right to belong. Inclusion assumes that living and learning together benefits everyone e.g., those who are gifted, are non-English proficient, or have a disability". Villa & Thousand (2005, p.181) asserts: "When students with disabilities are provided with supports and services to access the general education curriculum, their peers maintain state benchmark-level performances, and the students with disabilities experience higher academic and social achievement" [1].

It has been recognized over the period that visually impaired children have the same basic physical, intellectual and emotional needs as all normal children [1]. It is obvious that the restrictions imposed by their limited visual acuity cause special needs. The special needs for these children include the adaptation of the school curriculum, instructional methods and the design of educational material. The extent of adaptation to these needs would determine the degree of school success that the child will enjoy in becoming a mature, independent and contributing adult [2].

The World Health Organization (WHO) estimates that approximately 10 per cent of the world's population suffers from some form of disability. <http://www.unicef.org/rosa/InclusiveBan.pdf> [3]. At present, there is little reliable data for this sector in Bangladesh. A comprehensive survey on the prevalence and status of disabled persons in Bangladesh has been undertaken by the Ministry of Social Welfare which is under process to be published.

The persons with Disabilities Act 1995 (Equal opportunities, protection of rights and full participation) came into force in February 1996 in the UK. It is a landmark and a significant step to ensure equal opportunities for people with disabilities and their full participation in national development programs [4].

It is essential to have a glance over the historical developments of education of visually handicapped. Education is one of the essential factors to ensure the quality of life of an individual. Education of blind children along with the sighted children became possible through Louise Braille, a blind teacher who invented a system of embossed dot symbols. The Missouri School for the Blind in St. Louise was the first American school to adopt Braille [5]. Until early 19th century, visually impaired children were being educated in special schools. According to Roberts (1986), cited in Huebner & Ferrell (1989), the children

with visual impairment were among the first children with disabilities to be mainstreamed in the 1940s and 1950s, but attitude toward and strategies for integrating them were inadequate [6].

There is a full inclusion position statement from the leading organizations, such as American Council of the Blind, American Foundation for the Blind, Association for Education and Rehabilitation of the Blind and Visually Impaired, Canadian Council of the Blind, Canadian National Institute for the Blind, National Federation of the Blind, and the National Library Service for the Blind and Physically Handicapped has clearly expressed the approach recommended for providing an appropriate education for the placement of blind children in regular educational facilities. This approach commensurate with the philosophy of the individuals with Disabilities Education Act and asserts that the children with disabilities should be educated with the normal students to the maximum extent [7] [8].

III. DEFINITION OF VISUALLY IMPAIRMENT

“There is no universally accepted definition of blindness and because of this, one cannot satisfactorily compare epidemiological studies of the visually impaired from one country to another” [9]. The visually impaired persons are a highly heterogeneous group whose most common characteristic is some degree of visual loss. Some are totally blind while others are able to distinguish between light and dark or merely can see a couple of feet away. Individuals with tunnel vision have good sight for distance but are handicapped by very narrow visual fields. Others may have a high degree of photophobia; in that case, even with minor visual impairment, they are restricted in certain activities. These persons function differently in their environment. It is, therefore, hard to define who is and who is not handicapped by his / her visual impairment. A subtle and comprehensive survey of the blind conducted by the World Health Organization in 1996 lists 65 different definitions of visually impairment throughout the world [9].

Tobin (1994, p. 1) asserts: “In the United Kingdom, a person is eligible to be registered as blind if he is ‘so blind as to be unable to perform any work for which eyesight is essential’ [10]. The child with a mild and correctable visual impairment can lead almost a normal life using glasses or contact lenses

IV. SOCIALIZATION AND INCLUSION OF VISUALLY IMPAIRED ADOLESCENTS

A child is born with immense potential for a variety of behaviour. While growing up in a human society, a child has to learn the social norms, values, rules and regulations of the people in a particular social environment. An individual cannot be fully human without contact with others in the society. Hollander asserts: “Being led into the ways of a society or group is called socialization. This process occurs primarily through learning during the formative years, but adjustment to new situations is a lifelong process” [11].

Moreover, socialization and adjustment depend upon many factors such as, environment, cultural differences, etc. The culture of a particular society has a great influence of a man’s life

and behaviour. Socialization involves learning the rules, values and attitudes approved by the society. Every society has organized means for formal socialization, such as schooling. Nevertheless, there are many less organized patterns, such as family relationship, contact with other adults, peers, siblings, and mass media and so on.

A blind individual has to contact others for social adjustment. Therefore, relationships play a significant role of a blind individual’s emotional, social and vocational progress that involves society, parents, siblings, teachers, peers, and lovers. These relationships mold self-concept, self-confidence, self-esteem, and self-acceptance formation in blind adolescence appears to be largely related to an adolescent’s ability to adjust to blindness [12].

V. ROLE OF DIFFERENT RELATIONSHIPS

In the case of visually impaired students lack of sight or defective sight is likely to be a source of additional stress and anxiety at this sensitive stage. Parents and child relationship is the most important thing in the development of a blind child’s life. The affectionate acceptance of the child in the family helps him to develop his academic performance and social interaction better. Sommers (1944) states: “Any ensuing educational program is likely to be affected by the attitude of parents towards their visually handicapped child and his handicap” [13]. Then, the child expands his world to include other family members, specially his/her siblings. Moreover, it is important to become a part of the group. His / her visual impairment retards his / her ability to act and looks like their peers. In this situation, parent’s, sibling’s and teacher’s help is necessary to identify the deficiencies of blind pupils in being like his group. They should help them to overcome those deficiencies and to be accepted to their sighted peers [14].

VI. ROLE OF A TEACHER AND EDUCATIONAL DEVELOPMENT

The role of a teacher in a mainstream education is important to a quality educational program for the visually handicapped. A visually impaired pupil has a rightful access to an educational program which fulfills his / her needs and abilities. In a classroom, most of the instruction is given orally which is an advantage for those pupils. Provided with the necessary special materials, the visually impaired student can take his / her place in the classroom beside his normal peers (Lowenfeld, 1974, p. 83-85) [15].

The teacher can help the visually impaired child to fit into the school program through creative modifications and adaptations. The teacher helps others to contact with the child and accept the child’s abilities and limitations and guide the child to meet his / her needs within the school program. According to Kekelis and Sacks (1988): “Experiences in the mainstream were more successful when the classroom teacher and special education resource teacher formed a strong partnership. These experiences were further enhanced when the two teachers considered social-emotional competence to be a major focus of the child’s education” [16].

VII. METHODOLOGY

Case study has been chosen for the study as the research method as it is essentially a research in depth rather than breadth. According to Robson (2002, p. 179 & 181), case study is a well-established research strategy where the focus is on a case. It is interpreted in a wide range to include the study of an individual person, a group, a setting, an organization, etc. in its own right in which context is taken into account [17]. The study has been carried out in a Comprehensive Secondary School in the South of England that helps systematic and in depth study on certain population in a single institution. From a single mainstream school, different social setting and events were examined to explore the social inclusion of visually impaired pupils. Therefore, this study is a descriptive one which tries to penetrate new possibilities from a particular social setting.

Data have been collected from both primary and secondary sources. It includes interviews, observations and documentation as tools of data collection. The questionnaires were semi-structured but the questions were predetermined so as to suit the conditions that were deemed to be the most appropriate. The following research questions were set to collect information: 1. How well do non-VI students accept (treat, relate to) VI children and vice-versa; 2. How the Mainstream Teacher and Learning Support Assistant help the VI students in their learning and socialization with their peers; And, 3. How well are the VI students socialized into the culture (including values, norms of behaviour etc.) of the mainstream school? The questionnaires of the study were based on the research question mentioned above.

Sample consists of nine people interviewing of two visually impaired pupils (X- Partially Sighted Female, Y- blind, Male), three sighted pupils as well as two teachers, a Learning Support Assistant, a parent and an educational psychologist.

VIII. PROCEDURE

The School was visited twice. At the very outset of conducting the study the topic and purpose of the study was explained to the authority of the school. Before interviewing, permission was sought from those who were being interviewed to maintain the ethical concern of the research. Two visually impaired pupils (X- Partially Sighted Female, Y- blind, Male), three sighted pupils as well as two teachers (Mainstream Teacher and a Science Teacher), a Learning Support Assistant (LSA), a parent and an educational psychologist were interviewed. During the study, observation was done to have deeper insight into the matter of interaction of the VI pupils with non-VI pupils in the school. Lesson study in the classroom was also observed very keenly.

Information has also been collected from relevant literature review and other documents as well. When making questionnaires, the questions were grouped under sub-headings. Data have been analyzed which were collected from the interviews and observation for a possible range of themes or patterns and to narrow it down to give a manageable shape. It involved ongoing reflection on data and its interpretation. Data were analyzed, coded and re-coded after collection [2]. In analyzing data, questionnaires were categorized according to the theme of the research and also recoded after getting the response

from the participants. This post coding occurs when the coding is selected from a sample of the responses and responses are then given a value. In this study, validity and reliability are both being achieved by source- triangulation as interviews, observations and documents have been used to collect information. 'Triangulation is a valuable strategy (...) to enhance the rigour of the research' [17].

IX. OBJECTIVES

- How do the VI students along with other sighted children study and interact with each other in a mainstream school;
- How the support of Mainstream Teacher and Learning Support Assistant enhances the learning and socialization of VI student with other non-VI students in a mainstream class.
- How the VI students turn out successfully and offer them to gain independence, self-confidence and self-esteem and also trust in their own abilities as well as expectations of quality of life in an inclusive school setting.

X. THE STUDY ON THE SECONDARY MAINSTREAM SCHOOL IN THE SOUTH OF ENGLAND SHOWS THE FOLLOWING FINDINGS

A. *Traveling to the School & Movement Around the School*

The VI pupils need a very little support from others for their mobility if they are well supported in the school. A partially sighted visually impaired (VI) girl (X) does not feel any problem in her mobility inside or outside the school. Wearing glasses or contact lenses she can move quite normally like other pupils. The blind pupil Y usually used to travel 20 miles to get to school by a taxi, a public transport with a couple of pupils which shows his normal social interaction with those pupils. He also mentions that free movements depend on surroundings. As he gets more support from the school, he can work independently inside the school but he needs support outside. One of the LSAs (Learning Support Assistant) said, when a VI pupil enrolls in this school, LSA always support that pupil for the first two weeks so that they become more independent afterwards in their mobility and in their every day work in the school environment.

VI pupils (X, Y) and are given proper orientation and mobility training along with LSAs support. As VI pupils are well supported in the school, they need a little help from others for their mobility. Actually, mobility skill depends on the degree and condition of individual's visual impairment. The partially sighted VI pupils are facing fewer problems than the blind pupils in their mobility. For the blind pupil Y, mobility outside the school is dangerous. Experience shows that even though a blind person with a highly mobility skill is somewhat dependent on the assistance of others which affects the social attitude and interaction.

B. *Functioning in the Class/School*

The class teachers are very much caring to VI pupils in this school. When VI pupils face any difficulty to understand lesson

or any learning instruction LSA assist to support them. Both the teachers form a supportive environment in the classroom. Sometimes, VI pupil's peers and friends help them in reading sheet or white board and in their mobility. In fact, with the correct and efficient support of the school, they enjoy normal life as much as possible. The mainstream teachers with the help of LSAs and VI provision have built a strong, supportive teamwork which helps congenial social and academic environment for VI pupils in the classroom.

The partially sighted Pupil X does not use Braille but uses enlarged and modified texts. Wearing lenses or taking special support a partially sighted pupil can work almost normally with their other peers. Pupil Y, who is legally blind, needs more special support which he gets from LASs in the class. He uses Braille for reading and writing. It is noted that sometimes, VI pupils are given extra time to complete their works. Pupil Y is often slower to complete work so is given opportunity to complete some of his homework during school time. Both VI and sighted pupils take part in group discussion to share ideas and also take part in other activities in the school with their peers enthusiastically. Thus, VI pupils are well accepted by their peers and teachers in the school.

Findings show that blind pupil Y is very confident and with the correct support he performs well in school. The partially sighted pupil X works almost normally. She needs least support in doing her work, so is independent inside the school as well as outside. Indeed, with the correct and efficient support of the school, they enjoy normal life as much as possible. The mainstream teachers with the help of LSAs and VI provision have built a strong, supportive teamwork which helps congenial social and academic environment for VI pupils in the classroom. Moreover, as other sighted pupils accept VI pupils normally, a friendly environment has been developed for their social inclusion in the school.

C. *Social Inclusion in the School*

Findings show that both VI and other sighted pupils develop friendship normally in this school. Pupil X who is partially sighted and pupil Y who is legally blind meet their peers and friends in the tutor group meeting for registration which is a good example of their socialization. They have fun and talk and chat together in their free times. VI pupils have full participation in all school activities. To support VI pupils' extracurricular activities, after-school clubs and educational visits, the school makes all necessary arrangements.

Future Plan: Both the VI and sighted pupils have their future plan and have common feelings. The VI pupils are as confident as sighted pupils in their choice of study. As VI pupils are supported enough from this well resourced school, they are able to develop self-confidence and independence and thus are able to retain their self-esteem.

About the Secondary Mainstream School: If the children with disability (visually impaired) are supported enough with their special needs facilities they become more independent. It is found that the LSA and staff of the VI provision have formed a very caring and supportive community in this school. The VI unit is keeping in contact with The Royal National Institute of Blind People (RNIB) to get support and to improve their quality of support towards VI pupil. The VI students get enough support

which includes in-class, technical modification, networked computers with speech and magnification software, mobility orientation alongside the Mobility Officer.

The VI pupils study the same lesson as like as the rest of the pupils. But VI pupils are provided with modified text according to their eye condition. N 18 which is enlarged or adapted for the partially blind pupils and N 24 (Braille format) with fewer pictures and in larger font to support the blind students for their science, practical work (Exploring Science). They are given practical lesson especially, on Food, Technology and Physical Education to be more independent in their everyday life, because there are many dangers around a kitchen area or in a wood work or science room which need to be explained to VI pupils. So, LSAs are always supporting them in those lessons. In addition, for examination, they get modified examination paper and also get 100% extra time. In addition, to participate in the school's extra-curricular activities, after-school clubs and educational visits for VI pupils, the school makes all necessary arrangements. School does not exclude VI pupils from the opportunity rather they make sure that they are safe as they believe that pupils with a visual impairment integrate well within the school's everyday life.

As the students are well supported with special needs, they perform well. Villa & Thousand (2005, pg.181) asserts: "When students with disabilities are provided with supports and services to access the general education curriculum, their peers maintain state benchmark-level performances, and the students with disabilities experience higher academic and social achievement." [1]. Findings show that the classroom teacher and the LSAs and staff of VI provision have formed a very caring and supportive community for the enhancement of social and academic development of VI children in this school. Indeed, in an inclusive school setting, partnership of both the classroom teacher and LSAs is most important to help VI pupils to become competent enough to cope with the school environment. It enhances the ability of VI pupils. There is some other study that has also shown the similar effect when VI and sighted pupils are studied together. Even the school authority believes parents are a very important part of the partnership that is necessary if each pupil is to achieve his / her full potential.

XI. CONCLUSION

This study is an endeavour to find out the response of two main research questions: how the VI student along with other sighted children study and interact with each other in a mainstream school; How the support of Mainstream Teacher along with Learning Support Assistant (LSA) enhances the learning and socialization of VI student with other non-VI students in a mainstream class. The aim was to find out how VI pupils come out successfully to retain their self-esteem, self-confidence and independence.

It is evident from the findings that pupils with disability perform well and learn better in an inclusive school setting. The study affirms the statement of Villa & Thousand (2005) that inclusion assumes living and learning together benefits both disabled and normal pupils [1]. The VI pupils, in this Comprehensive Secondary School, learn better how to adjust themselves with other pupils and also learn how to cope with the

situation. Simultaneously, normal pupils learn to help VI pupils which foster a harmonious socialization for both the pupils.

Once again, the study relates to the experience of Villa & Thousand (2005). For normalization, the pupils with disabilities need special support and services to access into general curriculum. When VI pupils are provided with supports and services to the common curriculum, their peers maintain 'state benchmark-level performances'. On the other hand, pupils with visual problem experience 'higher academic and social achievement'. The study also ensures the same experience where VI pupils' academic performance is good. They are able to develop better socialization. On the other hand, sighted pupils learn to help VI pupils and perform well. While the Mainstream Teachers with the help of LSAs and other VI provisions build a supportive teamwork, it enhances conducive environment in the socialization and academic performance for the VI pupils in the classroom.

Indeed, it is generally experienced that visually impaired pupils in the mainstream school, experience isolation and insecurity. If these pupils are provided with special needs support and are well accepted by other sighted pupils, teachers, staff, etc. they will grow up into more independence which helps better socialization. In this study, the visually impaired pupils in this Comprehensive Secondary School have developed their independence mastering the basic skill of everyday life successfully. With the correct and appropriate support of the school, they have grown their self-esteem and become confident in their own abilities in every step of their life which helps them to achieve higher expectations of life. They are also well accepted and socialized into the culture including values and norms of the mainstream school. Therefore, this school could be a model for the other mainstream schools to be followed who are working for the inclusion of the visually impaired pupils towards independence. Thus, the aim of the study has been proved to be true in reality.

ACKNOWLEDGMENT

The author wishes to thank Roehampton University, Erasmus Mundus Course Authority for rendering support in doing the research on Social Inclusion of Visual Impaired Students in A Comprehensive Mainstream School of South of England and grateful to Professor John Lodge for efficient and proper guidance.

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Generalization of Newton's Forward Interpolation Formula

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Abstract- In this paper we generate new Newton's Forward Interpolation Formula's using 12, 13 and 14 points, that help us to calculate any numerical integration with very much less amount of error's, the idea is increase the coefficients instead of making many intervals.

We used fractions not decimals in our results, since this proved to be useful.

Index Terms- Newton's Forward Interpolation, Numerical integration, *Maple*, *MATLAB*, Numerator and Denominator.

I. INTRODUCTION

The most commonly encountered mathematical models in engineering and science are in the form of differential equations. The dynamic of physical systems that have one independent variable can be modeled by ordinary differential equations, whereas systems with two, or more, independent variables require the use of partial differential equations. Several types of ordinary differential equations, and a few partial differential equations, render themselves to analytical (closed-form) solutions. These methods have been developed thoroughly in differential calculus. However, the great majority of differential equations, especially the nonlinear ones and those that involve large sets of simultaneous differential equations, do not have analytical solutions but require the application of numerical techniques for their solution.

There are several numerical methods for differentiation, integration, and the solution of ordinary and partial differential equations. These methods are based on the concept of finite differences. Therefore, the purpose of the Finite Difference Methods and Interpolation is to develop the systematic terminology used in the calculus of finite differences and to derive the relationships between finite differences and differential operators, which are needed in the numerical solution of ordinary and partial differential equations.

The calculus of finite differences may be characterized as a "two-way street", that enables the user to take a differential equation and integrate it numerically by calculating the values of the function at a discrete (finite) number of points. Or, conversely, if a set of finite values is available, such as experimental data, these may be differentiated, or integrated, using the calculus of finite differences. It should be pointed out, however, that numerical differentiation is inherently less accurate than numerical integration.

Another very useful application of the calculus of finite differences is in the derivation of interpolation/extrapolation formulas, the so-called *interpolating polynomials* which can be used to represent experimental data when the actual functionality of these data is not known.

The word interpolation refers to interpolating some unknown information from a given set of known information. The technique of interpolation is widely used as a valuable tool in science and engineering. The problem is a classical one and dates back to the time of Newton and Kepler, who needed to solve such a problem in analyzing data on the position of stars and planets.

Mathematical applications of interpolation include derivation of computational techniques for • Numerical differentiation • Numerical integration • Numerical solutions of differential equations.

This paper constructs of :

- 1) Abstract
- 2) Introduction
- 3) PRELIMINARIES
- 4) MAIN NEW RESULT'S
- 5) Conclusions

n	d	A	c_0	c_1	c_2	c_3	c_4	c_5	c_6	$c_{n,d}$
1	1	1/2	1	1						-1/12
2	3	1/3	1	4	1					-1/90
3	3	3/8	1	3	3	1				-3/80
4	5	2/45	7	32	12	32	7			-8/945
5	5	5/288	19	75	50	50	75	19		-275/12 096
6	7	1/140	41	236	27	272	27	236	41	-9/1400

We can see from the table above , that if $n = 1$ gives as the Trapezoidal rule , and so on .
 And mentioned the general equation for Newton Cotes open which is :-

$$\int_0^{nh} f(x)dx = h \sum_{i=1}^{n-1} w_i f(ih) + R_{n-1,n}(h)$$

Alkis Constantinides & Navid Mostoufi also touched to a group of important algorithms to find Newton Forward Interpolation equation using 9 points (dividing the 8 periods) using MATLAB software, with a comparison with previous methods.

Remark :- For all the equations

$$x_1 \leq \xi \leq x_{n+1}, f_1 = f(x_1), f_2 = f(x_2), \dots, f_n = f(x_n), h = \frac{x_{n+1} - x_1}{n} .$$

So far what was to be found are: -

1) Ueberhuber Using 5 point`s

$$\int_{x_1}^{x_5} f(x)dx = \frac{2}{45} h(7f_1 + 32 f_2 + 12f_3 + 32f_4 + 7f_5) - \frac{8}{945} h^7 f^{(6)}(\xi)$$

2) Abramowitz and Stegun Using 6 point`s

$$\int_{x_1}^{x_6} f(x)dx = \frac{5}{288} h(19f_1 + 75 f_2 + 50f_3 + 50f_4 + 75f_5 + 19f_6) - \frac{275}{12096} h^7 f^{(6)}(\xi)$$

3) Abramowitz and Stegun Using 7 point`s

$$\int_{x_1}^{x_7} f(x)dx = \frac{1}{140} h(41f_1 + 216 f_2 + 27f_3 + 272f_4 + 27f_5 + 216f_6 + 41f_7) - \frac{9}{1400} h^9 f^{(8)}(\xi)$$

4) Abramowitz and Stegun Using 8 point`s

$$\int_{x_1}^{x_8} f(x)dx = \frac{7}{17280} h(751f_1 + 3577 f_2 + 1323f_3 + 2989f_4 + 2989f_5 + 1323f_6 + 3577f_7 + 751f_8) - \frac{8183}{518400} h^9 f^{(8)}(\xi)$$

5) Abramowitz and Stegun Using 9 point`s

$$\int_{x_1}^{x_9} f(x)dx = \frac{4}{14175} h(989f_1 + 5888 f_2 - 928f_3 + 10496f_4 - 4540f_5 + 10496f_6 - 928f_7 + 5888f_8 + 989f_9) - \frac{2368}{467775} h^{11} f^{(10)}(\xi)$$

6) Ueberhuber Using 10 point`s

$$\int_{x_1}^{x_{10}} f(x)dx = \frac{9}{89600} h(2857(f_1 + f_{10}) + 15741(f_2 + f_9) + 1080(f_3 + f_8) + 19344(f_4 + f_7) + 5778(f_5 + f_6)) - \frac{173}{14620} h^{11} f^{(10)}(\xi)$$

7) Ueberhuber Using 11 point`s

$$\int_{x_1}^{x_{11}} f(x)dx = \frac{5}{299376} h(16067(f_1 + f_{11}) + 106300(f_2 + f_{10}) - 48525(f_3 + f_9) + 272400(f_4 + f_8) - 260550(f_5 + f_7) + 427368 f_6) - \frac{11346350}{326918592} h^{13} f^{(12)}(\xi)$$

III. MAIN NEW RESULT`S

1) . Using 12 point`s

$$\int_{x_1}^{x_{12}} f(x)dx = \frac{11}{87091200} h(2171465f_1 + 13486539f_2 - 3237113f_3 + 25226685f_4 - 9595542f_5 + 15493566f_6 + 15493566f_7 - 9595542f_8 + 25226685f_9 - 3237113f_{10} + 13486539f_{11} + 2171465f_{12}) - \frac{2224234463}{237758976000} h^{13} f^{(12)}(\xi)$$

Hence the error is = $\frac{2224234463}{237758976000} h^{13} f^{(12)}(\xi)$.

2) . Using 13 point`s

$$\int_{x_1}^{x_{13}} f(x)dx = \frac{1}{5255250} h(1364651f_1 + 9903168f_2 - 7587864f_3 + 35725120f_4 - 51491295f_5 + 87516288f_6 - 87797136f_7 + 87516288f_8 - 51491295f_9 + 35725120f_{10} - 7587864f_{11} + 9903168f_{12} - 1364651f_{13}) - \frac{3012}{875875} h^{15} f^{(14)}(\xi)$$

Hence the error is = $\frac{3012}{875875} h^{15} f^{(14)}(\xi)$.

3) . Using 14 point`s

$$\int_{x_1}^{x_{13}} f(x)dx = \frac{13}{402361344000} h(8181904909f_1 + 56280729661f_2 - 31268252574f_3 + 156074417954f_4 - 151659573325f_5 + 206683437987f_6 - 43111992612f_7 - 43111992612f_8 + 206683437987f_9 - 151659573325f_{10} + 156074417954f_{11} - 31268252574f_{12} + 56280729661f_{13} + 8181904909f_{14}) - \frac{2639651053}{344881152000} h^{15} f^{(14)}(\xi)$$

Hence the error is = $\frac{2639651053}{344881152000} h^{15} f^{(14)}(\xi)$.

IV CONCLUSION

In this study we attained the following results :

- 1) We Evaluated the numerical integration $\int_a^b f(x) dx$, with more accuracy and much more less amount of error`s .
- 2) The high order Newton Forward Interpolation Formula`s makes a great tool to find the trigonometrically fitted formulae for long-time integration of orbital problems. This is true for trigonometrically-fitted formulae for the numerical solution of the Schodinger equation, for also trigonometrically-fitted formulae of high order for long-time integration of orbital problems . This is addition to multilayer symplectic integrators .
- 3) We made a great deal of combination between Mathematics and the computers science represented by computer programs languages such as *pascal* , *c* & *c++* and computer programs *Maple* & *MATLAB* to compute the big amount of numbers and coefficients .
- 4) We gave a useful tool for a large number of researcher`s and student`s in many areas of science, engineering, and business. Mathematicians who need to calculate any bounded integration (the area under a curve) That`s not all , but they can choose any number of Decimal places since any equation is written in the form of Numerator and Denominator .
- 5) The study provided a great potential to the Engineers , scientists and researchers to find the solution of their Differential equations and the Partial Differential equations with more significance results , knowing that a small error in calculation leads to big functional errors .
- 6) This study will open a big door to the researcher`s to find the next height order equation of Newton`s Forward Interpolation Formula .

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Filamentary Keratitis: A Case Series

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Abstract-

Introduction:

Filamentary keratitis describes a condition in which filaments which are adherent complexes of mucus and corneal epithelium are present on the corneal surface. Filaments appear as small, gelatinous strands on the anterior surface of the cornea and may differ in size, shape, composition, and distribution. We hereby report five different cases of filamentary keratitis due to various ocular conditions and their respective management.

Aim:

To report a case series of five patients with filamentary keratitis due to various ocular conditions resulting in severe dry eye and management of the same.

Materials and methods:

Five cases of filamentary keratitis were consecutively selected over a period of six months at a tertiary care hospital. The patients were treated according to the causal factors and a follow up was maintained.

Result:

Filamentary keratitis as seen in our cases results from severe dry eye due to various conditions like meibomian gland disease, corneal anaesthesia, post cataract surgery and systemic chemotherapy. Filamentary keratopathy in patients with corneal anaesthesia demand a high index of suspicion from the clinician's side as the presenting symptoms are very mild due absent corneal sensations. All patients require removal of filaments and frequent preservative free lubricating eye drops along with specific treatment for the causal factor. Topical cyclosporin eye drops are useful in refractory cases.

Conclusion:

Filamentary keratitis is a long standing and recurrent condition which needs long term followup. Underlying cause needs to be identified and long remissions are possible when treatment is aimed at the root cause.

Index Terms- Filamentary keratitis, dry eye, corneal filaments, aqueous deficient dry eye.

I. INTRODUCTION

Filamentary keratitis describes a condition in which filaments which are adherent complexes of mucus and corneal epithelium are present on the corneal surface. Filaments consist of a variable combination of degenerated epithelial cells and mucus that are firmly attached to the corneal surface at one end.¹ Filaments appear as small, gelatinous strands on the anterior surface of the cornea and may differ in size (as small as 0.5 mm and as long as 10 mm), shape, composition, and distribution.² A lack of tear production may result in the increased production of mucus by conjunctival goblet cells. Since mucus serves as a disposal system for exfoliated epithelial cells, the requisite elements for filament formation may be present in dry eye states.³ Tanioka et. al.⁴ hypothesized that filament generation starts due to an injury to the surface epithelium as result of various disease conditions. Further, blinking or movement of the eye causes friction between the palpebral conjunctiva and the injured epithelium and produces the filament core. This core then interweaves with mucin, conjunctival epithelium and inflammatory cells building up the filament. This phenomenon is sometimes associated with inflammation and the detachment of basal cells from the Bowman's layer due to blink or eye movement related mechanical friction. Aqueous-deficient dry eye is characterized by excessive abnormal epithelial debris and mucus strands, which adhere firmly to the damaged areas of epithelium and basement membrane, forming corneal filaments.⁵

We hereby report five different cases of filamentary keratitis due to various ocular conditions and their respective management.

II. MATERIALS AND METHODS

Five cases of filamentary keratitis were consecutively selected over a period of six months at a tertiary care hospital. The patients were treated according to the causal factors and a follow up was maintained.

III. CASES

Case 1:

A 52 year old female presented with complaint of redness and mild foreign body sensation in right eye since one week. She had right eye esotropia of 30 degrees along with lateral rectus palsy since 6 months. Patient was a known case of carcinoma of larynx with CNS metastasis. She underwent two cycles of chemotherapy four months back and then discontinued all treatment and took some ayurvedic medicines later.

Best corrected visual acuity in both eyes was 6/12. Right eye anterior segment examination showed circumcorneal congestion, corneal filaments superiorly and punctate epithelial erosions all over.(Figure 1) Left eye had a normal ocular surface. Both eyes had a posterior subcapsular cataract. There were no corneal sensations in the right eye while corneal sensations in left eye were normal all over the cornea.

Schirmer's test values in right eye 0 mm while in left eye was 4 mm. Fluorosein tear film breakup time was 1 second in right eye and 2 seconds in left eye with tear film instability in both the eyes. Grading of the conjunctiva and cornea using the Oxford Scheme revealed panel E or grade 4 staining.⁶

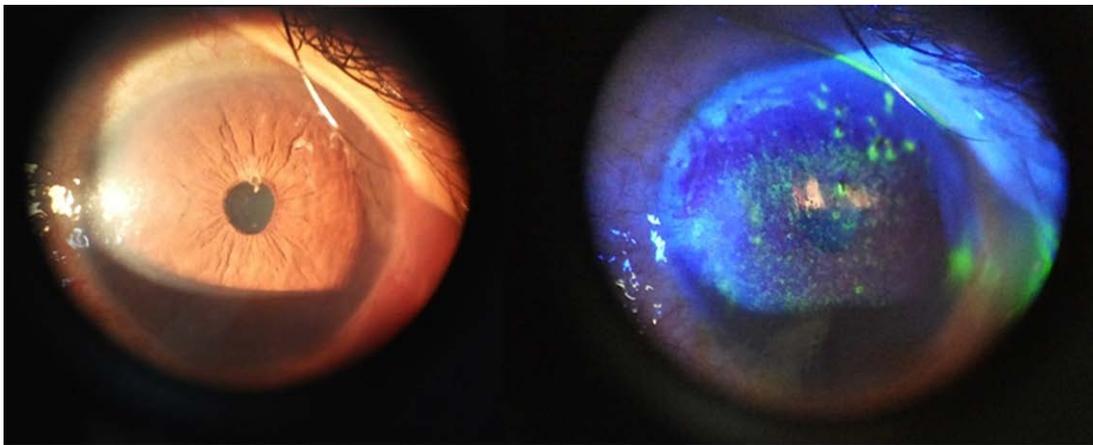


Figure 1 – Right eye shows circumcorneal congestion, corneal filaments superiorly and punctate epithelial erosions all over.

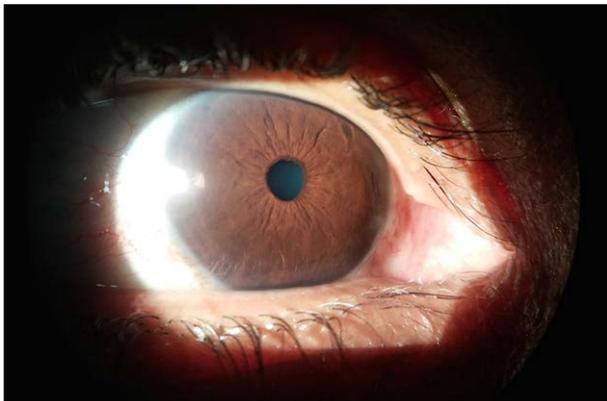


Figure 2 – Right eye slit lamp photograph two weeks after treatment.

Patient was treated with removal of filaments with a straight tying forcep. She was prescribed use of 10% N- Acetylcysteine eye drops four times daily in right eye, hourly instillation of preservative free 1% carboxymethyl cellulose and four times GenTeal Gel (Trademark - Novartis Pharmaceuticals Australia Pvt Limited). She was advised four times instillation of 1% CMC eye drops for the left eye to prevent ocular surface damage. Patient responded with disappearance of pain and filaments.(Figure 2) Few punctate erosions persisted on the first week followup.

There have been certain well recognised side effects of cancer chemotherapy which ultimately lead to dry eye and ocular surface damage. Lacrimal duct stenosis has been reported in a patient who received adjuvant chemotherapy for breast cancer.⁷

It has been observed in a major review that systemic chemotherapy for cancer leads to unique anatomic, physiologic as well as biochemical alterations in the eye.⁸ Several anti-cancer chemotherapeutic drugs are incriminated for the incidence of dry eyes in cancer patients. Few of them are cyclophosphamide, imatinib, nilotinib, pentostatin and busulphan.⁹ Further in this patient, an ocular surface anaesthesia is another contributing factor in addition to deficient aqueous secretion. A low schirmer's reading in both eyes is suggestive of involvement of the lacrimal glands or ducts or a neurological deficit for lacrimal secretion.

Since the use of chemotherapeutic drugs is essential, a thorough ophthalmic evaluation is mandatory for all patients receiving these medicines.

Case 2:

A 38 year old female presented with complaint of redness, pain and watering in right eye since 4 days. The best corrected visual acuity in both eyes was 6/6. Slit lamp examination of right eye showed conjunctival and circumcorneal congestion, punctate erosions, corneal filaments and a 2 x3 mm epithelial defect at 7 o'clock position (Figure 3). The corneal sensations were normal in both eyes. Anterior segment of left eye was within normal limits.

Schirmer's test values were 0mm and 5mm in right and left eye respectively. Fluorosein tear film breakup time was zero second in right eye and one second in left eye with tear film instability in both the eyes. Grading of the conjunctiva and cornea with double staining using the Oxford Scheme revealed panel D(grade 4) and panel C(grade 3) in right and left eye respectively.

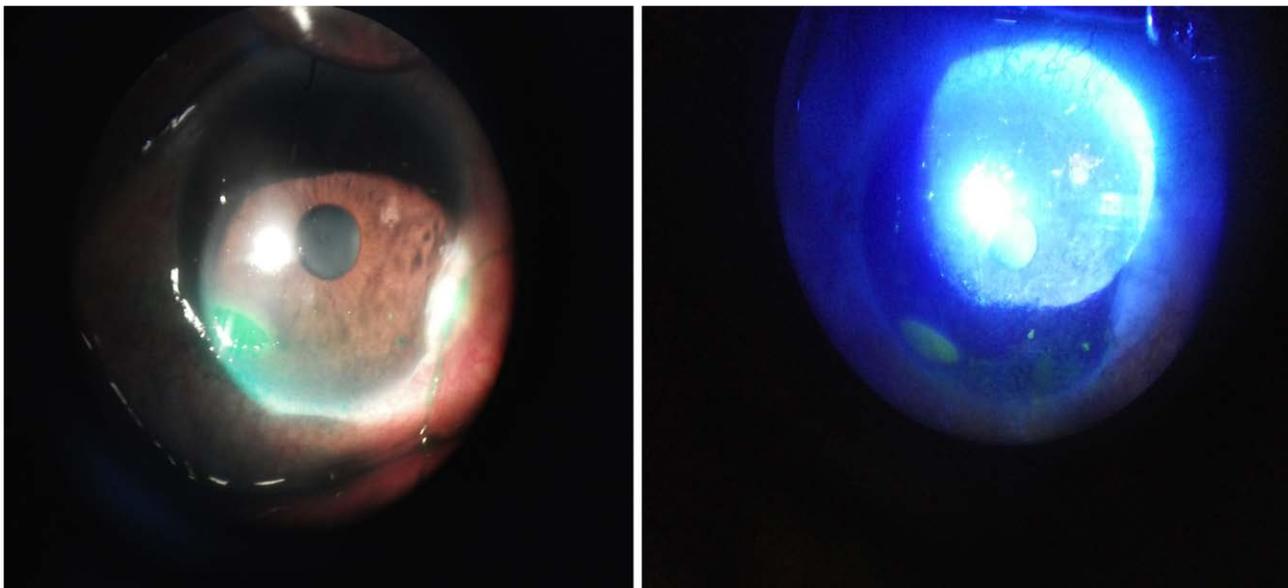


Figure 3 – Right eye slit lamp examination shows conjunctival and circumcorneal congestion, punctate erosions, corneal filaments and a 2 x3 mm epithelial defect at 7 o'clock position

She responded well to removal of filaments, 10% N- acetylcysteine, Systane ultra eye drops (Alcon) (active ingredients Polyethylene Glycol 400 0.4%, Propylene Glycol 0.3%) and GenTeal gel.

After 1 month of follow up, the epithelial defect had completely healed, filaments had subsided with remnant punctate erosions.

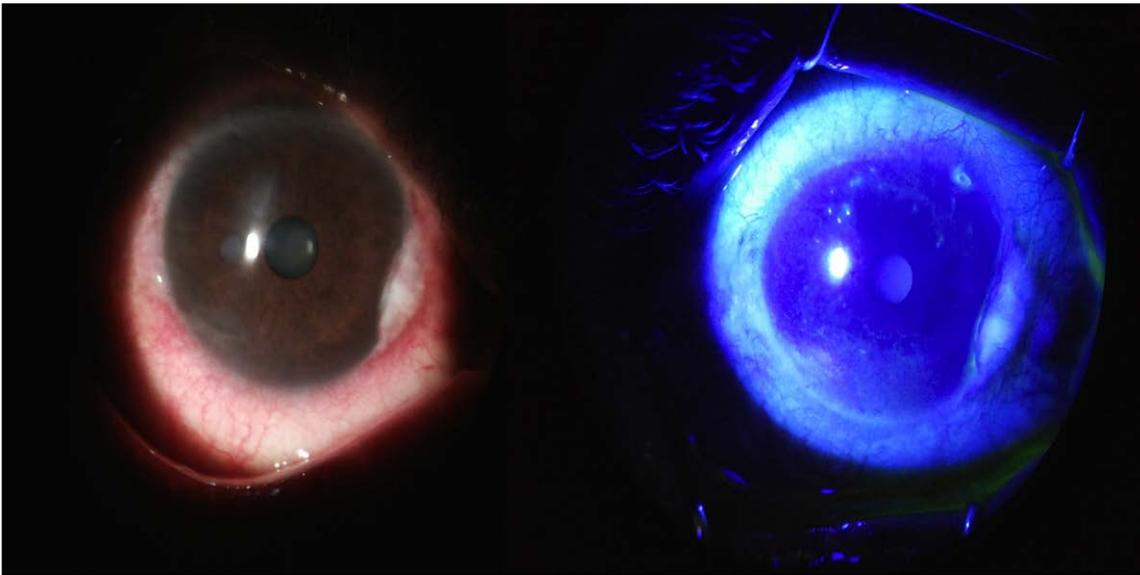


Figure 4- Right eye slit lamp photographs after one week of treatment

Since the Schirmer's readings were persistently low, she was started on cyclosporine 0.05% eye drops twice daily. On further followups, the patient was symptom free with use of lubricants and cyclosporine eye drops.

Investigations like ESR, CRP and RA factor were done and were found to be within normal limits. The cause for aqueous deficiency in this patient remained unknown, but patient did well with regular use of lubricants and cyclosporine eye drops.

Case 3:

A 57 year old male patient came for a routine followup 10 days post cataract surgery with complaints of foreign body sensation, pain and watering in the operated eye right eye. His best corrected visual acuity was 6/12 in right eye and 6/9 in left eye. Slit lamp examination of the anterior segment revealed corneal filaments in the superonasal quadrant, conjunctival congestion and occasional cells in the anterior chamber. (Figure 5) Rest of the anterior segment examination was within normal limits.

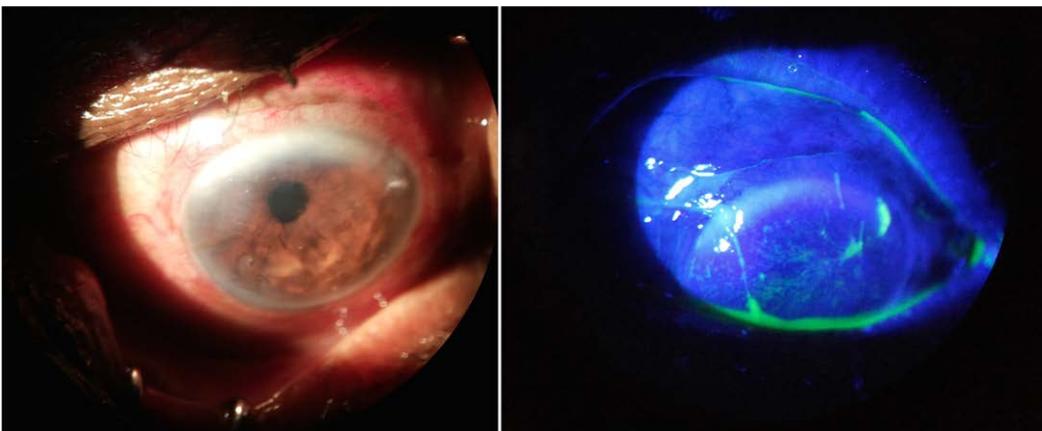


Figure 5 – Right eye slit lamp images show corneal filaments in the superonasal quadrant, conjunctival congestion and a sclerocorneal tunnel incision covered by conjunctiva.

As a part of treatment, the corneal filaments were removed and patient was advised post cataract steroid tapering, 1% carboxy methyl cellulose eye drops one hourly and four times instillation of 10% N- Acetyl cysteine eye drops. Patient responded to the treatment with disappearance of filaments and reduction of pain on the next followup visit after four days.

Case 4:

A 61 year old male patient was operated for left eye small incision cataract surgery. One month post surgery patient presented with pain, foreign body sensation and redness of the operated eye. His best corrected visual acuity was 6/12 and 6/24 in the right and left eye respectively.

On slit lamp examination of the anterior segment the left eye showed filaments in the superior quadrant of the cornea, punctate epithelial erosions all over the cornea, few descemet's folds and plus two anterior chamber reaction.(Figure 6) The sclero-corneal tunnel was sutured with a 10-0 nylon suture and its knot was exposed.

His right eye showed punctate epithelial corneal erosions in the centre. Both eyes had a well placed posterior chamber intraocular lens. The lids in both the eyes had a mild meibomitis. Schirmer's test in both eyes had zero readings while the fluorescein tear film breakup time was two seconds in both eyes. Grading of the conjunctiva and cornea with double staining using the Oxford Scheme revealed panel C(grade 3) and panel E(grade 5) in right and left eye respectively.

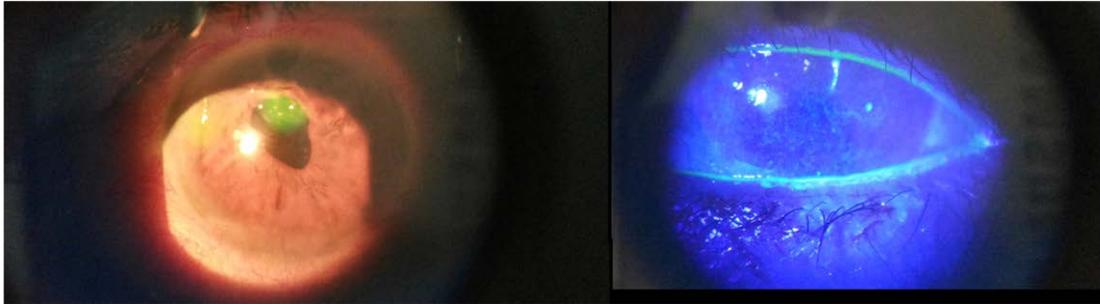


Figure 6 – Slit lamp images of left eye show filaments in the superior quadrant of the cornea and punctate epithelial erosions all over the cornea

Patient was investigated for ESR, CRP, RA factor, ANA profile, fasting and post prandial blood glucose, all of which were found to be within normal limits.

Patient was treated with removal of filaments with tying forceps, 10% N- acetylcysteine in 0.5% carboxymethyl cellulose eye drops, Systane ultra eye drops (Alcon) (active ingredients Polyethylene Glycol 400 0.4%, Propylene Glycol 0.3%), GenTeal gel and ofloxacin with dexamethasone eye drops in rapid tapering dose(as a post operative medication after cataract surgery). Patient responded to the treatment with disappearance of filaments and decrease in the punctate erosions.

On subsequent followup, patient was started on cyclosporine 0.05% eye drops in both eyes in view of persistently low Schirmers' readings and corneal staining. Lid hygiene and oral doxycycline 100mg twice daily were also started for meibomitis. Two months after cyclosporine and other medical treatment his ocular surface improved (though not totally) but the Schirmers' readings continued to be 1mm in both the eyes. For the same reason, patient is treated with punctal occlusion with silicone punctal plugs.

The right eye of this patient had an uneventful surgery and postoperative period was also asymptomatic. In the left eye, sclerocorneal tunnel was sutured with an exposed knot that lead to persistent ocular surface inflammation which in turn precipitated filamentary keratitis.

Case 5:

A 30 year old male patient presented to the out patient department with chief complaints of pain, redness, watering and photophobia in both eyes (more in the right eye) since one month. His distant visual acuity was 6/6 in both eyes.

Slit lamp examination of the anterior segment revealed severe meibomian gland disease with filaments in right eye and moderate meibomian gland disease with few filaments in left eye.(Figure 7,8) In both the eyes, filaments were located in superior cornea. Rest of the anterior segment and posterior segment examination were within normal limits.

Schirmer's readings in both eyes were more than 25 mm after five minutes. Fluorescein tear film breakup time was three seconds in both eyes.

Grading of the conjunctiva and cornea with double staining using the Oxford Scheme revealed panel C(grade 3) in both eyes.

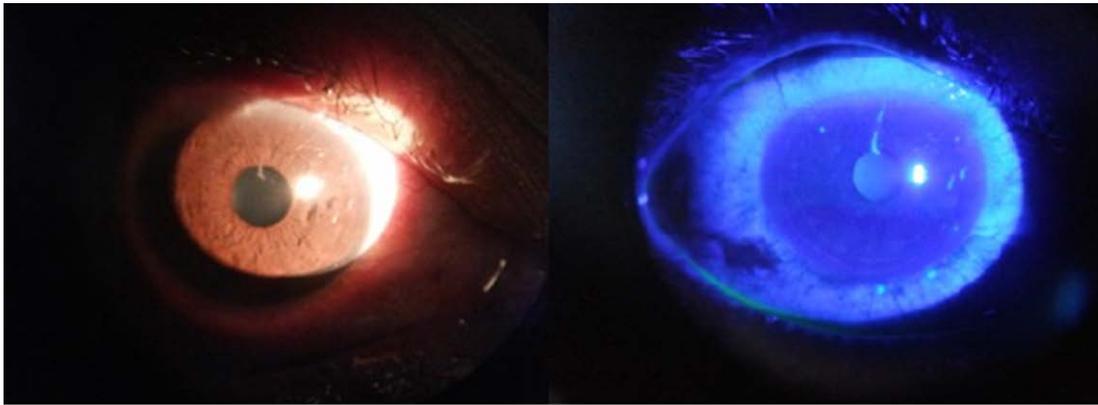


Figure 7 – Right eye slit lamp photograph shows a central corneal filament.



Figure 8 – Left eye image shows inflamed lid margins secondary to severe meibomian gland disease.

Patient responded with removal of filaments with tying forceps, 10% N- acetylcysteine in 0.5% carboxymethyl cellulose eye drops, Systane ultra eye drops (Alcon) (active ingredients Polyethylene Glycol 400 0.4%, Propylene Glycol 0.3%), GenTeal gel, oral tablet doxycycline 100mg twice daily for six weeks, hot fomentation, lid hygiene and lid massage. On subsequent weekly followup, filaments had resolved and the meibomitis was under control. Patient was advised to continue Systane ultra eye drops and maintain lid hygiene.

Six months later patient discontinued the lubricating drops and came back with filamentary keratopathy with meibomitis. He was again managed on similar lines. Since meibomian gland disease was the causal factor for dry eye, patient was kept on oral tablet doxycycline for another four weeks. In the last followup, patient had a relatively stable ocular surface, a clear cornea and fluorescein tear film breakup time of five seconds in both eyes.

This patient too was investigated for ESR, CRP, RA factor, ANA profile, fasting and post prandial blood glucose which were found to be within normal limits.

As defined by the international workshop on meibomian gland dysfunction (MGD), MGD is a chronic, diffuse abnormality of the meibomian glands, commonly characterized by terminal duct obstruction and/or qualitative/quantitative changes in the glandular secretion. This may result in alteration of the tear film, symptoms of eye irritation, clinically apparent inflammation, and ocular surface disease.¹⁰ Another study has found MGD as the most common cause of evaporative dry eye.¹¹

IV. DISCUSSION

Surgical conditions have also been associated with filament formation. Dodds and Laibson reported several cases of filamentary keratitis after extracapsular cataract extraction.¹² The same was noted in our study (Cases 3 and 4) in which the patient had undergone a manual small incision cataract surgery. One of the reasons for this may be a pre-existing asymptomatic dry eye which aggravates following surgery and use of epitheliotoxic eye drops in postoperative period. Further it has been shown previously that corneal epithelial edema is one of the predisposing factors of filamentary keratopathy.¹³ The same could be correlated with this postoperative

cataract patient where corneal edema was present in the early postoperative period which gave rise to filamentary keratitis in an already predisposed eye. This necessitates a preoperative evaluation of cataract patients with use of simple tests like fluorescein tear film break up time and Schirmer's test. Ocular surface inflammation and local drug toxicity can precipitate filamentary keratitis which was observed in these two postoperative cases.

All patients with low Schirmers' readings depicting an aqueous deficient state were investigated for RA factor as untreated rheumatoid arthritis can lead to severe filamentary keratopathy.¹⁴

Keratoconjunctivitis sicca or aqueous deficiency remains the most common cause of filamentary keratitis¹⁵, which was observed in our study too with most of the cases showing low Schirmers' reading.

Patients with corneal anaesthesia and filamentary keratitis may present with only redness as the other symptoms usually associated with this condition like pain, foreign body sensation, watering, photophobia may be absent (Case 1). Clinician should have a high index of suspicion to diagnose these cases.

Preservatives in various eye drops lead to an increase in the cellular exfoliation and cytotoxic changes in the corneal epithelium due to which there is an increase in the filament receptor site, which in turn causes filamentary keratopathy.¹⁶

V. CONCLUSION

Thus, preservative free artificial tear eye drops supplementation after mechanical removal of filaments remains the mainstay of treatment, while cyclosporine eye drops help in reducing the surface inflammation in severe dry eye patients.

Filamentary keratitis is a long standing and recurrent condition which needs long term followup. Underlying cause needs to be identified and long remissions are possible when treatment is aimed at the root cause.

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Psycho-wellbeing of Ist MBBS students of SMS Medical College, Jaipur” (Raj) India

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Abstract- Background and Objectives: Mental disorders account for a large proportion of the disease burden in young people in all societies and earlier diagnosis can facilitate better treatment .¹ So, this study was conducted to find out the psycho-wellness of Ist MBBS Students. **Materials and Methods:** A cross-sectional study was carried out on 250 students of I MBBS. They are interrogated as per MMS scale to assess the psycho-wellbeing of students. These data collected were analyzed and inferred with Chi-square, ANOVA and Tukey test of significance. OR for suicidal tendency and PTSD was also found out. **Results:** Out of 230 students, 26.96% and 15.65% were in red and orange zone of psycho-wellness respectively. Suicidal tendency was found in 11.3% and PTSD was found in 18.26% of students. Suicidal tendency and PTSD was found significantly more in students of red and orange zone. Psycho-wellness was found significantly more in females, middle class students and students who have attempted PMT more times. **Conclusions:** More than one fourth of students were in red zone of psycho-wellness and suicidal tendency in more than one tenth of students. Psycho-morbidity was found more in females, middle class and students who have attempted PMT more times.

Index Terms- Anxiety Disorders, MMS, Psychotic Disorders, PTSD and Psycho-wellness

Abbreviation: CTSC (Clinical Trial Screening Committee), EC (Ethical Committee), MMS (Modified MINI Screen Scale), PTSD (Post Traumatic Syndrome Disorder) and PMT (Pre-Medical Test)

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I. INTRODUCTION

Psycho-morbidity is one of the common and major emerging diseases all over the world. It is the curse of urbanization and development. In India urban population is more than 30% and is expected to 56% by 2025.² There is increase recognition of complex effects of urbanization on health. The nature of modern urbanization is having bad effect on mental health because of over crowing, pollution, stresses, rising level of violence, poor social support etc.³ Pandav R *et al.*⁴ found a lifetime prevalence of 26.5% and 30% of major depression and anxiety disorders,

respectively. The rate of serious mental illness was higher for 18 to 25 year olds (7.4 %) in 2008 than for any other age group over 18.⁸ In addition, the onset for 50 percent of adult mental health disorders occurs by age 14, and for 75 percent of adults by age 24.⁵

Adolescents are biologically prone to have more mood swings because of the hormonal changes associated with adolescence and coupled with the fact that their brains are still developing⁶ Youth is the stage at which most mental disorders begin but often detected in later life, and then it becomes difficult to treat. So, detecting these disorders and individual prone to these disorders at earlier ages can facilitate better treatment.¹ Available data suggest that 20 percent of adolescents i.e. one in five adolescents have a diagnosable mental disorder.⁷ So this study was conducted on I MBBS students of SMS Medical college, Jaipur (Rajasthan) with following objectives:-

1. To assess the psycho-wellbeing of I MBBS students SMS medical College, Jaipur.
2. To present distribution pattern of psychiatric illnesses in I MBBS students SMS medical College, Jaipur (Rajasthan)

II. MATERIALS AND METHODS

Study Design and Study Universe: A cross-sectional observational study was carried out on 230 students of I MBBS after taking clearance from Clinical Trial Screening Committee (CTSC) and Ethical Committee (EC) of SMS Medical College, Jaipur. After taking written inform consent from each of the student, they are given predesigned Performa to fill.

Study population: I MBBS students present on the day of survey excluding Students want to participate in the survey.

Performa has two major parts. Part (1) has general information regarding socio-demographic data and study pattern. Part (2) Performa is Modified Mini Screen (MMS) scale to assess the psycho-wellbeing of students.

Modified Mini Screen (MMS) acceptability and reliability was found satisfactory by many authors.^{8,9} It is a 22-item scale designed to identify persons in need of an

assessment in the domains of Mood Disorders, Anxiety Disorders and Psychotic Disorders. (Section ‘A’ for Mood, section ‘B’ for Anxiety and section ‘C’ for Psychosis).

MMS also interpret psycho-wellness zone as **Green Zone (No Disease Zone)** (Scores between ‘1’ to ‘5’) where no further action is required, **Orange (Borderline Disease)** (Scores between ‘6’ to ‘8’) consider for referring to Psychiatric and **Red Zone (Yes Disease)** (Scores ‘9’ and above): referred to Psychiatric for confirmation of diagnosis and treatment.

Question number (4) of MMS says about Suicidal tendency and Question no. (14 and 15) says about depression. If both Questions (14 and 15) are yes it predict Post Traumatic Syndrome Disorder (PTSD) and individual is referred to Psychiatric for further evaluation

These proforms were collected after filled by students. Data thus collected were compiled in MS Excel and analyzed with Primer version 6 with Chi-square, ANOVA and Tukey test of significance. OR Ratio of suicidal tendency and PTSD was also found out.

III. RESULTS

In this cross sectional observational study on the day of survey 230 students were present out of total 249 so attendance was 92.37% to represent the I MBBS students.

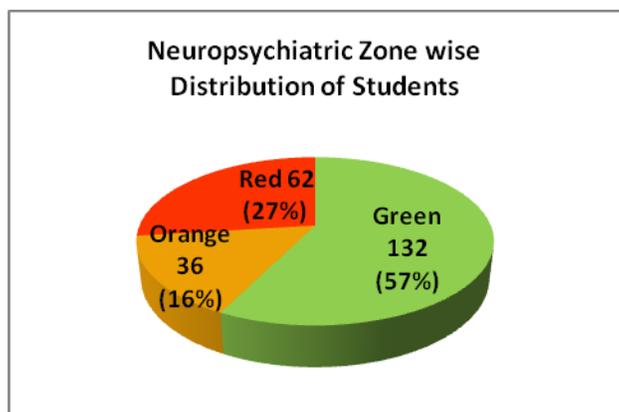


Figure No:1

Out of these 230 students, 132 students (57.39%) were in green zone (no disease zone), while 36(15.65%) students were in orange (borderline) and 62 students (26.96%) were in red zone (Psychiatric disease zone) of psycho-wellness. (Fig 1)

Mean scores of students in section ‘B’ which belongs to Anxiety group was observed 2.77 which was the highest followed by mean scores of section ‘C’ (Psychosis group) and section ‘A’ (Depression group). This distribution was found with significant variation (p<0.001) (Table 1).

Table No. 1
MMS Mean Scores of Students (N=230)

Neuropsychiatric Section	Mean Score of Students	SD of Scores of Students
Section ‘A’ (Depression)	1.49	1.41
Section ‘B’ (Anxiety)	2.77	2.46
Section ‘C’ (Psychosis)	1.50	1.68
Total Score	5.72	4.64

It was also depicted that Anxiety was found to be associated with Depression (p<0.05) and Depression with Psychosis (<0.05) but Anxiety and Psychosis was not found to be associated (p>0.05) (Table 2).

Table No. 2
Association among Neuropsychiatric Sections

Neuropsychiatric Zone	*P<0.05	Association
Depression v/s Anxiety	Yes	Yes
Anxiety v/s Psychosis	Yes	Yes
Psychosis v/s Depression	No	No

*Tukey Test

It was also observed in this study that suicidal tendency was found in 26 (11.3%) students and PTSD was found in 42 (18.26%) students.

It was also revealed that suicidal tendency was found significantly more in students of orange zone whereas PTSD was found maximum in students of red zone. Suicidal tendency and PTSD was found significantly in student of red and orange zone (OR= 10.667 and 8.49 for orange and red zone in comparison to green zone for suicidal tendency. And OR= 10.667 and 8.49 for orange and red zone in comparison to green zone for PTSD) (Table 3)

Table No. 3
Neuropsychiatric Zone wise Suicidality and PTSD

Neuropsychiatric Zone (N=230)	® Suicidality (n=26)		* PTSD (n=42)	
	No.	OR	No.	OR
Green (132)	4	1(R)	10	1(R)
Orange (36)	9	10.667	10	4.692
Red (62)	13	8.490	22	6.710
Chi-square test P Value LS	21.522 at 2 DF P <0.001 HS		24.603 with 2 DF P <0.001 HS	

®Que. No. 4 ‘Yes’ of MMS and *Que. No. 14 & 15 both ‘Yes’ of MMS

It was also depicted from this study that although religion, caste and type of family of the student was not associated with type of psycho-wellness zone but sex, type of residence and socio-

economic status was associated with type of psycho-wellness zone. It was found that there were significantly more proportion of females in red and orange zone. Likewise, significantly higher proportion of urban students was in red and orange zone. Middle class students were found significantly more in red and orange zone than upper and lower class. It was also revealed in this study that although coaching status, educational status of parents were not associated with type of psycho-wellness zone but number of attempts for PMT is strongly associated with type of psycho-wellness zone. It was found that as the number of attempts for PMT increases the proportion of students in red and orange zone increases (Table 4).

Table no 4
Association of variables on psychiatric wellness

Variables	Psychiatric Wellness Zones (N=249)			X ² Test P Value LS
	Green (n=132)	Orange (n=36)	Red (n=62)	
Sex				
Male (n=159)	84	26	48	P=0.042 S
Female (n=70)	26	20	24	
Residence				
Rural	65	22	35	P=0.009 S
Urban	37	34	37	
Religion				
Hindu (n=224)	128	35	60	P=0.723 NS
Muslim (n=4)	3	0	1	
Other (n=3)	1	1	1	
Caste				
General (n=93)	58	14	21	P=0.742 NS
OBC (n=79)	40	14	25	
SC (n=34)	21	4	8	
ST (n=25)	13	4	8	
Type of Family				
Joint Nuclear (n=99)	55	15	29	P=0.558 NS
Nuclear (n=105)	62	19	24	
Three Generation	15	2	9	
Socio-economic Status				
Class I	82	25	37	P=0.008 S
Class II	6	8	2	
Class III	7	7	13	
Class IV	11	5	6	
Class V	6	1	6	
Coaching				
No	3	1	1	P=0.923 NS
Yes	129	35	61	

Number of Attempts				P<0.001 S
1	59	10	27	
2	47	27	32	
3	3	9	13	
>3	3	0	2	
Father's Education				P=0.540 NS
illiterate	8	2	4	
Primary	8	1	5	
Middle	6	2	5	
Secondary	21	5	12	
Graduate	36	14	19	
Professional	30	6	5	P=0.437 NS
Mother's Education				
illiterate	38	8	23	
Primary	12	2	8	
Middle	16	4	2	
Secondary	14	6	9	
Graduate	30	8	11	
Postgraduate	12	5	8	
Professional	10	3	1	

IV. DISCUSSION

Present study observed that 26.96% of students were in red zone i.e. Psychiatric disease zone of psycho-wellness. Well comparable observations were made by other also. Centres for Disease Control and Prevention¹⁰ reported more than one in four (29 %) high school students in grades 9-12 in year 2012. Likewise, another survey that collected information from adolescents between the ages of 12 and 17 found that in 2008, about one in 12 (8 percent) reported experiencing a major depressive episode during the past year.¹¹ K. Sebi et al¹² also reported psychiatric illnesses in 26.7% , which was well comparable to present study.

Present study also observed that only 79.13% students were found with few or less symptoms of anxiety followed by depression and psychosis i.e.70 % and 58.26% respectively. In contrast to that the most prevalent mental disorder experienced among adolescents by another author was depression¹³ with more than one in four high school students found to have at least mild symptoms of this condition.¹⁴ Knopf D. et al¹³ also reported anxiety in 10 percent of adolescents which was quite lower than the present study but another author⁹ reported 30% anxiety and

18% psychosis and 39% mood disorders in adolescents. The present study reports much higher proportion that may be because of the reason that here each symptom of these disorders was considered as psycho-disorders.

In the present study it was also revealed that Anxiety was found to be associated with Depression and Depression with Psychosis but Anxiety and Psychosis was not found to be associated. Well comparable observations were made by other authors^{13,14}.

The single most disturbing potential consequence of adolescent mental disorders is suicide, which was observed in 11.3% of students in the present study. This suicidal tendency was found to be associated with depression in the present study. Menon V et al¹⁵ also observed association between high intent of suicide in young is associated with psychiatric morbidity and presence of hopelessness. Although suicide can have multiple causes, 90 percent of adolescents who commit suicide had a diagnosable mental disorder, and up to 60 percent of them were suffering from depression at the time of their death.¹⁶

It was also depicted from this study that however religion, caste and type of family was not associated with type of psycho-wellness zone but there were significantly more females, middle class students and students who have attempted PMT more times were in red and orange zone. Almost similar observations were made by other authors. Nair MK et al¹⁷ reported Adolescent girls were at risk of developing Social Anxiety Disorder (SoAD) (adjusted OR = 1.69). Level of education had a protective influence on SoAD (adjusted OR = 0.59). Swarnalatha N et al¹⁸ reported more depression was in female sex and low socio-economic status.

Findings similar to those of the current study were also observed in the studies conducted by Goswami et al¹⁹ and Jain RK et al,²⁰ who also reported female predominance in psycho-morbidity.

V. CONCLUSION

More than one fourth of students were in red zone of psycho-wellness and about one sixth were in orange zone. Suicidal tendency was also found in more than one tenth of students. Anxiety was found to be associated with Depression and Depression was associated with Psychosis. Psycho-morbidity was found predominantly in females, middle class students and students who have attempted PMT more times.

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Handwritten Character Recognition – A Review

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Abstract- In the field of pattern recognition, HCR is one of the most intricate and tricky area. Plenty of works were proposed for foreign languages but a few works exists for south Indian languages due to the complex shape and varying writing styles of individuals. This paper introduces a review of offline and online recognition of different natural languages. HCR is an optical character recognition, which convert the textual document in to machine readable format. To attain 99.9 % accuracy in the field of HCR is very difficult. The efficiency of HCR depend the features extracted and the classifier used.

Index Terms- Adaboost, Artificial Neural Network, Contourlet, Curvelet, Gabor filter, K-Nearest Neighbor, MQDF, Ridgelet, Support Vector Machine.

I. INTRODUCTION

Reading of written or printed document is easy for human being, this ability can be induced in machine using OCR (Optical Character Recognition) technique. OCR is the identification of both handwritten and printed document using computer. In OCR technique, digital camera or a scanner is used to capture different types of documents like paper documents, PDF files and character images and convert all these documents into machine editable format like ASCII code.

Advantage of OCR systems is that it can reduce the data entry time, storage space required by documents. Fast retrieval is an alternative advantage. OCR can be used in diverse fields like banking field where checks can be processed without human interruption and to digitize paper documents in legal industries.

OCR can be classified into two categories based on text type and acquisition of documents (Figure 1). On the basis of text type OCR is of two types HCR, (Handwritten Character Recognition) recognition of intelligible handwritten input from source such as paper documents and PCR, (Printed Character Recognition) recognition of printed documents. Main reason for high recognition complexity in HCR is due to the varying writing styles of different peoples. Even in same individual also the writing style and format are different. OCR is divided in to Off-line and On-line recognition systems based on acquisition of documents. In Off-line systems already written document is scanned and is taken as input for recognition. But in the case of On-line systems character is recognized at the time of writing, where characters are captured by a tablet digitizer. Electronic pen is used to write the character on the digitizer and based on the pen movement character can be recognized.

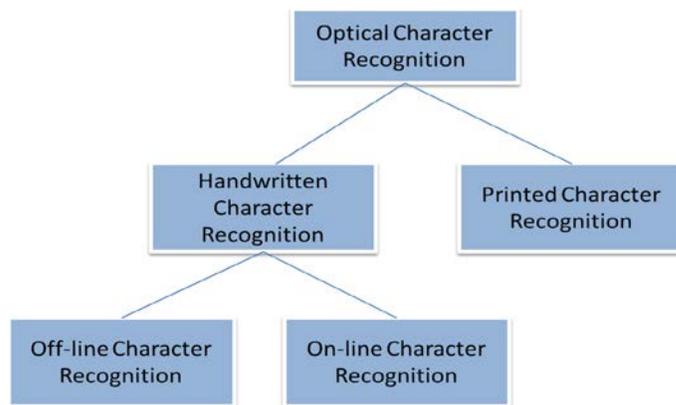


Figure 1. Classification of Optical Character Recognition

Stages of OCR systems broadly divided in to pre-processing, segmentation, feature extraction and classification (Figure 2).

A. PREPROCESSING

Preprocessing is an important step in character recognition, which includes noise removal, binarization, skeletonization and normalization [14].

Noise removal

Noise is the unwanted intensity values in an image that has no significance in the output. Different types of noises such as impulse noise, gaussian noise, speckle noise and photon noise are added to the character image during image acquisition. Noise removal is the technique required to eliminate this unwanted bit patterns. Linear and non linear filtering can be used for noise removal. Median filter is a non linear filter very effective in removing salt and pepper noise, which is an impulse noise present in image as small black and white dots [19]. Median filter sort all the pixels in a particular area and replace the centre pixel with the median of sorted values.

Binarization

Process of converting color or gray scale image into bilevel image. Local and global thresholding is the method used for binarizing an image. In local thresholding different threshold values are chosen but for global thresholding a single value is used. Otsu is the global thresholding used which iteratively determine all possible threshold values and find out there

variance. The optimal threshold is chosen in such a way that which has minimum interclass variance.

Skeletonization

It is a morphological operation which converts the image in to one pixel wide representation without affecting their connectivity. Thinning required to obtaining the skeleton of an image by eliminating pixels that have more than two neighbours.

Normalization

Process of converting image into some standard form. Normalization includes size and skew normalization [18]. Size normalization converts image in to fixed size. Bilinear and bicubic interpolation can be used. Skew may introduce in the image at the time of scanning, which is the deviation of text from base line. To align this text skew detection and corrections are required.

B. SEGMENTATION

Segmentation is the process of converting input image in to individual characters. Which include line segmentation, word segmentation and character segmentation.

C. FEATURE EXTRACTION

Feature extraction is the main phase in character recognition. Which extract most relevant features. Recognition accuracy is mainly depends on extracted features. Different feature extraction methods described are Contourlet transform [6][1], Ridgelet transform [2], Curvelet transform [7][8], Gabor filter [10][4], Directional features [17][3], Gradient and curvature [9], Gradient alone is used as feature in [12][1], zonal feature [18][5], Count, position of horizontal and vertical intensity lines [16] and boundary tracing [15].

D. CLASSIFICATION

Classification is the decision making stage of character recognition. The extracted features are used for recognizing characters. The classification of relevant features are done by using different classifier that are neural network [1][4][13][16][5], SVM [2][9][10][12], MQDF [3], Adaboost [6], KNN [7][8][11], Multilayer perceptron [14], Decision tree [15], Genetic algorithm [17].

II. LITERATURE REVIEW

This section gives a review of Handwritten Character Recognition in different languages. A brief sketch of preprocessing, feature extraction and classification methods for several works are summarized below.

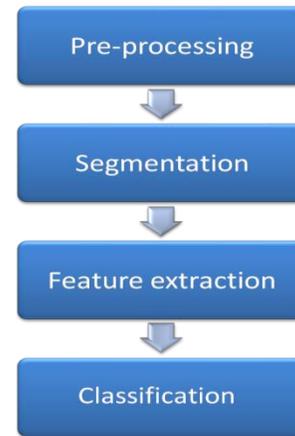


Figure 2. Stages of Optical Character Recognition

- 1) Global thresholding is used to convert the input image in to bilevel form. Erosion, dilation and thinning are the morphological operations. To obtain the skeleton thinning is used. Line segmentation, word segmentation and character segmentation used for segmenting input image in to individual characters. After all these preprocessing the character image is given to the feature extraction phase for extracting relevant features. Contourlet transform is the feature extraction method. Total 32 features are obtained by four level decomposition of Contourlet, aspect ratio, ratio of horizontal and vertical grid values. The extracted features are classified by feed forward neural network. Using the 32 features yield 97.3% accuracy.
- 2) Hassiba Nemmour et al [2] had taken care of handwritten Arabic word recognition. Two approaches for word recognition such as analytic and holistic approaches are explained. Ridgelet transform is used for feature extraction. Advantage of using ridgelet is to highlight the line singularities in the handwritten words. SVM is used as the classifier. This work gives 84% efficiency.
- 3) Bindu S Moni et al [3] presented Malayalam character recognition based on modified quadratic classifier and directional features. The preprocessing method used is the size normalization to convert the image in to 72 X 72. To decompose the character image in to blocks or zones meshing technique is introduced. The normalized image is taken for feature extraction and directional features are obtained by applying sobel mask. MQDF is the classifier used. Recognition efficiency of 95.32% is obtained.

AUTHOR	PREPROCESSING	FEATURE EXTRACTION	CLASSIFICATION	ACCURACY
Aji George [1]	Noise removal, Binarization, Skeletonization and Normalization	Contourlet transform	Feed Forward Neural Network	97.3%
Hassiba Nemmour [2]	NA	Ridgelet transform	SVM	84%
Bindu S Moni[3]	Size Normalization	Directional Features	MQDF	95.32 %
Nusaibath C[4]	Binarization And Skeletonization	Gabor Filtering	Neural Network	96.80%.
Pritpal Sigh[5]	Binarization And Normalization	Zonal Density, Aspect Ratio	Multi Layer Neural Network	88.8%
G Y Chen[6]	Normalisation	Contourlet Transform	Adaboost	NA
Mamatha HR[7]	Binarisation And Thinning	Curvelet Transform	KNN	90.5%.
Angshul Majumdar [8]	Thinning And Thickening	Curvelet	KNN	96.80%
Jomy John [9]	NA	Gradient And Curvature	SVM	NA
Sukhpreet Singh [10]	Noise Removal, Skew Correction And Skeletonization	Gabor Filter	SVM	94.29%
Alvaro Gonzalez [11]	NA	Gradient Feature	KNN	85.8%.
Ashutosh Aggarwal [12]	Binarization, Noise Removal And Skeletonization	Gradient	SVM	94%
Karanbir Kaur[13]	Cropping, Binarization	40-Point Feature Extraction	ANN	NA
Anita Pal[14]	Skeletonization And Normalization	Boundary Tracing Along With Fourier Descriptor.	Multilayer Perceptron Network	NA
Abdul Rahiman M [15]	Noise Removal, Skeletonization	Count And Position Of Vertical And Horizontal Lines	Decision Tree	NA
Sumedha B. Hallale [16]	Noise Removal, Skeletonization And Normalization	Directional Features	Neural Network	NA
Vedprakash Agnihotri [17]	Binarization, Noise Removal, Edge Detection And Dilation	Zonal Feature	Genetic Algorithm.	NA

- 4) Nusbath C et al [4] in offline handwritten character recognition the input image is acquired by digital camera and scanner. Preprocessing is done to correct the input image, binarization and skeletonization is used for this purpose. Line segmentation, word segmentation and character segmentation are used to segment the characters. Most relevant features are identified by Gabor filtering. Additional features taken are aspect ratio, ratio of horizontal and vertical grid values. Neural network is used for classification. Recognition efficiency obtained is 96.80%.
- 5) Pritpal Singh et al [5] presented handwritten character recognition for Gurumukhi numerals. Here the stages of character recognition include preprocessing, feature extraction and classification. The filtered image binarised and normalized to 32 X 64. Features are taken as the wavelet coefficients. In addition to this wavelet feature zonal features are also consider here. Zonal density is obtained by dividing the normalized image in to 16 zones. Aspect ratio is the final feature value for making the feature vector. Multi layer neural network that uses back propagation algorithm as the classifier. Recognition rate of 88.8% is obtained.
- 6) G Y Chen et al [6] suggested invariant pattern recognition. Invariant means features must be independent. Features that are invariant under translation, rotation, scaling is obtained by Fourier transform. For palm print classification Contourlet transform extract the features and invariant feature is obtained by taking Fourier of the Contourlet coefficients. Classifier used is the adaptive classifier Adaboost. For handwritten numerals also Fourier is applied to Contourlet coefficients and invariant features are classified using Adaboost.
- 7) Mamatha H R et al [7] is the recognition of Kannada numerals. Kannada is the official language of state Karnataka. It is derived from the southern Bramhi lipi. To preprocess the image binarisation and thinning done. To overcome the limitations of wavelet a new approach is introduced called curvelet transform. So the features are curvelet coefficients and standard deviation is the dimension reduction technique. For the classification of characters KNN used. This paper gives accuracy of 90.5%.
- 8) Angshul Majumdar et al [8] focus on the recognition of Bangali characters. Curvelet coefficients are taken as the feature values. Here two thinned and thickened version of the image is considered. The fundamental concept is that if the character can't recognize with original image it will be recognized with morphologically altered variations. For testing and training five variations of input image is taken and classified using KNN. Overall accuracy of 96.80% is obtained.
- 9) Jomy John et al [9] propose a handwritten character recognition system for Malayalam language. Gradient and curvature are calculated in feature extraction. Directional information from the arc tangent of gradient is used as gradient feature. Strength of gradient in curvature direction is used as the curvature feature. It uses a combination of gradient and curvature feature in reduced dimension as the feature vector. Support Vector Machine used as classifier.
- 10) Sukhpreet Singh et al [10] propose Handwritten Gurumukhi character recognition for isolated characters. The preprocessing stage reduces noise and distortion, removes skewness and performs skeletonization of the image. Word segmentation and character segmentation is used as segmentation stages. Gabor Filter based methods are used for feature extraction. The extracted features are given to SVM for classification and achieves accuracy of 94.29%
- 11) Alvaro Gonzalez et al [11] presents an easy and fast method to recognize individual characters in images of natural scenes that is applied after locating text on such images. Feature can be extracted by using Gradient feature. The recognition is based on a gradient direction feature. KNN for classification. The efficiency of this work is 85.8%.
- 12) Ashutosh Aggarwal et al [12] propose a method for Isolated Handwritten Devanagari Character Recognition. Binarization, noise removal and skeletonization are used as preprocessing steps. Thresholding is used as binarization, median filter used for salt and pepper noise removal. Horizontal and vertical segmentations are used to select individual character. Gradient methods are used as Feature Extraction. The obtained feature is passed to SVM for classification. It gives the recognition efficiency of 94%.

- 13) Karanbir Kaur et al [13] had taken care of English handwritten character recognition. Introduce image cropping, gray the image and binarization as preprocessing steps. 40-point feature extraction is introduced for extracting the features of the handwritten alphabets. ANN is used for classification.
- 14) Anita Pal et al [14] focus on the recognition of English handwritten character using neural network. Input character is acquired by scanning. Skeletonization and normalization are used as preprocessing steps. The features are extracted from the handwritten character by using boundary tracing along with Fourier Descriptor. Multilayer Perceptron Network is used for the classification of extracted feature.
- 15) Abdul Rahiman M et al[15] introduces Malayalam handwritten character recognition by using vertical and horizontal line positional analyzer algorithm. Image were acquired by scanning is converted to gray scale. Noise removal, skeletonization are used for preprocessing. Line segmentation and character segmentation are used to separate individual character. Count and position of vertical and horizontal lines are taken as relevant features. The characters are classified based on the extracted feature using decision tree.
- 16) Sumedha B. Hallale et al [16] had taken care of directional feature extraction for handwritten character recognition. Noise removal, skeletonization and normalization are used as preprocessing to prepare the input image. Directional features are extracted using sobel mask. Relevant feature extracted are given to neural network for classification.
- 17) VedPrakash Agnihotri et al [17] Presented zone based features for the recognition of Devanagari script. Enhance the input image using binarization, noise removal, edge detection and dilation. For getting the zonal feature divide the enhanced image in to 54 equal zones. So 54 features are obtained from each character. The extracted features are classified using genetic algorithm.

III. CONCLUSION

This paper presents detailed review of character recognition in different languages and studies various algorithms for recognition. From this review it can be observed that recognition

accuracy depends on the feature extraction and classification methods used. The best recognition accuracy was reported for [1], uses Binarization, Noise removal, Skeletonization and Normalization as preprocessing methods. Contourlet extract the significant features and are classified using feed forward neural network.

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Availability model for a consecutive-k-out-of-n:F system of non-identical components with fuzzy rates

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Abstract- In this paper availability model for a linear (circular) consecutive-k-out-of-n:F system (or C(k, n:F) system) of non-identical components has been considered. It is assumed that both the working time and repair time of each component are Rayleigh distributed. The estimate of the parameters from the Rayleigh distribution can be represented by triangular fuzzy numbers. A numerical example is solved to demonstrate the procedure clarifying the theoretical development.

Keywords - Linear (circular) C(k, n:F) system ; availability; Rayleigh distribution; fuzzy rates.

I. INTRODUCTION

Redundancy is used in design to improve system availability.

A linear (circular) C(k, n :F) system is one kind of systems with redundancy. Suppose that n components are linearly (circularly) connected in such a way that the system fails if and only if at least k consecutive components fail. The C(k, n :F) system (both linear and circular) include the series and the parallel systems as special cases. For example, when k=n the linear and circular C(k, n :F) system becomes the series system, and when k=1, the linear and circular C(k, n :F) system becomes the parallel system. The problem of evaluating the reliability of the C(k, n:F) system has been the subject of many paper [1-5]. Though various studies of the C(k, n:F) system structure, have been reported in the literature, little attention has been paid to such systems that are repairable [6-10]. consecutive system. Sharifi and Moosakhani [12] works on a system with two element with constant and increasable fuzzy. Study a repairable consecutive-k-out-of-n:F system with fuzzy states introduced by Guan and Yueqin [13]. El-Damcese and Temraz [14] use a model for a k-out-of-n: F system that consists of n independent and identical components connected in parallel using non-homogeneous/ homogeneous continuous-time Markov chain.

This paper presents a procedure for computing intervals for the availability model for a linear (circular) C(k, n:F) system of non-identical components. An analysis of the life time and the repair time of the each component follow Rayleigh distribution. Fuzzy rates are used to model the uncertainty in the system availability. The estimated these fuzzy numbers using random samples.

II. AVAILABILITY OF COMPONENT

The transition diagram of the component failure rate $\lambda(t)$ and repair rate $\mu(t)$ is shown in Figure 1.

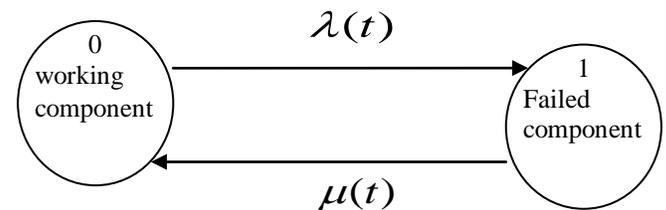


Figure 1. The transition diagram of the component

The Kolmogorov differential equation corresponding to continues time Markov chain of component availability associated with Figure 1 is

$$\frac{d}{dt} P_0(t) = -\lambda(t) P_0(t) + \mu(t) P_1(t) \tag{1}$$

Since $P_0(t) + P_1(t) = 1$, we have

$$\frac{d}{dt} P_0(t) = -(\lambda(t) + \mu(t)) P_0(t) + \mu(t) \tag{2}$$

Consider that the life and repair times follow Rayleigh distribution, so the (failure/repair) rates are given by the following relation:

$$\lambda(t) = \frac{t}{\alpha^2} \text{ and } \mu(t) = \frac{t}{\beta^2} \quad t \geq 0, \alpha, \beta > 0$$

Assuming $P_0(0) = 1$, then equation (2) can be solved to obtain the availability of component at time t:

$$A(t) = p_0(t) = \frac{1}{\alpha^2 + \beta^2} \{ \alpha^2 + \beta^2 \}$$

$$\times \exp\left[-\frac{1}{2}\left(\frac{\alpha^2 + \beta^2}{\alpha^2 \beta^2}\right)t^2\right] \quad (3)$$

III. THE AVAILABILITY OF THE LINEAR (CIRCULAR)
 C(k, n:F) SYSTEM

The availability of the linear C(k, n:F) system composed of non-identical components associated with [15] is given by

$$A_{line}(t; k, n) = \sum_{i=0}^{k-1} \sum_{j=r}^m \left[\prod_{l \in S_{b,j}^i} (1 - A_l(t)) \right] \left[\prod_{l \in S_{g,j}^{n-i}} A_l(t) \right] + \sum_{i=k}^M \sum_{j=r'}^{m'} \left[\prod_{l \in S_{b,j}^i} (1 - A_l(t)) \right] \left[\prod_{l \in S_{g,j}^{n-i}} A_l(t) \right] \quad (4)$$

with

$$A_l(t) = \frac{1}{\alpha_l^2 + \beta_l^2} \{ \alpha_l^2 + \beta_l^2 \times \exp\left[-\frac{1}{2}\left(\frac{\alpha_l^2 + \beta_l^2}{\alpha_l^2 \beta_l^2}\right)t^2\right] \} \quad (5)$$

$$r = \sum_{z=0}^{i-1} \binom{n}{z}, \quad m = \sum_{z=1}^i \binom{n}{z},$$

$$r' = \sum_{z=0}^{i-1} N(z, k, n), \quad m' = \sum_{z=1}^i N(z, k, n)$$

and

$$N(z, k, n) = \begin{cases} 0 & , z > M \\ \binom{n}{z} & , 0 \leq z \leq k - 1 \\ \sum_{w=0}^{\lfloor \frac{z}{k} \rfloor} (-1)^w \binom{n-z+1}{w} \binom{n-wk}{n-z} & , k \leq z \leq n \end{cases} \quad (6)$$

where

$A_l(t)$ is the availability of component l at time t ,

$S_{b,j}^i$ denote b^{th} bad component that belonging to state j with i bad components and $(n - i)$ good components,

$S_{g,j}^i$ denote g^{th} good component that belonging to state j with i bad components and $(n - i)$ good components,

M is the maximum number of total components failures that a Linear C(k, n:F) system may experience without being failed,

$\binom{n}{z}$ number of combinations of z items out of possible n ,

$\lfloor z/k \rfloor$ smallest integer less than or equal to z/k .

Where $A_{line}(t; k, n)$ indicates the availability of the linear C(k, n:F) system. This equation reduces a circular system availability evaluation problem into a linear system availability evaluation problem.

For any $A_{line}(t; k, n - z - 2)$, $0 \leq z \leq k - 1$ may be evaluated with equation (4) or other recursive equations to be introduced later.

The availability of the circular C(k, n:F) system is equal to the probability that there is a run of exactly i failures covering the selected point and the remaining $n-z-2$ components form a working linear C(k,n:F) system, where i may take values from 0 to $k-1$. A direct combinatorial approach is also available for the circular C(k, n:F) systems. Similar to equation (4) the following general equation can be used.

$$A_C(t; k, n) = \sum_{i=0}^{k-1} \sum_{j=r}^m \left[\prod_{l \in S_{b,j}^i} (1 - A_l(t)) \right] \left[\prod_{l \in S_{g,j}^{n-i}} A_l(t) \right] + \sum_{i=k}^d \sum_{j=r''}^{m''} \left[\prod_{l \in S_{b,j}^i} (1 - A_l(t)) \right] \left[\prod_{l \in S_{g,j}^{n-i}} A_l(t) \right] \quad (7)$$

with

$$r'' = \sum_{z=0}^{i-1} N_C(z, k, n), \quad m'' = \sum_{z=1}^i N_C(z, k, n)$$

Where d is the maximum number of failed components that may exist in the system without causing the system to fail and $N_C(z, k, n)$ is the number of ways of arranging n components including z failed ones in a circle such that at most $k-1$ failed ones are consecutive.

Using the same approach as for the linear system, we can derive the value of M as follows. If n is a multiple of k , then

$$d = \frac{n}{k}(k-1) = n - \frac{n}{k}, \quad , \delta = \alpha, \beta, l=1, 2, \dots, n \quad (11)$$

If n is not a multiple of k, then,

$$d = \left\lfloor \frac{n}{k} \right\rfloor (k-1) + (n-1 - \left\lfloor \frac{n}{k} \right\rfloor k) = n-1 - \left\lfloor \frac{n}{k} \right\rfloor$$

In summary, we have

$$d = \begin{cases} n - \frac{n}{k} & \text{if } n \text{ is a multiple of } k, \\ n - \left\lfloor \frac{n}{k} \right\rfloor - 1 & \text{if } n \text{ is not a multiple of } k. \end{cases} \quad (8)$$

the factor $N_C(z, k, n)$ can be expressed in terms of $N(z, k, n)$ which is for the linear systems, as given in the equation

$$N_C(z, k, n) = \frac{n}{n-z} N(z, k, n-1), \quad k \leq z \leq n-1 \quad (9)$$

IV. ESTIMATION OF THE (FAILURE/ REPAIR) RATES FOLLOW RAYLEIGH DISTRIBUTION

Consider that the life and repair times follow Rayleigh distribution, so the (failure/repair) rates with the MLE of the Rayleigh parameter are given by the following relation:

$$\hat{\lambda}_l(t) = \frac{t}{(\alpha_l^M)^2} \quad \text{and} \quad \hat{\mu}_l(t) = \frac{t}{(\beta_l^M)^2} \quad l = 1, 2, \dots, n$$

where

$$\delta_l^M \square = \sqrt{\sum_{i=1}^q X_i^2 / 2q} \quad \delta = \alpha, \beta, l=1, 2, \dots, n \quad (10)$$

If q, the size of random sample, is large ($q \geq 30$) then the $(1-\gamma)100\%$ confidence interval for each parameter $\alpha_l, \beta_l, l=1, 2, \dots, n$ can be calculated from the following relations:

$$[\delta_l^L, \delta_l^U] = \left[\delta_l^M \mp Z_{\gamma/2} \sqrt{\text{var}(\delta_l^M)} \right]$$

where

$$\text{var}(\delta_l^M) = \frac{(\delta_l^M)^2}{4q}$$

V. THE ESTIMATION OF FUZZY FAILURE AND REPAIR RATES

Usually, the failure rate and the repair rate of a component “ l ” have known probability distribution functions with parameters α_l, β_l driven from collected data or the opinions of the experts. Due to uncertainty in the values of these parameters, they can be modeled by triangular or trapezoidal fuzzy numbers. Here, we use the triangular membership functions

$$\tilde{\alpha}_l = (\tilde{\alpha}_l^L, \tilde{\alpha}_l^U), \tilde{\beta}_l = (\tilde{\beta}_l^L, \tilde{\beta}_l^U) \quad \text{which can written as follow:}$$

$$\eta_{\tilde{\delta}_l}(x_l) = \text{triangle}(x_l; \delta_l^L, \delta_l^M, \delta_l^U) = \begin{cases} (x_l - \delta_l^L) / (\delta_l^M - \delta_l^L), & \delta_l^L \leq x_l \leq \delta_l^M \\ (\delta_l^U - x_l) / (\delta_l^U - \delta_l^M), & \delta_l^M \leq x_l \leq \delta_l^U \\ 0, & \text{otherwise} \end{cases} \quad (12)$$

The fuzzy parameters $\tilde{\alpha}_l, \tilde{\beta}_l$ can be represented by crisp intervals, taking from the α -cuts of their membership functions; $0 < \alpha < 1$ as follow:

$$\tilde{\delta}_l(\alpha) \square = \left[\tilde{\delta}_l^L(\alpha), \tilde{\delta}_l^U(\alpha) \right] = \left[\delta_l^L + \alpha (\delta_l^M - \delta_l^L), \delta_l^U - \alpha (\delta_l^U - \delta_l^M) \right] \quad (13)$$

VI. ILLUSTRATIVE EXAMPLE

In this example, consider the availability of linear (circular) C(2,4:F) system of non-identical components with life time and the repair time of this system follow Rayleigh probability distributions. The parameters can be represented by triangular fuzzy numbers.

The availability of linear C(2,4:F) system of non-identical components of equations (4) to (6) can be obtained from the following relation:

$$A_{line}(t; 2, 4) = \prod_{l=1}^4 A_l(t) + \sum_{l=1}^4 (1 - A_l(t)) \left[\prod_{\substack{v=1 \\ v \neq l}}^4 A_v(t) \right]$$

$$+ A_1(t)A_3(t)\left[\prod_{\substack{v=2 \\ v \neq 3}}^4 (1 - A_v(t))\right] + A_2(t)A_3(t)(1 - A_1(t)) \\ \times (1 - A_4(t)) + A_2(t)A_4(t)(1 - A_1(t))(1 - A_3(t))$$

The availability of circular C(2,4:F) system of non-identical components of equations (7) to (9) can be obtained from the following relation:

$$A_C(t;2,4) = \prod_{l=1}^4 A_l(t) + \sum_{l=1}^4 (1 - A_l(t)) \left[\prod_{\substack{v=1 \\ v \neq l}}^4 A_v(t) \right]$$

$$+ A_1(t)A_3(t)\left[\prod_{\substack{v=2 \\ v \neq 3}}^4 (1 - A_v(t))\right] + A_2(t)A_4(t)(1 - A_1(t))(1 - A_3(t))$$

where

$$A_l(t) = \frac{1}{\alpha_l^2 + \beta_l^2} \{ \alpha_l^2 + \beta_l^2 \\ \times \exp[-\frac{1}{2}(\frac{\alpha_l^2 + \beta_l^2}{\alpha_l^2 \beta_l^2})t^2] \}, \quad l=1, 2, 3, 4$$

The statistical data of $\alpha_l, l = 1, 2, 3, 4$ taken from each component with $\gamma = 0.05, 0.03, 0.07, 0.03$, $q=70, 70, 50, 50$ and $\sum_{i=1}^q X_i^2 = 1220, 1100, 1000, 920$ respectively, also the statistical data of $\beta_l, l = 1, 2, 3, 4$ taken from each component with $\gamma = 0.075, 0.045, 0.065, 0.040$, $q=36, 36, 40, 40$ and $\sum_{i=1}^q X_i^2 = 800, 700, 850, 720$ respectively. The values of their lower, medium, and upper limits are calculated according to equations (10) and (11), we can obtain

$$\begin{aligned} (\alpha_1^L, \alpha_1^M, \alpha_1^U) &= (2.606, 2.95, 3.296), \\ (\alpha_2^L, \alpha_2^M, \alpha_2^U) &= (2.603, 3.028, 3.452) \\ (\alpha_3^L, \alpha_3^M, \alpha_3^U) &= (2.757, 3.162, 3.567), \\ (\alpha_4^L, \alpha_4^M, \alpha_4^U) &= (2.704, 3.197, 3.690) \end{aligned}$$

And

$$\begin{aligned} (\beta_1^L, \beta_1^M, \beta_1^U) &= (2.844, 3.333, 3.822), \\ (\beta_2^L, \beta_2^M, \beta_2^U) &= (2.792, 3.416, 4.039) \\ (\beta_3^L, \beta_3^M, \beta_3^U) &= (2.786, 3.260, 3.734), \\ (\beta_4^L, \beta_4^M, \beta_4^U) &= (2.714, 3.303, 3.892) \end{aligned}$$

According to the relation (13), we can obtain the $\alpha\text{-cut} = 0, 0.1, 0.2$ of the (α_l^L, α_l^U) , and (β_l^L, β_l^U) , for $l=1, 2, 3, 4$.

Table 1. The intervals for $\tilde{\alpha}_l$ and $\tilde{\beta}_l$ for $l=1, 2, 3, 4$ corresponding to $\alpha\text{-cut} = 0, 0.1, 0.2$

$\alpha\text{-cut}$	$(\tilde{\alpha}_1^L, \tilde{\alpha}_1^U)$	$(\tilde{\alpha}_2^L, \tilde{\alpha}_2^U)$	$(\tilde{\alpha}_3^L, \tilde{\alpha}_3^U)$	$(\tilde{\alpha}_4^L, \tilde{\alpha}_4^U)$
0	[2.606, 3.298]	[2.603, 3.452]	[2.757, 3.567]	[2.704, 3.690]
0.1	[2.641, 3.26]	[2.646, 3.412]	[2.798, 3.409]	[2.753, 3.641]
0.2	[2.681, 3.23]	[2.698, 3.369]	[2.838, 3.369]	[2.803, 3.591]
$\alpha\text{-cut}$	$(\tilde{\beta}_1^L, \tilde{\beta}_1^U)$	$(\tilde{\beta}_2^L, \tilde{\beta}_2^U)$	$(\tilde{\beta}_3^L, \tilde{\beta}_3^U)$	$(\tilde{\beta}_4^L, \tilde{\beta}_4^U)$
0	[2.844, 3.822]	[2.792, 4.039]	[2.786, 3.734]	[2.714, 3.892]
0.1	[2.894, 3.773]	[2.854, 3.967]	[2.833, 3.687]	[2.773, 3.833]
0.2	[2.942, 3.724]	[2.917, 3.914]	[2.881, 3.639]	[2.832, 3.774]

By using the intervals for $\tilde{\alpha}_l$ and $\tilde{\beta}_l$ corresponding to $\alpha\text{-cut} = 0, 0.1, 0.2$ from Table 1, then represent graphically the two functions $A_{line}(t;2,4)$ and $A_C(t;2,4)$ at different values of $\alpha\text{-cut}$ as shown in Figures 2 and 3.

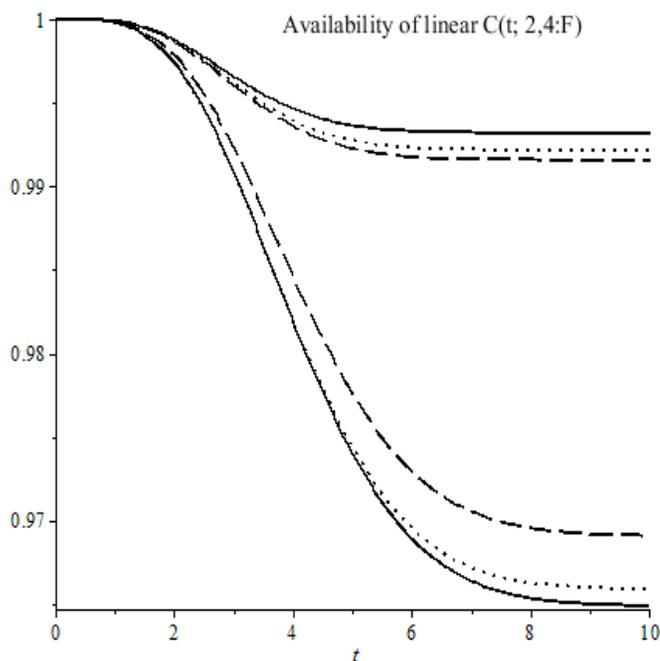


Figure 2. The $A_{line}(t;2,4)$ for $\alpha\text{-cut} = 0$ (solid line), $\alpha\text{-cut} = 0.1$ (dotted line), $\alpha\text{-cut} = 0.2$ (dashed line)

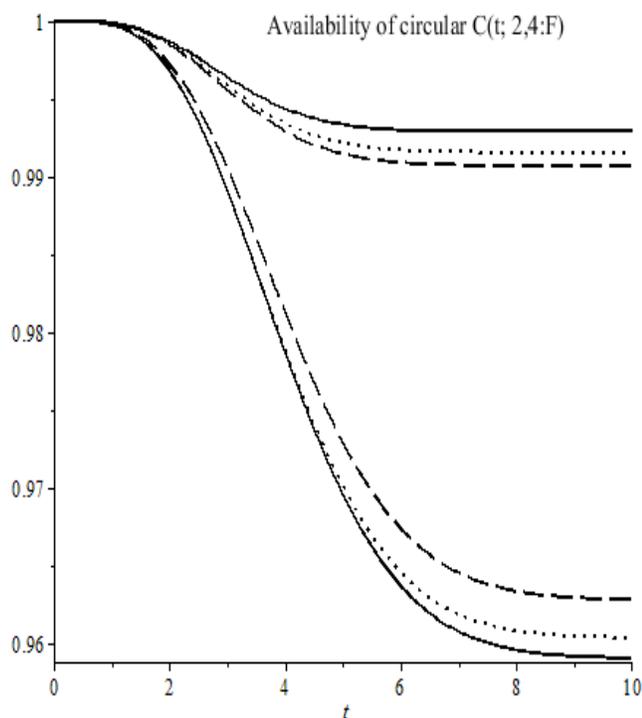


Figure 3. The $A_C(t;2,4)$ for $\alpha\text{-cut} = 0$ (solid line), $\alpha\text{-cut} = 0.1$ (dotted line), $\alpha\text{-cut} = 0.2$ (dashed line)

VII. CONCLUSION

Consecutive-k-out-of-n system models have been proposed for system availability evaluation and the design of integrated circuits, microwave relay stations in telecommunications, oil pipeline systems, vacuum systems in accelerators, computer ring networks (k loop), and spacecraft relay stations. Such systems are characterized by logical or physical connections among components in lines or circles.

In this paper presents a model for the availability of linear (circular) $C(k,n:F)$ system of independent and non- identical components. The estimated parameters of the Rayleigh distribution of the proposed model are fuzzy and all the fuzzy numbers have triangular membership functions. Fuzzy rates are used to model the uncertainty in the availability system. This paper includes a numerical example to illustrate the model.

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Response of Some Rice Varieties to Different Crop Management Practices towards Morphological and Yield Parameters

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Abstract- The present investigation was undertaken with seven rice varieties to assess their responses to three management practices, namely System of Rice Intensification (SRI), Recommended Practice (RP) and Traditional Practice (TP) towards morpho-physiological and yield parameters. The results indicated that all the cultivars under study performed better under SRI as compared to other two practices with respect to different morphological and yield traits including grain yield. All the cultivars exhibited delayed panicle initiation, increased leaf area, leaf area index and leaf area duration under SRI practice as compared to other two cultivation practices. Among the varieties, PAC 837 recorded the highest grain yield (7.83 t/ha), followed by Arize 6444 (6.55 t/ha) and IR-64 (5.07 t/ha) under SRI practice.

Index Terms- System of Rice Intensification(SRI), Recommended cultivation Practice(RP), Traditional cultivation Practice(TP)

I. INTRODUCTION

The *System of Rice Intensification*, known as SRI -- *le Système de Riziculture Intensive* in French and *la Sistema Intensivo de Cultivo Arrocerero* (SICA) in Spanish -- is an agro-ecological [methodology](#) for increasing the productivity of irrigated rice by changing the management of plants, soil, water and nutrients.

Most simply, SRI is a set of concepts/principles/insights/practices that change the management of plants, soil, water & nutrients: (a) to produce larger, more effective, longer-lived root systems, and (b) to enrich the life in the soil to achieve more productive, healthier phenotypes from any genotype.

System of rice intensification (SRI) is not a fixed package of technical specifications but a system of production with four main components viz. soil fertility management, planting method, weed control and water management.

SRI yields are highly variable -- both between countries and within countries. This is because of the four factors contributing to rice production, not just the first two usually cited as follows.

- Genetic potential,
- Resource inputs (quantitative),
- Management of inputs (qualitative), and

- The abundance and diversity of soil biota, and their response to SRI management

Keeping the above in view the present work was taken on SRI to assess its performance in comparison to other traditional cultivation practices in relation to the productivity of rice crop under varied cultivation practices vis a vis varied cultivars.

II. MATERIALS AND METHODS

The field experiment was conducted in the Research Farm of the Krishi Vigyan Kendra, Arunachal, Silchar in *Rabi* season, and the laboratory works were carried out in the Soil Testing Laboratory, Silchar, and in the Department of Ecology and Environmental Science, Assam University, Silchar. The materials for the investigation consisted of seven rice varieties, out of which one is a traditional cultivar (Koilya Boro), four HYVs (Luit, IR-64, Dichang and MTU 1010) and two hybrids (PAC 837 and Arize 6444). All the seven varieties were grown under three management practices, namely, SRI, RP and TP. The experiment was laid out in a split plot design with three replications with a plot size of 5m X 4m. Under SRI practice, seedlings of 12-day old were raised in the seed bed with high organic matter and were transplanted at a spacing of 25cm X 25cm, while under RP, 21-days old seedlings were raised in standard seed beds and transplanted at a spacing of 20cm X 15cm. On the other hand, 30-day old seedlings raised in normal seed beds were transplanted traditionally at relatively closer spacing under TP. Transplanting was done at the rate of 1, 2-3 and 3-4 seedlings per hill for SRI, RP and TP, respectively. The field was kept moist throughout the growing period in case of SRI, while 5-10 cm water depth was maintained upto flowering stage in the plots managed through RP and normal available water level was maintained in the plots managed through TP. Ten plants from each plot were randomly chosen for recording observations on the six growth parameters (i.e plant height, root length, root to shoot ratio and root volume, number of tillers/ hill and per cent tiller mortality), three physiological parameters (i.e. days to panicle initiation, leaf area index and leaf area duration) and four yield traits (i.e. number of panicles/ m², number of grains/ panicle, 1000-grain weight and grain yield/ha.etc)

Plant height was measured with the help of a meter scale from the ground level to the apex of main axis. Root length was measured from root/shoot demarcation point to root tip according to the method of Sirohi *et al.* (1978). Root to shoot ratio was

calculated from the data on root and shoot length (cm) at different stages of growth. Root volume was determined by water displacement method used by Raja and Bishnoi (1990). Total number of tillers per plant was counted at maximum tillering and flowering stages of growth. Percent tiller mortality was calculated by the following formula:

$$\text{Tiller mortality (\%)} = 100 - \frac{\text{Number of tillers at flowering stage}}{\text{Number of tillers at maximum tillering stage}} \times 100$$

Days to panicle initiation was recorded as per the number of days taken for panicle initiation from the date of sowing. Leaf area index, which expresses the ratio of leaf surface (one side only) to the ground area occupied by the plant, was calculated using the formulae, suggested by Evans (1972). Similarly, Leaf area duration (LAD) was measured as leaf area index per unit of time and was calculated by Gardener *et al.* (1985)'s equation, $LAD = LAI \times M$, where, $M = \text{Number of days (crop growth period)}$. The data were analyzed following standard procedure (Kothari, 2004).

III. RESULTS AND DISCUSSION

Growth and morphological characters

Plant height, root length, root to shoot ratio and root volume recorded at 30 days after transplanting (DAP), 50 DAP and 70 DAP are presented in the Table 1. The results revealed that plant height was significantly lower in case of SRI practice at 30 DAP but it was significantly higher at 50 and 70 DAP in all the varieties. Similar results were also obtained in case of root length, root to shoot ratio and root volume. Among the varieties, Koiya Boro (a local variety) produced the tallest plants under SRI practice and exhibited minimum root to shoot ratio under TP. PAC 837, a hybrid variety recorded maximum root length and root volume, while, MTU 1010, a HYV recorded minimum root length and root volume under SRI and TP, respectively. Both the hybrids included in the present investigation exhibited highest root to shoot ratio under SRI practice. Observations recorded on number of tillers/ hill at two different stages, *viz.*, maximum tillering stage and flowering stage and on percent tiller mortality are presented in Table 2. Number of tillers per hill was found to be the highest for PAC 837 at both maximum tillering and flowering stages in all the three practices. However, the number of tillers was more in case of SRI practice as compared to other two practices for all the tested varieties. Per cent tiller mortality was found to be highest in case of var. Dichang under traditional practice and lowest in case of Koiya Boro and Arize 6444 under SRI. Sarath and Thilak (2004) also reported that the Dry weights of stem, leaf, and root and the total dry weight, leaf area and total root length per hill during the growing period and the tiller number per plant at heading were significantly higher in SRI compared to other treatments. Similar results were also reported by Zheng, 2004 for plant height and culm length and Krishna *et al.*, 2008 for number of tillers per plant.

Physiological parameters

The observations made on the days to panicle initiation, leaf area index (LAI) and leaf area duration (LAD) are presented in

the Table 3 . The results revealed that the panicle initiation was delayed significantly under SRI for all the tested varieties. Similarly leaf area index and leaf area duration were also found to be more in case of SRI followed by the recommended practice as compared to traditional practice. Variety wise PAC 837 exhibited delayed panicle initiation and maximum LAI and LAD under SRI practice, while, Dichang exhibited earliest panicle initiation, while Koiya Boro recorded minimum LAI and MTU 1010 recorded minimum LAD under traditional practice. Thakur *et al.*, 2011 also reported significant improvements in the morphology of SRI plants in terms of root growth, plant/Culm height, tiller number per hill, tiller perimeter, leaf size and number, leaf area index (LAI), specific leaf weight (SLW), and open canopy structure.

Yield attributing traits

Observations on the major yield parameters like number of panicles/m², number of grains per panicle, 1000-grain weight and grain yield/ha are presented in Table 4. The results revealed that like the growth and physiological parameters, all the varieties showed better performance in terms of yield attributing traits including grain yield under SRI practice, followed by recommended practice. Among the varieties tested PAC 837 produced the boldest grains with maximum number of panicles/m² and number of grains/ panicle. Highest grain yield was recorded with PAC 837 (7.83 t/ha), followed by Arize 6444 (6.05 t/ha), IR-64 (5.07 t/ha) under SRI practice, which could be attributed to their better performance in terms of yield attributing traits as well as growth and physiological parameters. Uphoff and Kassam (2009) reported that depending on their current yield levels, output per hectare was found to have increased usually by 50% or more, with increases of at least 20%, and sometimes 200% or more in case of SRI as compared to other practices. Kumar *et al.* (2010) also reported that significant differences were observed between the varieties under SRI. They observed that hybrids (4-42% yield advantage) performed better over the varieties (2-17%) under SRI as against ST. Since seed requirement is quite low in SRI, this could be the best method for cultivating hybrids, whose seed cost is relatively higher compared to HYVs. Lin *et al.* (2011) also reported that under intermittent water application as recommended with SRI management, grain yield increased by 10.5–11.3%, as compared to standard irrigation practice. The factor that contributed most to higher yield was increased number of grains per panicle under SRI treatment.

Based on the result presented above it can be suggested that SRI is more effective agronomical practice for higher production of rice in comparison to Recommended and traditional cultivation practices. The Hybrid varieties under study are more responsive to SRI than RP & TP with respect to yield and other parameters.

Table 1. Variation in growth and morphological characters for all the seven varieties under SRI.

Stages	30 DAP			50 DAP			70 DAP		
	Plant height (cm)								
Variety	SRI	RP	TP	SRI	RP	TP	SRI	RP	TP
Luit	26.67	39.67	38.00	88.00	86.00	82.00	110.00	108.00	102.33
IR-64	29.33	40.33	35.00	89.00	88.33	74.67	114.00	113.33	108.00
Dichang	28.67	38.00	34.33	90.67	84.67	75.33	116.33	110.67	107.00
Arize 6444	25.00	36.00	36.00	85.00	77.67	70.33	105.00	105.00	107.67
PAC 837	28.33	38.33	36.67	93.00	80.67	83.00	117.33	105.67	104.33
MTU 1010	33.33	43.33	40.00	92.67	90.00	78.00	121.67	120.33	116.33
Koiya Boro	31.33	48.33	45.67	104.00	104.00	100.00	131.33	125.00	122.33
CD _{0.05} (treat.)	1.860			3.563			1.650		
CD _{0.05} (var.)	1.418			1.800			3.128		
	Root length (cm)								
Luit	8.00	12.33	11.33	17.33	15.00	14.00	22.00	21.00	20.00
IR-64	8.67	12.00	11.00	17.67	15.33	14.33	22.67	20.00	19.00
Dichang	9.00	13.00	11.67	18.00	16.33	13.33	22.67	19.33	17.67
Arize 6444	7.67	11.00	12.00	16.33	14.00	13.67	23.33	22.67	20.00
PAC 837	8.00	11.67	9.00	19.00	15.00	15.00	25.33	20.00	20.00
MTU 1010	8.33	9.67	9.67	18.00	14.00	12.00	24.00	19.33	17.33
Koiya Boro	8.00	11.33	10.00	21.67	13.67	11.67	28.00	19.00	17.67
CD _{0.05} (treat.)	0.714			0.701			1.252		
CD _{0.05} (var.)	0.992			-			-		
	Root to shoot ratio								
Luit	0.30	0.31	0.30	0.20	0.17	0.17	0.20	0.19	0.20
IR-64	0.30	0.30	0.31	0.20	0.17	0.19	0.20	0.18	0.18
Dichang	0.31	0.34	0.34	0.20	0.19	0.18	0.19	0.17	0.17
Arize 6444	0.31	0.31	0.33	0.19	0.18	0.19	0.22	0.22	0.19
PAC 837	0.28	0.31	0.25	0.20	0.19	0.18	0.22	0.19	0.19
MTU 1010	0.25	0.22	0.24	0.19	0.16	0.15	0.20	0.16	0.15
Koiya Boro	0.26	0.23	0.22	0.21	0.13	0.12	0.21	0.15	0.14
CD _{0.05} (treat.)	-			0.016			0.011		
CD _{0.05} (var.)	0.03			0.018			0.015		
	Root volume (cc)								
Luit	17.70	26.83	25.30	43.57	37.87	35.73	52.77	50.57	48.10
IR-64	19.17	26.50	24.30	44.17	38.40	35.80	54.43	47.97	45.63
Dichang	20.03	28.23	25.97	44.80	40.47	33.37	54.57	46.37	42.43
Arize 6444	16.97	24.37	26.63	41.30	35.60	33.97	55.90	51.10	48.03
PAC 837	17.83	25.77	20.03	47.50	37.57	36.73	60.63	48.10	48.03

MTU 1010	18.57	21.50	21.63	44.67	35.00	30.33	57.47	46.43	41.63
Koiya Boro	17.50	25.10	22.10	53.97	34.17	28.40	67.03	45.63	42.50
CD _{0.05} (treat.)	0.154			0.131			0.33		
CD _{0.05} (var.)	0.211			-			-		

Table 2. Variation in number of tillers/hill and percent tiller mortality at different stages of crop growth for all the seven varieties.

Variety	Maximum tillering stage			Flowering stage			Per cent tiller mortality		
	SRI	RP	TP	SRI	RP	TP	SRI	RP	TP
Luit	27.33	24.00	20.33	21.00	16.67	16.00	23.15	30.53	21.00
IR-64	37.33	23.00	20.00	32.33	16.33	12.67	13.30	28.83	36.51
Dichang	28.00	24.33	19.67	23.33	17.00	12.33	16.86	30.18	37.14
Arize 6444	39.00	34.00	28.00	36.00	25.67	23.67	7.72	24.38	15.44
PAC 837	41.33	38.00	34.00	35.33	31.00	28.00	14.50	18.45	17.57
MTU 1010	37.67	23.33	18.33	29.33	16.33	12.67	21.74	29.90	30.90
Koiya Boro	22.33	20.33	18.67	17.33	17.00	15.00	5.36	16.48	19.36
CD _{0.05} (treat.)	2.032			1.606			4.257		
CD _{0.05} (var.)	1.501			1.422			4.133		

Table 3. Variation in physiological parameters like days to panicle initiation, LAI and leaf area duration for all the seven varieties.

Variety	Days to panicle initiation			LAI at max. tillering stage			Leaf area duration		
	SRI	RP	TP	SRI	RP	TP	SRI	RP	TP
Luit	69.00	66.33	64.67	1.64	1.61	1.58	172.35	164.27	158.24
IR-64	76.00	75.33	72.00	1.72	1.65	1.62	202.81	189.99	186.28
Dichang	63.00	62.33	61.67	1.68	1.66	1.58	158.21	154.78	145.51
Arize 6444	84.67	82.33	80.67	1.67	1.65	1.59	225.97	217.90	206.47
PAC 837	86.33	83.00	81.00	2.00	1.94	1.92	269.64	255.55	249.32
MTU 1010	65.67	66.67	64.33	1.40	1.39	1.36	153.95	149.78	142.66
Koiya Boro	85.67	86.00	84.67	1.35	1.31	1.29	189.16	179.20	174.38
CD _{0.05} (treat.)	1.928			0.026			2.627		
CD _{0.05} (var.)	1.888			0.043			5.106		

Table 4. Variation in yield attributing traits for all the seven varieties taken for experimentation.

Characters	No. of panicles/ sq.m.			No. of grains/ panicle			1000-grain weight (g)			Grain yield (t/ha)		
	Variety	SRI	RP	TP	SRI	RP	TP	SRI	RP	TP	SRI	RP
Luit	309.33	261.33	213.33	105.33	99.00	85.67	25.51	25.46	25.40	4.28	3.64	2.81
IR-64	442.67	229.33	181.33	111.67	98.00	90.67	26.52	25.43	25.31	5.07	4.08	3.55
Dichang	378.67	288.00	170.67	108.00	95.00	89.00	25.00	24.56	24.58	4.22	3.79	3.16
Arize 6444	490.67	298.67	272.00	128.67	115.00	106.33	26.98	25.68	25.76	6.05	5.03	4.56
PAC 837	544.00	293.33	266.67	130.67	117.33	106.67	28.24	27.03	26.89	7.83	6.29	5.70
MTU 1010	458.67	186.67	144.00	98.33	87.33	76.00	24.47	24.19	24.16	4.77	4.12	3.46
Koiya Boro	234.67	122.67	197.33	97.33	83.00	73.33	23.44	23.34	23.22	3.11	2.68	2.34
CD _{0.05} (treat.)	25.049			10.179			0.113			0.149		
CD _{0.05} (var.)	19.686			5.665			0.159			0.215		

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The Current Status of Physical Education Curriculum at high schools In Sudan

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Abstract- In this study we investigate the current status of physical education Curriculum in Sudanese High Secondary schools. The main tools for collecting data in this research are analyzing educational polices, Questionnaires and Interviews. Our questionnaire form contains 5 parts for our most important 18 items, and the sample size are 60 forms. The Cranach alpha coefficient for identification equals to 0.8570 which confirms the stability of resolution and suitability for use. The Statistical Software (SPSS) also used for analyzing our questionnaire data. We found that the main problem facing physical education and sport activities in Sudanese High Secondary schools is the absence of the special physical educations curriculum. In addition to that, the shortage in the textbook of physical education, and the scarcity of the physical education teachers at high schools.

Keywords - Sudan; Physical Education curriculum, high school; graduate Examination.

1. INTRODUCTION

Internally, Hussnia, 1981 studied the reasons for the delay of Physical Education in girls high schools in Sudan, where the researcher used the descriptive method. The sample consisted by normal manner from girls High schools students in Khartoum state, which included 24 High schools. The most important conclusions for Hussnia, 1981 were as follows: the negligence of the sports leaders, the physical education program did not take adequate attention of the officials and did not put any planning to it, the lack of capabilities which assist in achieving the progress in the subject whether equipment instrument. The most important recommendations mentioned by Hussnia, 1981 are: (i) Redistribution of the available number of the physical education teacher at high schools. (ii) To increase the number of physical education teachers in schools. (iii) To establish sunshades and providing inexpensive tools to teach students.

While Faruk, 2001 conducted an analytical study of some of the teachers of the physical education problems at high school in Sudan, by using the descriptive method survey and adopted a sample study on the community of teachers in high schools in Khartoum state. And the most important conclusions were as follows; lack of vocational training which resulted in teachers' ignorance of the modern techniques. Absence of training

facilities such as lack of training equipments, accessories and tools, devices, closed galleries and the lack of budgets. Attitudes of the community towards physical education. That the community more interested in Sports festival rather than school physical education. Furthermore, lack of interest from the part of the officials to develop the physical education profession. Faruk 2001, recommended that (i) The Ministry of Education must provide rehabilitation programs to improve the performance of physical education teachers, (ii) The Faculty of Education and Sports must reform the curricula and teaching methods to develop the professional performance of the Graduates, and (iii) The Faculty of Education and Sports construct sports facilities in high secondary schools and a quest to find sports facilities in created schools.

Recently Nawal 2004, studied the impediments to exercise the school sports activity for girls' high school students in Sudan by the determinants of participation and desired activities, using the descriptive method and survey method, also used the sample age of students in the state of Khartoum. She concluded that the time is not sufficient to carry out the teaching and receiving an adequate result. She kept saying that the physical education and school sports needed special care; and that human, material resources and information had to be provided because it is one of the most important obstacles for teaching and learning practice.

The most important recommendations of Nawal 2004, study were as follows: (i) the development of physical activity and school sports depended largely on the time factor, (ii) provision of school capabilities including the information potential and security and safety factors, and (iii) finally the physical education curriculum should enhance activities practised on the basis of team or individual work.

Secondly, at the regional and international level (Prick & Hantelman, 1986), studied the job satisfaction and time pressure using a linking descriptive approach. The study aimed to identify the public and private problems that might face teachers in both the Netherlands and Germany through the analysis of research reports obtained through the study. They compared between the teaching and other professions in terms of the problem that faced both teachers and other people. They also compared between the problems that faced teachers who had left their teaching profession and joined other fields of work. Beside this, they compared between all the problems experienced by current and former teachers. Prick & Hantelman (1986) recommended that comparative studies were needed in order to improve the

situation and conditions of teachers through revealing the problems teachers might face practising their teaching craft.

On the other hand (Mahmoud, 1987), studied the professional problems facing physical education teachers in high secondary schools in the Arab Republic of Egypt. His target was Giza region, and the study applied on a sample of 70 teachers who were selected randomly from 13 boys high secondary schools in Giza Governorate. He depended on a list of the professional problems taken from Ismail Hamid Osman. The list represented the problems face physical education teachers in Egypt. Mahmoud (1987) used the descriptive method to analyze the data. The main results of his study indicated that the most important problems facing physical education teachers ranged as follows: a) lack of capabilities required to achieve the objectives of the profession in high secondary schools and the attack on the backyards and land space for high secondary schools, b) the misconceptions of parents' upon physical activity in schools, c) the miscare of mass media upon physical education in high secondary schools, d) the suffering of physical education teachers in Egypt, and e) the physical education curriculum has not developed.

In addition to that, (Shamma 1994), studied the professional problems of physical education in girls primary schools in Bahrain. She used documents, official records, personal interview, and questionnaire as tools for collecting data. The data included a sample study for all teachers of physical education for elementary girl schools in Bahrain. The total numbers sample was 130 teachers. The researcher adopted the descriptive method for the analysis. The most important findings of the study included; 1) the necessity of developing curricula in physical education faculties with scientific development and work to raise the performance of the teachers, 2) giving importance to the female pupils in primary schools toward the contents of the physical education curricula so that they can have space to discover some different sports skills and, 3) making sessions promote the performance the teachers of physical educational departments.

2. METHODS

This research utilized a qualitative like document analysis, interview, and quantitative research like the questionnaire survey, through using the following two tools.

2.1 Analyzing educational polices, schools programs, daily school activities, which I got from the teachers of physical education at some of the high schools in the three cities of Khartoum state (Khartoum – Omdurman – and Khartoum Bahree). And the most important documents to investigate the current status of physical education in Sudanese high schools were the previous studies conducted in the same field of the current research with a different point of view as shown in the section of introduction.

2.2 The questionnaires addressed to education authorities, and curricula developers to identify the challenges facing the integration of physical education in Sudanese high schools.

At the process of preparing the questionnaire we had interviewed a number of researchers and specialists teachers in the field of physical education in some universities in Sudan as follows:

- (i) The Dean of the Faculty of Physical Education at Sudan University of Science and Technology (Dr Eltayeb, 2012).
- (ii) The Dean of the Faculty of Physical Education at University of Alneelain (Dr Abdallah, 2012).
- (iii) The Head of the School Department, Faculty of Physical Education at Sudan University of Science and Technology (Dr Hakeem, 2012).
- (iv) The guide of the physical education teacher's at local Kalakla schools of Khartoum State (Dr Nafisa, 2012).
- (v) The Head department of Physical Education at the University of Kassala, in Kassala state of the eastern Sudan (Dr Mohammed Hussein, 2012).
- (vi) A teacher of physical education, at Sudan University of Science and Technology, faculty of physical education (Dr Ahmed Adam, 2012).

The concept of stability test is intended by the extent of its being a measurement free of errors i.e., how to measure the result of the amount of real attribute that it aims to measure. The test being constant means accuracy or consistency. This researchers must determine the degree of reliability in the test data as the consistency of measurements or observations obtained by (Abu Sarie, 2004). Further, (Churchill, 2002) explained that the best way to assess the internal consistency to a combination of factors or phrases within the framework or a single group, is to look for these words within its essential use of alpha Cronbach coefficient, which is a useful test to measure the stability of the test. The test was conducted to measure the stability, or the internal consistency of each axis of the study and phrases included in the questionnaire. In addition to that (Easterby, 2002), shows that when the value of alpha coefficient is 0.6 or more, this means the research tools are stable.

Here in our work we found that by the analysis of the data collected, the alpha Cronbach coefficient for identification was equal to 0.8570 which is a high value; this confirms the stability of resolution and suitability for use as shown in table 1.

Table 1. Shows The Reliability Coefficient (alpha Cronbach).

Reliability Coefficient		
Number of Cases	Number of Items	Alpha
60	18	0.8570

3. RESULTS AND DISCUSSION

Statistical analysis of the research data (using SPSS Statistical Packages for Social Studies) revealed the following results.

3.1 BASIC INFORMATION ABOUT THE SUBJECTS

Table 2. shows the Gender Type, The Educational Background Variable, Specialization Variable and the Experience Variable. From which we found that the number of males in the sample was (45) representing (75%), while the

number of females (15) representing (25%) of the sample size. Also we found that the number of recipients a Bachelor's degree, Higher Diploma, Master's and Doctorate in the sample were (42), (7), (7) and (4), representing a percentage of (70%), (11.7%), (11.7%) and (6.7%) of the sample size, respectively. While the specialists in physical education were (43), while non-specialists were (17), which represents the proportion of (71.7%) and (28.3%) of the sample size, respectively. And finally we found that the number of the subject experience between 1-5 years were (16) representing (26.7%), and between 6-10 years were (22) representing (36.7%), and between 11-15 years were (11) representing (18.3%), while for more than 16 years were (11) representing (18.3%) of the sample size, respectively.

Table 2. Shows the Basic Information about the Subjects

No.	Information of Subjects	State	Frequency	Percent	Total
1	Gender Type	Male	45	75%	60 100%
		Female	15	25%	
2	Educational Background	Bachelor	42	70.0	
		High Diploma	7	11.7	
		Master	7	11.7	
		PhD	4	6.7	
3	Specialization	Physical Education	43	71.7	
		Other	17	28.3	
4	Experience	1 - 5 years	16	26.7	
		6 - 10 years	22	36.7	
		11 - 15 years	11	18.3	
		More than 16 years	11	18.3	

3.2 NATIONAL AND LOCATION EDUCATION POLICY

From table. 3. we found that the subjects who answered the question (There are credit hours for the teaching of physical education subject?) with Disagree were (19) representing (31.7%), and who answered Weak Agree were (13) representing (21.7%), and who answered Medium Agree were (5) representing (8.3%), and who answered Strong Agree were (7) representing (11.7%), and who answered Very Strong Agree were (16) representing (26.7%) of the sample size, respectively.

While the subjects who answered the question (There is specific plan to implement the physical education curriculum?) with Disagree were (26) representing (43.3%), and who answered Weak Agree were (8) representing (13.3%), and who answered Medium Agree were (5) representing (8.3%), and who answered Strong Agree were (8) representing (13.3%), and who answered Very Strong Agree were (13) representing (21.7%) of the sample size, respectively.

For the question (There is a neglect of the Department of Curriculum and Educational Planning from the ministry of Education and public education to physical education subject?) the subjects who answered Disagree were (6) representing

(10%), and who answered Weak Agree were (4) representing (7%), and who answered Medium Agree were (5) representing (8.3%), and who answered Strong Agree were (9) representing (15%), and who answered Very Strong Agree were (36) representing (60%) of the sample size, respectively.

And also, for the question (The mandatory of the physical education in all high secondary schools?) the subjects who answered Disagree were (20) representing (33.3%), and who answered Weak Agree were (7) representing (11.7%), and who answered Medium Agree were (2) representing (3.3%), and who answered Strong Agree were (7) representing (11.7%), and who answered Very Strong Agree were (24) representing (40%) of the sample size, respectively.

In addition to that, for the question (There are specific conditions for choosing physical education subject among the items eligible for admission to the colleges of education?) the subjects who answered Disagree were (34) representing (56.7%), and who answered Weak Agree were (6) representing (10%), and who answered Medium Agree were (4) representing (6.7%), and who answered Strong Agree were (5) representing (8.3%), and who answered Very Strong Agree were (11) representing (18.3%) of the sample size, respectively.

On the other hand, for the question (The final examination for the second and third grade includes the physical education subject?) the subjects who answered Disagree were (33) representing (55%), and who answered Weak Agree were (4) representing (6.7%), and who answered Medium Agree were (5) representing (8.3%), and who answered Strong Agree were (6) representing (10%), and who answered Very Strong Agree were (12) representing (20%) of the sample size, respectively. 2.1.7 There is coordination for the examination of the physical education subjects between the Ministry of Education and Public Education and the Faculty of Physical Education and Sports.

From other point of view, for the question (There is coordination for the examination of the physical education subjects between the Ministry of Education and Public Education and the Faculty of Physical and Sports?) the subjects who answered Disagree were (37) representing (61.7%), and who answered Weak Agree were (12) representing (20%), and who answered Medium Agree were (0) representing (0%) means no one, and who answered Strong Agree were (1) representing (1.7%), and who answered Very Strong Agree were (10) representing (16.7%) of the sample size, respectively.

Finally for the question (There are mentors the follow the teaching of physical education subject in high secondary schools?) the subjects who answered Disagree were (30) representing (50%), and who answered Weak Agree were (7) representing (11.7%), and who answered Medium Agree were (10) representing (16.7%) means no one, and who answered Strong Agree were (1) representing (1.7%), and who answered Very Strong Agree were (12) representing (20%) of the sample size, respectively.

Table 3. Shows frequencies and percentages for responses of National and Location Education Policy questionnaire questions.

No.	Questions	Answers					Total
		Disagree	Weak Agree	Medium Agree	Strong Agree	Very Strong Agree	
1	There are credit hours for the teaching of physical education subject	19 31.7%	13 21.7%	5 8.3%	7 11.7%	16 26.7%	60 100%
2	There is specific plan to implement the physical education curriculum	26 43.3%	8 13.3%	5 8.3%	8 13.3%	13 21.7%	
3	There is a neglect of the Department of Curriculum and Educational Planning from the ministry of Education and public education to physical education subject	6 10%	4 6.7%	5 8.3%	9 15%	36 60%	
4	The mandatory of the physical education in all high secondary schools	20 33.3%	7 11.7%	2 3.30%	7 11.7%	24 40.0%	
5	There are specific conditions for choosing physical education subject among the items eligible for admission to the colleges of education	34 56.7%	6 10.0%	4 6.70%	5 8.30%	11 18.3	
6	The final examination for the second and third grade includes the physical education subject	33 55.0%	4 6.70%	5 8.30%	6 10.0%	12 20.0%	
7	There is coordination for the examination of the physical education subjects between the Ministry of Education and Public Education and the Faculty of Physical and Sports	37 61.7%	12 20.0%	0 0.00%	1 1.70%	10 16.7%	
8	There are mentors the follow the teaching of physical education subject in high secondary schools	30 50.0%	7 11.7%	10 16.7%	1 1.70%	12 20.0%	

3.3 PHYSICAL EDUCATION CURRICULUM

From table 4, we found that the subjects who answered the question (There are special physical education curriculum?) with Disagree were (22) representing (36.7%), and who answered Weak Agree were (8) representing (13.3%), and who answered Medium Agree were (8) representing (13.3%), and who answered Strong Agree were (5) representing (8.3%), and who answered Very Strong Agree were (17) representing (28.3%) of the sample size, respectively.

For the question (There is a shortage in the textbook of physical education?) the subjects who answered Disagree were (9) representing (15%), and who answered Weak Agree were (3) representing (5%), and who answered Medium Agree were

(5) representing (8.3%), and who answered Strong Agree were (6) representing (10%), and who answered Very Strong Agree were (37) representing (61.7%) of the sample size, respectively.

And for the question (The current textbook fit enough to be a curriculum for Physical Education?) the subjects who answered Disagree were (32) representing (53.3%), and who answered Weak Agree were (16) representing (26.7%), and who answered Medium Agree were (3) representing (5%), and who answered Strong Agree were (1) representing (1.7%), and who answered Very Strong Agree were (8) representing (13.3%) of the sample size, respectively.

While for the question (The current textbook includes various physical education activities?) the subjects who answered Disagree were (20) representing (33.3%), and who answered Weak Agree were (21) representing (35%), and who answered Medium Agree were (10) representing (16.7%), and who answered Strong Agree were (2) representing (3.3%), and

who answered Very Strong Agree were (7) representing (11.7%) of the sample size, respectively.

In addition, for the question (The physical education subject is to be one of the associated subjects with the daily class schedule?) the subjects who answered Disagree were (13) representing (21.7%), and who answered Weak Agree were (9) representing (15%), and who answered Medium Agree were (14) representing (23.3%), and who answered Strong Agree were (9) representing (15%), and who answered Very Strong Agree were (15) representing (25%) of the sample size, respectively.

Moreover, for the question (There is a dearth of the tools of physical education subject in the high secondary schools?) the subjects who answered Disagree they were (12) representing (20%), and who answered Weak Agree were (3) representing (5%), and who answered Medium Agree were (2) representing (3.3%), and who answered Strong Agree were (2) representing (3.3%), and who answered Very Strong Agree were (41) representing (68.3%) of the sample size, respectively.

In other hand, for the question (The shortage of play grounds attached to the high secondary schools?) the subjects who answered Disagree were (8) representing (13.3%), and who answered Weak Agree were (5) representing (8.3%), and who answered Medium Agree were (0) representing (0%) means no one, and who answered Strong Agree were (4) representing (6.7%), and who answered Very Strong Agree were (43) representing (71.7%) of the sample size, respectively.

Then, for the question (The shortage of service tools that help in the success of teaching physical education subject?)

the subjects who answered Disagree they were (7) representing (11.7%), and who answered Weak Agree were (5) representing (8.3%), and who answered Medium Agree were (0) representing (0%) means no one, and who answered Strong Agree were (4) representing (6.7%), and who answered Very Strong Agree were (44) representing (73.3%) of the sample size, respectively.

From other point of view, for the question (There is guide for the teachers of physical education to teach the current textbook?) the subjects who answered Disagree were (33) representing (55%), and who answered Weak Agree were (8) representing (13.3%), and who answered Medium Agree were (5) representing (8.3%), and who answered Strong Agree were (4) representing (6.7%), and who answered Very Strong Agree were (10) representing (16.7%) of the sample size, respectively.

Finally, for the question (There is examinations for physical education subjects?) the subjects who answered Disagree were (32) representing (53.2%), and who answered Weak Agree were (6) representing (10%), and who answered Medium Agree were (8) representing (13.3%), and who answered Strong Agree were (3) representing (5%), and who answered Very Strong Agree were (11) representing (18.3%) of the sample size, respectively.

Table 4. Shows frequencies and percentages for responses of Physical education curriculum questionnaire questions

No.	Questions	Answers					Total
		Disagree	Weak Agree	Medium Agree	Strong Agree	Very Strong Agree	
1	There are special physical education curriculum	22 36.7%	8 13.3%	8 13.3%	5 8.3%	17 28.3%	60 100%
2	There is a shortage in the textbook of physical education	9 15.0%	3 5.00%	5 8.30%	6 10.0%	37 61.7%	
3	The current textbook fit enough to be a curriculum for Physical Education	32 53.3%	16 26.7%	3 5.00%	1 1.70%	8 13.3%	
4	The current textbook includes various physical education activities	20 33.3%	21 35.0%	10 16.7%	2 3.30%	7 11.7%	
5	The physical education subject is to be one of the associated subjects with the daily class schedule	13 21.7%	9 15.0%	14 23.3%	9 15.0%	15 25.0%	
6	There is a dearth of the tools of physical education subject in the high secondary schools	12 20.0%	3 5.00%	2 3.30%	2 3.30%	41 68.3%	
7	The shortage of play grounds attached to the	8	5	0	4	43	

	high secondary schools	13.3%	8.30%	0.00%	6.70%	71.7%
8	The shortage of service tools that help in the success of teaching physical education subject	7	5	0	4	44
		11.7%	8.30%	0.00%	6.70%	73.3%
9	There is guide for the teachers of physical education to teach the current textbook	33	8	5	4	10
		55.0%	13.3%	8.30%	6.70%	16.7%
10	There is examinations for physical education subjects	32	6	8	3	11
		53.3%	10.0%	13.3%	5.00%	18.3

4. CONCLUSION

The findings of the study reveal that government educational policy must treat physical education the same as it does with the other educational subjects in high secondary schools which means physical education should have its own teaching credit hours and specific plan to implement its curriculum. That is, positive attitudes from the part of the Educational Planners in the ministry of Education towards physical education is needed. Further it is better not to treat physical education as an optional subject in high secondary schools. It should be regarded as one of the requirements of university education. Finally, there should be mentors to follow the teaching of physical education in the Sudanese high secondary schools. So Ministry of education should pay great attention to physical education curricula and think of the practical ways to develop and promote it. The current textbook needs to be reexamined so that it can meet the needs of the pupils in Sudanese high secondary schools and the community as a whole. It should include various physical education activities. Furthermore, there should be serious and effective methods for assessing pupils' performance in the physical education subject.

ACKNOWLEDGMENT

I would like to thank professor Xiao Zan Wang for her kind help and support, and extending thanks to all teachers and colleges at both College of Physical Education and Health, East China Normal University, Shanghai, China and at Physical Education departments of Sudanese Physical Education faculties, with especial thanks, to the teaching staff of Physical Education at Sudanese high secondary schools including the area of our sample study.

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Code-switching and mixing of English and Arabic amongst Arab students at Aligarh Muslim University in India

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Abstract- The aim of this study is to posit some points touching the use of Code-switching and mixing of English and Arabic . The objectives of this study were to show 1- whether Arab students at Aligarh Muslim University (AMU) code-switch and mix to English in their daily contacts or not ,2- why Arab students at AMU code switch and mix to English.

This investigation was conducted on the 19th of January, 2015. It investigated 100 Arab students of different educational levels ,nationalities and ages , they are at 3 levels of education: Bachelors, Masters, and Ph.D. at AMU.

The tool used for data collection in this study was a questionnaire. The result have shown that most of Arab students at AMU do code-switch and mix to English in their conversations .

Finally, the findings show that the reasons Arab students at AMU code-switch and mix to English refer to the lack of knowledge in English .

Index Terms- Code-switching (CS) ,Code-mixing (CM) ,Aligarh Muslim University (AMU)

I. INTRODUCTION

The communication between users of different speech varieties appear in languages contact .Referring to Hammer and Blanc (2000), languages in contact describe a situation where two or more codes are used in interactions between people . Bilinguality is the psychological state of an individual who has access to more than one linguistic code as a means of social communication; the degree of access will vary along a number of dimensions which are psychological, cognitive, sociolinguistic, social psychological, social, sociological, sociolinguistic, sociocultural and linguistic (Hammers, 1981 cited in Hammers and Blanc, 2000: 6).

The study of language in contact focuses more on various types of language contact situations and various forms of bilingualism. However, the main issue in bilingualism research is code-switching and mixing , the alternative use of two or more languages in the same conversation by bilingual speakers (Lesley and Muysken, 1995).

The study of language contact as phenomena like bilingualism and CS/CM has increased last few years. Referring to (Jonsson, 2005) work 'language contact phenomena' was established to show different types of language contact phenomena such as code-switching, code-mixing, and

borrowings. This concept also covers phenomena that are not counted as code-switching, for example, loans and interference .

CS and CM can be Considered as a normal result of the bilingualism which is the interaction in two or more languages in multilingual and multicultural communities. Haugen (1956 cited in Romaine, 1995: 52) differentiate between: "switching, the alternate use of two languages; interference, the overlapping of two languages, or application of two systems to the same item; and integration, the use of words or phrases from one language that have become so much a part of the other that it cannot be called either switching or overlapping."

In 2006 Chung points that meeting the complex communicative demands requires the speakers of a community where two or more languages are used to switch from one language to another.

Referring to Haugen (1956), bilingual tend to use or form sentences that have elements from both languages especially at the beginning of the language development. It is normal for a speaker who speaks two or more languages fluently to switch or mix between them on justness or frequently while speaking to other people who speak the same languages. It also appear that if a speaker spends a lot of time in a bilingual or multilingual environment, he/she will start to switch from one language to another.

The purpose of this study is to discuss the phenomenon of Code-switching and mixing of English and Arabic amongst Arab students at(AMU)in India

Likely, higher learning institutions in India have decreed the language of content subject class rooms to English, which is the more significant of the second language in this large country . The motivation behind the moving towards using a second language in teaching, or content . this thing improve the language of local and the foreign students who are attending and learning at Aligarh Muslim University in India

Code-switching and mixing can be considered as a natural product of bilinguals' interaction in two or more languages in multilingual and multicultural communities.

This investigation tries to calibrate whether Arab students at AMU code switch/mix to English and the reasons they code-switch/mix to English in daily communication.

II. STATEMENT OF PROBLEM

Bilinguals are known for their ability to code-switch and mix between the languages they speak through their conversations by substituting words or phrases from one

language with words or phrases from another language. The phenomenon of code-switching and mixing are appeared in the conversations among Arab bilingual speakers of English where they use a lot of English expressions and loanwords .

Many studies have been conducted on code-switching and mixing .On the other hand, few studies have been done on Arabic bilingual speakers of English. Whereas, there is a lack of information about the way of Arabic speakers of English code-switch and mix between the two languages in daily dialogues or conversations.

Previous studies on code –switching and mixing concentrated on the reasons why Arab bilingual code switch and mix to English . Previous studies did not concentrate on the kinds of code-switching and mixing used by Arab bilingual.

In other words, fewer studies have been conducted at the university setting to investigate the phenomenon of code-switching and mixing among Arab bilingual. Thus, study will examine code-switching and mixing in a university setting, for example, Aligarh Muslim University. The study will concentrate on the reasons why Arab students at Aligarh Muslim University code-switching and mixing to English in their daily dialogue. It will also examine the kinds of code-switching and mixing used by Arab University students at AMU.

III. THE PURPOSES OF THIS STUDY ARE:

- To assure whether Arab students at Aligarh Muslim University code- switch and mixing to English or not.
- To assure the reasons Arab University students at Aligarh Muslim University code-switching and mixing in their daily dialogues or conversations.

IV. RESEARCH QUESTIONS

- Do Arab students at Aligarh Muslim University code-switch and mix to English?
- What are the reasons Arab students at Aligarh Muslim University code-switch and mix to English in their daily dialogues?

Importance of the study

- The results of the study will be particularly important for their possibility in creating a better understanding of the code switching and mixing phenomenon amongst Arab bilingual.
- The researcher, moreover,believes this study will make a simple assistance in filling the gap of the lack of studies in the domain of the bilingualism, especially in code-switching and mixing of Arabic bilingual of English.
- The results will contribute to both L1 and ELS/EFL teachers' understanding of language use and communication among Arab University students.
- Last one, it is expected that the results of this study will help in second language acquisition investigation or research on the use of the second language. This means the study will share in the SLA literature on the problem of code-switching and mixing.

V. DEFINITION OF CONCEPTS

Code-switching

Code-switching occurs when a speaker alternates between two or more languages, or language varieties, in the context of a single conversation. Referring to Grosjean (1982) code-switching is the alternate use of two or more languages in the same utterance, and this can be in a form of a single word, or a phrase, or a sentence/s. In 1998, Spolsky define code-switching as the phenomenon which occurs when bilingual switch between two common languages they share in the middle of a conversation, and the switch takes place between or within sentences, involving phrases, words, or even parts of words.

Code-switching, in this investigation , is defined as the phenomenon where bilingual change words, phrases, and sentences of one language by another languages.

Code-mixing

Code-mixing assign to the mixing of two or more languages or language varieties in speech.

The terms code-mixing are used to describe more stable situations in which many languages are used without any pragmatic effects. referring to Alvarez (1998) the formal code-mixing should be treated as distinct from code-switching, defined in pragmatic or discourse terms.

Bilingualism

Bilingualism refers to "the state of a linguistic community in which two languages are in contact with the result that two codes can be used in the same interaction and that a number of individuals are bilinguals" (Hammers and Blanc, 2000: 6).

In (1994) Mohanty defines bilingualism through defining the bilingual person, who is the one with an ability to meet the communicative demands of him/herself and of the society by interacting with the other speakers in normal circumstances in two or more languages.

The previous study on bilingualism said that proficient bilingual speakers employ code-switching and mixing in their speeches for different purposes and at different levels.

Bloomfield (1933) defines bilingualism as having the control of two languages equivalent to the native .

Referring to Haugen (1953) and Suleiman (1981): Bilingualism usually occurs within some particular social setting.

Bilingualism amongst Arabs

There are a large number of Arabs who live outside Arab countries. Those Arab people are at most bilingual, but their language choice varies from the first generation and the second generation who were born outside Arab countries and did not acquire the Arabic basics.

Among Arab Immigrants in India

CS/CM were observed as phenomena in the informants speech in settings such as home, friendship, and university.

The study found that CS/CM is used among the informants as a strategy in communication. but the motivations for switching and mixing in the informants speech are limited for some extent.

VI. IN JORDAN

The bilingualism phenomena in Jordan is appeared by the use of hundreds of English loanwords and expressions (Hazaymeh, 2004; Kailani, 1994). Since many Jordanians are bilingual in English, they prefer to code switch and mix towards English in fields as work ,education and general conversation. Hazaymeh also said that recent cultural contacts with the English-speaking countries have introduced many aspects of English culture and English loanwords into Arabic in the Jordanian society. Cultural contacts have been established by various means such as education, technology, trade, sports, media, and communications.

consequently, many Jordanians have been encouraged to learn English and become bilingual. Hazaymeh also point that Jordanians of different social backgrounds and ages like to code switch to English, using English words and expressions in their daily interactions because of many reasons, for example as a sign of knowing English and as a symbol of social prestige.

VII. FOCUS ON THE REASONS FOR CODE-SWITCHING AND MIXING

For several years ,code-switching and mixing researchers have trying to find a reason for code-switching and mixing. researcher like Gumperz (1982) and Auer (1984) have defined code-switching as one of a number of discourse cues (both verbal and nonverbal) that help signal and interpret interlocutors intentions. while the interest of other researchers, was to describe the morpho-syntactical constraints in inter-sentential switching focusing on the position or location in a sentence where code-switching and mixing would be allowed.

VIII. RESEARCH METHODOLOGY AND SAMPLING

The research method have used in this study was quantitative. The method have employed in this study to collect data from some learners, Arab University students at AMU in India. The sample included Arab students from different ages, and nationalities. This held with Arab students at AMU. The participants have represented the following countries: Palestine, Jordan, Iraq, Yemen, Syria, Sudan, and Oman who enrolled at three levels of education, for instance Bachelor, Master, and PhD at Aligarh Muslim University/ India.

IX. SAMPLES

One hundred Arab students have participated, ten of them females and the rest males, 44 males and 6 females, were chosen through random sampling, using a list of all Arab students names gained from the Postgraduate Programme Departments at (AMU). The sample included Arab students of different ages and nationalities,32 Yemenis , 53 Jordanians,5 Palestinians , 2 Syrians, 2 Libyans , and 6 Iraqis, who are enrolled at 3 levels of education, Bachelors, Masters, and Ph.D. at Aligarh Muslim University (AMU).

The students were Arab bilingual of English; they speak Arabic as their mother tongue, including many varieties, and

English as a second language. They are enrolled in different programmes at AMU.

A total of 100 questionnaires were distributed of which 96 were returned; the return rate was more than 90%. moreover, only 91 of them were analyzed.

X. CONCLUSION

It has been recognized in the literature of CS/CM that this phenomenon is universal in the multilingual countries; but, the reasons for this phenomenon differ between countries. CS/CM have been observed in the daily discussion of Arab students at AMU. Arab students at AMU are mostly bilingual and they tend to code switch/mix towards English and Urdu in their speech. This study has found that the majority of Arab students at AMU do code-switch/mix to English in their daily conversations.

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Simulations of enhanced CNTFET with HfO₂ gate dielectric

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Abstract- Carbon Nanotube is one of the rising technologies within nano science, which is showing high efficiency and wide range of applications in many different fields of science and technology. The Carbon Nanotube Field Effect Transistors (CNTFETs) have been explored and proposed to be the rising candidate for the next generation of integrated circuit (NGIC) devices. In this paper first the Carbon Nanotube and density of state (DOS) with different types of nanotubes considering energy gap have been reviewed. We have then studied the carbon nanotube field effect transistor. In this research CNTFET is analyzed where the bandgap is 0.94eV with HfO₂ as gate dielectric. Finally the simulation of proposed model is given.

Index Terms- Carbon Nanotube, Carbon Nanotube Field Effect Transistor, CNT DOS

I. INTRODUCTION

As the discovery of carbon nanotubes by Iijima in 1991 at the NEC Fundamental Research Laboratory in Tsukuba, Japan [1], momentous development has been achieved for understanding the characteristics and searching possible applications on relevant technology. Carbon nanotubes have small bandgap compare to other traditional semiconductor technologies. Nanotubes have a small weight and high elastic modulus, and they are predicted to be the strongest fibers that can be made. CNTs high strength and high flexibility are unique properties. They also have fascinating electronic properties. The electronic properties depend drastically on both the diameter and the chirality of the hexagonal carbon lattice along the tube [2–4]. CNTs can play a vital role in nano electronic devices such as transistors, memory components, digital logic devices etc. because of its excellent conductivity and high dielectric properties [5].

Scaling down of electronic devices has been the fundamental strategy for improving the performance of VLSIs. The ITRS suggests that in 2016 the gate length of MOSFETs will be less than 16nm [6]. Though this roadmap still continues, MOSFETs will soon reach its limiting size. For this reason, the semiconductor industry is searching for different materials to integrate with the current silicon-based technology and in the long run, possibly replace it. The carbon nanotube field effect transistor (CNTFET) is the most promising alternatives due to its properties. It was demonstrated in 1998 [7]. Carbon nanotube field-effect transistors offer high mobility for ballistic transport, high mechanical and thermal stability, and high resistance to electro migration, attracting strong interest as alternative device technologies for future nano electronics applications [8]. Recently, a carbon nanotube transistor, which integrates ultra-short channel, thin high- κ top gate insulator, excellent Pd source drain contacts is demonstrated using a self-align technique [9].

This paper propose CNTFET which is one of the most promising device. This paper has been devised into main two sections, first in section II the mobility of CNTs are discussed with analyzing the density of state (DOS) of different types of nanotubes. In second part, from section IV, the proposed CNTFET device modeling has been described with its parameters, along with simulation results in section V. We conclude the paper in section VI.

II. CARBON NANOTUBE

Carbon is an element with symbol C and atomic number 6 ($1s^2 2s^2 2p^2$). Carbon is a group 14 element that resides above silicon on the periodic table. It is nonmetallic and tetravalent—making four electrons available to form covalent chemical bonds. Like silicon ($1s^2 2s^2 2p^6 3s^2 3p^2$) and germanium ($1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^2$), carbon has four electrons in its valence shell. There are several allotropes of carbon like graphite, diamond, and amorphous carbon [10]. When carbon atoms are arranged in crystalline structures composed of benzene like rings, they form several allotropes that contains exceptional electronic properties. The physical properties of carbon vary widely with the allotropic form. Under normal conditions, diamond, carbon nanotubes, and graphene have the highest thermal conductivities of all known materials (e.g. diamond: $900\text{--}2300 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$, carbon nanotube: $3180\text{--}3500 \text{ W}\cdot\text{m}^{-1}\cdot\text{K}^{-1}$) [11]. Carbon nanotubes (CNTs) are an allotrope of carbon. Carbon Nanotubes have many forms, differing in length, thickness, and in the type of helicity and number of layers. It can be categorized into Single Walled Carbon Nanotube (SWCNT) and

Multi Walled Carbon Nanotube (MWCNT) shown in Figure 1. The carbon nanotubes have diameters from less than 1nm to 50 nm. These have excellent mechanical and transport properties too.

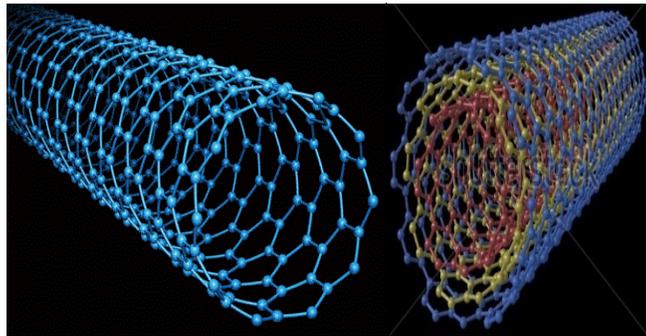


Figure 1: SWCNT and MWCNT [13]

Table I: Properties of carbon nanotube [12]

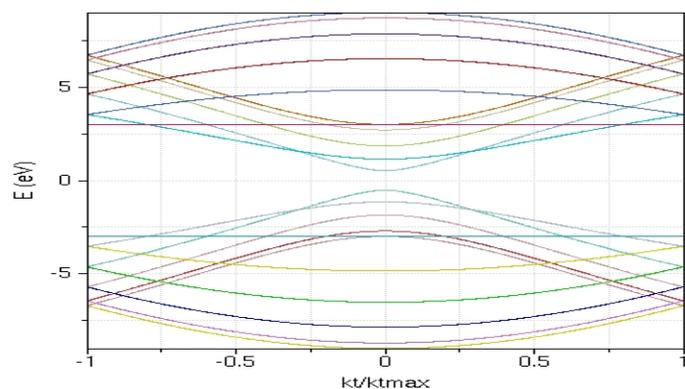
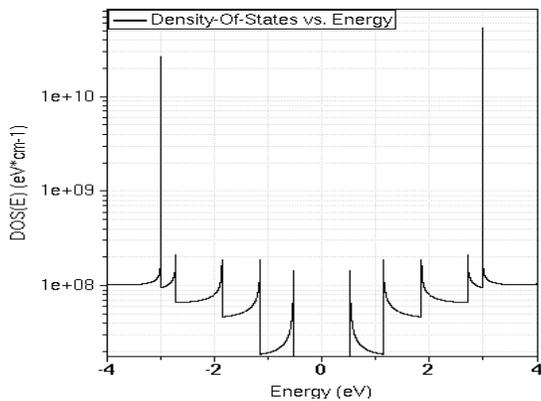
Specific Density	1.3-2
Young's Modulus(TPa)	~1
Tensile Strength(GPa)	10-60
Electrical Conductivity(mho/m)	10 ⁶ -10 ⁷

In another way the rolled graphene (CNT) is explained by a coordinate of indices (n,m), which is known as Chiral Vector. It represents whether CNT is metallic or semiconducting and diameter of CNT. The table shown below describes Chirality of carbon nanotube. The diameter of carbon nanotube, $d = \frac{\sqrt{3} a_{c-c}}{\pi} \sqrt{m^2 + mn + n^2}$ where $a_{c-c} = 0.142\text{nm}$ is the carbon-carbon bond length [14].

Table II: Types of CNTs according to m and n values

Type of CNTs	Values of m and n	State
Armchair	m=n	metallic
Zigzag	m=0	semiconducting
Semiconducting or Chiral	n-m≠3×integer	Semiconducting(large bandgap)
Quasi-Semiconducting	n-m=3×integer	Semiconducting(small bandgap)

Figure 2 shows the density of state (DOS) of different types of nanotubes. The simulated end states are within the energy gap of semiconducting carbon nanotubes, implying that the end states are a 1-D analogy with conventional surface states. The band gaps of carbon nanotubes are small, so CNTs are either metallic or semi conductive. The energy band structures of carbon atom provides an occupied energy level in the band gap depending upon the density of states and types of CNT. The (10, 0) nanotube acts as semi conducting material since it has energy gap between conduction and valence band. The (8, 8) nanotube act as conducting material as the valance and conduction bands are overlapping.



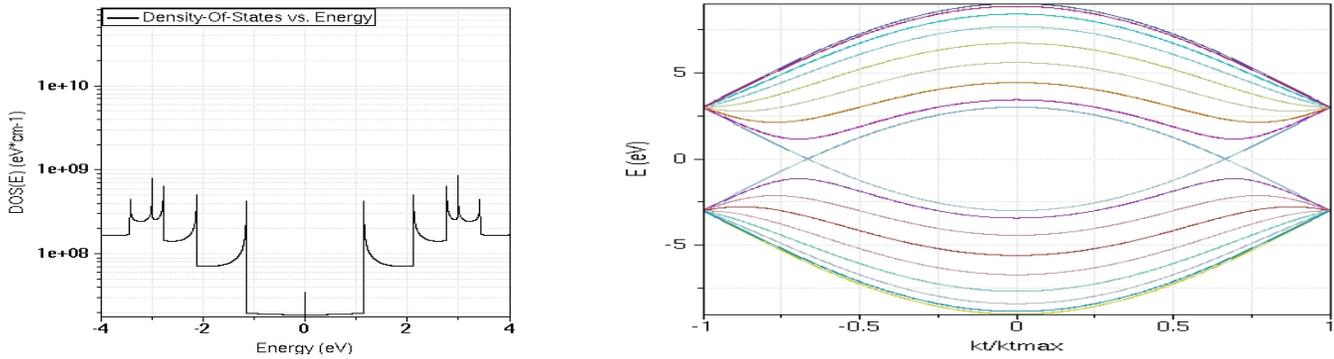


Figure 2: DOS vs Energy for (10,0) and (8,8)

III. CARBON NANOTUBE FIELD EFFECT TRANSISTOR

A carbon nanotube field-effect transistor (CNTFET) indicates to a field-effect transistor that handles a single carbon nanotube or an array of carbon nanotubes as the channel material rather silicon in the conventional MOSFET structure. CNTFET is a three-terminal (three to six layers) device consisting of a semiconducting nanotube bringing two contacts (source and drain), and acting as a carrier channel, which is turned on or off electrically via the third contact (gate). According to fabrication geometry there are many type of CNTFET devices such as Back-gated CNTFET, Top-gated CNTFET, Wrap-around gate CNTFET and Suspended CNTFET etc. [15-18]. These are divided broadly in two categories: Planar CNTFET and Coaxial CNTFET shown in Figure 3. CNTFETs show different characteristics compared to MOSFETs in their theoretical experiments. In a planar gate structure, the p-CNTFET produces ~1500 A/m of the on-current per unit width at a gate overdrive of 0.6 V while p-MOSFET produces ~500 A/m at the same gate voltage [19]. This on-current advantage contains from the high gate capacitance and modified channel transport. Since an effective gate capacitance per unit width of CNTFET is about double that of p-MOSFET, the compatibility with high gate dielectrics becomes a superior advantage for CNTFETs [20].



Figure 3: Carbon Nanotube Field Effect Transistor: Planar, Coaxial

IV. MODELLING OF CNTFET

The proposed device is formed with a (10,0) CNT. So the channel diameter = 0.782885 nm. For gate insulation HfO_2 ($k=15$) is used. Energy gap for a nanotube is given by

$$E_g = \frac{2 \times a_{c-c} \times \gamma}{\text{channel diameter}} \quad (1)$$

Where γ is the nearest neighbor-hopping parameter ($\gamma=2.5-3.2$)

Using $\gamma=2.6$, the energy gap is 0.94384 eV. The parameters used in proposed model and calculations are given in Table III.

Table III: Proposed parameters

Energy Gap	0.94eV	Gate oxide thickness	1.6nm
CNT diameter	0.78nm	Gate Dielectric(HfO ₂)	15

Using Landauer’s formula [21], conductance can be represented by

$$G = \frac{2Te^2}{h} \tag{2}$$

Where e is the charge of electron and h is the Planck’s constant. T is known as the transmission function in terms of energy that represents the probability of an electron injected at one end of a conductor will emit at the other end. T can be expressed as

$$T = \text{trace} [\Gamma_S G_0^r \Gamma_D G_0^a] \tag{3}$$

$G_0^r G_0^a$ represents the retarded and advanced Green’s function of the nanotube and Γ_D, Γ_S are the coupling of the CNT to the source and the drain. Finally the current is found using the Landauer Buttiker expression

$$I_d = \frac{4d \int T(E)[f_s(E) - f_d(E)]dE}{h} \tag{4}$$

T is the transmission probability across the source/drain; f_s and f_d are the source/drain Fermi-Dirac distribution functions consistent potential.

V. SIMULATIONS

Hafnia (HfO₂) adopts the same structure as zirconia (ZrO₂,K~25). Unlike TiO₂(k=40), which features six-coordinate Titanium in all phases, zirconia and HfO₂ consists of seven-coordinate metal centers[22]. Hafnium-based oxides were introduced by Intel in 2007 as a replacement for silicon oxide as a gate insulator in field-effect transistors [23].We simulate the I-V Characteristics of CNTFET using HfO₂ as gate insulator for proposed model. The drain current reaches around 60.1µA at the gate voltage of 1V (drain voltage fixed to 1V).At a gate voltage of 1.5V drain current reaches around 112 µA. So the high-K gate insulator and bigger CNT diameter allows higher drain current.

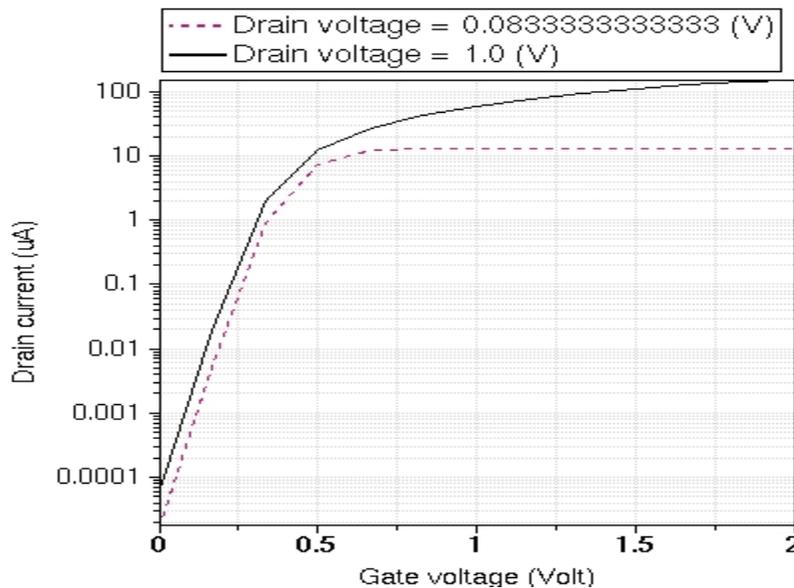


Figure 4: I-V Characteristics of proposed CNTFET (solid black line)

In order to achieve a relatively large transconductance the CNT must have large channel diameter. The larger the transconductance, the greater the gain it will deliver. As the diameter gets smaller this reduces the carrier mobility, changing the transconductance. The transconductance behavior is obtained at .78nm diameter, with different drain voltage (figure 5,6). The transconductance varies by a factor of 10/V depending on the amount of voltage applied to the gate. However, the increase of V_G will reduce the allowed voltage signal through the drain.

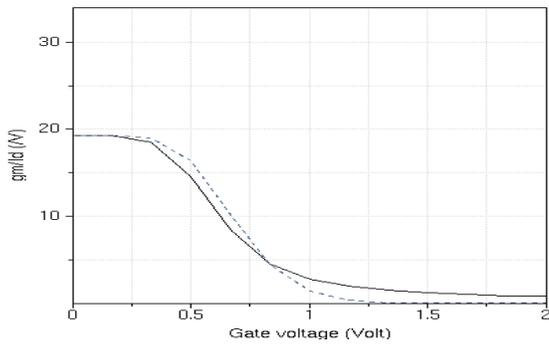


Figure 5: Transconductance of CNTFET ($V_D=0.5V$)

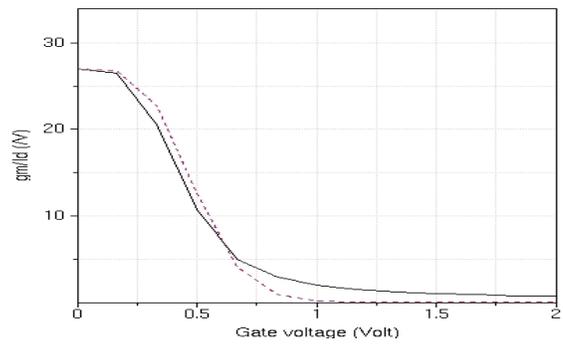


Figure 6: Transconductance of CNTFET ($V_D=0.7V$)

Figure 6 shows the output characteristics of the proposed CNTFET. The channel allows the current to flow when the gate voltage is greater than 0.3V. So the on current is $154\mu A$ at $V_g=2.0V$ and $V_d=1.0V$, and the off current is $6.61e-05 \mu A$ at $V_g=0V$ and $V_d=1.0V$. Figure 7 shows average velocity versus the gate voltage at saturation. The average velocity starts decreases around 1.8V of gate voltage.

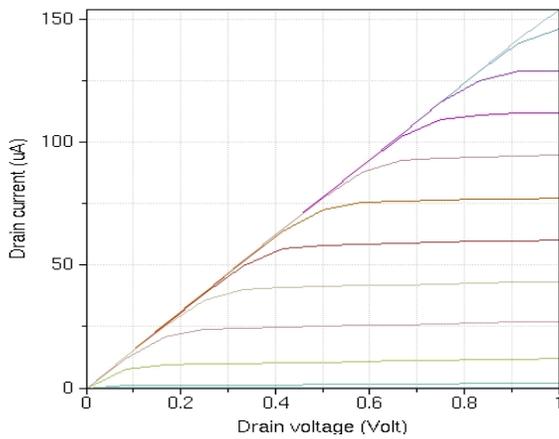


Figure 6: I_d Vs V_d Curve at different V_g

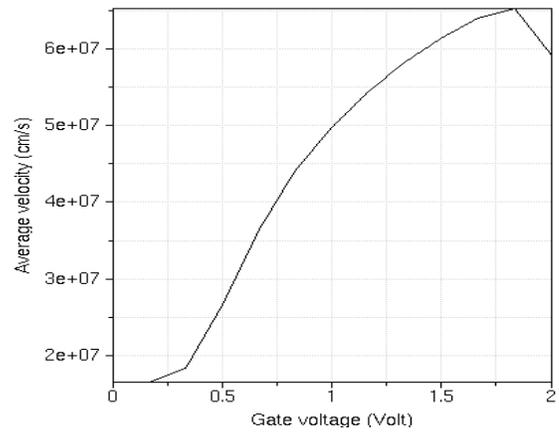


Figure 7: Avg. Velocity Vs Gate voltage

Figure 8 shows the mobile charge behavior as a function of gate voltage. Figure 9 shows the quantum capacitance versus the gate voltage at different drain voltages. It is clear that a higher quantum capacitance can be found at a gate voltage 0.5 or 1.75 volt (for proposed model).

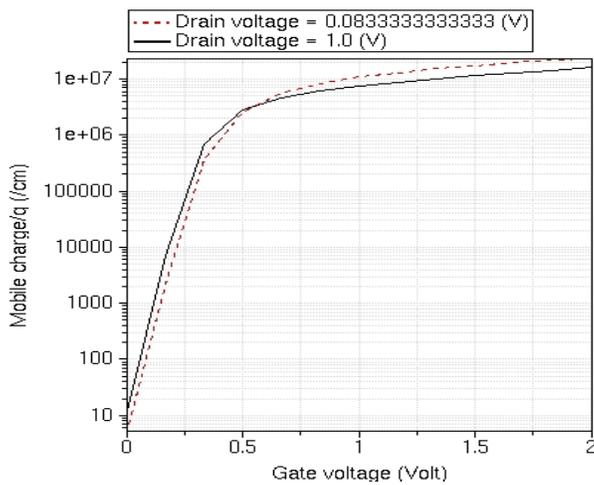


Figure 8: Mobile charge behavior

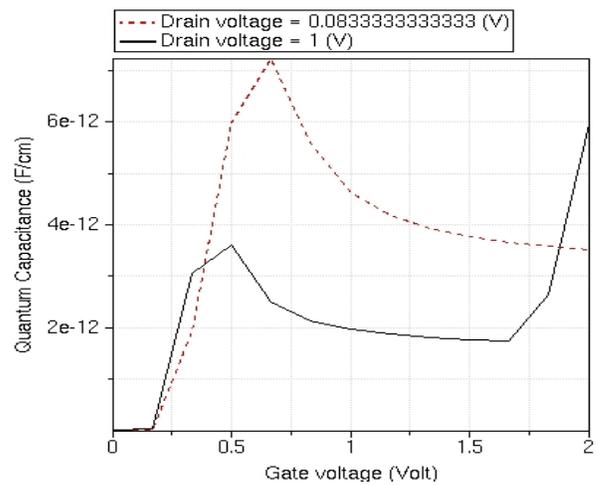


Figure 9: Quantum capacitance versus the gate voltage

VI. CONCLUSION

The proposed parameters and gate dielectric of CNTFET make the transistor a challenge to develop and to control the aspects of it such as maximum transconductance. We found two regions for maximum transconductance. Hafnia is used in optical coatings, and as a high- κ dielectric in DRAM capacitors and in advanced metal-oxide semiconductor devices. The advantage for proposed CNTFET is its high dielectric constant: the dielectric constant of HfO_2 is 4–6 times higher than that of SiO_2 . In recent years, hafnium oxide (as well as doped and oxygen-deficient hafnium oxide) attracts additional interest as a possible candidate for resistive-switching memories [24].

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Rural-Rural Migration in Bayelsa State, Nigeria: A Case Study of Rural-Rural Migrants along Tombia-Amassoma Expressway.

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Abstract- Migration is one inevitable action in human race. Having known the myriads of migration processes carried out by man and studied by researchers, this project seeks to expose a rare scenario of rural-rural migration; its inherent causes, effect and suggest remedies. With a target population of 50 rural migrants in a household grouping along the Tombia-Amassoma express road, this project successfully examined the entire population using the probability/non-probability sampling techniques and holistically retrieved vital information's which conveniently brought us the conclusion that this rural-rural migrants were actually living at the margin of life and in suggestions could be assisted in various ways by initiating community development programs through the building of schools, infrastructures and basic amenities which could be orchestrated by either governmental or non-governmental agencies to help raise their standard of living.

Index Terms- Rural migrants, Community development, Standard of living, Bayelsa state.

I. INTRODUCTION

Moving from one place to another in search for greener pasture is not new in human history (Todaro, 1984). In Africa, the history of migration is as old as the continent itself. Anthropological research result in Mitochondrial Eve Hypothesis (MEH) revealed that human have a common mitochondrial ancestor that lived in Africa perhaps, 200,000 years ago. The researchers used the diversity of mitochondrial DNA to trace the material lineage of different ethnic groups and the patterns of population migration. According to the hypothesis, the more similar the mitochondrial DNA of a pair of individual, the more recent are their last common ancestors. The diversity of the mitochondrial DNA among Africans was found to be much greater than that within any other ethnic groups in the world, thus suggesting earlier population movement than anywhere else (Charles, 2008).

Migration is a social process that has occurred almost at every epoch of life. In Nigeria, the Atlantic slave trade of 1500AD was a period of forced movement. The natural history of migration must start with the process that causes migrants to move, and then continue to the expected ends or outcome (Light, 2004). The general view of migration globally has been centred on people moving to "Areas of Economic Development"

(Udo, 1970). However, most studies on migration tend to address only the inception of migration, the outcome are mostly left out.

Research studies on migration centered on issues of urbanization is on the increase every day. Most scholars tend to forget that at times people move to areas that are even worse than their origin. In spite of immense attention given to migration studies have shown that rural-rural migrants have been grossly neglected. When Lee (1966) cited in Oucho (1984) codified Raven (1895) laws of migration into a theory in terms of the migrants characteristics, attention was given only to rural-urban migration.

The constant factor of change is inherent in every social process including migration. Every individual is subject to this fact and a contributor to this process either settlers or migrants. Migration whether rural-urban or rural-rural is regarded as a social process in which the households play important roles to the community. By allowing its members to migrate, the household is seen as adopting a diversification strategy where a diverse portfolio of activities and social support capacities are adopted in the struggle for survival and in order to improve standard of living (Ellis, 1998) but more often than not what we see is the negative effect or the contributing consequences of migration especially when patterns involve the rural people.

One of the most important factors is road network. Road has been a source of change all over the world, but one of the latent consequences of this in regard to migration is for people coming to squat on the road as seen in Bayelsa state along the Tombia-Amassoma road. It is glaring that such a place is inhabitable for human beings due to its closeness to the refuse dump and more so, with the absence of basic amenities and necessities of life.

The security measure undertaken to tackle terrorism currently in Nigeria as a whole, emphasizes the fact that everyone should live in a secured shelter and environment. Passers-by on this road wonder why people would settle in such an insecure and filthy environment. The road in question was constructed to ease transport problems for dwellers and immigrants of Amassoma community but it has suddenly become a dwelling place for migrants. Passers-by on the road have been wondering what would have prompted human beings to settle in such insalubrious, unhealthy, dirty and insecure location.

However in spite of this verbal resentment by the public, no study has ever been undertaken to ascertain or provide answers to questions or worries by the passers-by or the concerned public.

In accordance with the basic ethic of research as laid by ASA (American Sociological Association (1997) this research

would be the very first attempt to undertake and proffer possible solutions and answers about the migrants in regards to ;
Who are they?
Where are they from?
Why are they settling at their present location? And many other problems that keep lingering in the minds of passers-by.

II. STATEMENT OF PROBLEM

Resentment by the public has no head way in deriving any useful information about the migrants.
What seems to be the problem here is that no one knows
Who actually are the migrants?
Where are they coming from?
What actually propels their movement?
What are the problems being faced in their present location?
Why are they settling in the location?

To find answers to these and many others is the sole objective of this research. Users of the Tombia-Amassoma road have long neglected any attempt to find any quantifiable information about the migrants and this research is an attempt to provide answers to the above questions.

III. OBJECTIVE OF THE STUDY

The study intends to achieve the followings as its main objectives.

1. To identify the demographic profile of the migrants.
2. To ascertain the migrants origin.
3. To find out how long the migrants have been in the location.
4. To determine the extent to which their life is better in their present location than it was before they came there.
5. To have information about their means of livelihood/ occupation in their present location.
6. To identify the problems encountered by them.
7. To proffer solutions to the problems they and other similar migrants face. The above objectives were turned into analysable research questions.

IV. MIGRATION: A DOUBLE BARRELED PHENOMENON

Migration is a complex sociological concept which deserves some explanation. Simply put it refers to the movement of people from one place to another. Many scholars have describe the push and pull factors that are the driving forces behind migration (Todaro,1984; Reed,2003; Aripko, 1991). Often the actual decision to migrate occurs only when the advantages. A review of early literature presents migration in terms of individual decision involving comparison of wages and earnings (Todaro,1984). In recent years, ideas have been broadened to account for other assumptions and decision as well as economic considerations that trigger migration. For instance the household production model believes that family members migrate as a strategy to maximize expected income (Zhao,1991) while the portfolio models sees migration as one tactic in the family's larger strategy of risk management (Stark,1999).

V. WHO MIGRATES?

Labour migration is a selective process affecting individuals with certain economic, social, educational and demographic characteristics (Todaro 1982). Every individual is therefore not equally likely to migrate. Using data from Africa and Latin America countries, Browning shows that out-migrants are disproportionately concentrated in the young adult age group, are more likely to males single and are better educated than the population of origin, but\ the characteristics of migrants varies with purpose of migration, the size of the place of origin and destination and the distance travelled. Boy's greater access to education helps to prepare them to move either to acquire education or for employment after their training. Most wage employment in the mines, plantation and factories are for young men. Consequently areas of high in-migration have high sex ratios and areas of out-migration have a larger proportion of males. Long distance migrate are also likely to be older than short distance migrants their moves require great maturity and are less likely to be for education (Sada 1984). This does not mean that there are many females' uneducated, older and married migrants. What is implies is that propensity to migrate is greater for individuals having the set of characteristics. There is considerable relationship among them (Caldwell 1968a,Swindell 1979)

VI. MIGRATION WITHIN AND BETWEEN COUNTRIES

Internal migration and international migration are often considered separately, but can be part of a single overall migration system; the pressures to migrate are the same. The push and pull factors outlined above and others may first generate movement form the country side to the cities, leading later to migration.' leaving traditional forms of production and social relationships to move into burgeoning cities is the first stage of fundamental social , psychologically and cultural changes, which create the predisposition for further migrants. To move from peasant agriculture into a city like manila, Soa Paulo or Lagos may be a bigger step for many than the subsequent move to a 'global city' like Tokyo, Los Angelas or Sydney.

There are other connections between rural-urban and international migration. Rural people drawn into the cities may find employment in sectors vacated by urban dwellers that have in turn moved up a notion to replace those who have gone to work abroad. In some part of the world, such as in South-East Asia, the departure of rural migrants for the towns creates labour shortages which are filled by new rural migrants either from within the century or from across borders, thus creating new international migration streams and new patterns of integration and disintegration. (Ekpeyong 1999:58)

VII. MIGRATION AND SPATIAL CHANGES IN NIGERIA

RURAL-URBAN MIGRANTS

Rural –urban Migrants has affected the socio-economic and political changes of rural Nigeria in many ways. In most instance, it has resulted in rural depopulation, (a greying of rural

population) especially of young school leavers and the elites. This is clearly documented in the fact that technological development in the cities is skilled biased. This has raised the relative demand for educated and skilled labour (Stalker,1994; Montgomery et al,2003). Since the rate of return to schooling in the rural areas is lower than in cities, it provides the motivation for rural-urban migration. This movement in human capital resources is not without consequences where it is the able bodied men and women that move, it deprived the rural areas of substantial manpower need on the farm, retards agriculture and food production, thereby quickening the stagnation of rural economy (Massey, 1990). In recent times, it has encouraged child trafficking used for street hawking in the cities. Other issues of current ailment include declining productivity of agriculture which is contributing to the current food crisis in Nigeria, declining rural household income, enculturation and negative changes in social values (Montgomery et al, 2003).

RURAL-RURAL MIGRANTS

In an earlier work which focused on rural-rural migration in Cross River state, Nigeria Ottong (1991;265) observed that rural-rural migrants contributed nothing to either host community or to their community of origin. He blamed their non-contribution on two factors; poverty and claims of indigene ship. Rural-rural migrants are mostly unskilled labourer who could engage only on primary occupation of farming, fishing, hunting, lumbering, wine taping and other menial jobs. Such occupational engagements, the author argues, leaves nothing tangible after subsistence to send home by way of remittances, or by way of new knowledge gained in the host community.

VIII. MIGRATION: CAUSE AND EFFECT

The reasons of migration are grouped 4 major factors as touching the parts of the entire of a society.

- A. Natural
- B. Social
- C. Economic
- D. Political

Natural: This are caused by the disasters in their countries (Migrants), break free of poverty.

Economic: the search for better work chances, high rate change of money value, credit interest exchange etc.

Political: War, some laws made to discriminate other races.

EFFECT ON HOST COMMUNITY

The effect on its host community has both good and bad effects in some cases as society varies.

BAD EFFECTS:

Safety: (some immigrants are aggressive and illegal. Cases such as stealing, vandalizing occurs).

Higher competition for jobs.

GOOD EFFECTS:

Speeds up the growth of the country (buildings such as sky scrapers are build).

More human workers/ labour.

Less burden

Works could be done faster.

EFFECTS ON THEIR LIVES (MIGRANTS/ IMMIGRANTS)

They have no choice than to; Learn to be independent, Lonely, Discriminated. (Selene, 2009)

Although causes of migration have modified over hundreds of years. Some cases are constant, some of them do not carry the same importance as years ago (for example, in 18th and 19th centuries labour migration did not have the same character like today).

In general we can divide factors causing migrants into two (2) groups of factors: Push and Pull factors in general. Both are of economic, political, cultural and environmental based.

IX. THEORETICAL FRAMEWORK

As the problems and opportunities that accompany migrants become more apparent, attention had shifted from the migrants to their families and their communities. Contemporary researchers have equally moved attention from the reasons from migrating to consequences of migration (Mansuri and Rao, 2004).

The expression migration experience refers to the fact that different causes for migration will produces different outcomes observable from a sociological perspective. For example, a person who moves within a nation will not have the same migration experience as a political refugee. In most cases, refugees need special services from the receiver population such as emergency, shelter, food and legal aid. The psychological trauma of fleeing their homeland and leaving family members behind can also complicate refugee's adjustment to their new environment. Considering the fact that a migrant can be a slave, refugee, or job-seeker or have some other reasons for moving, no single theory can provide a comprehensive explanation for the migration process.

Although a comprehensive theory is unattainable, it remains a crucial task for demographers to explain why people migrate. Theories of migration are important because they can help us understand population movement within their wider political and economic context. For example, if out migration from third world nations is shown to be a result of economic problems caused by the global economy, then such migration should be managed with better international economic agreements instead of restrictive immigration acts.

Indeed, rather than slowing Mexican in-migration to the United States, termination of the bracer program actually increased the amount of illegal immigration because it exacerbated Mexican poverty.

Ernest Ravenstein is widely regarded as the earliest migration theorist. His theory and some others would suit this research work. Ravenstein, an English geographer, used census data from England and Wales to develop his "Laws of Migration" (1889). He concluded that migration was governed by a 'PUSH-PULL' process; that is, unfavorable condition in one place (oppressive laws, heavy taxation, etc). 'Push' them out. Ravenstein's laws stated that the primary cause for migration was better external economic opportunities; the volume of migration decreases as distance. Increase; migration occurs in stages instead of one long move; population movements are

bilateral; and migration differentials (e.g gender, social class, age) influence a person's mobility.

Knowledge of a potential receiver population, family ties and the like can facilitate or retard migration.

X. RAVENSTEIN'S LAWS OF MIGRATION

Most migrants move only a short distance.

There is a process of absorption, where by people immediately surrounding a rapidly growing town move into it and the gaps they leave are filled by migrants from more distant areas, and so on until the attractive force (Pull factors) is spent.

There is a process of dispersion, which is the inverse of absorption.

Each migration flow produces a compensating counter-flow. Long- distance migrants go to one of the great centres of commerce and industry.

Natives of towns are less migratory than males.

Economic factor are the main cause of migration.

Many theorists have followed in Ravenstein's footsteps and the dominant theories in contemporary scholarship are more or less variations of his conclusions. Everette Lee (1966) reformulated Ravenstein's theory to give more emphasis to internal (or Push) factors, Lee also outlined the impact that intervening obstacles have on the migration process. He argued that variables such as distance, political and political barriers and having dependents can impede or even prevent migration. Lee pointed out that the migration process is selective because differentials such as age, gender and social class affect how person's responds to push-pull factors, and these conditions also shape their ability to overcome intervening obstacles. Furthermore, personal factors such as a persons' education.

XI. EVERETTE LEE THEORY

Lee refined 'Push-Pull' model. Everette Lee, a pioneer migration researcher, refined the push-pull theorem in three ways;

Lee recognize that there are both positive and negative factors associated with the place of origin and positive and negative factors associated with place of destination (e.g desire to remain near relatives; known hardships to be encountered at the destination. Thus, there two sets of 'push' and two sets of 'pull' involved. The forces involved maybe numerous and heterogeneous both for origin and destination.

He further emphasis that there are intervening obstacles and restrictions between origin and destination. Among these obstacles are distance, cost of moving, loss of income, housing, legal regulations and entrance controls.

The Lee model recognized any type of force (economic, social, environmental, political, and cultural. Hence it is very comprehensive for Lee migration is a balance of push-pull at origin, push-pull at destination and the intervening obstacles.

XII. METHODOLOGY

The study area for this research is the Tombia-Amassoma road. The road is 40km touching both ends of the community, the Tombia community is just a portion of Yenagoa and Amassoma. The road is a connector of the population of both communities which is summed to about 40,000.



MIGRANTS HOUSES, JUST BY THE ROAD SIDE



The area is located geographically at the south of Bayelsa state within the Southern Ijaw local government area to be precise, which happens to be the biggest local government area in the state. Taking a conglomeration of the entire structures there, it is more of an isolated compound with buildings and structures harbouring neighbours with bushy forest and stagnant rivers all along the road. Building patterns or settlement styles is homogeneous having almost all living homes built with sink and wood some were even covered with raffia palms. The locale started in 1982 as a fishing camp with a single structure (house). The soil texture and environmental condition is good for farming because it composes of well -nourished loamy soil. The area welcome all kinds of subsistence crop for agriculture but majorly the plantation of plantain was at its peak which at times were

offered for sale as a result of production surplus. The first dwellers of the area were the owners of the area; the people of "YENIZUE-GENE EPIE KINGDOM I" located at Yenagoa.

The purposive sampling was used to be more specific and direct to the target population. A suitable statistical procedure was applied on the data collected. Some parts of the research question were restructured into testable questions with variables while the others were contained in the interview scheme. The uses of tables, simple percentages, themes (for the interview) were used. The various formulae were adopted during analysis;
Simple percentage= $\frac{\text{No. of Respondent}}{\text{Total Population}} \times 100/1$

PICTORAL VIEW OF THE AREA



Migrants source of water for all domestic use and Migrants craft business



Building structure of the migrants houses and the Arial view of the houses

XIII. DATA ANALYSIS OF THE STUDY

TABLE 1: SOCIO-DEMOGRAPHIC PROFILE OF THE MIGRANTS

PROFILE	VARIABLE	NUMBER	PERCENTAGE
Sex	Male	15	30.00
	Female	35	70.00
Age	18-35	30	60.00
	36-55	17	34.00
	56 & above	3	6.00
Marital Status	Single	6	12.00
	Married	42	84.00
	Divorced	0	0.00
	Widowed	2	4.00
	Separated	0	0.00
Level of Education	Primary	5	10.00
	Secondary	10	20.00
	Tertiary	5	10.00
Major Occupation	No-Formal Education	30	60.00
	Farming & Fishery	30	60.00
	Trading	5	10.00
	Civil & Public Service	2	4.00
	Artesian	10	20.00
	Others	3	6.00
Employment status	Unemployed	42	84.00
	Employed	5	10.00
	Retire	3	6.00
Classified as	Rich	2	4.00
	Average	8	16.00
	Poor	40	80.00
Household Size	0-4	30	60.00
	5-9	17	34.00
	10-14	3	6.00
	15 & above	0	0.00
Religion	Christian	42	84.00
	Islam	0	0.00
	Traditional	8	16.00

Source: fieldwork, 2013

Findings

From Table 1, it is clear those females are more in number than the males which is 70%:30% respectively. The respondents are dominated by matured teenagers of ages 18-35years which is 60% while ages 36-55years are 34% and 56years and above were very low even lesser than half of the population which is just 6%. Although the population is a household population as it is clearly shown from the table that married ones are 84% which is almost the entire population while the singles and widows the remaining share of the population is 12%:4% respectively.

Those without formal education are more than half of the population 30(60%) while those with Primary Education 5(10%), Secondary Education 10(20%) and the very Tertiary Education 5(10%).

The most prominent occupation is farming/fishing which is more than half of the population 30(60%) from the total 50(100%). Trading, Civil and Public Service. Artesian and others are 10% :4% : 20% : 6% respectively.

The status of employment of the population is not at balance at all, because the unemployed are 42(84%) while the other status are far lesser than even 2/3rd of the population which is shown as Employed 10% and Retired 6%.

The economic rating of the migrants was as follows; 80% were considered as poor, while 16% are average and 4% rich.

Families with exactly 0-4 members were 60% of the population while 5-9 members were closely more than 2/3rd of the population which is 34%, 10-14 members were just 6%.

Lastly, Christian worshippers were more in the population than any other religion. As shown from the table is Christians 84%, Islam 0%, traditional worshippers 16% which makes a total of 100%.

TABLE 2: STATE OF ORIGIN

State	Number	Percentage %
Bayelsa	5	10.00
Delta	35	70.00
Rivers	5	10.00
Edo	0	0.00
AkwaIbom	3	6.00
Others	2	4.00
Total	50	100.00

Source: fieldwork, 2013

Findings

Table 2 shows the state of origin in Nigeria where each of the migrants hails from. From the table, it is clear that almost all the migrants are from Southern Nigeria which has been segmented as Bayelsa 10%, Rivers 10%, Edo 0%, AkwaIbom 6%, others 4%(outside the southern region) and the Delta, the largest amongst all as 70% out of the total 100%.

TABLE 3: AMOUNT OF MONEY EARNED MONTHLY BY THE MIGRANTS

(N) Amount	Number	Percentage %
1,000-5,000	40	80.00
6,000-10,000	5	10.00
11,000-15,000	3	6.00
16,000-20,000	2	4.00
Total	50	100.00

Source: fieldwork, 2013

Findings

The table above shows the money in total that is earned monthly by the migrants and the entire population at large. From table 2, 80% of the populations earn as low as N 1000-5000 monthly, while inversely those who earn N6000-10000, N11000-15000 and 16000-20000 are 10%:6% and 4% respectively.

TABLE 4: SOURCE OF CAPITAL OF THE MIGRANTS

Sources	Number	Percentage%
Salary	2	4.00
Personal Savings	33	66.00
Co-operative Society	5	10.00
Bank Loan	0	0.00
Borrowing	5	10.00
Others(Gifts)	5	10.00
Total	50	100.00

Source: fieldwork, 2013

Findings

The table above shows the means through which table 3 has been derived; which indicates the source of capital. From table 4, those who are into Personal Savings are greatly higher in the population which is 66% while those in Salary scheme are just 4%. Those who take Loan from the bank are absolutely 0% which means no one. Those into Co-operative Society through borrowing and those dependent on Gifts are of equal number and percentage 5(10%) which is not up to 2/3rd of the population.

TABLE 5: LENGTH OF SQUATTING IN THEIR PRESENTLOCATION

Years	Number	Percentage %
1	2	4.00
3	35	70.00
5	8	16.00
Indigene of Bayelsa	5	10.00
Total	50	100.00

Source: fieldwork, 2013

Findings

Table 5 above shows the number of years the migrants have being in the location. Amongst the rural migrants 10% of the population were Bayelsans (who were permanent dwellers and not migrants), aside which 70% of the migrants have spent 3 years, 4% have spent just a year and 16% 5 years in the location.

Total	50	100.00
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Source: fieldwork, 2013

TABLE 6: THE MOTIVE OF THE MIGRANTS FOR MIGRATING

Motives	Number	Percentage %
Due to Housing Problems and High cost of living in former location	35	70.00
Scarcity of job and money	10	20.00
Indigene of Bayelsa	5	10.00

Findings

Table 6 shows the main reason behind the migration process of the rural migrants. From the table above, aside the 10% Bayelsans, more than 1/4th of the population (20%) migrated as a result of job and money scarcity while the bulk of the population which is the remainder (70%) were as a result of housing problem and high cost of living.

TABLE 7: IMPROVED CONDITION OF LIVING TO LENGTH OF STAY

Length of stay	Improved	%	Not Improved	%	Somehow	%
1-3years	4	8.00	20	40.00	13	20.00
4-5 years	0	0.00	8	16.00	0	0.00
Indigenes	0	0.00	0	0.00	5	10.00
Total	4	8.00	28	56.00	18	36.00
			Total	=	50	100.00

Source: fieldwork, 2013

Findings

Table 7 shows the percentage and number of the population response to which their living condition has changed over the years spent.

From the above table, migrants who have spent 1-3 years administered that 8% them have noticed improvement in their living condition while opposes it and 26% were not certain to whether improved or not.

For those who have spent up to 4-5 years were certain that things have not improved which are 8 (16%) of the 50 (100%). The Bayelsan dwellers responded in their 10% as uncertain to the changes in the living condition.

Beside the aforementioned problems, more than half of the entire population complained of “Oppression from the indigenes” which obviously excludes the Bayelsa dwellers and they are 70% of the population.

In the view of the above problems, the migrants and also dwellers have been coping with the problems through various strategies such as the use of electric generator for electricity supply, some live on herbal medication, the use of local river water for domestic use and above all the oppressed migrants have only been coping with their peculiar conditions.

TABLE 9: FUTURE PLANS OF THE MIGRANTS AS REGARD THEIR DEPARTURE

More Years to stay	Number	Percentage
<1 year	10	20.00
1-3years more	30	60.00
4-5years more	5	10.00
As long as possible	5	10.00
Total	50	100.00

Source: fieldwork, 2013

Findings

The above table shows the plan of the migrants in, line with time of their departure from the area.

20% of the population will be departing in less than a year from now (2013). While 60% will still have to stay at least up to 3years and 10% intends spending up to 4-5 years more. But the Bayelsa dwellers which are 10% of the population are ready to stay for as long as possible.

TABLE 8: PROBLEMS ENCOUNTERED BY THE MIGRANTS

Problems	Number	Percentage %
No electricity supply	50	100.00
No health care system	45	90.00
No hygienic water	45	90.00
No security	25	50.00
Oppression from indigenes	35	70.00
No education system for children	20	40.00

Source: fieldwork, 2013

Findings

Table 8 above shows the problem encountered by the entire population in the location. The entire 100% population complained over zero supply electricity. Still in high response, 90% complained no health care system and hygienic water for domestic use. Households of 40% which is 20 of total 50 complained of no school faculty for children and 50% complained of security.

TABLE 10: SOLUTION PROFFERED BY THE MIGRANTS AS REGARDS THE PROBLEM THEY ENCOUNTERED

Suggested Solutions	Number	Percentage %
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Provision of health care system	45	90.00
Provision of bore hole water system	45	90.00
Provision of Electricity supply	50	100.00
Provision of Good security measure	25	50.00
Provision of school facility for children	20	40.00

Source: fieldwork, 2013

Findings

In line with table 8, table 10 shows the solutions suggested by the entire population to the problem they encounter. Of most importance, 100 % of the population the immediate provision of electricity supply while 90% also suggested provision of water and health care facilities.

Half of the population 25(50%) suggested good provision of security and less than half suggested provision of school for the children which is 40%.

XIV. SUMMARY OF FINDINGS

The study of rural-rural migration is a rear scenario especially that of rural-rural migrants along the Tombia-Amassoma express way. A summary of the findings are as follows;

- Women are more amongst the migrants including those who are widows with children.
- Most of the migrants have no-formal education which makes them illiterate.
- The bulk of the migrants are farmers and fishermen/women which means that many feed on agricultural produce.
- The richest migrant (in terms of monthly income) earns N20000 monthly while others earn as low as N1000 per month.
- The oldest migrant in the location have spent 5 years in the location. And surprisingly.
- The locale is owned by the YENIZUEGENE EPIE KINGDOM 1 OF BAYELSA STATE, that's why at 2012 the area was publicly and formally referred to as YENEZUEGENE EPIE II.
- As bad as the condition of living in the area seems to be, the migrants are compelled to pay fines and levies in the area for fishing, farming etc

XV. CONCLUSION

This study of rural-rural migrant along the Tombia-Amassoma expressway is indeed an eye opener. From the findings one can conclude that the migrants are living at the margin of life which calls for a great and urgent attention. At the end of a successful research the followings were found;

Firstly, women are found in the business of migration than the men. The former were 70% in attendant while the later 30%. This is not in line with other studies where men were more in

migration than women. The condition of the area alone was not welcoming for the insatiable man.

Secondly, the level of education was consistent with the type of occupation of the migrant in the area. This was the case where 60% had no formal education and correlatively 60% were agriculturally employed through farming/fishing.

Thirdly, the 4% civil/public servants were the only migrants who earned N16000-20000 and above monthly. The other 96% were far even below expectation (as low as N2000 monthly)

Fourthly, houses were built without proper planning; all were built on difficult terrain, poor settlement layout, buildings on pipe lines all these were pictorially shown in the study.

Furthermore, 100% of the migrants and the supposedly Bayelsa indigene all suffer from one basic need of life or the other.

Lastly, the coping strategies of the migrants were almost in averrance with the problems faced by the migrants because the coping strategies were problems themselves and could even generate even bigger problems for example;

Coping strategy for no electricity supply-----candle stick (light) -----can also lead to fire outbreak.

Nevertheless, from the research it was found that through a form of collective voluntary conscience, all migrants and indigenescontributively in attendance are participating in one form of socio-cultural activity or the other such as Epie Festival and also have some informal gatherings in form of recreational activities mostly at evening hours.

In climax, Nigeria as in other developing countries as shown in the population, difficulties in solving negative effect or a double barred effect of immigration is the failure on the part of the local government which happens to be the closest administrator to the people bridging the gap between the federal government and the people.

XVI. RECOMMENDATIONS

This is a sympathetic situation of the migrants. The question to be asked is that, considering the problems faced by the migrants in their former and present locations, and having identified through the study that majority of the migrants are from Delta state, what effort has the Delta State Government made to curtail people(its indigenes) from moving out of the state? There is need for the governments concern to look critically into the issue raised above.

Secondly, the Ministry of Non-indigene Matters, Health and that of Environment and more so Niger Delta Development Commission Chapter in Bayelsa state should please narrow their aids to these squatting migrants, ; since most of the migrants are from the Niger Delta region,

In all of these, the common man and passer-by should not play the left out wing in rendering any voluntary assistance to the migrants for exhibiting such unusual movement from rural to rural.

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English to Marathi Translator with retaining structure of data

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Abstract- People of different linguistic background could not able to interact with each other. This concept of translation will help people to communicate comfortably. Also it will help to fill communication gap between two linguistically different backgrounds. It will help to the people in the villages, who have taken education of English. Majority of the Indian population is not familiar with English while most of the information available on web or electronic information is in English. So, to reach out to the common man across various sections and field, an automatic language translator is important. So the main objective of Machine Translation (MT) is to break the language barrier in a multilingual nation like India. MT gives several approaches to translate source language to target language. In this paper we are translating English to Marathi with retaining structure of data.

Index Terms- Approaches. Communication, Language, Lexicon, Machine Translation(MT) .

I. INTRODUCTION

Hindi is a widely spoken language and it is the principal official language of the Republic of India. On the other hand, English is internationally popular language. In India, English as a language has played a major role in administration, legal and education sector since British period. Presently, an awareness has been developed in this country for using regional languages such as Marathi , Kannada etc. for government document writing, for primary and higher education and every other domain of public life. In this context, it has become very important to build system which can translate English to various Indian languages. With the existence of huge text resources in internet and India being one of the most prominent users of web, even commercial companies are finding it necessary to venture out for building machine translation.

There are three types of machine translation framework :

Rule-Based Machine Translation (RBMT) systems use large collections of rules which is manually developed over time by human experts mapping structures from the source language to the target language. The first RBMT systems were developed in the early 1970s. The human factor in rule-based systems helps deliver fairly good automated translations with predictable results. Rule-based systems can be quite costly and time consuming to implement as well as to maintain. As rules are added and updated these systems have the potential of generating ambiguity and translation degradation over time[1].

Statistical Machine Translation systems use computer algorithms to produce a translation that looks best statistically

from millions of permutations. The first ideas of statistical machine translation were introduced by Warren Weaver in 1949, including the ideas of applying Claude Shannon's information theory. Statistical machine translation was re-introduced in 1993 by researchers at IBM's Thomas J. Watson Research Center and has contributed to the significant resurgence in interest in machine translation in recent years. Statistical models consist of words and phrases learned automatically from bilingual parallel sentences, creating a bilingual "database" of translations. The attractiveness of statistical systems comes from the level of automation in building new systems using its machine learning capabilities, leading to rapid turnaround time and the low cost of processing power required for constructing and operating these statistical models.

Hybrid Machine Translation:

Hybrid-based approach is developed by taking the advantage of both statistical and rule-based translation methodologies which has proven to have better efficiency in the area of MT systems. At present, several governmental and private based MT sectors use this hybrid-based approach to develop translation from source to target language, which is based on both rules and statistics. The hybrid approach can be used in a number of different ways. In some cases, translations are performed in the first stage using a rule-based approach followed by adjusting or correcting the output using statistical information. In the other way, rules are used to pre-process the input data as well as post-process the statistical output of a statistical-based translation system. This technique is better than the previous two techniques and has more power, flexibility, and control in translation [1].

II. NEED OF TRANSLATION

The official language of India is Hindi. According to the Constitution, Parliamentary business may be conducted in either Hindi or English. In corporation world English language is used for official work. At state level different languages are used, for example Marathi language is used in Maharashtra , Kannada is used in Karnataka etc. So there is need to translate English to local language for communication/ circulation and interaction purpose. In office work there is need to translate documents into local language.

III. PROBLEM STATEMENT

This paper aim to translate English to Marathi word by word convertor with retaining structure of input file. For example if

input file is document file with English text so we are going to translate it in Marathi with retaining same structure of input file means if input file contains bold or italic font style words, after convertor it will display with same property.

IV. METHODOLOGY

As per our problem statement we are presenting English to Marathi convertor on basis of word. For translating words we created dictionary for retrieving the corresponding Marathi word. First open the document file which we want to translate from location. Then read file document file so here we identify the property of each word in file such as font style, font size etc. Extract the words from document file and search it in database. When it found write it in output file with all properties.

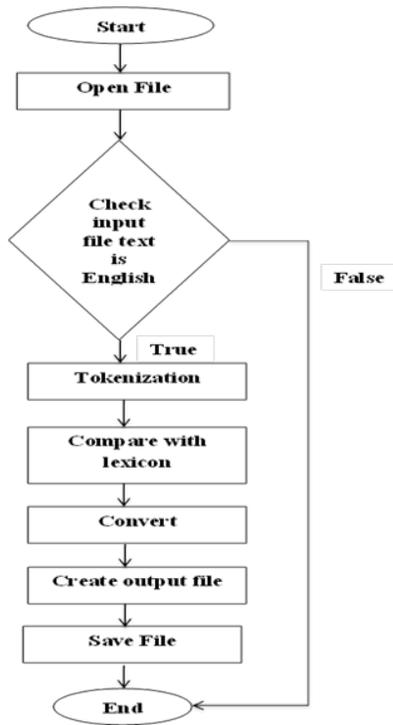


Fig.1 Flowchart of proposed system

The flowchart given above in fig.1 which shows all steps taken. As stated below first step is to open the document file. The file which is open should contain only English text. so first check is document contains English text. If the file contains English text, then tokenization is done. Here words are separated and then identify the properties of words. Some words can be bold or italic. Then compare word with lexicon. So for that we need large amounts of database. After searching appropriate words convert into Marathi language. Create same input file extension and write to output text and save file. So in this we get output file.

The screenshots given below Fig.2 shows that it is home page so it gives options like open, Translate, save file. For getting help there is menu provided Help and last one is Exit.

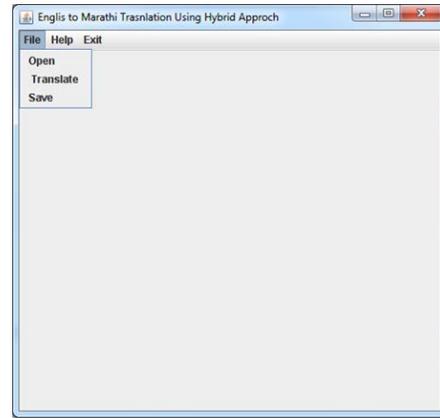


Fig.2 Home Page

On the next screenshot given in Fig.3 which shows the contents of file. When we clicked on open menu item it will open dialog box through which we open document file. As given in fig.3 it shows contents of file here the contents are,

This is *example*

Actual input file contains this text in which first word “This” is bold, “is” is plain text and “example” is bold and italic style.

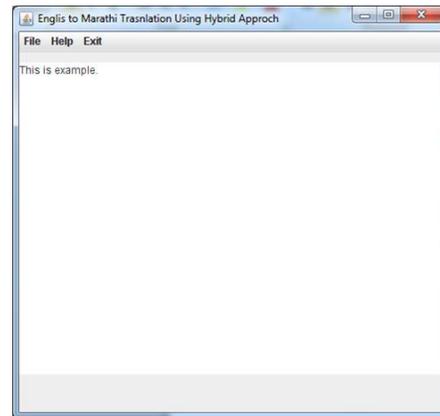


Fig.3 Open document file

Fig.4 is convert file means this fig shows that after tokenization we translate words into Marathi

“हे आहे उदाहरण”

So we are going to write this line in output file. Then this file with same extension of input file.

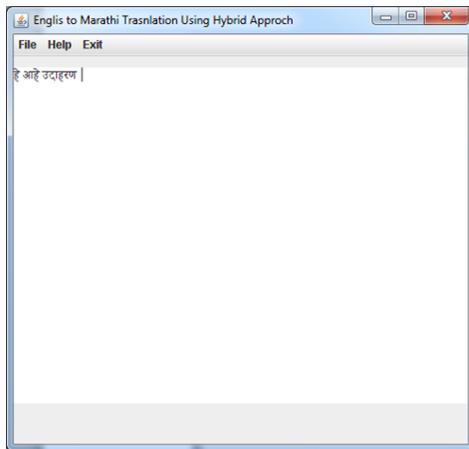


Fig.4 Translate document file

Now Fig.5 shows the actual output file after converting it into Marathi text. The output file contains same contents with translating into Marathi language along with their properties.

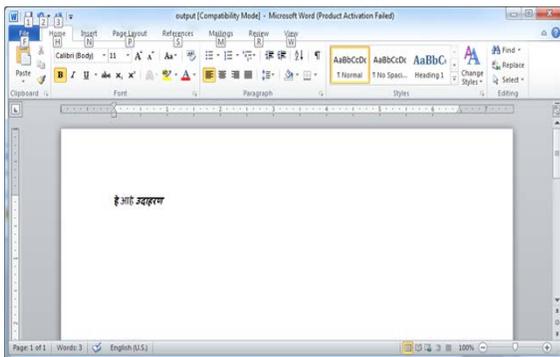


Fig.5 Output File

V. CONCLUSION

Language translators are very important in day to day life as we presented basic translator which is word by word translator. In an office there are many circulars and document which has to translate into local language. In that there is need to translate documents should be retained with structure.

ACKNOWLEDGMENT

This acknowledgement is humble attempt to honestly thank all those who are directly or indirectly involved in my project and are of immense help to me. I would sincerely like to thank

you our guide Prof. Z. M. Shaikh for giving me valuable guidance also thanks to principal and all staff of NK Orchid College of Engineering.

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Improving Energy Efficiency using Mobility based Data Compression in LEACH-C for Wireless Sensor Networks

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Abstract- A Wireless Sensor Network (WSN) is built from a network of devices referred to as nodes, which can sense the environment and are used to communicate the required information collected from monitored fields. The communication and collection of information is done with the help of wireless links, where each node is linked to one or a number of sensors. The nodes in turn are deployed in large numbers depending upon the application where it is used. In modern days the process is bidirectional where the sensor activity can be monitored. The longevity in network lifetime is necessary as they have limited battery power which is to be used efficiently. This has led to new horizons upon energy saving and reduced power consumption among sensor nodes. Hierarchical cluster-based routing protocols are considered as one of the most efficient routing protocols in wireless sensor networks (WSN) due to its higher energy efficiency, network scalability, and lower data retransmission. An energy efficient hierarchical routing protocol LEACH-EN based on LEACH-C is designed by introducing the concept of dynamic node scenario in LEACH-C where movement of nodes is introduced along with compression of data from each node using LZW compression technique. The energy of nodes by introducing dynamic node concept along with compression seems to be efficient than the energy of nodes in LEACH-C protocol and therefore network longevity can be maintained to a certain extent.

Index Terms- WSN, LEACH, LEACH-C, Network lifetime, LZW compression, Mobility based

I. INTRODUCTION

Wireless Sensor Networks are tiny sensor nodes with the main purpose of sensing, computation and communication about physical and environmental activities which in turn is used in wide range of applications such as civilian, healthcare, habitat monitoring etc., in our day to day life. WSNs are battery operated sensing devices where replenishing the batteries is impossible and hence an energy saving method has to be employed to save power.

Routing is an important concept in sensor networks as they deal with the process of data dissemination and data gathering after which the shortest possible and efficient path to reach the destination is chosen. In WSNs routing may be divided into flat routing and hierarchical routing [1]. In flat routing, nodes are similar in carrying out tasks which proves to be a disadvantage when it comes to a larger environment. In flat routing the energy

is wasted at times of data processing and thus the limited bandwidth which is allocated has not been used efficiently

In hierarchical routing nodes are dissimilar in the tasks which they carry out. Thus in terms of energy they prove to be efficient when compared to flat routing as they utilize the bandwidth efficiently. [2],[3]. Clustering technique has been introduced in which there is a Cluster Head (CH) and the respective cluster members. Nodes with less energy are chosen as cluster members and that with high energy are chosen as cluster heads which then carry out the sensing process.

The paper is organized as follows: Section II provides an overview of the LEACH and LEACH-C protocol and their comparison. In Section III the problem statement has been discussed. Section IV an overview of LZW data compression technique which is employed based on LEACH-C is given. Mobility based data compression is introduced in Section V. Section V provides the simulation results. Finally we conclude the paper in Section VII.

II. CLUSTER BASED ROUTING PROTOCOLS

CLUSTERING

A WSN consists of hundreds or thousands of nodes deployed based on the application with a centralized Base Station (BS). Clustering based protocols prove to be efficient as these protocols unlike others partition the area into smaller regions. Each region has its Cluster Head (CH) and the cluster members (CM). Hence energy has been efficiently used and does not waste the allocated bandwidth.

Cluster-based routing is mainly two-stage routing method, where the first stage is used to clustering and selecting cluster head for each cluster. Cluster head performs data aggregation and fusion to decrease transmitted packets. The second stage is used to sense and route data, but, most techniques in cluster-based routing focused on the first stage which is "who and when to send or aggregate" the data, channel allocation etc.

LEACH

The LEACH protocol (Low-energy Adaptive Clustering Hierarchy) presented by Heinzelman et al. partitions the nodes into clusters and in each cluster a dedicated node, the cluster head, is responsible for creating and maintaining a TDMA schedule; all the other nodes of a cluster are member nodes. To all member nodes, TDMA slots are assigned, which can be used to exchange data between the member and the cluster head; there is no peer-to-peer communication. With the exception of their time slots, the members can spend their time in sleep state. The

cluster head aggregates the data of its members and transmits it to the sink node or to other nodes for further relaying.[4]. Since the sink is often far away, the cluster head must spend significant energy for this transmission.

The protocol is organized in **rounds** and each round is subdivided into a setup phase and a steady-state phase . The **setup phase** starts with the self-election of nodes to cluster heads. In the **advertisement phase**, the cluster heads inform their neighbourhood with an advertisement packet. The cluster heads contend for the medium using a CSMA protocol with no further provision against the hidden-terminal problem[5].. The non cluster head nodes pick the advertisement packet with the strongest received signal strength. In the following cluster-setup phase, the members inform their cluster head (“join”), again using a CSMA protocol. After the cluster setup-phase, the cluster head knows the number of members and their identifiers.

It constructs a TDMA schedule, picks a CDMA code randomly, and broadcasts this information in the broadcast schedule sub-phase. After this, the TDMA steady-state phase begins. Because of collisions of advertisement or join packets, the protocol cannot guarantee that each non cluster head node belongs to a cluster[6]. However, it can guarantee that nodes belong to at most one cluster. The cluster head is switched on during the whole round and the member nodes have to be switched on during the setup phase and occasionally in the steady-state phase, according to their position in the cluster’s TDMA schedule. LEACH would not be able to cover large geographical areas of some square miles or more, because a cluster head two miles away from the sink likely does not have enough energy to reach the sink at all, not to mention achieving a low BER.

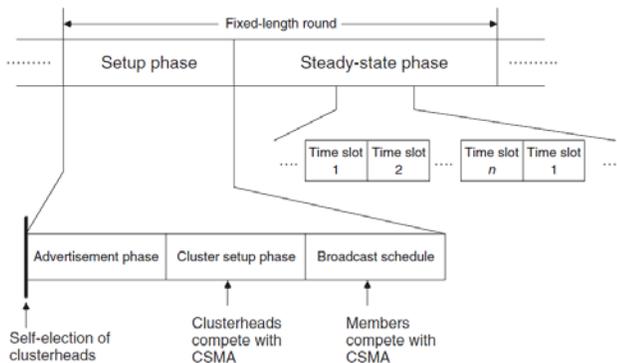


Figure 1. Organization of LEACH

LEACH-C

LEACH-C (LEACH-Centralized), a protocol that uses a centralized clustering algorithm and the same steady-state protocol as LEACH (e.g., nodes send their data to the cluster-head, and the cluster head aggregates the data and sends the aggregate signal to the base station). During the set-up phase of LEACH-C, each node sends information about its current location and energy level to the base station. The base station runs an optimization algorithm to determine the clusters for that round. The clusters formed by the base station will in general be better than those formed using the distributed algorithm[7].

However, LEACH-C requires that each node transmit information about its location to the base station at the beginning

of each round. This information may be obtained by using a global positioning system (GPS) receiver that is activated at the beginning of each round to get the node’s current location.

III. PROBLEM STATEMENT

A sensor node is a tiny device that includes three basic components: a sensing subsystem for data acquisition from the physical surrounding environment, a processing subsystem for local data processing and storage, and a wireless communication subsystem for data transmission. In addition, a power source supplies the energy needed by the device to perform the programmed task. This power source often consists of a battery with a limited energy budget. In addition, it could be impossible or inconvenient to recharge the battery, because nodes may be deployed in a hostile or unpractical environment. On the other hand, the sensor network should have a lifetime long enough to fulfil the application requirements. In many cases a lifetime in the order of several months, or even years, may be required. Thus, the design of energy efficient cluster-based is very important to prolong the life time of the sensor node by improvising LEACH-C protocol in terms of transmission of data and also enhancing node movements and positions the energy.

IV. PROPOSED SYSTEM

A. CLUSTER FORMATION

During the set-up phase of LEACH-C, each node sends information about its current location and energy level to the base station. The base station runs an optimization algorithm to determine the clusters for that round. The clusters formed by the base station will in general be better than those formed using the distributed algorithm. However, LEACH-C requires that each node transmit information about its location to the base station at the beginning of each round[6],[7]. This information may be obtained by using a global positioning system (GPS) receiver that is activated at the beginning of each round to get the node’s current location. The life time of the cluster head is increased due to the randomized rotation of the cluster. Based on the energy level the cluster head is selected. The sensor node with higher energy is converted as the cluster head.

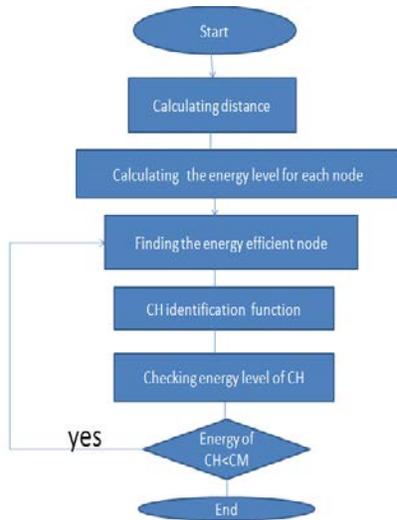


Figure 2. Cluster head selection based on energy level

B. IMPLEMENTATION OF LZW(LEMPEL-ZIV-WELCH) COMPRESSION IN LEACH-C

Lempel-Ziv-Welch (LZW) is a universal [lossless data compression algorithm](#). The algorithm is simple to implement, and has the potential for very high throughput in hardware implementations. It was the algorithm of the widely used Unix file compression utility [compress](#), and is used in the [GIF](#) image format. A particular LZW compression algorithm takes each input sequence of bits of a given length (for example, 12 bits) and creates an entry in a table (sometimes called a "dictionary" or "codebook") for that particular bit pattern, consisting of the pattern itself and a shorter code.

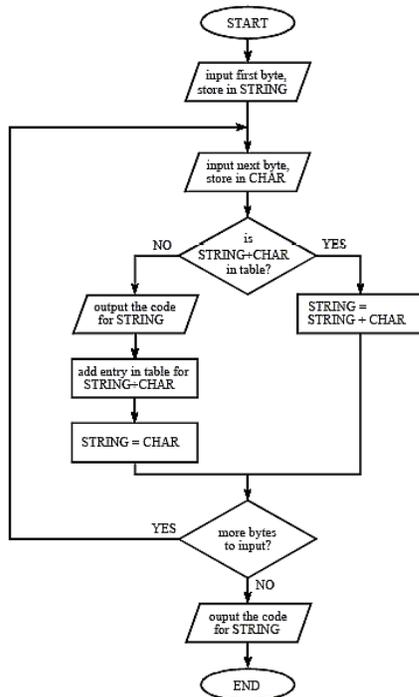


Figure 3. LZW Compression

As input is read, any pattern that has been read before results in the substitution of the shorter code, effectively compressing the total amount of input to something smaller. Unlike earlier approaches, known as LZ77 and LZ78, the LZW algorithm does include the look-up table of codes as part of the compressed file. The decoding program that un-compresses the file is able to build the table itself by using the algorithm as it processes the encoded input.

Encoding

- Initialize the dictionary to contain all strings of length one
- Find the longest string W in the dictionary that matches the current input
- Emit the dictionary index for W to output and remove W from the input
- Add W followed by the next symbol in the input to the dictionary
- Go to Step 2

A dictionary is initialized to contain the single-character strings corresponding to all the possible input characters (and nothing else except the clear and stop codes if they're being used). The algorithm works by scanning through the input string for successively longer substrings until it finds one that is not in the dictionary. When such a string is found, the index for the string without the last character (i.e., the longest substring that is in the dictionary) is retrieved from the dictionary and sent to output, and the new string (including the last character) is added to the dictionary with the next available code. The last input character is then used as the next starting point to scan for substrings.

Decoding

The decoding algorithm works by reading a value from the encoded input and outputting the corresponding string from the initialized dictionary. In order to rebuild the dictionary in the same way as it was built during encoding, it also obtains the next value from the input and adds to the dictionary the [concatenation](#) of the current string and the first character of the string obtained by decoding the next input value, or the first character of the string just output if the next value cannot be decoded (If the next value is unknown to the decoder, then it must be the value that will be added to the dictionary this iteration, and so its first character must be the same as the first character of the current string being sent to decoded output). The decoder then proceeds to the next input value (which was already read in as the "next value" in the previous pass) and repeats the process until there is no more input, at which point the final input value is decoded without any more additions to the dictionary.

V. MOBILITY BASED DATA COMPRESSION

In LEACH the election and cluster head rotation makes sure that the cluster heads do not die due to prolonged extra work. This is done by the random rotation of the cluster head duty across the nodes in the cluster by considering the energy level of the nodes. In view of mobility centric environment, the election

of a cluster or the job rotation of the cluster head on purely energy level with node mobility into consideration. Node movement is introduced randomly along a particular distance covered by the BS. The node with the highest energy and lesser mobility is chosen to be the cluster head. The nodes at first move along a certain distance where during this period of time there may be a change in energy among nodes. The LEACH-C based approach is followed after this where the node with the highest energy is chosen to be the cluster head. Over a period of time this scenario of node position and energy may change and again the threshold value of energy is found out and the CH is chosen. When there is movement among member nodes, there are chances of nodes moving closer to the BS and hence its energy may not change at this distance at any cost.

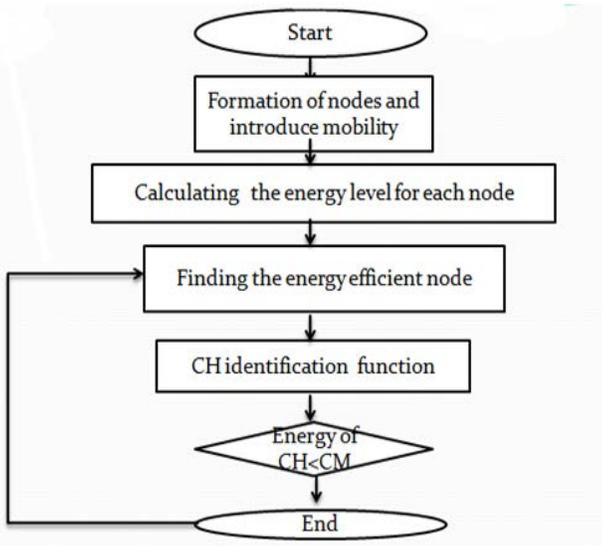


Figure 4. Mobility based technique

In the initial level of cluster, sink or BS that transmit a "Start" message to form cluster in network in its transition range of sensor nodes. This message received by sensors nodes which close to BS.

The nodes are formed and then node movement is introduced. The energy of the nodes is checked and CH is identified. In every cycle the highest energy node is selected as CH. Energy changes when node movement is introduced.

The simulation is carried out using NS-2 tool. The cluster heads are selected based on LEACH-C protocol after which randomized rotation of cluster heads take place. Data compression is done by entering data to nodes. Compression takes place at the respective cluster heads. Decompression is done at the base station.

VI. RESULTS AND DISCUSSION

When mobility of nodes is introduced along with compression in the LEACH-C protocol then the energy of nodes seems to perform well compared to the original LEACH-C protocol.

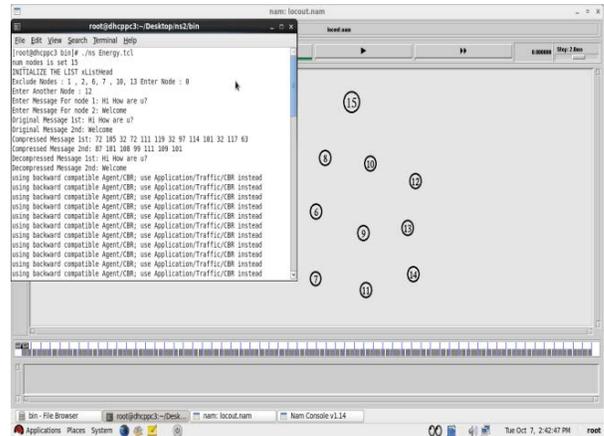
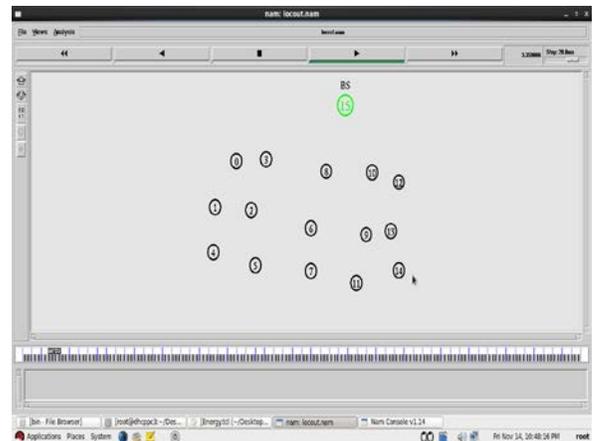
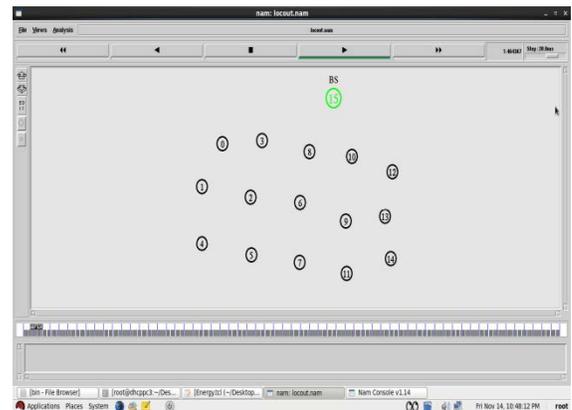


Figure 5. Formation of nodes and data obtained for all nodes



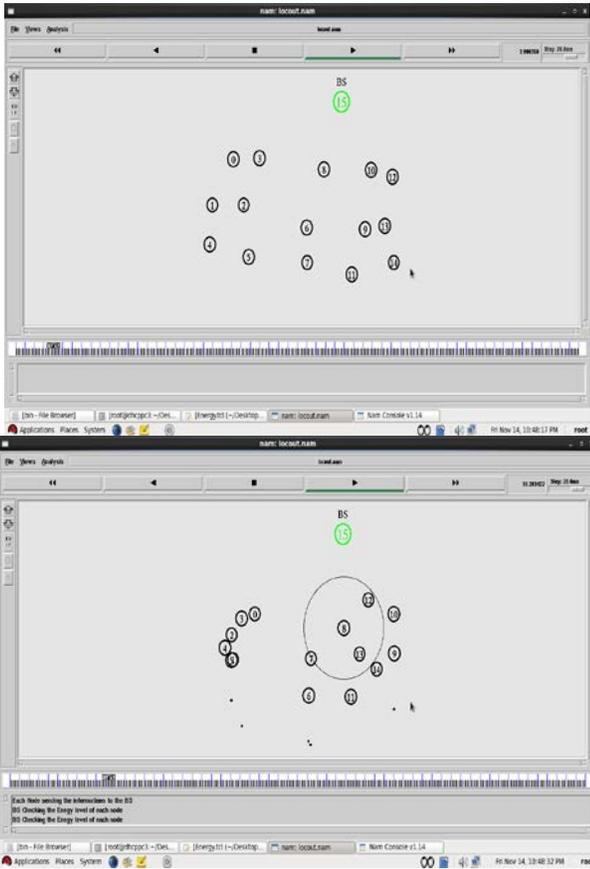


Figure 6, 7, 8, 9 Mobility among member nodes

Figure 6 shows that initially the CH are 1,6,13 and as the compression process goes on depending on the energy the CH changes to 2, 7, 10. In Fig 7,8,9 the CM compresses after which the CH receives this data. The data transmission to the BS is shown and at the BS the decompression of the sent data is done.

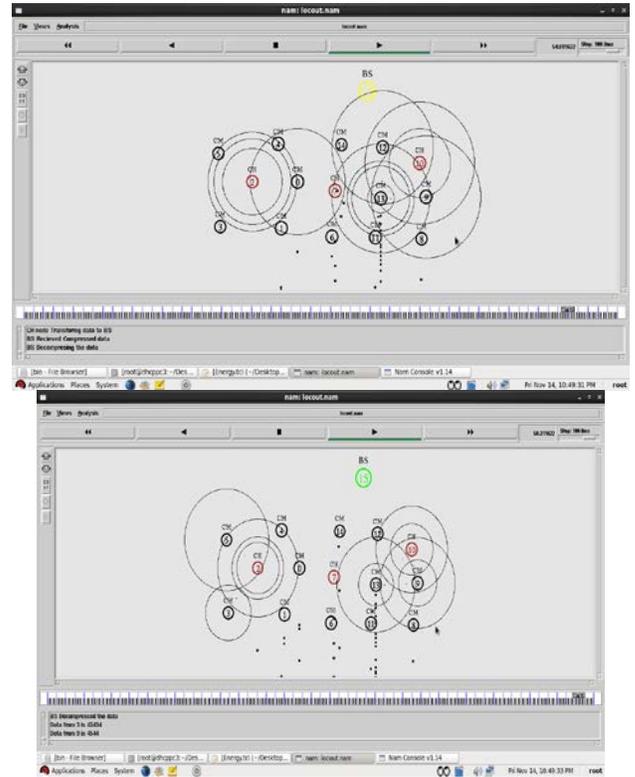


Figure 10, 11, 12 and 13 CM compressing data and sent to CH after which BS decompresses at the receiving end

A. PERFORMANCE OF LEACH AND LEACH-C

The LEACH and LEACH-C performance are conducted on the parameter of the time and energy. The time is given in the x-axis and the energy is given in the y-axis.

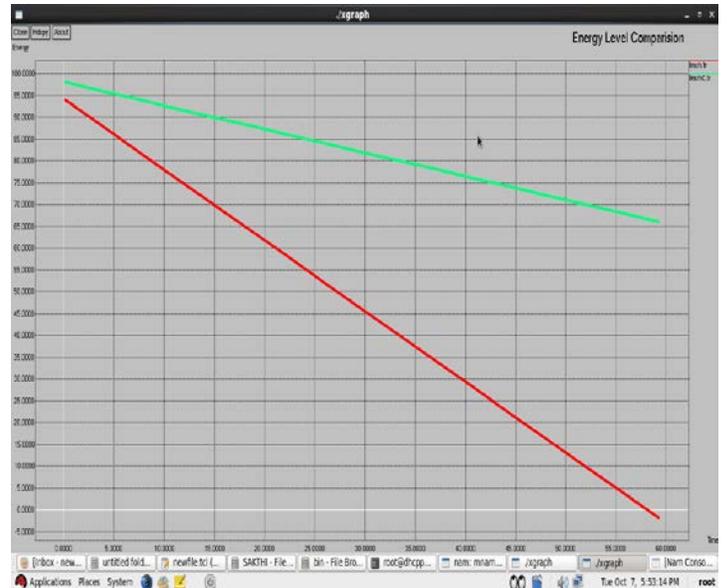
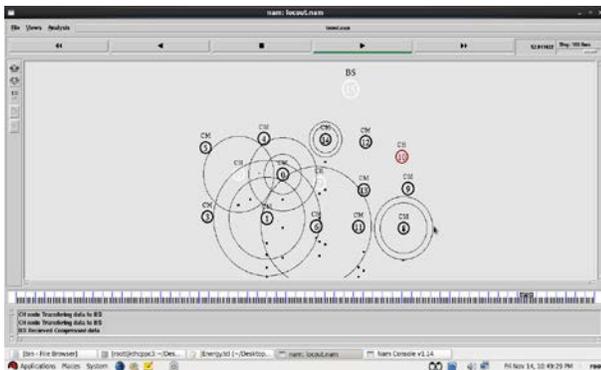


Figure 14. Comparison based on Energy

In the Figure 14. the Energy level of the leach and leach-c protocol as been displayed with respect to time. In the initial state both are at the same energy level. In case of leach they perform a poor clustering set up during a given round thus energy level decreases drastically but in case of the leach-c protocol they perform centralized clustering algorithm and also randomized rotation of the cluster head so energy is reduced gradually. Thus LEACH-C consumes less amount of energy.

B. PERFORMANCE OF COMPRESSED AND UNCOMPRESSED DATA

The time is given in the x-axis and the energy is given in the y-axis. In the Fig 15 the data is transferred without compression it consumes large amount energy but When the data is transferred with compression they consume only less amount of energy

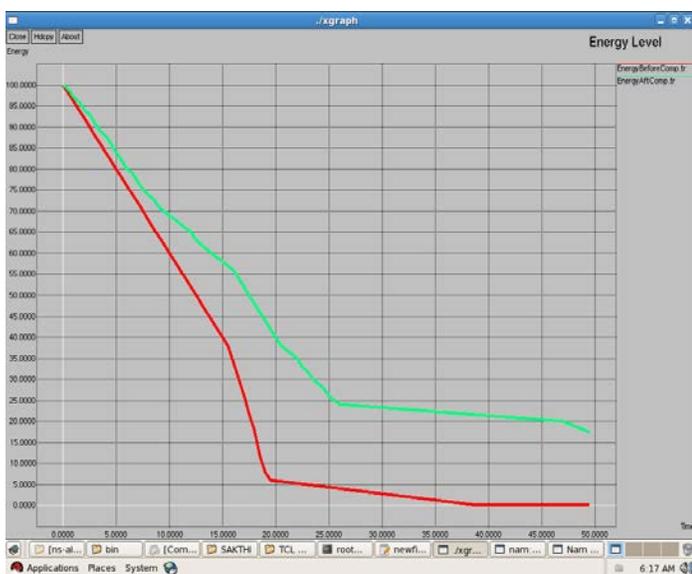


Figure 15. Energy of Compressed and Uncompressed data

C. PERFORMANCE COMPARISON BETWEEN RESIDUAL ENERGY OF NODES

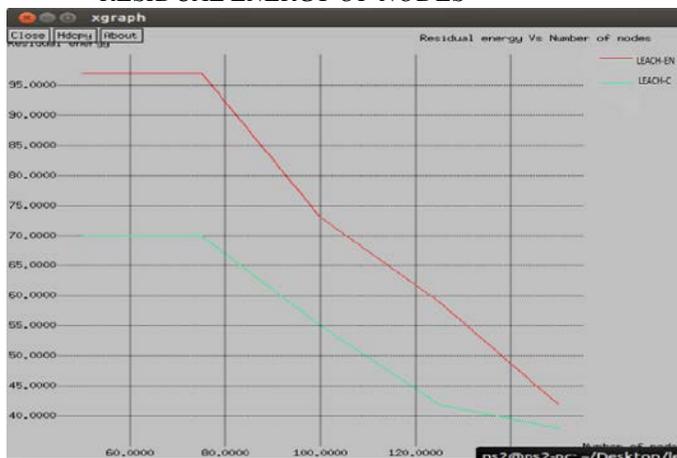


Figure 16 Comparison between residual energy of nodes

Figure 16 shows the comparison between residual energy of nodes in the network. Residual energy is nothing but the remaining energy at all nodes. The proposed protocol LEACH-EN show that when the number of nodes increases the energy among the nodes is balanced and residual energy using the LEACH-EN tend to be higher than the LEACH-C protocol. The number of nodes is taken along the x-axis and the energy in joules/bit is taken along the y-axis.

VII. CONCLUSION

The energy efficient hierarchical cluster based routing protocol seems to provide efficient routing based on two features. Firstly, the movement of nodes among the clusters will thus improve the energy, as a node move closer to a base station hence distance is reduced for transmission. After consideration of this scenario the energy level is measured using LEACH-C based approach. Secondly, compressing data at the sending end and decompressing it with LEACH-C based approach for the energy level monitoring can prove to be energy efficient.

Thus an energy efficient hierarchical routing protocol LEACH-EN is compared with the original LEACH-C under the above considerations and LEACH-EN seems to perform well to a certain extent when compared with that of the original LEACH-C protocol.

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Tobacco Control in India: Evidence Based Public Health Strategies and Interventions

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Abstract- Introduction: Tobacco is the foremost preventable cause of disease and death in the world today, killing half of the people who use it. Tobacco use kills nearly six million people worldwide each year. This epidemic can be resolved by becoming aware of the devastating effects of tobacco, learning about the proven effective tobacco control measures, national programs and legislation prevailing in the home country and then engaging completely to halt the epidemic to move toward a tobacco-free world. This study will review evidence based strategies to control tobacco menace. **Methods:** Data was collected from published research nationally and globally, WHO report on the global tobacco epidemic 2011, Centre for Disease Control and Prevention (2007): Best Practices for Comprehensive Tobacco Control Programs, Cochrane database systematic reviews. **Results:** It was observed that increasing tobacco prices through higher taxes is the most effective intervention to reduce tobacco use and encourage smokers to quit. A comprehensive ban on all tobacco advertising, promotion and sponsorship could decrease tobacco consumption by 7%, independent of other interventions, with some countries experiencing a decline up to 16% (WHO report on the global tobacco epidemic, 2011). Due to strict tobacco access policies targeting retailers and heavy fines for violation in Texas, USA, the sale of illegal sales to minors reduced from 56% in 1996 to 7.2% in 2006. In general, warning labels are overwhelmingly supported by the public, often with levels of support at 85–90% or higher, and even most smokers support labelling requirements. **Conclusion:** Most tobacco control intervention studies are from developed countries, there is a need to develop evidence-based, cost-effective interventions in developing countries for both smoking and smokeless tobacco use. Measures that proved very effective in the developed world, like tax increases on all tobacco products, need to be enforced immediately and the taxes collected should be used to support health promotion and tobacco control programs.

Index Terms- Tobacco-control, evidence-based, WHO, CDC

I. INTRODUCTION

Tobacco is the foremost preventable cause of disease and death in the world today, killing half of the people who use it. Tobacco use kills nearly six million people worldwide each year. According to the World Health Organization (WHO) estimates, globally, there were 100 million premature deaths due to tobacco in the 20th century, and if the current trends of tobacco

use continue, this number is expected to rise to 1 billion in the 21st century. (1) This global tobacco epidemic kills more people than tuberculosis, HIV/AIDS and malaria combined. This epidemic can be resolved by becoming aware of the devastating effects of tobacco, learning about the proven effective tobacco control measures, national programs and legislation prevailing in the home country and then engaging completely to halt the epidemic to move toward a tobacco-free world.

India is the second largest consumer of tobacco globally. India has one of the highest rates of oral cancer in the world, with over 50% due to smokeless tobacco use. Tobacco consumption continues to grow at 2-3% per annum. By 2020 it is predicted that tobacco will account for 13% of all deaths in India. As per the Report on Tobacco Control in India (2004), nearly 8-9 lakh people die every year in India due to diseases related to tobacco use. (2) Furthermore, up to one in five deaths from tuberculosis (TB) could be avoided if TB patients did not smoke. (3)

The tobacco problem in India is peculiar, with consumption of variety of smokeless and smoking forms. Understanding the tobacco problem in India, focusing more efforts on what works and investigating the impact of sociocultural diversity and cost-effectiveness of various modalities of tobacco control should be our priority. Lack of awareness of harm, ingrained cultural attitudes and lack of support for cessation maintains tobacco use in the community. There is a need to collate the successful evidence based interventions in curbing tobacco use. A major step has to be taken to control what the World Health Organization, has labeled a 'smoking epidemic' in developing countries

OBJECTIVE: To find out Evidence based Public Health strategies and interventions for Tobacco control.

METHODS

Data was collected from published research nationally and globally, WHO report on the global tobacco epidemic 2011, Centre for Disease Control and Prevention (2007): Best Practices for Comprehensive Tobacco Control Programs, Cochrane database systematic reviews.

II. RESULTS

TOBACCO TAXATION

It was observed that increasing tobacco prices through higher taxes is the most effective intervention to reduce tobacco

use and encourage smokers to quit. (1)The World Bank estimated that 10% increase in tobacco prices can save 9 million of lives in developing countries and 1 million in developed countries.(4)Between 2009 and 2010, Turkey became one of the 17 smoke-free countries in the world by increasing tobacco taxes by 77%,which increased cigarette prices by 62% .In Canada increased tobacco taxes reduced youth tobacco consumption by 68%. A price increase of 10% would reduce smoking by about 4% in high-income countries and by about 8% in low-income and middle-income countries (5).

According to recommendations made in The Economics of Tobacco and Tobacco Taxation in India, a 10% increase in bidi prices could reduce rural bidi consumption by 9.2% and a 10% increase in cigarette prices could reduce rural cigarette consumption by 3.4% and raising prices by 52.8% from their current levels, would significantly reduce bidi consumption and prevent 15.5 million premature deaths in bidi smokers. (6).Studies estimating the price responsiveness of cigarette demand to cigarette prices found that young people and lower-income groups are the most price-responsive (7).

BAN ON TOBACCO ADVERTISING, PROMOTION AND SPONSORSHIP (TAPS)

A comprehensive ban on all tobacco advertising, promotion and sponsorship could decrease tobacco consumption by 7%, independent of other interventions, with some countries experiencing a decline up to 16% (WHO report on the global tobacco epidemic,2011) . (8) Research in 22 countries on comprehensive ban on TAPS showed reduction in tobacco use by 6.3%. In 2010 China under obligations of WHO Framework Convention for Tobacco Control (FCTC) and to promote public health through sports made the 16th Asian Games completely smoke-free, including a total ban on tobacco sponsorships and advertising and sale of tobacco products. (9)

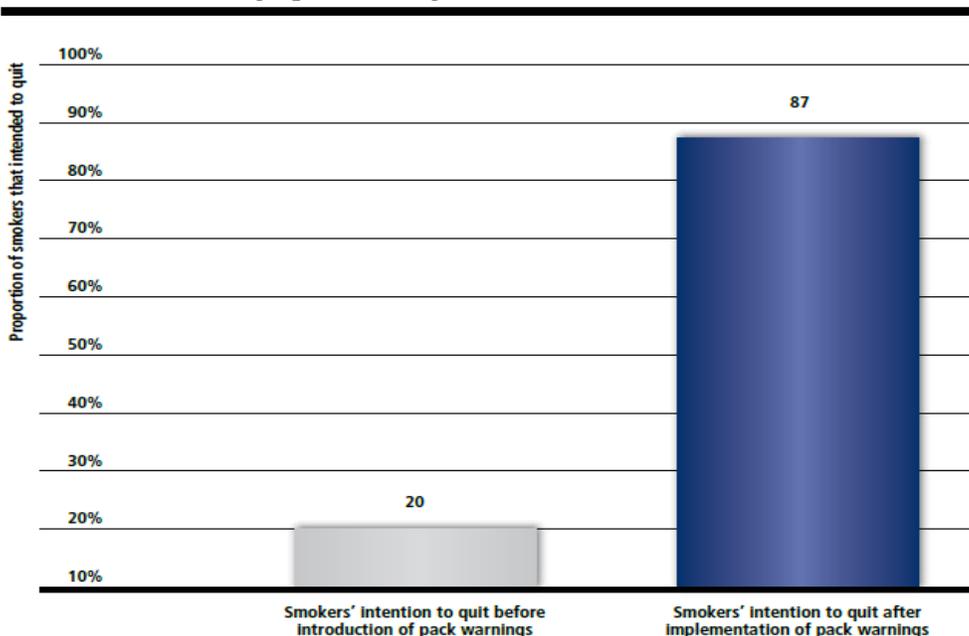
PROHIBITION OF SMOKING ON PUBLIC PLACES

Completely smoke-free environments with no exceptions are the only proven way to protect people from second-hand smoke .(10)HRIDAY (Health Related Information Dissemination Amongst Youth, Child) in its compilation of facts on Tobacco control mentioned that a Study from around 1200 public places in 24 countries found that the level of indoor air pollution was 89% lower in the places that were smokefree. A study(Pell et al. 2006)in Scotland found that the rate of admissions for childhood asthma fell by 18.2% annually after smoking ban , 86% improvement in air quality in bars and a 39% reduction in Second Hand Smoke(SHS) exposure. (11)In 2007 Chandigarh became the first smokefree city in India .Delhi the capital of India is also smokefree with high compliance of the smokefree rules.

PREVENTING YOUTH ACCESS TO TOBACCO& PICTORIAL WARNINGS

Due to strict tobacco access policies targeting retailers and heavy fines for violation in Texas ,USA,the sale of illegal sales to minors reduced from 56%in 1996 to 7.2% in 2006. Effective warning labels increase smokers’ awareness of health risks, and increase the likelihood that smokers will think about cessation and reduce tobacco consumption(12,13). In general, warning labels are overwhelmingly supported by the public, often with levels of support at 85–90% or higher, and even most smokers support labelling requirements (14,15) Warnings are also seen by non-smokers, affecting their perceptions of smoking and decisions about initiation,and ultimately helping to change the image of tobacco and “denormalize” its use (16) .In Brazil and Singapore smokers changed their opinion on the health consequences of smoking and said the warnings made them to quit. Evidence from Canada showed that pictorial warnings increase smokers intention to quit(17).(Figure-1)

Figure-1. Introduction of graphic warning labels in Canada increases smokers intention to quit.



Source: Hammond D et al. Impact of the graphic Canadian warning labels on adult smoking behaviour. Tobacco Control, 2003, 12:391–395.

III. MEDIA INTERVENTIONS

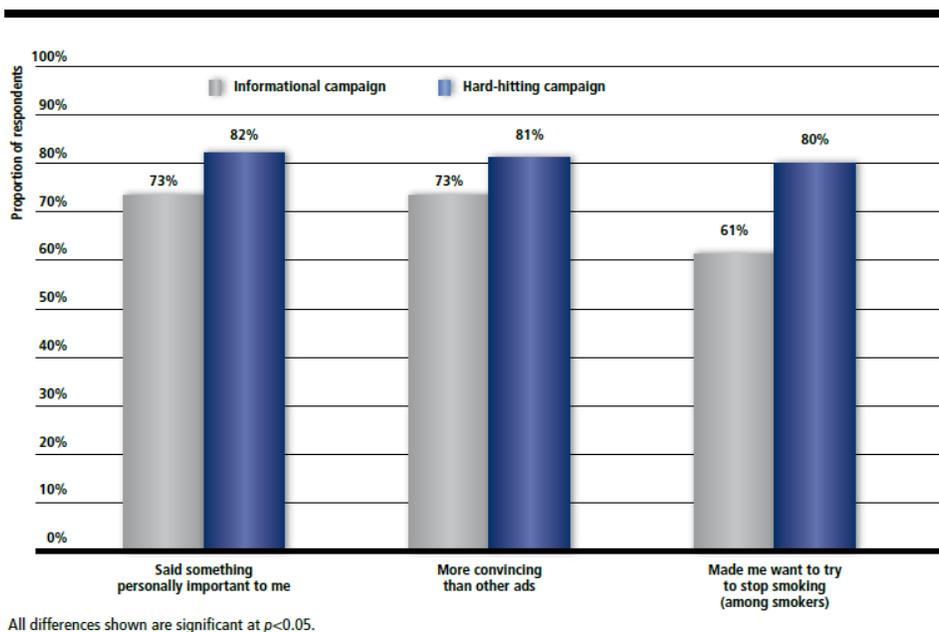
Anti-tobacco mass media campaigns can be cost effective compared with other interventions despite the expense required, and can have a greater impact because they reach large populations quickly and efficiently. Increased news coverage of tobacco control issues may reduce tobacco consumption and increase cessation attempts (19-21). News media coverage of smoking and health is associated with changes in population rates of smoking cessation but not initiation. Relationship between newspaper coverage of tobacco issues and perceived smoking harm and smoking behaviour among American teens. (22). Well managed publicity supporting mass media campaigns can have a large impact on the number of people aware of and responding to a campaign. Earned media can also be effective in motivating smokers to quit when tobacco control policy changes are put into effect (23). Within its National Tobacco Control Programme, the Government of India allocates approximately US\$ 5 million annually to antitobacco mass media campaigns.

Based on increasing evidence, including the recent Global Adult Tobacco Survey that shows smokeless tobacco is used by more than a quarter of all adults in India, one of the most recent campaigns highlights the harmful effects of smokeless tobacco

use. The campaign was run in three 6-week phases for more than a year to warn the public about the dangers of smokeless tobacco use. The first phase of the campaign, which aired on television and radio in November and December 2009 in 11 local languages, included hard-hitting footage of patients with tobacco-related cancers and featured an oral cancer surgeon describing the disfigurements suffered by tobacco chewers. The campaign was also adapted for northeastern Indian audiences and ran for eight weeks in early 2010. An evaluation of the campaign showed high recall and impact (24). Results of a national mass media campaign in India to warn against the dangers of smokeless tobacco consumption. (25) A web site (<http://www.chewonthis.in>) has been developed and launched jointly by the Ministry of Health and Family Welfare and Tata Memorial Hospital as an advocacy platform to highlight the dangers of smokeless tobacco products.

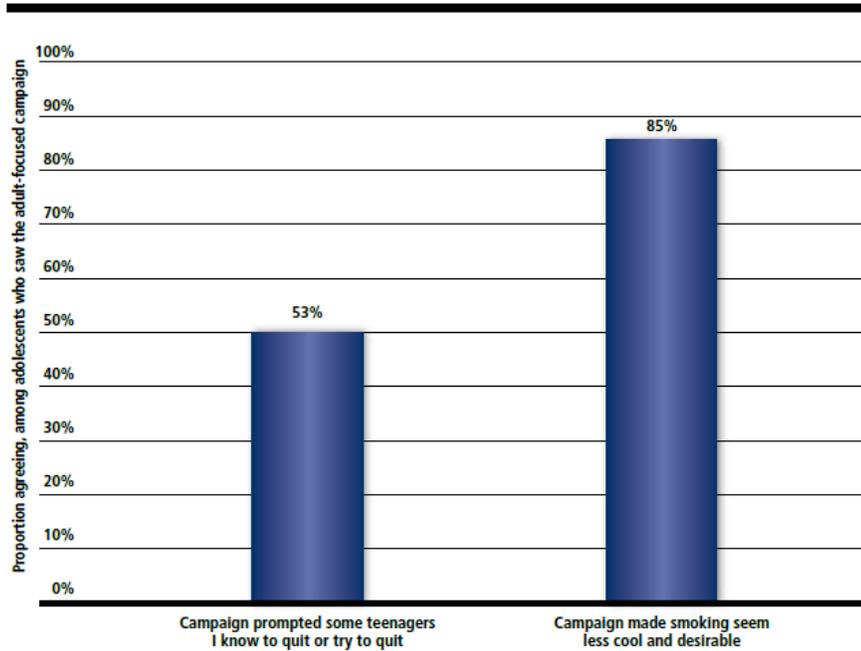
Various Studies (Murphy et al.2000, Donovan et al. 2003, Pechmann and Reibling 2003, Terry) showed that both smokers and nonsmokers indicated that the ads communicating real life experiences about the harm of tobacco were more thought provoking and more likely to change their smoking intentions. (26,27,28) A study from Brazil and Australia showed that media campaigns are quite effective.(29,30) (Figure-2,3)

Figure -2 Hard-hitting anti-tobacco campaigns are more effective than informational campaigns in Sao Paulo, Brazil



Source: Alday J et al.(2010). Smoke-free São Paulo: a campaign evaluation and the case for sustained mass media investment. *Salud Pública de México*, 2010, 52(Suppl. 2):S216–S225.

Figure-3 Adult -focused campaigns influence adolescent smokers and non-smokers in Australia



Source:White VN et al. Do adult-focused anti-smoking campaigns have an impact on adolescents.

OTHER INTERVENTIONS

Regardless of the possible reasons for higher prevalence of tobacco use among the less educated, community intervention studies in India have proven that educational interventions on the adverse effects of tobacco combined with personalized support for quitting this addiction receive a positive response and are successful in getting educationally deprived users to quit (31-

33).Quitting produces immediate and significant health benefits and reduces most of the associated risks within a few years of quitting (34). Zhu S.H et al.(2012) in their study on the effects of a multilingual telephone quitline for Asian smokers found six-month prolonged abstinence rate of 16.4% by counseling.(35) (Figure-4) Smokers reported prolonged cessation from quitline combined with medication(36) (Figure-5)

Figure-4.Six-month Prolonged Abstinence Rate

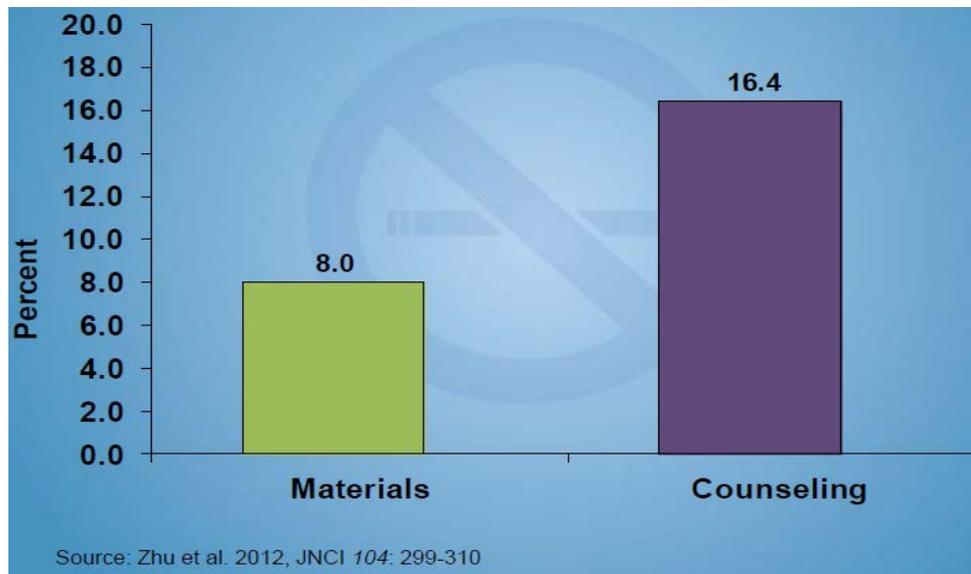
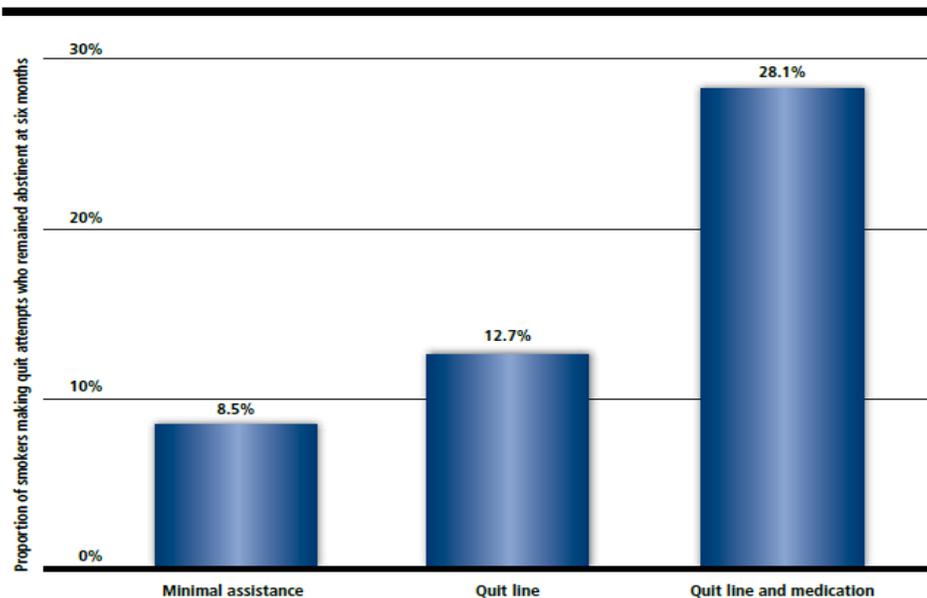


Figure-5 Smokers reporting six months continued cessation with different interventions



Source: Fiore MC et al. US Department of Health and Human Services, Public Health Service (Clinical Practice Guideline. 2008 update

Tobacco cessation centres(TCCs) from India have reported overall quit rates of around 16% at 6 weeks postintervention. (37) . [Mishra GA](#) et al. (2009) studied Workplace Tobacco Cessation Program in a chemical industry in rural Maharashtra, India found the tobacco quit rates increased with each follow-up intervention session and reached 40% at the end of one year. There was 96% agreement between self report tobacco history and results of rapid urine cotinine test.A positive atmosphere towards tobacco quitting and positive peer pressure assisting each other in tobacco cessation was remarkably noted on the entire industrial campus.(38)

A Cochrane review stated that a transtheoretical model(TTM) (stages of change) approach, two tested pharmacological aids to quitting (nicotine replacement and bupropion), and the remaining trials used various psycho-social interventions, such as motivational enhancement or behavioural management. The trials evaluating TTM interventions achieved moderate long-term success, with a pooled odds ratio (OR) at one year of 1.70 (95% confidence interval (CI) 1.25 to 2.33) persisting at two-year follow up with an OR of 1.38 (95% CI 0.99 to 1.92) (39).

[Mishra GA](#) et al. (2010) found that simple advice by health professional, taking as little as 30 seconds can produce quit rates of 5–10% per year. Pharmacological interventions when used with behavioral strategies can produce quit rates of about 25-30%. Nicotine Replacement Therapy (NRT) provides a slow and steady supply of nicotine in order to relieve craving and withdrawal symptoms, and is associated with quit rates of about 23% as against 13% with placebo. (40) [Monika A](#) et al. (2011) showed in school based program –HRIDAY- CATCH (Health Related Information Dissemination Amongst Youth, Child and Adolescent Trial for Cardiovascular Health), an increased sensitization and acceptance by schools of the need for lifestyle-related health intervention for adolescents. After a period of one

year , students in the intervention condition were significantly less likely than controls to have been offered, received, experimented with tobacco, or have intentions to use tobacco in the future. (p<0.05)

IV. DISCUSSION

WHO report on the global tobacco epidemic, 2011 shows that it is possible for any country, regardless of political structure or income level, to implement an effective tobacco control program to reduce tobacco use.Tobacco control interventions reviewed by the Cochrane collaboration, the US preventive services task force and the task force for community preventive services showed clinical interventions like brief cessation counseling interventions and increase prices of Tobacco products are very effective while community interventions to reduce exposure to secondhand smoke(SHS) ,complete bans on TAPS , group behavior therapy and telephone quitlines are effective.

With strong evidences suggesting that increased tobacco taxes, the dissemination of information about the health risks from tobacco and increased access to cessation therapies are effective in reducing tobacco use ,there is strong need for their implementation especially in low- and middle-income countries.A national coordinating mechanism at a high level of government should be convened with an official mandate to develop tobacco control infrastructure and coordinate policy implementation (41). Tobacco use prevalence often differs across income, age, ethnic groups and by gender, indicating social inequity. As national tobacco control programmes are designed to reduce tobacco use, efforts to ensure that population subgroups with disproportionately high rates of tobacco use are reached by policies and programmes are essential (42).

V. CONCLUSION

Most tobacco control intervention studies are from developed countries, there is a need to develop evidence-based, cost-effective interventions in developing countries for both smoking and smokeless tobacco use. Measures that proved very effective in the developed world, like tax increases on all tobacco products, need to be enforced immediately and the taxes collected should be used to support health promotion and tobacco control programs. Public health awareness, raising a mass movement against tobacco, sensitizing and educating all health care professionals for tobacco control and cessation by incorporating the topic in medical undergraduate curriculum, various CMEs, conferences, scientific meetings and workshops is vital. Expansion of Tobacco counseling centres (TCCs) to the periphery to reach the community, making them more accessible and widely acceptable, will facilitate millions of current tobacco users to quit the habit.

The progress in reaching the highest level of the MPOWER measures is a sign of the growing success of the WHO FCTC and provides strong evidence that there is political will for tobacco control on both national and global levels, which can be harnessed to great effect. Many countries have made significant progress in fighting the epidemic of tobacco use, and can be looked to as models for action by those countries that have not as yet adopted these measures.(43) Countries must continue to expand and intensify their tobacco control efforts, ensuring they have both the financial means and political commitment to support effective and sustainable programmes. Continued progress will stop millions of people from dying each year from preventable tobacco-related illness, and save hundreds of billions of dollars a year in avoidable health-care expenditures and productivity losses. It is up to us to make sure that this occurs.

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Malnutrition among School Children (0- 14 Years) of Gujars of Great Kashmir Himalayan Range (J & K state).

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Abstract- Variation in the availability of nutrients in diet and departure of same from standard requirement had badly affected the health of school children of Gujars of Great Kashmir Himalayas. Eighty percent of the sample pre-school children were identified under various levels of malnutrition. Severe degree of malnutrition has been computed at a very low weight. Even average weight was less by three and half kg than the weight recommended by I.C.M.R. The present paper attempts to analyze not only the geographical distribution and assessment of magnitude of malnutrition as a health problem among preschool children but also attempts to identify the causes that are directly or indirectly responsible.

Index Terms- Malnutrition, Under nutrition, Standard Requirement, Great Kashmir Himalayas.

I. INTRODUCTION

Inadequate amount of nutrients in diet in comparison to Indian Council of Medical Research (ICMR) recommended dietary allowances leads to malnutrition and under nutrition (Doshi,1995), that in-turn leads to not only low growth, under nutrition weight; increased risk of infectious diseases and deficiency diseases but also has a negative effect upon mental development (Verhasselt, 1997; Mishra, 1985).

The nutritional needs of child keep on changing. During infancy and early childhood period the nutrition requirements are quite high due to rapid growth but they level off during middle childhood period. Around the onset of puberty an accelerated phase of growth begins and the nutritional requirements increases tremendously before they taper off to adult level (Nath, 1997). There are many nutritional problems which effect children and the major ones are, low birth weight, protein energy malnutrition, exophthalmia. Scurvy and nutrition anemia (Park,2011). Malnourished children have poorer psychomotor development, leading to economic hardships for individuals and families in adulthood.

Nutritional deficiency may also cause, poor posture, certain bone deformities, narrow chest, poorly developed teeth and teeth badly placed in jaws (Dowd and Dent, 2011).

Malnutrition has long been recognized because of poverty (Aggarwal, 1986). Besides low income (Levinson, 1974), malnutrition is the result of household food insecurity, lack of clean water, lack of knowledge on good sanitation, and lack of alternative sources of income. It is also compounded by, inadequate care, gender inequality, poor health services, and poor

environment. Malnutrition causes great deal of human sufferings both physical and emotional (Oshaug et al., 1994). It is associated with more than half of all children's deaths worldwide (Pelletier et al., 1995). In India thirty per cent of children are born with low birth weight and almost 50 percent remain underweight by the age of three (UNICEF, 2012). Despite the improvement in survival of school children, there is still a major burden of diseases and ill health among this group particularly in the areas of poor nutrition and intestinal parasitic diseases that directly effects their education. Among the nutrition experts Patwardhan (1966) and Pelto (1991), have strongly stressed the consideration of geographical factors in identification and assessment of deficiency diseases. Nutrition patterns are affected not only by socio-economic and socio – cultural backwards of community but also by religion as religion plays a significant role to the extent that it imposes several restrictions on food consumed by them (Rani, Reddy and Sreedevamma, 2003).

Despite the economic growth in developing countries, under nutrition is still highly prevalent and is the main cause of chronic diseases. Every year, nearly 11 million children die before reaching their 5th birthday (Gupta, 2008). WHO has claimed that malnutrition contributes to 3.4 million child deaths at the global level (WHO, 2000). It has been estimated that nearly 30 percent of infants, children, adolescents, adults and elderly in the developing world are suffering from one or more of the multiple forms of malnutrition (WHO, 1999). Standard of nutrition varies from country to country and within the regions of diverse agro-climatic conditions whatever standard is chosen, under nutrition and malnutrition is wide spread in India, because of in-adequate poor and faulty nutrition status (Jaffrey, 1988). Child ill health described as the silent emergency has been a major focus of attention for several decades. Several nutrition programmes like I.C.D.S and Minimum Needs Programme have been launched for the downtrodden sections of population in general and vulnerable sections of population which includes pre-school children in particular but these programmes have not been successful to raise the level of nutrition to the optimum level (Bagchi.1994, Sacher and Gill 1993, Price, 1994).

Tribal areas constituting a very significant part of backward areas of the country, predominantly live in hilly and forest areas which are comparatively inaccessible and isolated and face the basic problems of poverty that leads to low health status (Gopalan, 2005). Gujars of Jammu and Kashmir are a scheduled tribes inhabiting mountainous and forest areas of Kashmir Himalayas. Due to physical constraints and low socio-economic

set up Gujars of Jammu and Kashmir face the problems of nutrition and health. The present research paper was an attempt to analyze the magnitude and geographical distribution of malnutrition as a public health problem and to identify the causes that are directly or indirectly responsible for such a situation .

II. REVIEW OF LITERATURE

Science of nutrition began in the late eighteenth century. It was Antonie Lavoisier, a French Scientist who did work on energy metabolism and is often called as father of science of nutrition (Vidya, 1999). Impact of nutrition on health of children is not a recent approach in Medical geography but has attracted the attention of experts for the last more than half a century and hence very good literature is available regarding the nutrition and its related health problems among children. Some notable contributions are.

Mc Carrison (1921), Tandon (1972), Chatterjee (1976), Mishra (1985), Aggarwal (1986), Freund (1990), Kumar (1995), Zargar et al. (1996), Kuhnlein and Pelto (1997), Pant (1998), Scrimshaw & Schürch (1998), Narasinga (1999), Das et al.

(2000), Jood et al. (2000), Mahapatra et al. (2000), Ray et al. (2000), Rice et al. (2000), Lakshmi and Padma (2004), Duboise (2004), Rather (2004), Agrahar (2005), Chapagain et al. (2005), Das and Biswas (2005), Gopalan (2005), Kumari (2005), Salah et.al (2006), Sohana et al. (2007), Varma, Kapoor and Goyle (2011), Varma et al. (2011), Khan and Khan (2012).

III. STUDY AREA

Great Kashmir Himalayan range is one of the most important physiographic divisions of Jammu and Kashmir State and extends uninterruptedly for a length of 150 km from Sundran drainage basin of Anantnag in the south to Kazinag ridge of Baramulla in the north. Great Kashmir Himalayan range is a massive topographical feature enclosing Kashmir Valley on the east-north east and north –northwest. The range lies between $33^{\circ}22'32.02''$ N – $34^{\circ}47'42.67''$ North latitude and $73^{\circ}48'10.96''$ E – $75^{\circ}34'22.23''$ East longitude. The mountainous range has an average altitude of 3442 meters and stretches over an area of 8948.84 sq. Kms (Figure 1).

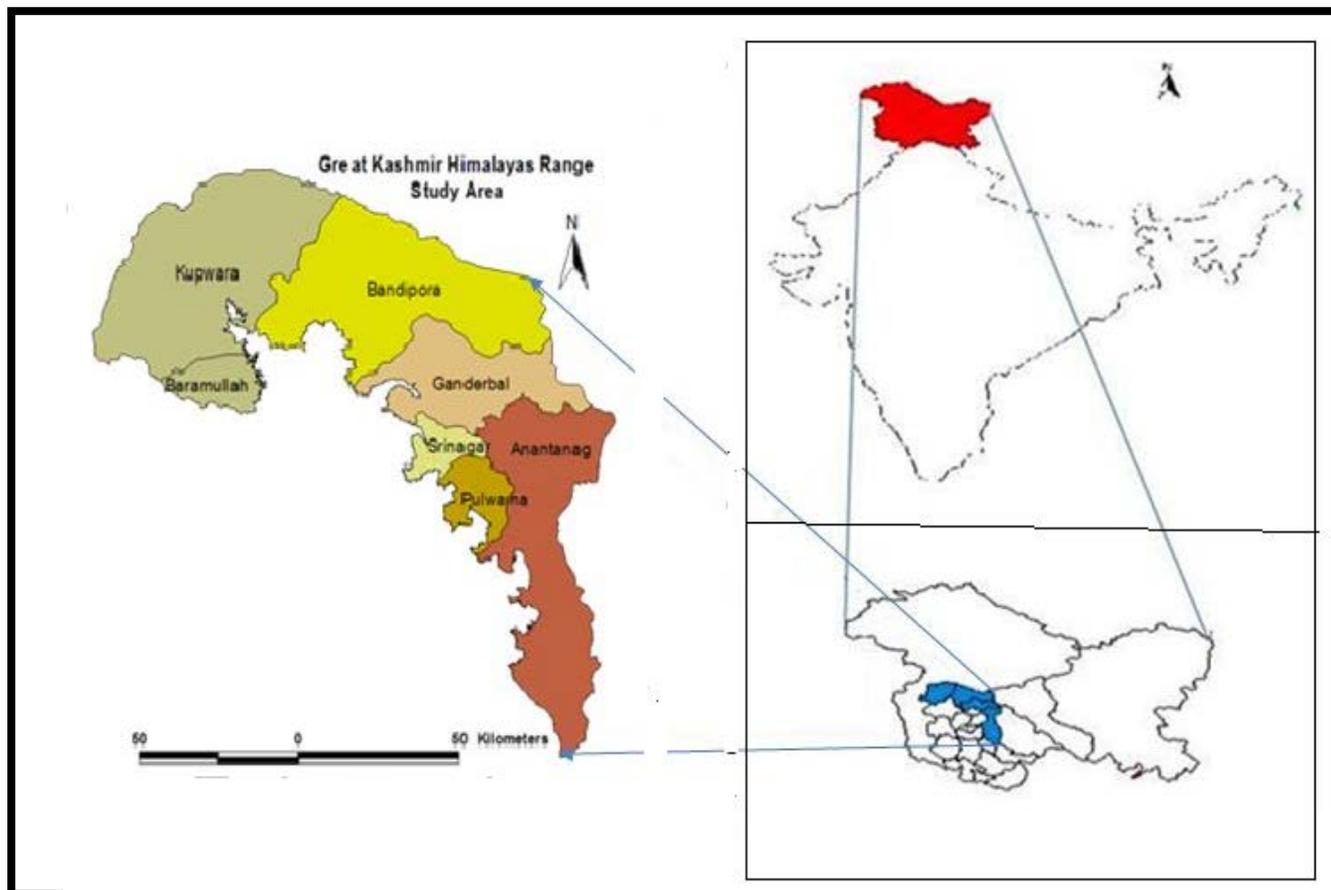


Fig. 1 : LOCATION MAP

Of the various mountain ranges girdling the Valley of Kashmir, Great Himalayan range is by far the most important range because of the altitude of its peaks, Kolahoi (5425 meters), Sheshnag (5096), Saribal (4882), Harmukh (4876 meters), Shutiyani (4371 meters) Rang top (3487 meters). The

base contour of the range is around 1800 meters in the south and gradually decreases to around 1600 towards north. Below the base contour of the mountain range, the Valley of Kashmir has homogeneity in level. The region has a slope from $10-30^{\circ}$ in the foothills and above 40° in the hilly areas. The present slope

characteristics have evolved through a sequence of events including spectacular changes in base level through faulting, folding and the consequent rejuvenation of drainage channels with pronounced effects on land forms in general and slope in particular (Raza et al., 1978)

The region is inhabited by Gujar community with very low socio-economic development.

Data Base and Methodology

Data base

The present research work was based on both primary and secondary data. Large data both primary and secondary was collected and generated from different sources.

Methodology

A comprehensive methodology used for the present study. An outline of the various methodological steps is provided in the figure 3.4 and described under the following headings.

Delineation of Study Area and demarcation of Altitudinal Zones (Unit of Study)

Base map of the study area was delineated from 19 SOI Toposheets and processed digitally in GIS environment. Great Kashmir Himalayan Range was divided into the following seven altitudinal zones with the help of software's like ERADAS Imagine 9.0 and Arc view GIS 3.2a.

Table 1 : Altitudinal Zones by Area

Altitudinal Zone	Alt. in meters amsl	Area in Sq. Kms.	Area in % to total Area
A	1600 – 1750	499.18	5.59
B	1750-1900	510.22	5.70
C	1900-2050	490.19	5.47
D	2050-2200	516.45	5.70
E	2200-2350	515.38	5.75
F	2350-2500	530.12	5.96
G	2500 – 6000	5887.30	65.83
	Total	8948.84	100

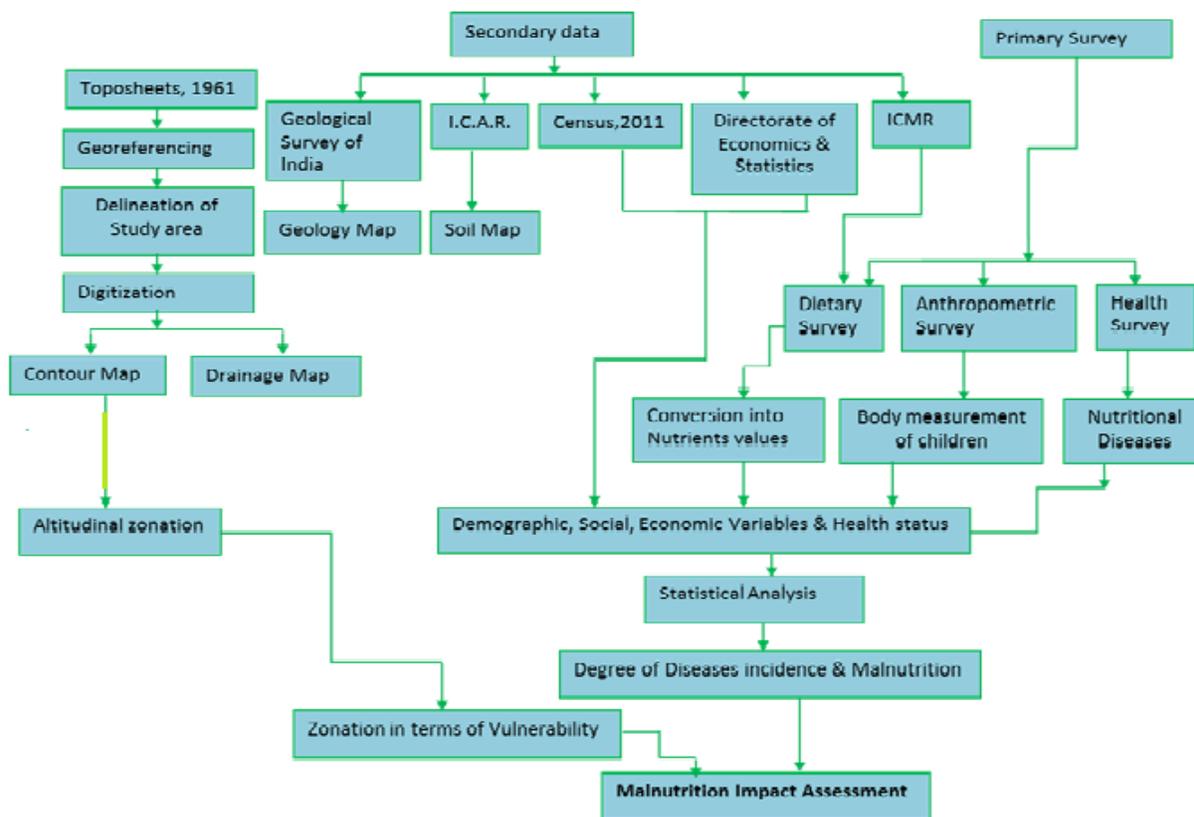


Fig . 2 : Flow chart showing methodological framework of the study

Selection of Sample Villages, Sample Households and Sample children (0-14 years):

Stratified Random Sampling technique was used for selection of around 20% of sample villages (60) and 20% of sample households (2080) in proportion to total number of villages and households from each altitudinal zone. For Micro level study, a Sample of 4160 children, one male and one female, falling in 0-14 years were selected for Micro study. The reason

behind selection of this age group was because of renewed awareness that the determinants of chronic diseases in later life and health behavior are laid down in 0 – 14 years of age (table 2). This age group was further divided into three sub groups - (0-3, 4-6 and 7-14 years) for being ages of different levels of schooling. Geo-coordinates and altitude of each sample village was measured with the help of GPS during field survey (Table 3).

Table 2 :Sample frame of the study

Alt. Zone	Alt. In mts. (AMSL)	Total Area (Km ²)	Revenue villages			Number of households			Number of children (0-14 years) for MICRO STUDY		
			Total In Area	Samp le	Percentage of sample	Total in Sample villages	Sampl e	Percenta ge of sample	Male	Female	Total
A	1600-1750	499.18	9	2	22.22	460	92	20.00	92	92	184
B	1750- 1900	510.22	31	6	19.35	1000	200	20.00	200	200	400
C	1900- 2050	490.19	71	14	19.71	2380	476	20.00	476	476	952
D	2050- 2200	516.45	72	14	19.44	2290	458	20.00	458	458	916
E	2200- 2350	515.38	81	16	19.75	2790	558	20.00	558	558	1116
F	2350- 2500	530.12	40	8	20.00	1480	296	20.00	296	296	592
G	2500-6000	5887.30	Un inhabited by Gujars								
Total		8948.84	304	60	19.73	10,400	2080	20.00	2080	2080	4160

Source : Computed from SOI toposheets and census of India 2011

Table 3 : Sample villages with altitude and geo-coordinates

S No.	Village Name	Lat./Long	Altitude (mams l)	S No.	Village Name	Lat./Long	Altitude (mams l)
1	Grand	33 ⁰ 40'43" N 75 ⁰ 15'20" E	1830	31	Dardpora Gugerpati	34 ⁰ 25'43" N 74 ⁰ 42'16." E	2250
2	Hard kichloo	33 ⁰ 50'45" N 75 ⁰ 16'40" E	2390	32	Aragam Nagbal	34 ⁰ 22'31" N 74 ⁰ 40'58E	2060
3	Gujran Batkot	33 ⁰ 56'34" N 75 ⁰ 18'07" E	2186	33	Chithi Bande chaliwan	34 ⁰ 22'46" N 74 ⁰ 41'13." E	2290
4	Ishnad	33 ⁰ 52'08" N 75 ⁰ 18'04" E	2268	34	Argam Halwadi	34 ⁰ 22'30" N 74 ⁰ 40'57." E	2055
5	Hapatnar	33 ⁰ 48' 17" N 75 ⁰ 21' 15" E	2520	35	Sumlar Gujarpati	34 ⁰ 22'30" N 74 ⁰ 43'41" E	1885
6	Salia	33 ⁰ 55'28" N 75 ⁰ 17'26" E	2210	36	Chuntimula gujarpati	34 ⁰ 24'23" N 74 ⁰ 44'05." E	1980
7	Gous	33 ⁰ 52'09" N 75 ⁰ 18'32" E	2190	37	Chatibandhi Gorhajan	34 ⁰ 23'40" N 74 ⁰ 42'25" E	1835
8	Shojan	33 ⁰ 51'14" N 75 ⁰ 18'25" E	1890	38	Malangam gujarpati	34 ⁰ 26'12" N 74 ⁰ 33'26. E	1950
9	Grandwan	33 ⁰ 52'43" N 75 ⁰ 17'54" E	2020	39	Mulkalama gujarpati	34 ⁰ 24'03" N 74 ⁰ 43'34" E	2375

10	Lidu	33°57'31" N 75°18'52" E	2049	40	Gujarpati Muqam	34°26'58" N 34°36" E	74°	2250	
11	Rishkobal	33°08'03" N 17°51" E	2350	41	Kudara	34°25'03" N 47°01" E	74°	2410	
12	Nagbal	33°52'32" N 75°20'25" E	2260	42	Dachna Gujarpati	34°26'02" N 30°56" E	74°	1680	
13	Dragund	34°25'51" N E	75°04'55"	2120	43	Manobal	34°30'15" N 30°15" E	74°	2055
14	Narasthan	34°13'27" N E	75°05'25"	2250	44	Londa	34°18'24" N 10°20" E	74°	2010
15	Guturu	34°30'27" N E	75°25'20"	2160	45	Nilzab	34°30'25" N 12°42" E	74°	2290
16	Hajannar	34°04'31" N E	75°03'37"	1893	46	Potwari	34°19'45" N 12°20" E	74°	2065
17	Nogh	33°55'46" N E	75°11'10"	2142	47	Khaitan	34°30'50" N 30°35" E	74°	1935
18	Bangidar	33°54'40" N E	75°14'09"	2354	48	Nowgam	34°28'19" N 14°25" E	74°	1980
19	Basmia	33°55'44" N 75°11'06" E	2262	49	Lahkoot	34°21'45" N 20°52" E	74°	1955	
20	Faqir Gujri	34°24'16" N 38°50" E	74°	2089	50	Rashiwari	34°40'55" N 48°45" E	74°	2410
21	Shal khud	34°10'59" N 54'58 E	74°	2215	51	Shiltra	34°19'14" N 12°08" E	74°	1835
22	Nagbal gujarpati	34°15'22" N 34'25" E	74°	1967	52	Inderdaji	34°20'12" N 08°54" E	74°	1950
23	Khanan	34°18'47" N 51'59" E	74°	2030	53	Khuri payeen	34°39'55" N 45°30" E	74°	2250
24	Poshkar	34°14'26" N 58°05" E	74°	2080	54	Khuri Bala	34°42'15" N 45°40" E	74°	2315
25	Pahalnar	34°20'49" N 51'59" E	75°	2142	55	Wadur bala	34°18'26" N 11°06" E	74°	2058
26	Wangat	34°19'33" N 06'50" E	75°	2195	56	Turkkpora	34°32'52" N 26°35" E	74°	2386
27	Astan mohla	34°15'29" N 54'44" E	74°	2048	57	Wanpur	34°28'12" N 16°30" E	74°	2036
28	Yarmukam	34°17'44" N 47'11" E	74°	2360	58	Wahalutar	34°46'22" N 14°32" E	74°	2253
29	Tsunt Wali war	34°47'14" N 54'28" E	74°	2370	59	Potus	34°45'20" N 12°28" E	74°	2146
30	Waniarm	34°17'44" N 48'30" E	74°	2295	60	Naidhu	34°25'23" N E	74° 16'55"	1684

Source: Based on GPS readings during Sample survey, 2013

Sample Survey / Field work

Field survey of 2080 sample households in stratified sample of 60 villages from seven altitudinal zones as unit of study was carried out. Food intake, anthropogenic measurement and health survey of 4160 sample children, comprising of one male and one female from each household of sample village was carried out. A structured schedule was used for primary data collection.

Malnutrition grading

As physical dimensions of body are influenced by nutrition particularly during the rapidly growing period of early childhood. Body measurement like weight for age, height for age, mid upper arm circumference (MUAC) and body mass can also provide information regarding malnutrition. Weight for age is the best one and used in the present study.

The weight of all individual sample children has been measured by digital weight measuring machine and compared with I. C. M. R. standard and then be categorized into different nutritional grades by applying the following percentage departure formula.

$$\text{Grades Malnutritio} \frac{\text{Estimated Weight} - \text{Standard Weight}}{\text{Standard Weight}} \times 100$$

Normal	> 80%	
Grade I	80 – 70 %	
Grade II	70 – 60%	
Grade III	60 – 50%	
Grade IV	<50%	

This classification was recommended by Indian Academy of Pediatrics (IAP) .

IV. RESULTS AND DISCUSSION

Weight for Age

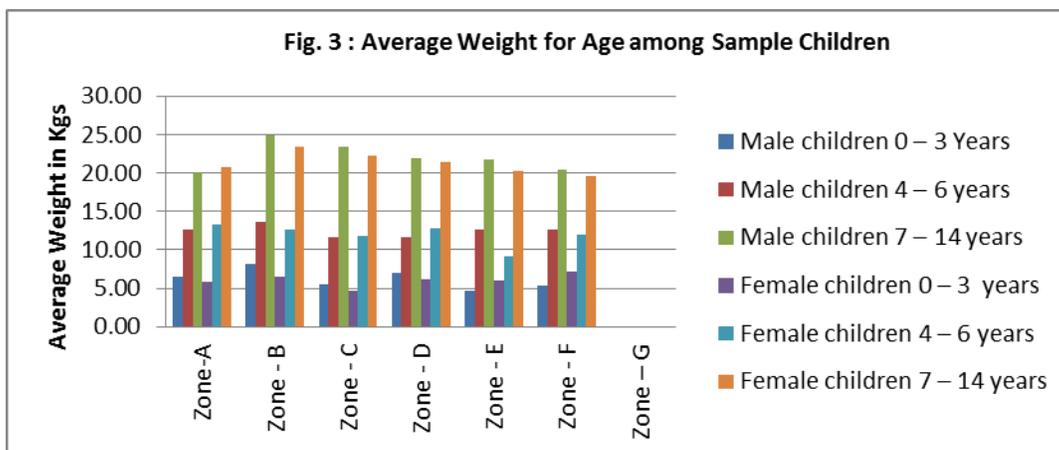
Weight of the 4180 children was recorded to assess the anthropometric status and classified into three age groups: 0 to 3, 4 to 6 and 7-14 years for both male and female children for comparative analysis and is shown in table 4. Analysis of data reveals that average weight of sample children in the age group 0 to 3 years was 6.220 kg for males and 6.084 kg for females. The average weight in the age group 4 to 6 years was 12.465 kg for males as compared to 11.925kg for females of the same age group. Average weight in the age group 7 to 14 was 22.105 kg for males and only 21.270 kg for females (Figure 3). It was very

interesting to note that the average weight of both male and female children was very less than the ICMR recommended weight for children of different age groups. Weight of children varies from one sample village to another. There was a decline in the weight of both male and female children with the increase in the altitude. Largest differences in the calculated weight than the ICMR recommended weight was noted in the age group 0-3 years. The reason could be large nutrition need for the fast growth on one side and very less attention of parents towards child because of being engaged in primary activity of collection of fire wood from the forest and herding of animals, getting of water from large distances etc.

Table 4: Average weight for age among sample Children by Age and Sex in Great Kashmir Himalayan Range.

Altitudinal Zone with Alt. in meters (amsl)	No. of Sample Villages.	No. of male Sample children (Male & Female – same ratio)	Average Weight for age (Kg) among sample children by age and sex					
			Male children			Female children		
			0 – 3 Years ICMR	4 – 6 years ICMR	7 – 14 years ICMR	0 – 3 years ICMR	4 – 6 years ICMR	7 – 14 years ICMR
Zone-A (1600 – 1750)	2	184	6.475	12.635	20.13	5.86	13.295	20.73
Zone - B (1750-1900)	6	400	8.158	13.632	24.962	6.505	12.613	23.467
Zone - C (1900-2050)	14	952	5.53	11.7	23.38	4.72	11.75	22.34
Zone - D (2050-2200)	14	916	7.05	11.61	21.93	6.25	12.77	21.35
Zone - E (2200-2350)	16	1116	4.7	12.65	21.72	5.95	9.22	20.19
Zone - F (2350-2500)	8	592	5.41	12.56	20.51	7.22	11.901	19.54
Zone G	Uninhabited							
Total	60	4160	6.22	12.465	22.105	6.084	11.925	21.27

Source: Sample survey, 2013



Source: - Based on Sample survey 2013

Malnutrition among Children (Based on Weight for age)

Classification proposed by Indian Academy of Pediatrics (IAP) was used for assessment of prevalence of malnutrition among the children in the age range of 1 to 14 years. Grades of malnutrition has been worked out for both male and female sample children of age groups 0-3, 4-6, 7-14 separately and briefly described as under

Grades of Malnutrition among Sample children (0-3 years) Based on Weight for age

Analysis of table 5 reveals that very less number of male sample children were normal (1.47 %) with weight for age greater than 80 percent of the recommended weight and the remaining were suffering from various grades of malnutrition. Near about 10.75 per cent were suffering from Grade I malnutrition with weight for age 70 to 80 % than recommended weight, 17.50 per cent were suffering from Grade II malnutrition with weight for age 60 to 70 % than recommended weight, 19.91 percent were suffering from Grade III malnutrition with weight for age 50 to 60 % than recommended weight and even 2.21 per cent were suffering from Grade IV malnutrition with weight for age less than 50 % than recommended weight. In case of female sample children percentage of various Grades of malnutrition was Grade I (6.43%), Grade II (18.23), Grade III (19.81) and Grade IV (2.42%). There is a considerable variation in grades of malnutrition in different altitudinal zones Grades of malnutrition in both male and female sample children shows an increasing trend with altitude (Figure 4).

Grades of Malnutrition among Sample children (4-6 years) Based on Weight for age

Analysis of data obtained from field survey reveals that very less number of male sample children were normal (2.68 %) with weight for age greater than 80 percent of the recommended weight and the remaining were suffering from various grades of malnutrition. Near about 12.61 per cent were suffering from

Grade I malnutrition with weight for age 70 to 80 % than recommended weight, 18.33 per cent were suffering from Grade II malnutrition with weight for age 60 to 70 % than recommended weight, 16.46 percent were suffering from Grade III malnutrition with weight for age 50 to 60 % than recommended weight and even 1.25 per cent were suffering from Grade IV malnutrition with weight for age less than 50 % than recommended weight. In case of female sample children percentage of various Grades of malnutrition were Grade I (7.33%), Grade II (19.86), Grade III (19.05) and Grade IV (1.61%) (Table 6). Altitude wise variation in grades of malnutrition in different altitudinal zones is also evident from the table 7.2. Grades of malnutrition in both male and female sample children shows an increasing trend with altitude (Figure 5)

Grades of Malnutrition among Sample children (7-14 years) Based on Weight for age

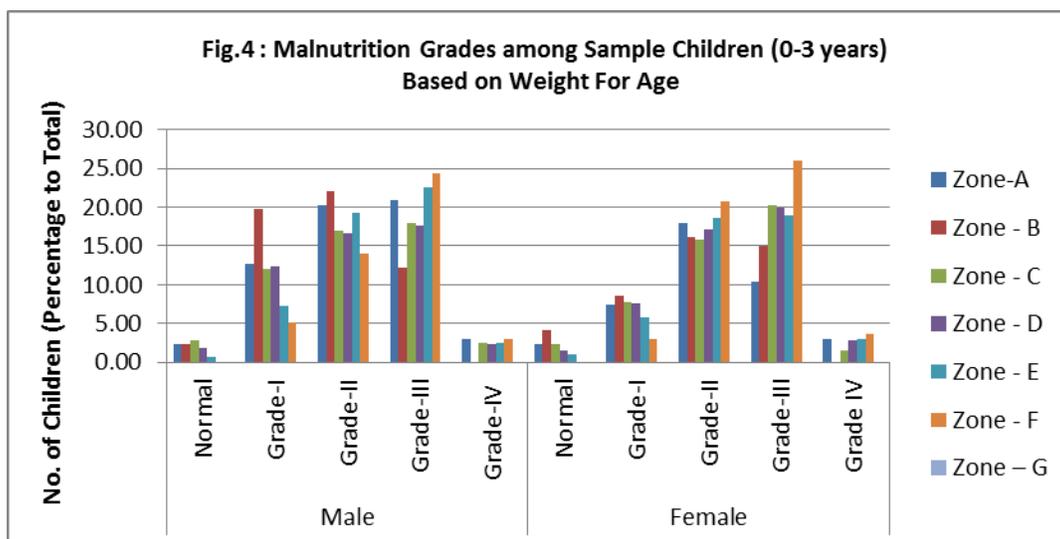
In case of sample children of 7-14 age group, it is observed that very less number of male sample children were normal (1.86 %) with weight for age greater than 80 percent of the recommended weight and the remaining were suffering from various grades of malnutrition. Near about 12.61 per cent were suffering from Grade I malnutrition with weight for age 70 to 80 % than recommended weight, 19.92 per cent were suffering from Grade II malnutrition with weight for age 60 to 70 % than recommended weight, 16.91 percent were suffering from Grade III malnutrition with weight for age 50 to 60 % than recommended weight and even 0.29 per cent were suffering from Grade IV malnutrition with weight for age less than 50 % than recommended weight. In case of female sample children percentage of various Grades of malnutrition were Grade I (9.75%), Grade II (19.11%), Grade III (18.87%) and Grade IV (0.43%) and altitude wise variation in grades of malnutrition in different altitudinal zones is also evident (Table 7). Grades of malnutrition in both male and female sample children show an increasing trend with altitude (Figure.6).

Table 5: Prevalence of malnutrition among children (0– 3 years) based on weight for age percentage departure (IAP classification)

Altitudinal Zone with Alt. in meters (amsl)	No. of Sample Villages	No. of Sample children (Male & Female –same)	No of children with % to total in different grades of malnutrition									
			Male					Female				
			Normal (Weight for age Grade-I (70 to 80%))	Grade-II (Weight for age 60to 70%)	Grade-III (Weight for age 50 to 60%)	Grade-IV (Weight for age < 50%)	Normal (Weight for age Grade-I (70 to 80%))	Grade-II (Weight for age 60to 70%)	Grade-III (Weight for age 50 to 60%)	Grade-IV (Weight for age < 50%)		
Zone-A (1600 – 1750)	2	39	1 (2.56)	5 (12.82)	8 (20.51)	8 (20.51)	1 (2.56)	1 (2.56)	3 (7.70)	7 (17.96)	4 (10.26)	1 (2.56)
Zone - B (1750-1900)	6	92	2 (2.18)	18 (19.56)	20 (21.75)	12 (13.04)	0 (0.00)	4 (4.36)	7 (7.60)	15 (16.30)	14 (15.21)	0 (0.00)
Zone - C (1900-2050)	14	199	5 (2.51)	26 (13.06)	31 (15.58)	37 (18.59)	4 (2.01)	4 (2.01)	15 (7.55)	33 (16.58)	41 (20.60)	3 (1.51)
Zone - D (2050-2200)	14	210	4 (1.90)	26 (12.38)	35 (16.67)	37 (17.62)	5 (2.38)	3 (1.43)	16 (7.62)	36 (17.14)	42 (20.00)	6 (2.86)
Zone - E (2200-2350)	16	274	2 (0.73)	20 (7.30)	53 (19.34)	62 (22.63)	7 (2.55)	3 (1.09)	16 (5.84)	51 (18.61)	52 (18.99)	8 (2.92)
Zone - F (2350-2500)	8	135	0 (0.00)	7 (5.19)	19 (14.07)	33 (24.44)	4 (2.96)	0 (0.00)	4 (2.96)	28 (20.74)	35 (25.93)	5 (3.70)
Zone G			Uninhabited									
Total	60	949	14 (1.47)	102 (10.73)	166 (17.50)	189 (19.81)	21 (2.11)	15 (1.58)	61 (6.43)	170 (18.13)	188 (19.81)	23 (2.32)

Source: Based on Sample survey, 2013

Figures in parenthesis represent percentage to total sample children.



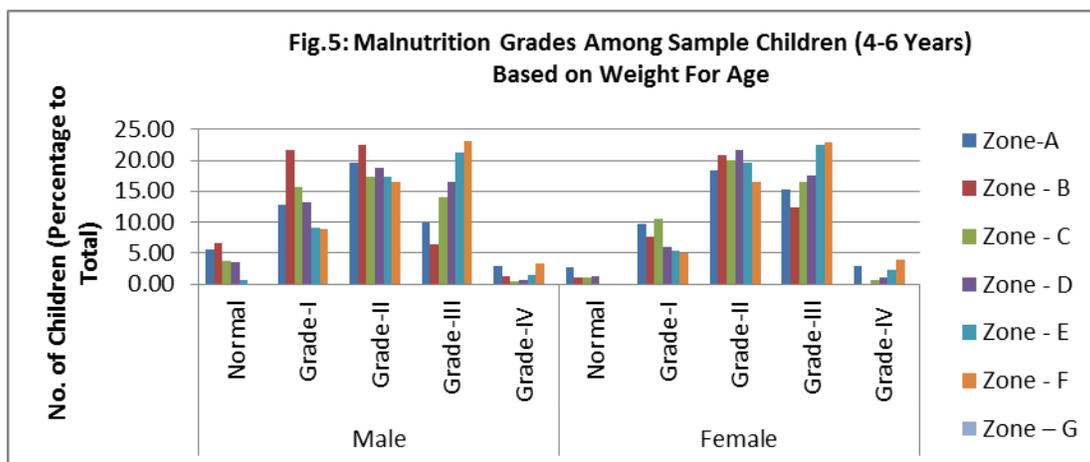
Source: - Based on Sample survey 2013

Table 6: Prevalence of malnutrition among children (4-6 years) based on weight for age percentage departure (IAP classification)

Altitudinal Zone with Alt. in meters (amsl)	No. of Sample Villages	No. of Sample children (Male & Female)	No of children with % to total in different grades of malnutrition									
			Male					Female				
			Normal (Weight for age (> 80%))	Grade-I (Weight for age (70 to 80%))	Grade-II (Weight for age 60to 70%)	Grade-III (Weight for age 50 to 60%)	Grade-IV (Weight for age < 50%)	Normal (Weight for age (> 80%))	Grade-I (Weight for age (70 to 80%))	Grade-II (Weight for age 60to 70%)	Grade-III (Weight for age 50 to 60%)	Grade-IV (Weight for age < 50%)
Zone-A (1600 – 1750)	2	54	3 (5.55)	6 (11.11)	11 (20.37)	5 (9.25)	1 (1.85)	2 (3.70)	6 (11.11)	10 (18.52)	9 (16.67)	1 (1.85)
Zone – B (1750-1900)	6	102	6 (5.88)	22 (21.57)	24 (23.52)	7 (6.86)	1 (0.98)	1 (0.98)	8 (7.84)	22 (21.57)	11 (10.78)	0 (0.00)
Zone – C (1900-2050)	14	270	10 (3.70)	42 (15.56)	48 (17.77)	34 (12.60)	1 (0.37)	3 (1.11)	29 (10.74)	56 (20.74)	45 (16.66)	2 (0.74)
Zone - D (2050-2200)	14	250	9 (3.60)	31 (12.40)	48 (19.20)	40 (16.00)	2 (0.80)	3 (1.20)	16 (6.40)	53 (21.20)	45 (17.60)	3 (1.20)
Zone - E (2200-2350)	16	292	2 (0.68)	27 (9.25)	49 (16.78)	63 (21.57)	4 (1.37)	0 (0.00)	16 (5.48)	56 (19.18)	69 (23.63)	6 (2.05)
Zone - F (2350-2500)	8	150	0 (0.00)	13 (8.67)	25 (16.67)	35 (23.33)	5 (3.33)	0 (0.00)	7 (4.67)	25 (16.67)	34 (22.67)	6 (4.00)
Zone G	Uninhabited											
Total	60	1118	30 (2.68)	141 (12.61)	205 (18.33)	184 (16.46)	14 (1.25)	9 (0.80)	82 (7.33)	222 (19.86)	213 (19.05)	18 (1.61)

Source: Based on Sample survey, 2013

Figures in parenthesis represent percentage to total sample children.



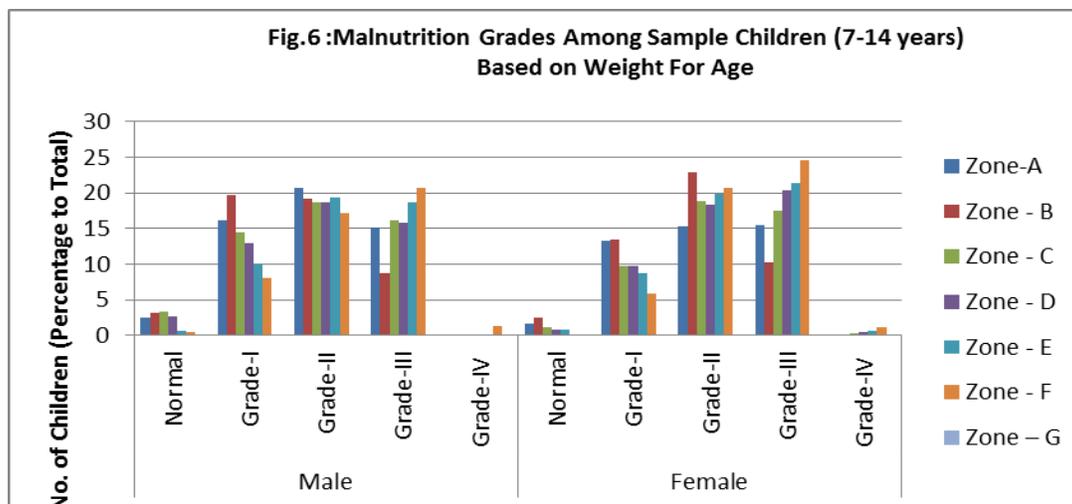
Source: - Based on Sample survey 2013

Table 7 : Prevalence of malnutrition among children (7 - 14 years) based on weight for age percentage departure (IAP classification)

Altitudinal Zone with Alt. in meters (amsl)	No. of Sample Villages	No. of Sample children (Male & Female –same ratio) (7-14 Years)	No of children with % to total in different grades of malnutrition .									
			Male					Female				
			Normal (Weight for age (△) 90%)	Grade-I (Weight for age (70 to 80%)	Grade-II (Weight for age 60to 70%)	Grade-III (Weight for age 50 to 60%)	Grade-IV (Weight for age < 50%)	Normal (Weight for age (△) 80%)	Grade-I (Weight for age (70 to 80%)	Grade-II (Weight for age 60to 70%)	Grade-III (Weight for age 50 to 60%)	Grade-IV (Weight for age < 50%)
Zone-A (1600-1750)	2	91	2 (2.19)	14 (15.38)	21 (23.07)	14 (15.38)	0 (0.00)	2 (2.19)	13 (14.28)	13 (14.28)	12 (13.19)	0 (0.00)
Zone - B (1750-1900)	6	206	7 (2.97)	40 (21.19)	40 (21.19)	19 (10.78)	0 (0.00)	6 (2.97)	27 (13.75)	46 (20.07)	21 (10.04)	0 (0.00)
Zone - C (1900-2050)	14	483	13 (2.69)	72 (14.90)	93 (19.25)	78 (16.15)	0 (0.00)	7 (1.45)	51 (10.56)	87 (18.01)	81 (16.77)	1 (0.20)
Zone - D (2050-2200)	14	456	11 (2.41)	60 (13.16)	85 (18.64)	76 (16.67)	1 (0.22)	4 (0.88)	45 (9.87)	83 (18.20)	89 (19.52)	2 (0.44)
Zone - E (2200-2350)	16	550	4 (0.73)	53 (9.64)	105 (19.09)	101 (18.36)	2 (0.36)	5 (0.91)	50 (9.09)	110 (20.00)	117 (21.27)	3 (0.55)
Zone - F (2350-2500)	8	307	2 (0.65)	25 (8.14)	54 (17.59)	66 (21.50)	3 (0.98)	0 (0.00)	18 (5.86)	61 (19.87)	75 (24.43)	3 (0.98)
Zone G	Uninhabited											
Total	60	2093	39 (1.86)	264 (12.61)	398 (19.02)	354 (16.91)	6 (0.29)	24 (1.15)	204 (9.75)	400 (19.11)	395 (18.87)	9 (0.43)

Source: Based on Sample survey, 2013

Figures in parenthesis represent percentage to total sample children.



Source: - Based on Sample survey 2013

V. CONCLUSION AND SUGGESTIONS

The study leads to the conclusion that the average weight for age in almost all age groups was less than the recommended by ICMR. There was a decline in the weight of children both male and female with the increase in the altitude because of decrease in nutrition intake.

From the classification of children into different grades of malnutrition on the basis of weight for age, it was observed that in all the three age groups, 0-3, 4-6 and 7-14, very less number of sample children were normal and majority of sample children both male and female were falling in different grades of malnutrition. Malnutrition grade III was very dominant with good percentage of sample children both male and female and even some percentage of sample children were falling in IV grade of malnutrition which is a bad indication of nutrition status. Female children were more malnourished than the males in the higher age groups. Grade of malnutrition in both male and female sample children shows an increasing trend with altitude.

On the basis of inferences drawn from the present analysis, the following measures are suggested for improving the nutritional status of children (0- 14 years) in this mountainous region. These recommendations are expected to serve as vital input for formulating a planning strategy for the development of nutritional status of children in this mountainous region.

- 1) Full coverage under ICDS and Strengthening of existing ICDS.
- 2) Proper coordination between functionaries.
- 3) Adoption of early infant feeding practices especially in higher altitudinal zones.
- 4) Proper health care of children during illness.
- 5) Awareness and full involvement of the community.
- 6) Development of basic facilities.
- 7) Proper immunization of children.

ACKNOWLEDGEMENT

We are very thankful to ICSSR for providing funding assistance to our project "Assessment of Malnutrition among Children – A Micro level study of Gujjars of Great Kashmir Himalayan Range". The present research paper is a part of the Project.

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Analysis of Cockcroft-Walton Voltage Multiplier

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Abstract- In this paper a high D.C. voltage is based on Cockcroft-Walton cascade rectifier, without using transformer. The purpose of this paper is to get an output of a high dc voltage by applying input as an low dc voltage. It provides continuous input current to load with low ripple voltage and current. Moreover, based on the n-stage CW voltage multiplier, the proposed converter can provide a suitable dc source for an n + 1-level multilevel inverter. In this paper, control strategy employs two independent frequencies, one of which operates at high frequency while the other one operates at relatively low frequency.

Index Terms- Capacitor, Cockcroft-Walton voltage multiplier, Diode.

I. INTRODUCTION

In general the voltage multipliers are used to get a high dc output voltage, DC-AC-DC inverters with step-up transformer. By using this size and cost will increase. The Cockcroft-Walton cascade rectifier is an electronic circuit device which generates a high dc output voltage from a low input AC voltage. This Cockcroft-Walton cascade rectifier is used in x-ray machines and television. This is made up of ladder network of capacitors and diodes. In this paper, the capacitor and diodes are connected across each other to get a high dc output voltage in number of n-stages. The advantage of the Cockcroft-Walton cascade rectifier is that the output across each stage is equal to twice the input AC voltage. It requires low cost components and easy to insulate and possibility of taking output from any stage, like a multi tapped transformer.

II. GENERATION OF HIGH D.C. VOLTAGE

Generation of high dc voltages is mainly required in research work in the areas of pure and applied physics. Sometimes, high direct voltages are needed in insulation tests on cables and capacitors. [7] There are various applications of high dc voltages in industries, research medical sciences etc. The most efficient method for generating high dc voltage is by the process of rectification employing voltage multiplier circuits. Electrostatic generators have also been used for generating high D.C. voltages. [8] The ac supply to the rectifier tubes may be of power frequency or may be of audio frequency from an oscillator. [7] The A.C. supply to the rectifier tubes may be of power frequency or may be of audio frequency from an oscillator. The latter is used when a ripple of very small magnitude is required without the use of costly filters to smoothen the ripple.

III. COCKCROFT-WALTON VOLTAGE MULTIPLIER

The Cockcroft-Walton voltage multiplier convert pulsating low ac input voltage to the high dc output voltage. Generally the Cockcroft-Walton voltage multiplier is made up of ladder network of capacitor and diodes. By using only capacitor and diodes the Cockcroft-Walton voltage multiplier can generate very high dc voltage from low level ac input, while at the same time being far lighter and cheaper than transformers. The output of the high step-up converter with Cockcroft-Walton voltage multiplier can be used for supplying AC loads.

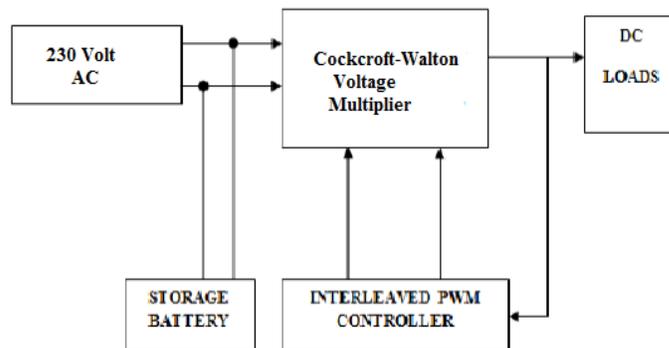


Fig. Block Diagram of Proposed System

The block diagram of proposed system is shown in the Fig. 1. In this proposed system we provide a 230 volt AC supply to the ladder network of capacitor and diodes (i.e. Cockcroft-Walton voltage multiplier). The dc output of the source can store in the storage battery. The high step-up converter with Cockcroft-Walton voltage multiplier is controlled by using an interleaved PWM controller. The low voltage output of the source is step-upped by using the high step-up converter with Cockcroft-Walton voltage multiplier.

The conventional n-stages Cockcroft-Walton voltage multiplier is shown in Fig. 2. In this Cockcroft-Walton voltage multiplier each stage is containing two capacitors and two diodes. Theoretically, an n-stage Cockcroft-Walton voltage multiplier dc output voltage is equal to the value of 2n times of the magnitude of the ac voltage source. Due to non-ideal characteristics of the circuit components the dc output voltage is practically less than the theoretic value [1], [2], [3]. Some drawback of CW multiplier is, under heavy-load condition, the CW multiplier intrinsically presents not only poor output voltage regulation but also high output ripple with line frequency. In some applications, for getting higher voltage gain we use line frequency transformers with high step-up ratio to cooperate with the CW voltage multiplier.

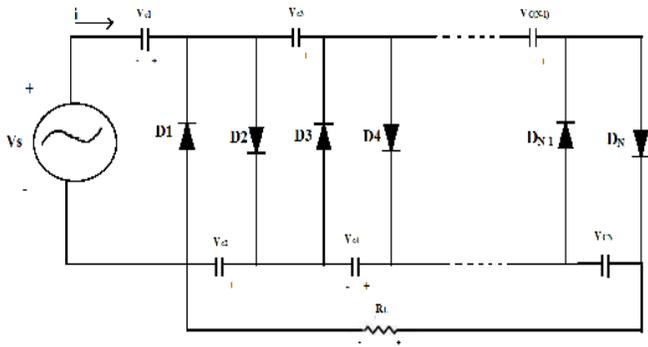
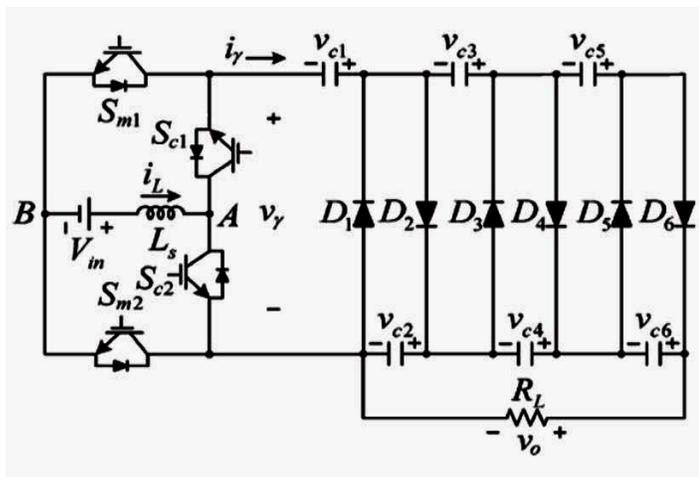


Fig2: n-stage Cockcroft-Walton voltage multiplier

IV. CIRCUIT DESCRIPTION



The circuit diagram of a 3-stage CW voltage multiplier is as shown in the figure. This converter has a four bidirectional switches which are sub-divided into two groups [Sm1, Sm2] and [Sc1, Sc2]. The converter is energized by the boost inductor which connected in series with the source. Each converter has an two independent frequency. One of the frequencies applies to two of the four switches to perform PFC function, and the other applies to the rest of the two switches to determine the output frequency of the matrix converter. [4]

For simplifying the circuit operation, consider three stages Cockcroft-Walton voltage multiplier which used in AC-DC converter. Before analyzing, some assumptions are made.

- 1) All the circuit elements are ideal and no power loss in that.
- 2) All the capacitors are sufficiently large.
- 3) Under reasonable load condition the voltage drop and ripple can be ignored.
- 4) Under steady state condition the proposed converter always in conduction mode.

According to the second assumption, each capacitor voltage in the CW voltage multiplier is given by:

$$V_{ck} = \begin{cases} vc & \text{for } k = 1 \\ 2vc & \text{for } k = 2,3,4 \dots n \end{cases}$$

Where V_{ck} is the voltage of the k th capacitor, vc is the maximum peak value of terminal voltage of the CW voltage multiplier under steady-state condition, and $N = 2n$. [4]

The Cockcroft-Walton voltage multiplier is based on four different types of modes.

Mode 1: In first positive half cycle in mode 1 switches S_{m1} and S_{c1} are turned on and switches S_{m2} and S_{c2} are turned off. The boost inductor is get charged by the V_{in} which is the source of 230 volt AC. In first mode the even groups capacitors C_6 C_4 C_2 are get discharged and supply to the load. And the odd group capacitors C_5 C_3 C_1 are not in conduction

Mode 2: In mode 2 S_{m2} and S_{c1} Switches are turned on while S_{m1} and S_{c2} Switches are turned off. And the current i_γ is positive. In this case boost inductor (L_s) and input V_{in} dc source are in series and they transfer boosted energy to the CW voltage multiplier through different even diodes. In this mode 2 diode D_6 is conducting, and even-group capacitors C_6 , C_4 , and C_2 are get charged, and the odd-group capacitors C_5 , C_3 , and C_1 are discharged. And in this way similarly diode D_4 is conducting mode and capacitor C_4 and C_2 are get charged while C_3 and C_1 are get discharged, in this case C_6 supplies load current, and C_5 is floating. Then again diode D_2 is conducting. Thus, C_2 is charged, C_1 is discharged, C_6 and C_4 supply load current, and C_5 and C_3 are not in conduction.

Mode 3: Now in another next half cycle in mode 3 S_{m2} and S_{c2} Switches are turned on, and S_{m1} , S_{c1} , and all CW diodes are turned off. The boost inductor L_s is get charged by the V_{in} dc source, the even group capacitors C_6 , C_4 , and C_2 supply the load current, and the odd-group capacitors C_5 , C_3 , and C_1 are not in conduction.[5]

Mode 4: In a mode 4 S_{m1} and S_{c2} Switches are turned on and S_{m2} and S_{c1} Switches are turned off. But in this case current i_γ is negative. Now the boosted voltage is “ $-V_\gamma$ ” and it transfer energy to the CW voltage multiplier through odd diodes. In this mode diode D_5 is conducting. And the even-group capacitors supplies load current except capacitor C_6 , and the odd-group capacitors C_5 , C_3 , and C_1 are charged. Then D_3 is conducting and C_2 is get discharged while C_3 and C_1 are charged, C_6 and C_4 supply load current, and C_5 is not in conduction. Similarly D_1 is conducting and C_1 is charged, all even capacitors supply load current, and C_5 and C_3 are not in conduction.

V. CONCLUSION

In this seminar, a high voltage based on the Cockcroft-Walton (CW) voltage multiplier without using a transformer has been presented to obtain a high voltage gain. Since the voltage stress on the active switches, diodes, and capacitors is not affected by increasing the number of cascaded stages, power components with the same voltage ratings can be selected. The Control strategy employs two independent frequencies, one is operates at high frequency to minimize the size of the inductor (L_s) while the other one operates at relatively low frequency according to the desired output voltage ripple. In future we can

increase number of n-stages the high dc output voltage can be converted to AC voltage.

ACKNOWLEDGMENT

Authors wish to thanks DES's College of Engineering & Technology, Dhamangaon (RLY), Maharashtra, India. Also like to pay gratitude towards Head of Department, Electrical Engineering and Principal DES's College of Engineering & Technology, Dhamangaon (RLY), Maharashtra, India for their valuable support and encouragement.

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Hybrid Power Generation System Using Wind Energy and Solar Energy

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Abstract- Now a day's electricity is most needed facility for the human being. All the conventional energy resources are depleting day by day. So we have to shift from conventional to non-conventional energy resources. In this the combination of two energy resources is takes place i.e. wind and solar energy. This process reviles the sustainable energy resources without damaging the nature. We can give uninterrupted power by using hybrid energy system. Basically this system involves the integration of two energy system that will give continuous power. Solar panels are used for converting solar energy and wind turbines are used for converting wind energy into electricity. This electrical power can utilize for various purpose. Generation of electricity will be takes place at affordable cost. This paper deals with the generation of electricity by using two sources combine which leads to generate electricity with affordable cost without damaging the nature balance.

Index Terms- electricity, hybrid, solar, power, wind.

I. INTRODUCTION

Electricity is most needed for our day to day life. There are two ways of electricity generation either by conventional energy resources or by non-conventional energy resources. Electrical energy demand increases in word so to fulfill demand we have to generate electrical energy. Now a day's electrical energy is generated by the conventional energy resources like coal, diesel, and nuclear etc. The main drawback of these sources is that it produces waste like ash in coal power plant, nuclear waste in nuclear power plant and taking care of this wastage is very costly. And it also damages he nature. The nuclear waste is very harmful to human being also. The conventional energy resources are depleting day by day. Soon it will be completely vanishes from the earth so we have to find another way to generate electricity. The new source should be reliable, pollution free and economical. The non-conventional energy resources should be good alternative energy resources for the conventional energy resources. There are many non-conventional energy resources like geothermal, tidal, wind, solar etc. the tidal energy has drawbacks like it can only implemented on sea shores. While geothermal energy needs very lager step to extract heat from earth. Solar and wind are easily available in all condition. The non-conventional energy resources like solar, wind can be good alternative source. Solar energy has drawback that it could not produce electrical energy in rainy and cloudy season so we need to overcome this drawback we can use two energy resources so that any one of source fails other source will keep generating the

electricity. And in good weather condition we can use both sources combine.

II. HYBRID ENERGY SYSTEM

Hybrid energy system is the combination of two energy sources for giving power to the load. In other word it can defined as "Energy system which is fabricated or designed to extract power by using two energy sources is called as the hybrid energy system." Hybrid energy system has good reliability, efficiency, less emission, and lower cost.

In this proposed system solar and wind power is used for generating power. Solar and wind has good advantages than other than any other non-conventional energy sources. Both the energy sources have greater availability in all areas. It needs lower cost. There is no need to find special location to install this system.

A. Solar Energy

Solar energy is that energy which is gets by the radiation of the sun. Solar energy is present on the earth continuously and in abundant manner. Solar energy is freely available. It doesn't produce any gases that mean it is pollution free. It is affordable in cost. It has low maintenance cost. Only problem with solar system it cannot produce energy in bad weather condition. But it has greater efficiency than other energy sources. It only need initial investment. It has long life span and has lower emission.

B. Wind Energy

Wind energy is the energy which is extracted from wind. For extraction we use wind mill. It is renewable energy sources. The wind energy needs less cost for generation of electricity. Maintenance cost is also less for wind energy system. Wind energy is present almost 24 hours of the day. It has less emission. Initial cost is also less of the system. Generation of electricity from wind is depend upon the speed of wind flowing.

The major disadvantages of using independent renewable energy resources are that unavailability of power for all time. For overcoming this we use solar and wind energy together. So that any one source of power fails other will take care of the generation. In this proposed system we can use both sources combine. Another way is that we can use any one source and keep another source as a stand by unit. This will leads to continuity of generation. This will make system reliable. The main disadvantages of this system are that it needs high initial cost. Except that it is reliable, it has less emission. Maintance cost is less. Life span of this system is more. Efficiency is more.

A main advantage of this system is that it gives continuous power supply.

III. DESIGN OF HYBRID ENERGY SYSTEM

For desing of the hybrid energy system we need to find the data as follows

A. Data required for Solar System:

1. Annual mean daily duration of Sunshine hours
2. Daily Solar Radiation horizontal (KWH/m²/day)

B. Data required for Wind System:

1. Mean Annual Hourly Wind Speed (m/sec)
2. Wind Power that can be generated from the wind turbine

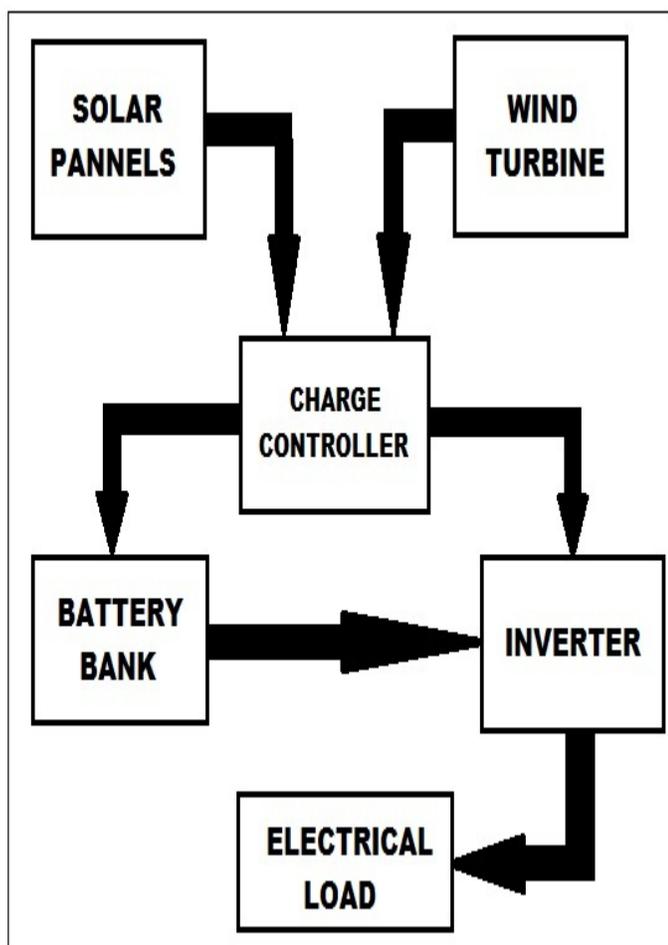


Fig. Block diagram of Hybrid energy generation system

Above figure shows the block diagram of the hybrid power generation system using wind and solar power. This block diagram includes following blocks.

- i. Solar panel
- ii. Wind turbine
- iii. Charge controller

- iv. Battery bank
- v. Inverter

i. Solar panel

Solar panel is use to convert solar radiation to the electrical energy. The physical of PV cell is very similar to that of the classical diode with a PN junction formed by semiconductor material. When the junction absorbs light, the energy of absorbed photon is transferred to the electron-proton system of the material, creating charge carriers that are separated at the junction. The charge carriers in the junction region create a potential gradient, get accelerated under the electric field, and circulate as current through an external circuit. Solar array or panel is a group of a several modules electrically connected in series parallel combination to generate the required current and voltage. Solar panels are the medium to convert solar power into the electrical power.

ii. Wind turbine

Wind turbine is that system which extracts energy from wind by rotation of the blades of the wind turbine. Basically wind turbine has two types one is vertical and another is horizontal. As the wind speed increases power generation is also increases. The power generated from wind is not continuous its fluctuating. For obtain the non-fluctuating power we have to store in battery and then provide it to the load.

iii. Charge controller

Charge controller has basic function is that it control the source which is to be active or inactive. It simultaneously charge battery and also gives power to the load. The controller has over-charge protection, short-circuit protection, pole confusion protection and automatic dump-load function. It also the function is that it should vary the power as per the load demand. It add the both the power so that the load demand can fulfill. And when power is not generating it should extract power from battery and give it to the load.

iv. Battery Bank

We have to choose battery bank size per the load requirement so that it should fulfill the requirement of load for calculating the battery bank size we need to find following data

1. Find total daily use in watt-hour (Wh).
2. Find total back up time of the battery

For increase in battery bank size we need to connect cell in series so that we can get the larger battery bank size.

v. Inverter

We have to choose greater rating inverter than the desired rating .The pure sign wave inverter is recommended in other to prolong the lifespan of the inverter. Inverter is need to convert DC power into AC power. As our load working on the AC supply so we need to convert DC power. The input voltage Output voltage and frequency, and overall power handling depends on the design of the specific device

or the circuitry. The inverter does not produce any power. The power is provided by the DC source.

IV. PROPOSED CALCULATION

The total power generated by this system may be given as the addition of the power generated by the solar PV panel and power generated by the wind turbine.

Mathematically it can be represented as,

$$P_T = N_W * P_W + N_S * P_S$$

Where,

P_T is the total power generated
 P_W is the power generated by wind turbines
 P_S is the power generated by solar panels
 N_W is the no of wind turbine
 N_S is the no of solar panels used

A. Calculations for wind energy

The power generated by wind energy is given by,
Power = (density of air * swept area * velocity cubed)/2

$$P_W = \frac{1}{2} \cdot \rho (A_W) (V)^3$$

Where,

P is power in watts (W)
 ρ is the air density in kilograms per cubic meter (kg/m^3)
 A_W is the swept area by air in square meters (m^2)
 V is the wind speed in meters per second (m/s).

B. Calculations for solar energy

To determine the size of PV modules, the required energy consumption must be estimated. Therefore, the power is calculated as

$$P_S = I_{ns}(t) * A_S * \text{Eff}(pv)$$

Where,

$I_{ns}(t)$ = isolation at time t (kw/m^2)
 A_S = area of single PV panel (m^2)
 $\text{Eff}(pv)$ = overall efficiency of the PV panels and dc/dc converters.

Overall efficiency is given by,

$$\text{Eff}(pv) = H * PR$$

Where,

H = Annual average solar radiation on tilted panels.
 PR = Performance ratio, coefficient for losses.

C. Cost

The total cost of the solar-wind hybrid energy system is depend upon the total no of wind turbines used and total no of solar panels used. Therefore the total cost is given as follows

$$\begin{aligned} \text{Total cost} &= (\text{No. of Wind Turbine} * \text{Cost of single Wind Turbine}) \\ &+ (\text{No. of Solar Panels} * \text{Cost of single Solar Panel}) \\ &+ (\text{No. of Batteries used in Battery Bank} * \text{Cost of single Battery}) \end{aligned}$$

$$C_T = (N_W * C_{WT}) + (N_S * C_{SP}) + (N_B * C_B)$$

Where,

C_T is the total cost in Rs
 C_{WT} is the cost of single wind turbine in Rs
 C_{SP} is the cost of single solar panel in Rs
 C_B is the Cost of single Battery in Rs
 N_W is the number of wind turbine used
 N_S is the number of solar panels used
 N_B is the number of Batteries used in Battery Bank.

Solar-wind hybrid energy systems needs only initial investment. It will compete well in generation with the conventional energy sources. When accounted for a lifetime of reduced or avoided utility costs. The cost of the system depends on the system chosen, wind resource on the site, electric costs in the area, and the battery bank required. Cost of the Wind-Solar Hybrid system is to be minimized. For minimize the cost of the system we need to increase the use of non conventional energy sources. So that production of solar and wind power generator will be increase. That will reduce cost of the whole system.

V. CONCLUSION

Hybrid power generation system is good and effective solution for power generation than conventional energy resources. It has greater efficiency. It can provide to remote places where government is unable to reach. So that the power can be utilize where it generated so that it will reduce the transmission losses and cost. Cost reduction can be done by increasing the production of the equipment. People should motivate to use the non conventional energy resources. It is highly safe for the environment as it doesn't produce any emission and harmful waste product like conventional energy resources. It is cost effective solution for generation. It only need initial investment. It has also long life span. Overall it good, reliable and affordable solution for electricity generation.

ACKNOWLEDGMENT

Authors wish to thanks DES's College of Engineering & Technology, Dhamangaon (RLY), Maharashtra, India. Also like to pay gratitude towards Head of Department, Electrical Engineering and Principal DES's College of Engineering & Technology, Dhamangaon (RLY), Maharashtra, India for their valuable support and encouragement.

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Carbon Credits: A Climate change Mitigation Strategy

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Abstract- Greenhouse gases (GHGs) are mainly responsible for global warming which is most dreaded problem of the new millennium. Electricity generation based on fossil fuel is the major source of emission of GHGs. In India about 52 per cent of its total electricity is generated using fossil fuel (coal). Indian agriculture consumes about 30 per cent of its total electricity. There is vast scope in minimizing the GHGs emission caused by power consumption in agriculture sector by adopting energy efficiency tool viz: modern irrigation methods like micro irrigation.

India is the world's largest producer of banana (*Musa sp.*) having about 27 per cent share of the global output. Irrigation of banana is one of the major consumers of water and energy. Hence, a field study was conducted on banana crop in Jalgaon district of Maharashtra for evaluating energy efficiency of two irrigation methods, namely, micro irrigation system (MIS) and the conventional flood irrigation (FI). The study revealed that water saving of 32% and electricity saving of about 36% was achieved by micro irrigation against the flood irrigation. The potential of gaining carbon credits by switching from flood irrigation to MIS for 5,000 ha area under banana crop in Jalgaon district was estimated at 11,750 (tCO₂e or carbon credits) worth Rs. 2000/ha. Thus, micro irrigation has a definite role in minimizing the impacts of climate change on Indian agriculture by reducing the consumption of water and electricity.

Index Terms- Banana, carbon credits, climate change, micro irrigation

I. INTRODUCTION

Conventional irrigation methods are employed for more than 80 per cent of the world's irrigated lands yet their field level application efficiency is only 40-50 per cent (Sivanappan, 2005). In contrast, drip irrigation has field level application efficiencies of 70-90 per cent as surface runoff and deep percolation losses are minimised (Westarp *et al.*, 2004). All agricultural operations require energy in the form of electricity, the magnitude of which varies as per different agro-climatic zones and even from farmer to farmer. The largest share of energy is utilized for pumping of irrigation water. Various research studies have shown that water saving, electricity saving, irrigation efficiencies and yield of crops using drip irrigation are substantially higher than crops irrigated by the conventional flood irrigation method (INCID, 1994; Magar *et al.*, 1998; Narayanamoorthy, 2007).

In India about 52 per cent of its total electricity is generated using fossil fuel (coal). Indian agriculture consumes about 30 per cent of its total electricity (Rekha Krishnan, 2009). According to BERI (2007), India is among the 10 fastest growing economies in the world. Due to this its fossil fuel share is expected to rise to

74 per cent of total energy by 2010, the corresponding increase in CO₂ emissions being 1,646 Million tons. The use of fossil fuels increases the Greenhouse gases (GHGs) emission. Thus, energy efficiency in agriculture has huge impact on overall power scenario in India. The United Nations Framework on Climate Change (UNFCCC) has made it mandatory that any carbon saving in the developing world, which could be traded with the developed world, has to be duly validated through certified emission reductions (CERs). Any work attaining saving of electricity by various means in the developing world can sell these certificates to any entity in the developed world. This trading could be done at a mutually agreeable price.

In case of horticultural crops, Banana (*Musa sp.*) is a globally important fruit crop produced in tropical and subtropical regions of developing countries with 97.5 Million tons of production. India is the world's largest producer of banana, accounting for about 27 per cent of the global output. At the same time, banana crop is one of the major consumers of water and energy. In this context, it would be interesting to evaluate the savings of water and electricity for banana crop due to use of drip irrigation as against the conventional irrigation. Hence, a pilot study was undertaken to generate the scientific information about water and power savings and standardize the same to assess the carbon credits that could be gained by adoption of drip irrigation.

II. METHODOLOGY

Location and treatment details: A study was conducted at two different locations in Jalgaon district of Maharashtra (21°01' N, 75°34' E and 209 m above MSL), one being at the Research and Development Farm of the Jain Irrigation Systems Ltd. Jalgaon and another in the farmer's field in Raver tehsil of Jalgaon district. In both the fields, soils are well drained (infiltration rate being 1.68 and 1.59 cm/h respectively) and slightly alkaline (pH being 7.7 and 7.65 respectively) with good water holding capacity. Banana crop (*Musa sp.*) cv. Grand Naine (tissue cultured) was planted at a spacing of 1.82 x 1.82 m. The trials were conducted on both drip irrigation (MIS) and flood irrigation (FI). In both trials the same plant population was maintained and irrigation was applied by considering 100 per cent evapotranspiration.

Water and electricity savings: The observations such as number of pumping hours, water consumption (kL) with the use of water meter and electricity consumption (kWh) with the help of energy meter were recorded separately during the study. For both MIS and FI, the savings in water and electricity were found from these observations.

Emission reductions: The main object of the study was to reduce water consumption, and thereby, reduce the electricity

consumption with the introduction of drip irrigation. The reduction in electricity consumption ultimately leads to the reduction of carbon dioxide (CO₂) emissions. For the determination of CO₂ emission reductions, specific electricity consumption (SEC) and grid emission factors were calculated.

$$SEC = \frac{EC}{A} \quad \text{(Eq. 1)}$$

Where,

SEC = Specific electricity consumption in the treatments (kWh/ha)

EC = Electricity consumption in the treatments (kWh)

A = Area under the treatments (ha).

CO₂ emission reductions and carbon credits: Then carbon dioxide (CO₂) emission reductions due the introduction of MIS in the study area were estimated as,

$$CO_2 \text{ emission reductions} = (SEC_{FI} - SEC_{MIS}) \times EF \quad \text{(Eq. 2)}$$

Where,

SEC_{MIS} = Specific electricity consumption in drip irrigation treatment (kWh/ha)

SEC_{FI} = Specific electricity consumption in flood irrigation treatment (kWh/ha)

EF = Grid emission factor (tCO₂/MWh)

Grid emission factor (EF) is the tonnes of CO₂ emissions in the atmosphere during one megawatt (MW) electricity generation in the thermal power plants. The value of grid emission factor (EF) for north India is 0.8401 tCO₂/MWh for the year 2009-10 (CEA, 2008). From the electricity consumption in flood and drip irrigation methods, the CO₂ emission reductions of the study area Jain R & D farm and farmer's field were computed. Using these values the CO₂ emission reductions were projected for the entire Jalgaon region by multiplying the total area under banana cultivation.

According to Kyoto Protocol and methodologies, suggested by the UNFCCC for energy efficiency in agriculture, the potential of carbon credits was estimated. According to the UNFCCC, one carbon credit is equal to one tonne CO₂ reduction which is also called as Certified Emission Reductions, CERs (Gold Standards, Version 2, 2009). The gain of carbon credits by improving energy efficiency of banana and electricity savings in pumping of water due to drip irrigation was then calculated from the total emission reductions obtained in the study.

III. RESULTS

Water and electricity consumption: The number of irrigations applied, the number of pumping hours and the water and electricity consumption in both, flood and drip irrigated fields are given in Table I & II and are depicted in Figure I. To constantly maintain the moisture level at field capacity in the root zone of the plants, the numbers of irrigations were high in MIS, but the quantity of water applied was significantly less than that in flood irrigation. The numbers of pumping hours in MIS were less than 25 per cent as that of flood irrigation.

A significant saving of water in MIS of about 35.14 and 29.24 per cent in the two fields was noted as against the flood irrigation. Similarly, the saving in electricity of 38.96 and 33.41 per cent was observed in MIS against FI.

Table I. Irrigation water and electricity consumption in irrigation methods (Jain R & D Farm)

Particulars	Jain R & D Farm		
	MIS	FI	% saving in MIS over FI
Depth of irrigation applied (mm/ha)	1455.6	2244.2	35.14
Total water consumption (kL/ha or m ³ /ha)	14,556	22,442	35.14
Total electricity consumption (kWh/ha)	4657.8	7630.3	38.96
Total number of irrigations applied	151	40	-
Total pumping hours used for irrigation application (h/ha)	397.7	1726.3	-
Hours used per irrigation	2.6	43.2	-

Table II. Irrigation water and electricity consumption in irrigation methods (Farmers field)

Particulars	Farmers field		
	MIS	FI	% saving in MIS over FI
Depth of irrigation applied (mm/ha)	1669.7	2359.8	29.24
Total water consumption (kL/ha or m ³ /ha)	16,697	23,598	29.24
Total electricity consumption (kWh/ha)	5343	8023.5	33.41
Total number of irrigations applied	126	42.1	-
Total pumping hours used for irrigation application (h/ha)	456.2	1815.3	-
Hours used per irrigation	3.6	43.1	-

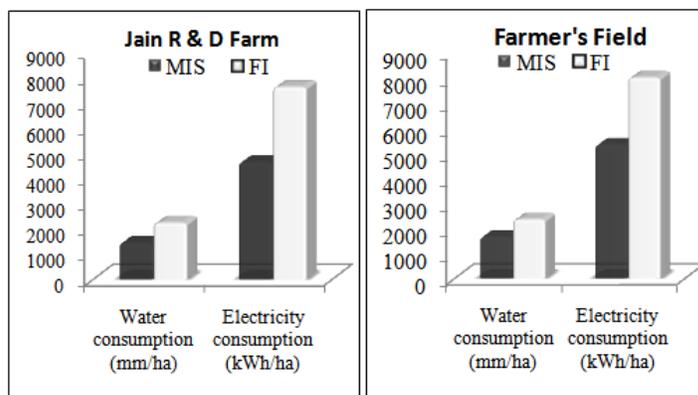


Figure I. Water and electricity consumption

Carbon credits analysis: The use of drip irrigation for banana cultivation, due to its saving in electricity, has a large

potential for carbon credit gains. The carbon credits gain by use of drip irrigation over FI was calculated for both the fields using Eq. 2 as shown in Table III. The carbon credits gain in Jain R & D farm and the farmer's field were found to be 2.5 and 2.2 tCO₂e/ha respectively. The value for R & D farm is higher over the farmer's field on account of the greater precision exercised during the irrigation process. The saving of carbon credits as per the current price of Rs. 850 (€13) amounts to a monetary gain of 1997.5 Rs./ha (average).

The potential of carbon credits gain projected for the area of 5,000 ha in Jalgaon district using average value of 1997.5 amounts to 11,750 tCO₂e and it will lead to monetary benefits of Rs. 10 Million per year.

Table III. Potential carbon credits gain in banana cultivation in Jalgaon district

Sr. No	Particulars	Jain R & D Farm		Farmer's field		Average
		MIS	FI	MIS	FI	
1	SEC (kWh/ha) as per Eq. 1	4657.8	7630.3	5343	8023.5	-
2	CO ₂ emission reductions (tCO ₂ e/ha)* as per Eq. 2	2.5		2.2		2.35
3	Projected potential of emission reductions from Jalgaon district (tCO ₂ e/yr) (Row 2 x 5,000***)	11,750				
4	Monetary Potential of carbon credits (CERs) gain due to MIS (Rs./ha) (Row 2 x 850**)	2,125		1,870		1997.5
5	Projected potential of carbon credits gain from Jalgaon district (Rs. Lakh) (Row 4 x 5,000***)	Rs. 100 Lakh				

*Grid emission factor = 0.0008401 tCO₂e/kWh

**Current price of carbon credit = Rs.850

*** Per 5,000 ha area under banana cultivation

IV. CONCLUSION

The present study clearly indicates the positive impact of drip irrigation technology on climate by reduction of carbon

emissions effected due to water and power saving for banana cultivation as against flood irrigation. Thus, if drip irrigation is adopted largely for various crops in India it can enormously help in countering the problems of global warming and climate change apart from generating revenue by sale of carbon credits.

ACKNOWLEDGMENT

This study is based on work supported by Jain Irrigation Systems Ltd., Jalgaon. Also technical guidance from the Department of Soil and Water Engineering, UAS, Raichur has made this project possible

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Internals of Firefox Mobile Operating System with NFC Components

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Abstract- Firefox is the emerging mobile operating system from Mozilla Gecko Technology. It creates the new revolution for the handheld device product development. Open source operating system has great support to platform integrator and power full to the mobile Application developer. This paper highlights the Layers of the Firefox operating system with details of layered architecture system. In general this explains about the How Android BSP is coupled with Firefox Layers. It briefs about the Firefox specific changes on the Android BSP. Detailed explanation on the NFC components, NFC data structures, NDEF messages structure and NFC daemon in Firefox system. This paper elucidate the requirement of Firefox operating system and constraint on Hardware and software. Currently, Firefox Application runs in various target systems like, simulator, Emulator, Desktop System, Mobile Phones, Hardware Development platform, and Dual boot support with Android OS.

Index Terms- NFC: Near Field Communication, HAL: Hardware Abstraction Layer, NDEF: NFC Data Exchange Format, I2C: Inter-Integrated Circuit communication protocol

I. INTRODUCTION

Developer and consumer have very much expectation in Firefox, because of its potential and power of the open source community. Currently Firefox flavor comes only in 'Smartphone'. The entire features are packed into single device other than else. The features are Social media supports in face-book, twitter, LinkedIn, Video Editor Software's are pre-installed as free applications in the device. Maps supported from HERE-Maps application get the traffic information, local transit information and direction of the movement, apart from that music gallery support, Browser supports, SMS authenticating for mobile billing, conference calling. Those are HTML-5 based application which is ready to work on the phone, not much customization required for porting into Firefox OS. Primary problem is lacking of shifting Android based Mobile OS to New Mobile Os with Linux BSP, "What is Firefox Layer Interaction with Android BSP", How the Application is exactly running on the Firefox, Interaction among the Firefox software layers and how to bring the Firefox operating system on alien devices.

The high-level view of the Firefox system is broadly divided into two segments, User Space and Kernel Space, based on the permission, process implementations. The kernel space has restricted access, physical communication with hardware system, driver for peripherals and exposes the functionalities to user space. User space program primary task is to get the access of kernel services, facilities for GUI framework; end user application which consists of core libraries provides to the API interface and other miscellaneous services.

II. FIREFOX KERNEL-SPACE

This layer is completely hardware related code and configuration of the peripherals. The primary source codes are u-boot code, Linux kernel, firmware, and drivers. Firefox reuses the kernel from Android; No additional features required identical with Android base source code. Feature of the kernel is IPC mechanism for RPC, optimized logging mechanism, mapping large memory to user-space; kill least recently used process and sophisticated power management system. Kernel offers the core services such as graphics, security, networking and memory management.

- A. *Boot strap:* ROM Code Checks if a valid application is present in booting sector and downloads it into internal SRAM. Bootstrap change hardware configuration, downloads U-Boot binary and starts the Boot Loader.
- B. *U-boot:* The boot loader, responsible for downloading kernel images, configures the network, SD card, etc. Then it loads the Device Tree Binary and starts the Linux kernel. Enhancement of fast boot supports firmware up gradation in USB interface.
- C. *Linux Kernel:* Primary task is process management, Memory management, Network stack management, and power management, device driver for processor specific and peripherals and scheduling the tasks, it requires the Linux kernel features like ASMEM, BINDER, LowMemoryKiller (LKM), Logger, USB Gadget, and ION. These android additional driver in Linux kernel released by GPLv2, offering extensive service to user space.

- D. *HAL (Hardware Abstraction Layer)*: This is middleware layer, between the kernel and user space. It abstracts device specific routines, algorithms and exposes the well define interface to application layer. It has various task routines
- 1) Module loading and unloading.
 - 2) Separate the platform logic from hardware interface.
 - 3) Communication channel for Application framework to access the devices

The open source projects like libusb, BleuZ, GPS and camera user space libraries are integrated in HAL. These libraries are low level access to across multiple hardware platforms. HAL loads the component into two ways, In runtime using `dlopen()` and automatically loaded by the dynamic linker. Hardware Platforms are Processor with Hardware specific components like Codecs, Modems, Display Device, and Sensors inter-connected with wires.

III. FIREFOX USER-SPACE

Like Android, Firefox is built upon the open source platform, Bugzilla releases all the source code to community to make available. Entire user space application layer spilt into three domains, Application, Open web platform interface, Infra structure layer. It ensures that each layer has its own security; other applications can still interact with each other. It has support of Native Libraries, Multimedia Frameworks and Daemons.

- A. *Application Layer*: In this layer component consist of Java Script, HTML, and CSS as a regular web application framework. Firefox uses the gecko (like webkit in android) powerful and standard-compliant browser engine. Gecko engine is attractive for browser application developers, its streamlined code base, supports W3C standards, and open-source.
- B. *Gaia*: The user interface of the Firefox OS platform. Anything we need to draw on the screen, Firefox OS start up the Gaia layer. Gaia implements the lock screen, home screen, and all the standard applications which we expect on a modern smartphone. Gaia is implemented entirely using HTML, CSS, and JavaScript. Its only interfaces to the underlying operating system are through open Web APIs, which are implemented by the Gecko layer. Third party applications can be installed alongside the Gaia layer.
- C. *Power of HTML5 and JS libraries*: Firefox supports HTML5 features; it makes much more capability of the web application development. Various built in application like browser, calendar, camera, contact manager, dialer are installed on the device. Firefox supports various libraries in the Gaia layer. Currently Firefox OS Gaia uses a modified version of Fabien Cazenave's L10n.js library to localize the default Apps that are available in Firefox OS. It is available in the Gaia source tree. The L10n.js parser also supports import rules that can be used for client side language selection.
- D. *Security system Sandbox*: The Firefox OS security framework uses sandboxing as a defense-in-depth strategy to mitigate risks and protect the mobile phone, platform, and data. Sandboxing is a way of putting boundaries and restrictions around an app during run-time execution. Each app runs in its own worker space and it has access only to the Web APIs and the data it is permitted to access, as well as the resources associated with that worker space (IndexedDB databases, cookies, offline storage, and so on). For details, check the Firefox links
- E. *WebAPI*: It is a term used to refer to a suite of device compatibility and access APIs that allow Web apps and content to access device hardware (such as battery status or the device vibration hardware), as well as access to data stored on the device (such as the calendar or contacts list). By adding these APIs, it helps to expand what the Web can do today and only proprietary platforms were able to do in the past.
- F. *Gecko Runtime*: This is the Firefox OS application runtime; this layer provides all the support for the trifecta of open standards: HTML, CSS, and JavaScript. It makes sure those APIs work well on every operating system Gecko supports. This means that Gecko includes, among other things, a networking stack, graphics stack, layout engine, a JavaScript virtual machine, and porting layers. Gecko is combination of both browser engine and rendering engine.
- G. *HTML API*: There are many HTML API available to develop the code for web using Java script.
 - 1) Connectivity: allowing you to communicate with the server in new and innovative ways.
 - 2) Offline & Storage: allowing webpages to store data on the client-side locally and operate offline more efficiently.
 - 3) Multimedia: making video and audio first-class citizens in the Open Web.
 - 4) 2D/3D Graphics & Effects: allowing a much more diverse range of presentation options.
 - 5) Device Access: allowing for the usage of various input and output devices.
 - 6) Styling: letting authors write more sophisticated themes.
- H. *Gonk* : Gonk is the lower level operating system of the Firefox OS platform, consisting of a Linux kernel and users pace hardware abstraction layer (HAL). The kernel and several of the user space libraries are common open-source projects:

Linux, libusb, bluez, and so forth. Some of the other parts of the HAL are shared with the Android project: GPS, camera, and others. The Gonk is a very simple Linux distribution from open source. Gonk is a porting target of Gecko; The port of Gecko to Gonk, is just like a port of Gecko to Mac OS X, Windows, and Android. Since the Firefox OS project has full control over Gonk, we can expose interfaces to Gecko that can't be exposed on other operating systems. For example, Gecko has direct access to the full telephony stack and display frame buffer on Gonk, but doesn't have this access on any other operating system.

- I. *Init process*: It is entry point of Firefox OS. Firefox init process executes the init.rc and init.b2g.rc configuration and starts up the b2g process. During start up this process handles the file system mounting, runs various system services, finally runs the b2g in highly privileged task.

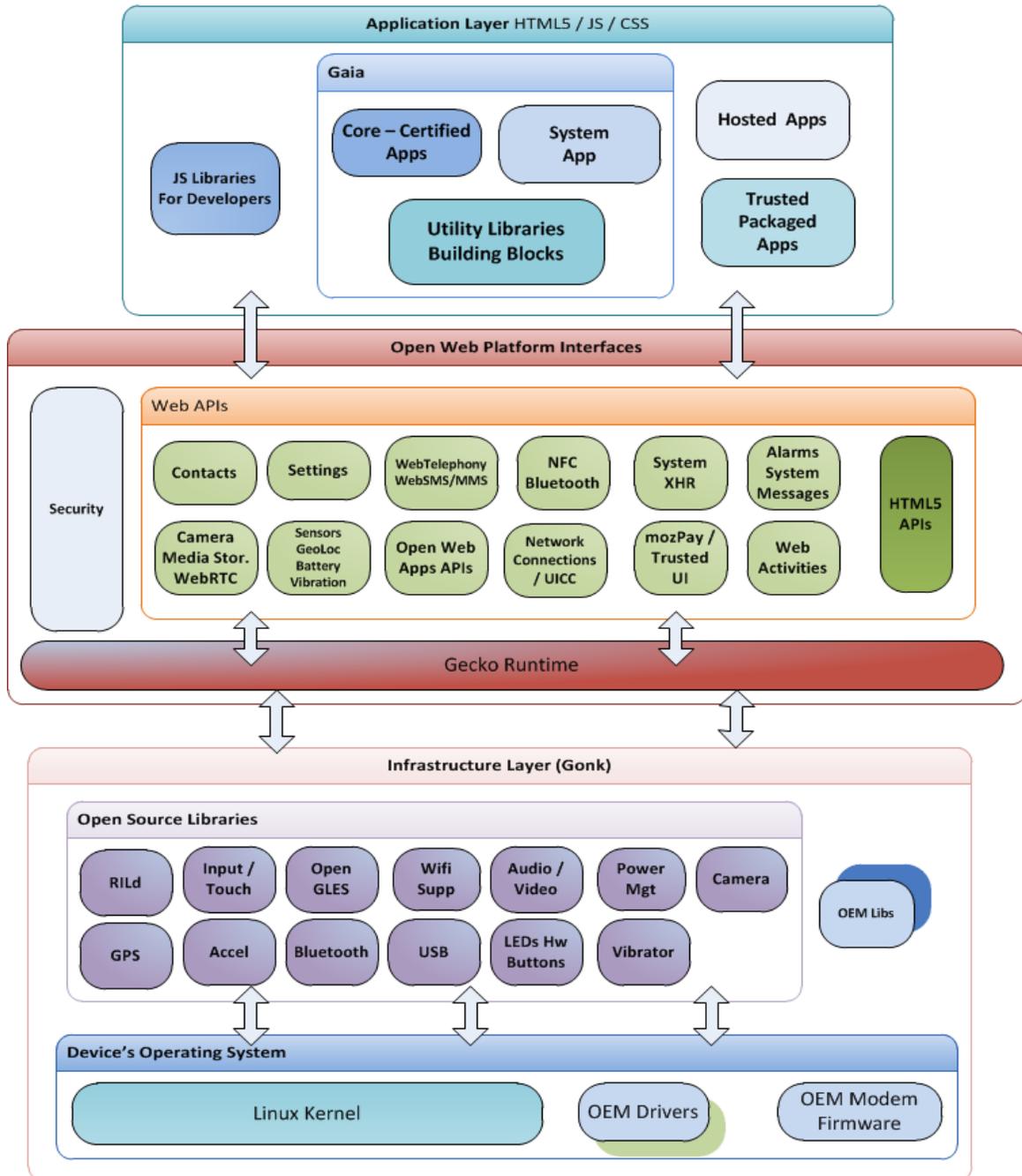


Figure -1: Architecture diagram of Firefox platform by Mozilla

IV. UNDERSTANDING OF NFC COMPONENT IN FIREFOX

User can share information to another NFC enabled device (like Mobile phone and Tablet) communication via paired device. Share content may be contact information, Image content, Video content, music content, URL, NFC enabled payments. The data can be shared via NFC to another device by tapping the mobile device with another NFC enabled device. Transfer of content takes place directly over NFC or support by other wireless communication (like BT and WiFi)

There are four types of NFC forum tags presents, which is build top of the product. Below table provides the NFC Forum tags and corresponding available product.

Table-1: NFC Tags Types

NFC Forum Tags	Compatible Products
NFC Forum Type 1 Tag	Innovision Topaz
NFC Forum Type 2 Tag	NXP MIFARE Ultralight
NFC Forum Type 3 Tag	Sony Felica
NFC Forum Type 4 Tag	NXP SmartMx and DESire

NDEF (NFC Data Exchange Format) is the encapsulated messages exchange between two NFC Forum devices. NFC Forum TAG is combination of encapsulated NDEF messaged and NFC forum Type TAG. This information stored as application data inside the NFC device.

Table-2: NFC States

State	Description
No Tech	No NFC-compatible technology discovered
Tech Discovered	A NFC- compatible technology has been discovered. This includes a NFC-A tag, a tag (possible different technology) with a NDEF message, or another NFC-enabled device
NDEF Details Pending	A tag or P2P device with a NDEF message has been discovered and the application requests the meta-data of that message. The details request is pending and not yet completed
NDEF Discovered	An NDEF-compatible tag has been discovered
NDEF Connect Pending	Applica5on wants to connect to the NDEF compa5ble tag. The connect request is pending and not yet completed
NDEF Connected	Applica5on is connected to NFC-A compa5ble tag
Close Pending	Applica5on is closing the connec5on to the tag. The close request is pending and not yet completed
NDEF Write Pending	Applica5on has issued a NDEF message write request that has not yet completed
NDEF Read Pending	A tag or P2P device with a NDEF message has been discovered and the applica5on reads that message. The read request is pending and not yet completed
NDEF Make Read Only Pending	Make the tag holding a NDEF message read-only. The request is s5ll pending
NfcA Tag Details Pending	A NFC-A compa5ble tag was discovered and the applica5on requests the tag details. The tag details request is pending and not yet completed
NfcA Tag Discovered	A NFC-A compa5ble tag has been discovered
NfcA Tag Connect Pending	Applica5on wants to connect to the NFC-A compa5ble tag. The connect request is pending and not yet Completed
NfcA Tag Connected	Applica5on is connected to NFC-A compa5ble tag
NfcA Transceive Pending	Applica5on issued a transceiver request. The request is ending and not yet completed

NFCD is a daemon in user space layer, it provides access to the NFC chipset. It uses IPC to communicate with Gonk layer. The scope of the protocol tag is reading and writing of NDEF messages, NFC-A (ISO 14443-3A) compatible tags (such as NXP's Mifare Ultralight tags) and P2P. The protocol is as similar as described by Android. NFC has two stack required to run the application. NFC kernel stack has driver for the NFC chipset, mostly comes with I2C protocol data communication. HAL implementation is driver commands, passing with register call-back implementation. Low level hardware control library for each chip specific in the NFC subsystem. Major task in the user space NFC daemon are,

- 1) Reading and Writing TAG specific Handling
- 2) LLCP protocol
- 3) NDEF protocol parsing and Decoding
- 4) Receive the NFC Notification and handover to application
- 5) Register content of target and create mozNfcPeer Object

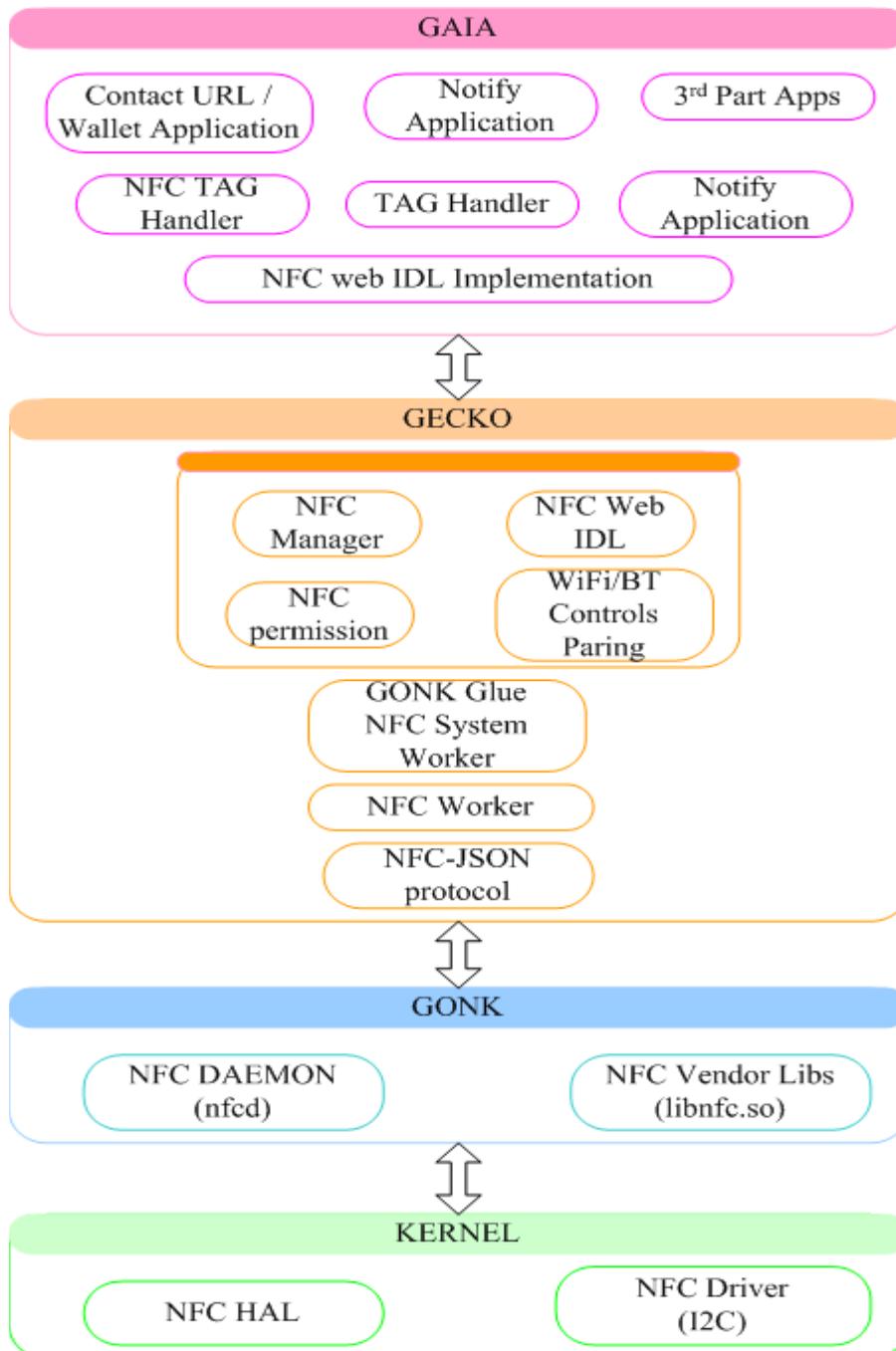


Figure -2: NFC Architecture diagram in Firefox platform

Table-3: NFC Software source Tree in Firefox

Source Tree Location	Implementation details
drivers/nfc/bcm2079x.c	NFC Low level driver implementation. It uses I2C based protocol to communicate with hardware chip.
gecko/ipc/nfc/	It provides communication between the nfc (daemon) and Application Layer
dom/system/gonk/	Implementation of NFC worker component. Provide high-level API representing NFC capabilities. Responsible for converting NFC requests from Content process to binary data NFC Responses from binary data to dictionary objects.
dom/nfc/	Implementation of WebIDL, Gaia Application uses the function of read/write NDEF data
Gaia/apps/system	Target application is located in the directory, it expect NDEF messaged from various application like Browser, contact, Music, Video.
Nfcd	SnepServer protocol implementation, establish communication between the Low level driver and Gonk

V. CONCLUSION

This paper briefs the high level architecture of Firefox Mobile operating system, basic requirements of porting new Hardware platforms and NFC software libraries for Integration. This paper helps to illustrate NFC application development on the Firefox platform. Firefox is currently evolving mobile platform, will absolutely go for long run because of open source framework. Device manufacturer and network providers have pace with development on Firefox. Huge scope of application development in Mobile domain. Android running Hardware platform will ease migration to Firefox Operating system with minimal configuration changes.

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Complement Properties on Strong Fuzzy Graphs

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Abstract- In this work we introduce the complement of strong fuzzy graph, tensor product of fuzzy graphs and strong fuzzy graph. Complement properties of tensor product of strong fuzzy graphs are discussed.

Index Terms- Complement of fuzzy graph, strong fuzzy graph, Tensor product.

the present study we have been introduced the tensor product of fuzzy graphs. The operations on (crisp) graphs such as Cartesian product, composition, tensor, and normal products are extended to fuzzy graphs and some of their properties are incorporated to investigate. Properties found are related to complement of fuzzy graph and strong fuzzy graph

I. INTRODUCTION

Rosenfeld [3] introduced fuzzy graph in 1975. The operations of Cartesian product, compositions of fuzzy graphs were defined by Moderson.J.N and peng.C.S [6]. In this note, we discuss a sub class of fuzzy graphs called strong fuzzy graph which were introduced by Moderson.J.N and peng.C.S [6]. In

II. BASIC DEFINITIONS

Definition 2.1 Fuzzy graph with S as the underlying set is a pair $G: (\sigma, \mu)$ where $\sigma: S \rightarrow [0,1]$ is a fuzzy subset, $\mu: S \times S \rightarrow [0,1]$ is a fuzzy relation on the fuzzy subset σ , such that $\mu(x,y) \leq \min \{\sigma(x), \sigma(y)\}$ for all $x, y \in S$.

Definition 2.2 Let (σ, μ) be fuzzy sub graph of $G = (V, X)$. Then (σ, μ) is called a strong [6] fuzzy graph of G if $\mu(u, v) = \sigma(u) \wedge \sigma(v)$ for all $(u, v) \in X$.

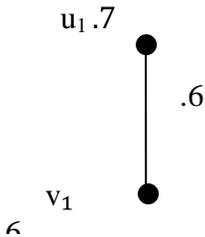


Fig. 1 Strong fuzzy graph

Definition 2.3 The complement of a fuzzy graph $G^c : (\sigma^c, \mu^c)$ where $\sigma^c = \sigma$ and $\mu^c(uv) = 0$ when $\mu(uv) > 0$ and $\mu^c(uv) = \sigma(u) \wedge \sigma(v)$ when $\mu(uv) = 0$.

Note: $(G^c)^c = G$ if and only if G is a strong fuzzy graph.

Definition 2.4 The tensor Product of two fuzzy graphs (σ_i, μ_i) on $G_i = (V_i, X_i)$, $i=1,2$ is said to be a fuzzy graph $G_1 \otimes G_2 = (\sigma_1 \otimes \sigma_2, \mu_1 \otimes \mu_2)$ on $G = (V, X)$ where $V = V_1 \times V_2$ and $X = \{(u_1, u_2), (v_1, v_2) | (u_1, v_1) \in X_1, (u_2, v_2) \in X_2\}$.

Fuzzy sets $\sigma_1 \otimes \sigma_2$ and $\mu_1 \otimes \mu_2$ are defined as

$$(\sigma_1 \otimes \sigma_2)(u_1, u_2) = \{(\sigma_1(u_1) \wedge \sigma_2(u_2))\} \text{ for all } (u_1, u_2) \in V \quad (\mu_1 \otimes \mu_2)((u_1, u_2), (v_1, v_2)) = \{\mu_1(u_1, v_1) \wedge \mu_2(u_2, v_2)\} \quad (u_1, u_2) \in X_1 \text{ and } (v_1, v_2) \in X_2$$

III. PROPERTIES

Tensor product of strong fuzzy graphs 3.1

The tensor product of two strong fuzzy graphs (σ_i, μ_i) on $G_{s_i} = (V_i, X_i)$, $i=1,2$ is defined as a strong fuzzy graph $G_{s_1} \otimes G_{s_2} = (\sigma_1 \otimes \sigma_2, \mu_1 \otimes \mu_2)$ on $G = (V, X)$ where $V = V_1 \times V_2$ and $X = \{(u_1, u_2), (v_1, v_2) | (u_1, v_1) \in X_1, (u_2, v_2) \in X_2\}$.

Fuzzy sets $\sigma = \sigma_1 \otimes \sigma_2$ and $\mu = \mu_1 \otimes \mu_2$ are defined as $\sigma(u_1, u_2) = (\sigma_1(u_1) \wedge \sigma_2(u_2))$ and $\mu((u_1, v_1), (u_2, v_2)) = \{\sigma(u_1, v_1) \wedge \sigma(u_2, v_2)\}$

Theorem 3.2 Let $G_{s_1} : (\sigma_1, \mu_1)$ and $G_{s_2} : (\sigma_2, \mu_2)$ be two strong fuzzy graphs. Then $G_{s_1} \otimes G_{s_2}$ is a strong fuzzy graph. Let $G_{s_1} \otimes G_{s_2} = G : (\sigma, \mu)$ where $\sigma = \sigma_1 \otimes \sigma_2$, $\mu = \mu_1 \otimes \mu_2$ and $G^* = (V, E)$ where $V = V_1 \times V_2$, $E = \{(u_1, u_2), (v_1, v_2) : u_1, v_1 \in E_1, u_2, v_2 \in E_2\}$

$$\begin{aligned}
 \text{Now, } \mu(u_1, u_2)(v_1, v_2) &= \mu_1(u_1, v_1) \wedge \mu_2(u_2, v_2) \\
 &= (\sigma_1(u_1) \wedge \sigma_1(v_1)) \wedge (\sigma_2(u_2) \wedge \sigma_2(v_2)) \quad \text{since } G_1 \text{ and } G_2 \text{ being strong.} \\
 &= (\sigma_1(u_1) \wedge (\sigma_2(u_2) \wedge \sigma_2(v_2))) \wedge (\sigma_1(v_1) \wedge (\sigma_2(u_2) \wedge \sigma_2(v_2))) \\
 &= (\sigma_1(u_1) \wedge (\sigma_2(u_2) \wedge (\sigma_1(u_1) \wedge \sigma_2(v_2)))) \wedge \{(\sigma_1(v_1) \wedge \sigma_2(u_2)) \wedge (\sigma_1(v_1) \wedge \sigma_2(v_2))\} \\
 &= \{(\sigma_1 \circ \sigma_2)(u_1, u_2) \wedge (\sigma_1 \circ \sigma_2)(u_1, v_2)\} \wedge \{(\sigma_1 \circ \sigma_2)(v_1, u_2) \wedge (\sigma_1 \circ \sigma_2)(v_1, v_2)\} \\
 &= \{\sigma(u_1, u_2) \wedge \sigma(u_1, v_2)\} \wedge \{\sigma(v_1, u_2) \wedge \sigma(v_1, v_2)\} \\
 &= \sigma(u_1, u_2) \wedge \sigma(v_1, v_2).
 \end{aligned}$$

Hence $G = G_{s_1} \otimes G_{s_2}$ is a strong fuzzy graph.

Theorem 3.3 If $G_{s_1} : (\sigma_1, \mu_1)$ and $G_{s_2} : (\sigma_2, \mu_2)$ be two strong fuzzy graphs then $\overline{G_{s_1} \otimes G_{s_2}} = \overline{G_{s_1}} \otimes \overline{G_{s_2}}$

Proof:

Let $G_{s_1} : (\sigma_1, \mu_1)$ and $G_{s_2} : (\sigma_2, \mu_2)$ are strong fuzzy graphs.
 $:(\sigma, \bar{\mu}) = \overline{G_{s_1} \otimes G_{s_2}}$

$$\bar{\mu} = \overline{\mu_1 \otimes \mu_2}, \bar{G} : (V, \bar{E})$$

$$\begin{aligned}
 \overline{G_{s_1}}(\sigma_1, \bar{\mu}_1) &= \overline{G_1}(V_1, \bar{E}_1) \\
 \overline{G_{s_2}}(\sigma_2, \bar{\mu}_2) &= \overline{G_2}(V_2, \bar{E}_2)
 \end{aligned}$$

$$\overline{G_{s_1}} \otimes \overline{G_{s_2}} : (\sigma_1 \otimes \sigma_2, \bar{\mu}_1 \otimes \bar{\mu}_2)$$

Now, the various types of edges say e , joining the vertices of V are the following and it suffices to prove that $\overline{\mu_1 \otimes \mu_2} = \bar{\mu}_1 \otimes \bar{\mu}_2$ in each case.

Case (i)

$$e = (u_1, u_2)(v_1, v_2) \quad u_1 v_1 \notin E_1, \text{ and } u_2 v_2 \notin E_2$$

Then $e \notin E$ Hence $\mu(e) = 0$

$$\begin{aligned}
 \text{Thus } \bar{\mu}(e) &= \sigma(u_1, u_2) \wedge \sigma(v_1, v_2) \\
 &= [\sigma_1(u_1) \wedge (\sigma_2(u_2) \wedge \sigma_2(v_2))] \\
 &= [\sigma_1(u_1) \wedge \sigma_1(v_1)] \wedge [\sigma_2(u_2) \wedge \sigma_2(v_2)]
 \end{aligned}$$

$$\text{Since } u_1 v_1 \notin E_1 \Rightarrow u_1 v_1 \in \bar{E}_1 \text{ and } u_2 v_2 \notin E_2 \Rightarrow u_2 v_2 \in \bar{E}_2$$

$$\begin{aligned}
 \text{we have } (\bar{\mu}_1 \otimes \bar{\mu}_2)(e) &= \bar{\mu}_1(u_1 v_1) \wedge \bar{\mu}_2(u_2 v_2) \\
 &= [\sigma_1(u_1) \wedge \sigma_1(v_1)] \wedge [\sigma_2(u_2) \wedge \sigma_2(v_2)] \\
 &= \bar{\mu}_1 \otimes \bar{\mu}_2(e)
 \end{aligned}$$

Case (ii)

$$e = (u_1, u_2)(v_1, v_2) \quad u_1 v_1 \in E_1, \text{ and } u_2 v_2 \notin E_2$$

Then $e \notin E$ also $e \notin \bar{E}$

Hence $\bar{\mu}(e) = 0$

$$u_1 v_1 \in E_1, \text{ and } u_2 v_2 \notin E_2$$

$$(\bar{\mu}_1 \otimes \bar{\mu}_2)(e) = 0$$

Case (iii)

$$e = (u_1, u_2)(v_1, v_2) \quad u_1 v_1 \in E_1, \text{ and } u_2 v_2 \in E_2$$

Then $e \notin E$ also $e \notin \bar{E}$

Hence $\overline{\mu}(e)=0$

Also $u_1v_1 \notin E_1, \Rightarrow u_1v_1 \in \overline{E_1}$

$u_2v_2 \in E_2 \Rightarrow u_2v_2 \notin \overline{E_2}$

Hence $(\overline{\mu_1} \otimes \overline{\mu_2})(e) = 0$

Case (iv)

$e=(u_1, u_2)(v_1, v_2) \quad u_1v_1 \notin E_1, \text{ and } u_2v_2 \in E_2$

Then $e \notin E$ also $e \notin \overline{E}$

Hence $\overline{\mu}(e)=0$

Also $u_1v_1 \notin E_1, \Rightarrow u_1v_1 \in \overline{E_1}$

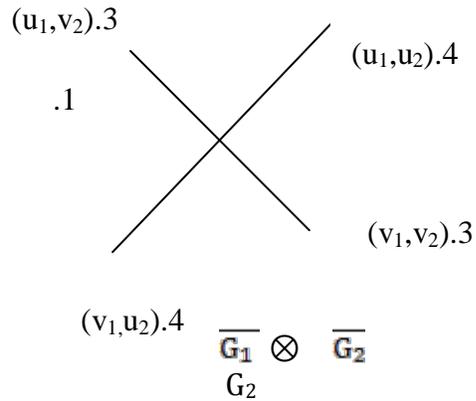
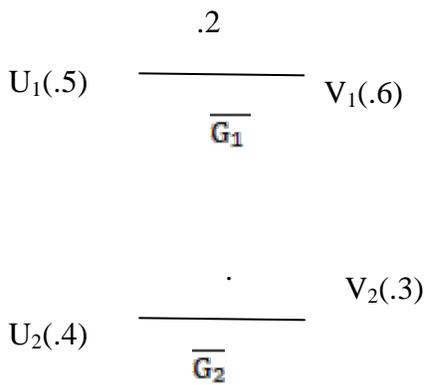
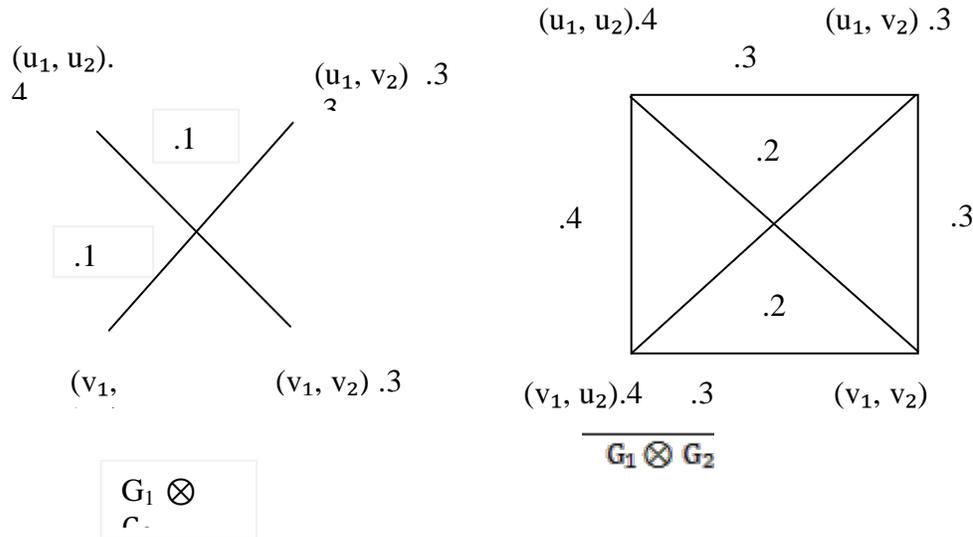
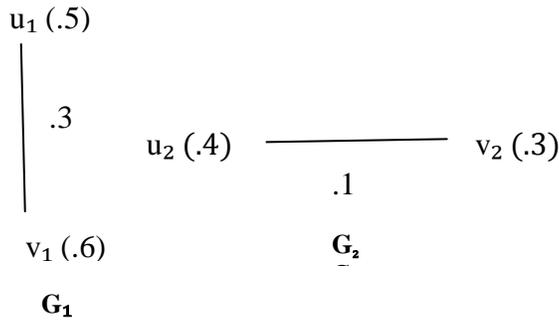
$u_2v_2 \in E_2 \Rightarrow u_2v_2 \notin \overline{E_2}$

Hence $(\overline{\mu_1} \otimes \overline{\mu_2})(e) = 0$

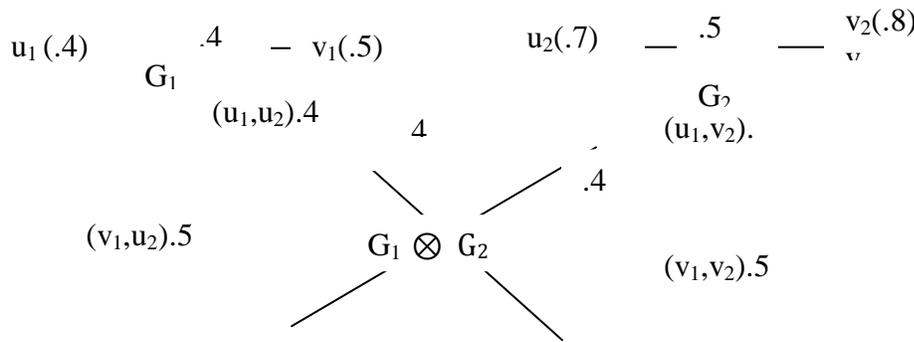
Thus from case (i) to (iv) it follows that $\overline{G_{S_1} \otimes G_{S_2}} = \overline{G_{S_1}} \otimes \overline{G_{S_2}}$

Remark 3.4

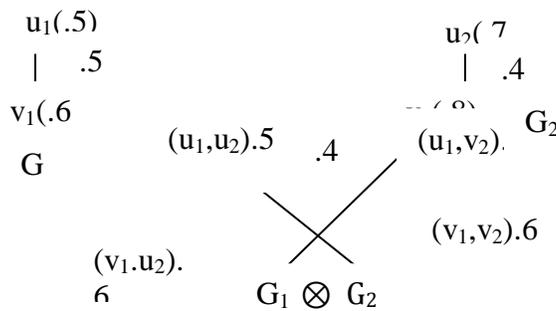
If general G_1 and G_2 are not strong fuzzy graphs then $\overline{G_1 \otimes G_2} \neq \overline{G_1} \otimes \overline{G_2}$



Corollary 3.5: If $G_1 \otimes G_2$ is strong then atleast G_1 or G_2 is strong.



In this example G_1 is strong G_2 is not strong and also leads that if one factor is strong then $G_1 \otimes G_2$ is strong. However, the following example shows that this may not always be true.



Here G_1 is strong G_2 is not strong then $G_1 \otimes G_2$ is not strong.

IV. CONCLUSION

In this paper we have proposed, complement of strong fuzzy graphs, tensor products of strong fuzzy graphs and the complement properties for tensor products of strong fuzzy graphs. In the fuzzy environment it is reasonable to discuss complement of strong fuzzy graphs and its properties.

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Patriarchy and Women: An Exploration of Ruskin Bond's Selected Novels.

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Abstract- Patriarchy is delineated as that kind of society where the supreme authority is vested in the hands of males. Due to such social system, a type of hierarchy and hegemony is maintained between the two biological sexes. But, it is maintained that such a system is not a biological but social construction. In patriarchy, females are perceived through the lens of being mere sexual object with no feelings. They have to undergo a lot of misery and exploitation in different fields and phases. This paper is an attempt to analyze Ruskin Bond's attempt to portray such a patriarchal system, that which he certainly observes through the eyes of criticism. If explored minutely, one can find traces of feminine suffering depicted inhibitedly.

Index Terms- discrimination, oppression, patriarchy, social construction.

I. INTRODUCTION

A social system where males hold the authorial power of the family as well as society delineates the word patriarchy. As Gulnaz Fatma puts it that as per standard sociological theory, "patriarchy is the result of sociological constructions that are passed down from generation to generation." The term signifies oppression of women by men, usually older men. Patriarchy literally means "the rule of the father" and originates from Greek. Sociologist Sylvia Walby has composed six overlapping structures that define patriarchy and take different forms in different cultures and different times:

- The state: women are unlikely to have formal power and representation.
- The household: Women are more likely to do housework and raise the children.
- Violence: Women are more prone to being abused.
- Paid work: Women are likely to be paid less.
- Sexuality: Women's sexuality is likely to be treated negatively.
- Culture: Women are misrepresented in media and popular culture.

Suppression, ill-treatment and exploitation of women in a patriarchal society have always prevailed as a subject matter in Indian fiction. This theme goes back to Indian epics like the Mahabharata and the Ramayana. While certain writers explicitly raise their voice in support of women's liberation and position in the society, some writers do not resist the patriarchal tradition but only shows women in traditional roles in society. Ruskin Bond is one such writer who presents a patriarchal society of his times

i.e. twentieth century but the sufferings of women is passively explored. If this writer is studied from a feminist angle, then it can be discerned that the writer criticizes this social system by satirizing the oppression in marital relationships, gender discrimination and the dominative nature of males. One can observe that his portrayal of suffering of women is not stark and naked. He, through the projection of patriarchy tries to revisit the role and status of women in society.

But the study has a limitation since it encompasses only three representative and famous novels for analysis of patriarchal system and woman's condition in it: *The Room on the Roof*; *Vagrants in the Valley*; and *Delhi Is Not Far*.

Discussion

Ruskin Bond endeavors to depict such a society where males have an oppressive and dominative attitude towards women. In Bond's world, females swallow their sufferings without any complaints. He portrays women who are trapped in a world of patriarchal conventions where they are bound by responsibility and obligations to serve the family and males. Their desires and emotions are crushed by men, sacrifice being made as their prime soul. This analysis of patriarchal conventions will be distinct as we move on through the paper.

In the beginning of the novel, *The Room on the Roof*, Suri cried: "Oh, Mummy!"(6) as the cycle along with Ranbir, Somi and the boy speeded through the steep downhill. This is a very common phrase which everyone utters or gets to hear at times of despair. But the phrase which incorporates the word "mummy" poses a question as to whether the mother is cried in reverence or otherwise! In reality, it signifies that mother is called not because one acknowledges her strength to save one, but because everyone takes their mothers for granted and they are seen to be supporting thing on which they will step and get over all difficulties.

Again if we come to the example of the missionary's wife, she never received any happiness which is clear in her effort to derive pleasure from gardening. She felt flattered when a butterfly landed on her bosom which indicates that she was not fortunate enough to obtain any appreciation, or any attention. In a patriarchal society, a woman's strength or voice is always tried to be killed. Even here, the male figure, Mr John Harrison hated the lady's lively spirit. A woman is made to obey her husband's orders which is also perceived when she obeys Mr. Harrison's wish to keep the boy occupied with works while he was absent from home. Moreover, the lady was also defeated when Rusty who was a mere adolescent declined her request to help her in her garden and finally had to submit: "All right dear, come back soon."(13). She has been entitled as "cauliflower-like lady" which marks female tenderness. The missionary wife's parental concern is never given the deserving response by the boy. Even

when she had accomplished all her works by herself after being refused by the boy and heartily welcomed Rusty offering him lemonade drink, he indifferently smiled only as a matter of courtesy and hurried away from the place. It really hurts when the boy thinks that such cruelty on his part could be forgiven by his good thought of donating money for upkeep of church, wife and garden, and it clarifies how a person remains unconcerned about female's emotions.

Another character, Meena Kapoor also represents the suffering woman as her husband is a drunkard, while she has to take care of him. She was not given much respect and it is evident when her son, Kishen did not even care to inform about the money which he asked from his father. Even, her husband did not care to attend to her feelings. Whenever he was scolded for having too many drinks, he "ignored" them. When the story of their arranged marriage is revealed, the readers come to know that they had been betrothed from childhood, while the same patriarchal reason goes behind this wedding: "Kapoor was a promising young man, intelligent and beginning to make money; and Meena at thirteen, possessed the freshness and promise of spring." (60). Females were only thought to be a toy made to please men. Her emotions never meant any importance to her drunkard husband, for which she went to Rusty in search of some care and affection. Again, in the world of Bond, females were only attached to domestic works like Meena was presumed to make tikkees while the male figures would do the accounts or selling activity in their future plan of opening a chaat shop. Mr. Kapoor fell into the category of a male patriarch who took females as something for use. Therefore, when his first wife met with an accident, he didn't even wait for the sorrow to die down but immediately another.

In his next novel, *Vagrants in the Valley*, another such character exists, of an Englishman, Mr. Pettigrew who also perceived females as entertaining dolls: "Only invalids get married, so that they can have someone look after them in their old age. No man's likely to be content with one woman in their life." (159). The attitude of self-centeredness of Mr. Pettigrew who only saw that women were ones that have come to nurse their so called gods or males when needed. But this is contrary to female attitude which is crystal clear in Rusty's aunt's utterance. She too wanted somebody (like Rusty) to take care of her but she never displayed the typical self-centric behavior of man but the feminine characteristic of caring for others: "Let us be burdens on each other. I am lonely, sometimes. I know you have friends, but they cannot care for you if you are sick or in trouble." (196-197). Even, Kishen, who was an adolescent began to like Aruna's company because of her physical beauty: "...examining her palm, predicted misery; his predictions were made at length, for he enjoyed holding Aruna's hand." (163-164). Again, another character, Devinder follows the utilitarian principle with the two prostitutes, Mrinalini and Hastini. He not only employs them for his physical satisfaction but often borrows money, which he hardly returns.

It is really strange to find the assumption of a woman (Rusty's aunt) about ghosts: "Oh they are usually the spirits of immoral women, and they have their feet facing backwards. They are called churels." So, this sense of patriarchal interpretation also got infused into the minds of women who themselves had no high thoughts of their own category.

In the other novel, *Delhi Is Not Far*, Seth Govind Ram too derives pleasure from females and living in a patriarchal society, he too has the instinct of possessing a mistress to satisfy his physical urge, while owning dancing girls at the same time. Again, male figures such as Deep Chand discerns the opposite sex from the utility perception: "What you should do, is marry a wealthy woman. It would solve all your problems" "She doesn't have to be a widow. Find a young woman who is married to a fat and important millionaire. She will support you" (14, 15) Even, selfish husbands like Kamla's live in Ruskin Bond's society who witnessed females as utility and entertainment materials: "I have a husband who is happy only if I can make myself attractive to others...he has given five acres of land for the favour of having a wife half his age. But it is Seth Govind Ram who really owns me; my husband is only his servant." From such statements, it is clear about the male attitude towards women. Women are never seen through the lens of respect; their feelings and desires are never regarded or attended to. They are commodities used for profitable interests. Bond portrayed the images of submissive and docile women like Suraj's mother who is described as a "subdued, silent woman." (28).

Another interesting but patriarchal distinction that bars both the sexes is when the readers come to the passage: "For a girl, puberty is a frightening age when alarming things happen to her body; for a boy it is an age of self-assertion, of a growing confidence in himself and in his attitude to the world. His physical changes are a source of happiness and pride." (30). Thus, patriarchy assumes that puberty invites danger into the lives of womankind. But feminists would surely argue that both females and males attain maturity at this stage and like males, females too become confident, thus making it a moment of celebration. Furthermore, in Bond's world, males feel like possessing women as if they were some commodities: "he (Suraj) constantly felt the urge to possess a woman." (31) Another male figure noticing women as sexual objects gets projected. For Ramu, it was a matter of pride that he could seduce quite a number of females, whom he had never visited more than once. He feels proud to have discarded them which he finds manly.

Ruskin Bond very well describes how women are stereotypically thought to be a burden. Women are mostly noticed to be dependent and fragile in nature. Ganpat said, "I am a poor man, with a wife to support." Women are so conditioned by the society that they believe in the social conventions. These ideas are instilled which results in formation of a timid mind. Women experience continuous insecurity in such a male-centered society and therefore desires for male support. This is evident when Kamla speaks out: "I want your protection, not your money, I want to feel that I am not alone in the world." Friendly and direct nature was restricted to the girls and therefore the boldness of Kamla surprised the protagonist of the novel. Infact, a model with the fashionable hair-cut aroused questions in the mind of Kamla who asked: "But her hair, how is it like that?" (32). Again the delicate nature of women is clear when the people find that women faint at troublesome situation which readers get to see in Bond's representation of patriarchy.

The study of this novel also brings to the forefront the insignificant position of women in a patriarchal society. A female, even if a mother, is not considered with regard but only her father's property matters: "A man's credentials are his father

and his father's property. His mother is another quantity; it is her family-her father-that matter."(34).

Insanity is also another aspect discovered in patriarchal society as extended by feminists. Some believe that females become insane and suffer more from psychological problems because of exploitation and frustration. An instance from this novel proves this contention and the author particularly stresses that a woman is announced to be insane by the husband's(Aziz) family: "...he was forced to send her after his family pronounced her insane."(11).

In addition, female characters like Kamla and Mrinalini in the novels *Delhi Is Not Far* and *Vagrants in the Valley* could not free themselves from the shackles of responsibility, even if they yearned for freedom. They had to think about their parents, while the male figures live a free life, neglecting most of the people around them, whose own desire matters the most in the world.

Conclusion

Thus, this paper reveals that Ruskin bond who is known to be much absorbed with themes like love, nature and childhood, also deals with such a sensitive issue of female discrimination and oppression. He goes on to criticize the social conditioning and the prevalent abusive ideas regarding females. He realistically draws the contemporary patriarchal society, underneath which his feministic outlook can be observed definitely. He, through the representation of patriarchy, goes on to speak for the cause of women. He, obviously understands the psychological frustrations of women, and their inherent and subdued desires which are buried in the graveyard called "sacrifice". Therefore, he establishes such protagonists like Rusty and Arun who falls in true love with women who are either married or a prostitute. He displays that prostitutes who are seen as degrading elements too have their own wishes. He shows that

while males always have choices, females are never offered with any alternatives. Therefore, even if Kamla, Mrinalini, Meena wanted to lead a different life, yet they could never show their back to their responsibilities. While women were always assumed to be responsible towards their family, men could move free from it. They never considered the feelings of women and could always feel shameless to pursue other women, despite having a wife. Bond, through these protagonists, attempts to extend his supporting hand to all those suffering females who have been crushed by the so called cruel patriarchal ideologies. But perhaps, because he himself is a male, therefore, he failed to portray the misery of women in a realistic and descriptive manner. It is only from certain gaps and implications that one can find that he too has the feeling that the patriarchal situation needs reformation.

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Parametric Studies on Detergent Using Low Cost Sorbent

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Abstract- Water is a valued natural resource for the existence of all living organisms. Indian rivers are polluted due to the discharge of untreated sewage and industrial effluents. Management of the quality of this precious resource is, therefore, of special importance. In these study industrial effluents samples from the various detergent factories were collected and analyzed for physicochemical and bacteriological evaluation of pollution. The use and effectiveness of granular and powder activated carbon made from agricultural waste i.e. coconut husk and that coconut husk is a suitable adsorbent for such an effluent. Maximum adsorption capacity is a derived from Langmuir isotherm. A series of fixed bed experiments was carried out and the results were applied to a bed-depth/service time model for column adsorption. The validity of such a model is discussed. In the removal of organic matter in wastewater effluents from a industry waste water were investigated. The effect of process variables such as carbonization temperature, carbonization duration and activation temperature on the production and quality of activated carbon was studied as well as adsorption capacity was studied.

Index Terms- Coconut husk as activated carbon, carbonization, activation temperature, detergent sample, adsorption.

I. INTRODUCTION

The water contamination by toxic metals through the discharge of industrial wastewaters is a worldwide environmental problem. Water is super abundant on the planet as a whole, but fresh potable water is not always available at the right time or the right place for human or ecosystem use. Water quality refers to the physical, chemical and biological characteristics of water.

Wastewater may be purely domestic or may contain some industrial wastewater as well. Residential waste water is a combination of excreta, flush water, and all types of wastewater generated from household. It is more commonly known as sewage and much diluted. There are two types of domestic sewage: black water or wastewater from toilet sand gray water, which is wastewater from all sources except toilets. Industrial wastewater comes from commercial activities (shops, restaurants, fast food shops, hospitals, etc.), industries (e.g., chemical industries, pharmaceutical companies, textile manufacturing, etc.), agriculture (e.g. Slurry), and so forth. Wastewaters from dyeing operations are characterized by color caused by both organic and inorganic compounds. The organic compounds are

more problematic in industrial effluent than inorganic materials because, apart from the color, it imparts on the wastewater, biodegradation of organic material in the dye depleting the dissolved oxygen of the water thereby stressing aquatic microbes. Traditional wastewater treatment technologies have shown to be ineffective for handling detergent because of the chemical stability of these pollutants. There is no single or economically attractive method of treatment of Industries wastewater, although notable achievements were made in the use of biotechnological approaches to solving the problem. In addition to biological treatment, many physical and chemical treatment methods have been employed for detergent removal from wastewaters such as coagulation, flocculation, filtration, oxidation or reduction, complex formation, or neutralization. New adsorption/oxidation, adsorption/reduction, and many combined processes were reviewed while radiation induced degradation process for treatment of wastewater. Solid sorbents have been employed in adsorption techniques to remove certain classes of chemical pollutants from waters; activated carbon is the most successfully used, but the high operating International Journal of Chemical Engineering costs and problems with regeneration of the spent activated carbon discourage its large-scale application. Therefore, a number of nonconventional sorbents have been tried for the treatment of wastewaters, in this class are various industrial wastes, agro waste, or natural materials available in large quantity at low cost and are classified as alternative sorbents for the removal of inorganic and organic pollutants from wastewaters. In this present study, the aim is to determine the efficacy of chemically modified and unmodified biological (portentous and cellulosic) waste sorbents in treatment of detergent wastewater; also the effect of particle sizes, carbonization (activation), and contact time will be established.

What is Adsorption?

Since activated carbon also possesses an affinity for heavy metals, considerable attention has been focused on the use of carbon for the adsorption of hexavalent chromium, complexes cyanides and metals present in various other forms from wastewaters. Watanabe and Ogawa first presented the use of activated carbon for the adsorption of heavy metals in 1929. Adsorption on activated carbon has been found to be superior compared to other chemical and physical methods for wastewater treatment in terms of its capability for efficiently adsorbing a broad range of pollutants, fast adsorption kinetics and its simplicity of design. However, commercially available activated carbons are still expensive due to the use of non-renewable and relatively high-cost starting material such as coal, which is

unjustified in pollution control applications. Therefore, in recent years, many researchers have tried to produce activated carbons for removal of various pollutants using renewable and cheaper precursors which were mainly industrial and agricultural byproducts, such as coconut shell, waste apricot, sugar beet bagasse, molasses, rubber wood sawdust, rice straw, bamboo, rattan sawdust, oil palm fiber and coconut husk. Coconut husk is the mesocarp of coconut and a coconut consists of 33–35% of husk.

Adsorption techniques employing solid sorbents are widely used to remove certain classes of chemical pollutants from waters, especially those that are practically unaffected by conventional biological wastewater treatments. However, amongst all the sorbent materials proposed, activated carbon is the most popular for the removal of pollutants from wastewater. In particular, the effectiveness of adsorption on commercial activated carbons (CAC) for removal of a wide variety of dyes from wastewaters has made it an ideal alternative to other expensive treatment options. Because of their great capacity to adsorb, CAC are the most effective adsorbents. This capacity is mainly due to their structural characteristics and their porous texture, which gives them a large surface area, and their chemical nature which can be easily modified by chemical treatment in order to increase their properties. However, activated carbon presents several disadvantages. It is quite expensive, the higher the quality, the greater the cost, non-selective and ineffective against disperse and vat dyes. The regeneration of saturated carbon is also expensive, not straightforward, and results in loss of the adsorbent. The use of carbons based on relatively expensive starting materials is also unjustified for most pollution control applications. This has led many workers to search for more economic adsorbents.

Role of activated carbon in controlling water pollution

- Water pollution is an important environmental issue which needs immediate attention.
- Prepared carbon from various agricultural wastes can play a valuable role in controlling water pollution.
- Carbon can reduce harmful materials and pollutants from water thereby minimizing water pollution.

II. MATERIALS AND METHODS

A. Collection of Sorbents and Preparation.

Cellulosic waste sorbents (coconut-husk (coir)) were procured from a local market around Navi Mumbai. They were thoroughly washed with soap solution, sun dried for two days before drying in an oven at 105°C for 2 hours, and then ground. Ground material was carbonized at temperature of 80°C for 30 mins, cooled and activated with H₂SO₄, and further heated at a temperature of 500°C for complete carbonization. The carbonized materials were again pulverized. Materials were sieved into two particle sizes of 325 μm and 625 μm using mechanical sieve.

B. Column preparation.

2.5 g of each sorbent (both carbonized and uncarbonized and each particle size) were separately packed in glass adsorption column with inner diameter 2.2cm, bed height 3-18cm; the wastewater was eluted into it and allowed a contact time of 60

and 120 minutes. The wastewater was collected after 60 and 120 mins, respectively, and all the previous parameters were again determined to ascertain the Percentage absorption after each batch. The flow rate was varied between 25-75 ml/min.

Adsorption isotherms are useful in providing information on the effectiveness of the adsorption system. However, the isotherms are obtained under equilibrium conditions. In most industrial treatment applications, the contact time is not sufficiently long for equilibrium to be achieved. In order to establish the suitability of coconut husk in removing detergent on a continuous basis, some flow studies using columns were conducted. For column operation, the husk is in constant contact with a fresh solution and hence equilibrium is unlikely to be attained. The usefulness of a column is related to the length of time before renewal or regeneration is necessary. For this purpose, the determination of breakthrough curve at different bed depths and flow rates is necessary.

C. Wastewater Collection and Analysis.

Detergent wastewater was collected from MIDC Talaja, Navi Mumbai. Physicochemical parameters of the wastewater were analyzed before and after contacting with the adsorbents for each contact time and particle size. Nitrate was determined according to American Public Health method, and chemical oxygen demand (COD) was determined by the dichromate method. Biological oxygen demand (BOD) and dissolved oxygen (DO) were determined electrochemically. The chloride content was determined by colorimetric method; while total suspended solid (TSS) and total dissolved solid (TDS) were determined by their respective standard methods. A standard pH meter was used to determine the pH, and a digital conduct meter (consort K120, Belgium) was used to determine electrical conductivity (EC). Heavy metals (Pb, Mn, Ni, and Cr) were determined at their respective wavelengths (281.5, 278, 231, and 358)nm after digestion using clean filtrates of the samples by means of atomic absorption spectrophotometer 205 A.

D. Analysis:-

Measurements commonly made include temperature, pH, conductivity, Dissolved Oxygen (DO) and turbidity. Apart from the field observations other parameters- Alkalinity, Total solids, Dissolved and Suspended Solids, Total Hardness, Sulphate, Phosphate, Chloride, Fluoride, Nitrate, Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD).

The sample was collected from TALOJA MIDC, Navi Mumbai. Then these samples were distributed in various fractions & analyzed for various parameters before passing through a activated carbon bed. Then Different activated columns of coconut husk bed by above method were prepared & the collected waste water sample was passed through it from the fixed bed for different contact time period. After that the sample is collected at the different time interval with different contact time & subjected for analysis for different parameters like PH, conductivity, D.O, turbidity, hardness, sulphate, Phosphate chloride, etc. Now these parameters were compared to the parameters analyzed before passing through the bed. From this comparison the amount of the various content adsorbed by the activated carbon bed (coconut Husk) is observed.

E. Adsorption Isotherms:

Adsorption isotherms were obtained by passing the detergent water sample through activated carbon coconut husk. The results from adsorption studies at equilibrium can be used to determine the maximum of detergent adsorbed by the husk by using a modified Langmuir isotherm shown below.

$$C_e / N_e = 1 / (N^*b) + C_e / N^*$$

Where N_e is the amount of detergent adsorbed per gram of husk at concentration C_e . Despite its lower adsorptive power, coconut husk, a cheap agricultural by product, could still be used to remove phosphate from wastewaters.

F. Activated carbon yield:-

The activated carbon yield was calculated based on Eq.

$$\text{Yield (\%)} = W_c / W_o \times 100$$

Where W_c the dry weight (g) of final activated carbon and W_o is the dry weight (g) of precursor.

2.7. The composition of coconut husk:

Moisture =15.0%

Lignin =43.0%

Ash=8.26%

Alkalinity of ash (as K_2O) =37.5%

G. Environmental hazards

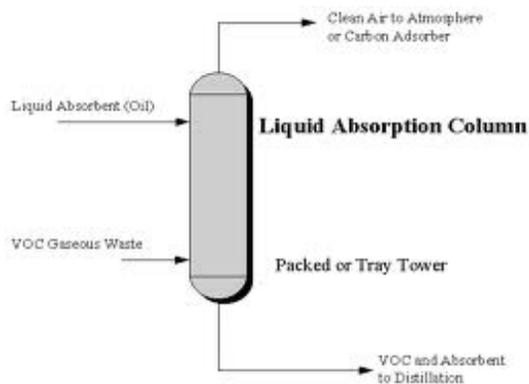
- Water and air pollution amongst major environmental issues.
- Environmental issues need to be addressed in the immediate future in order to maintain ecological balance
- Growing dye industries, pharma industries cause major water pollution.
- In many areas, water is contaminated with toxic materials as well as heavy metals.
- To develop a new, economic and fast acting method to control water pollution is the need of the day.

H. Physical Properties

- Activated carbon has the strongest physical adsorption forces or the highest volume of adsorbing porosity of any material known to man.
- Very high surface area 500 – 1500 m²/g.
- Highly porous structure – Consists of micro-pores and macro-pores

III. METHDOLOGY

The sample i.e. waste water which is highly contained detergent in it. It is collected from TALOJA MIDC CETP CO. SO. LTD, at Raigad District.



COLUMN METHOD BY USING COCONUT HUSK

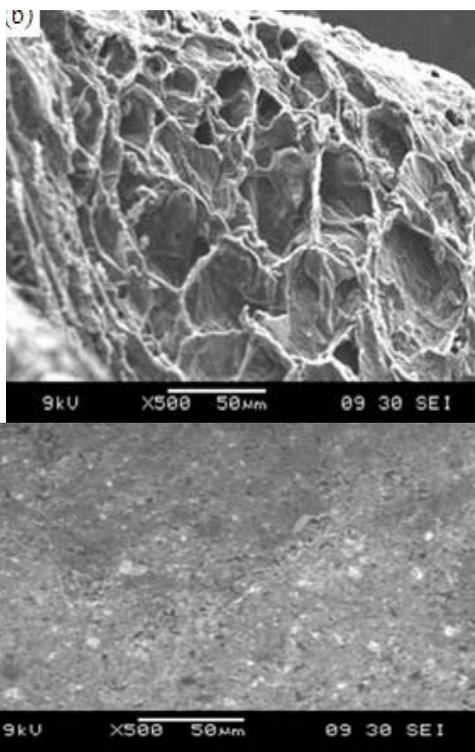
A..Column Study:

Adsorption isotherms are useful in providing information on the effectiveness of the adsorption system. However, the isotherms are obtained under equilibrium conditions. In most industrial treatment applications, the contact time is not sufficiently long for equilibrium to be achieved. In order to establish the suitability of coconut husk in removing detergent on a continuous basis, some flow studies using columns were conducted. For column operation, the husk is in constant contact with a fresh solution and hence equilibrium is unlikely to be attained. The usefulness of a column is related to the length of time before renewal or regeneration is necessary. For this purpose, the determination of breakthrough curve at different bed depths and flow rates is necessary.

B. Activated carbon characterization:-

The raw coconut husk was found to be high in volatile matter and moderate carbon content, indicating the suitability of coconut husk to be used as precursor for activated carbon preparation. After undergoing activation process, the volatile matter content decreased significantly whereas the fixed carbon content increased in activated sample. Similar trend was observed for the elemental analysis where the carbon content increased up to 73.8% for coconut husk activated carbon. This was due to the pyrolytic effect at high temperature where most of the organic substances have been degraded and discharged both as gas and liquid tars leaving a material with high carbon purity

The BET surface area, total pore volume and average pore diameter of the prepared activated carbon were found to be 370.75m²/g, 0.385cm³/g and 2.61 nm, respectively. The average pore diameter of 2.61 nm indicates that the coconut husk activated carbon prepared was in the mesopores region. During the activation, CO₂ gas molecules diffuse into the carbon structure thus increases the CO₂-carbon reaction, thereby developing more pores on the sample. From the SEM micrograph, the raw coconut husk surface texture was undulating with very little pores as shown in Fig. 3a. After activation process, pores were developed with homogeneous distribution on the coconut husk activated carbon surface (Fig 3b).



SEM micrographs;

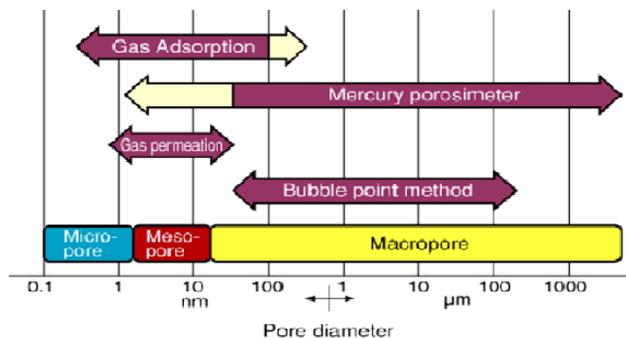
(a) raw coconut husk (magnifications: 500 xs)

(b) Coconut husk activated carbon (magnifications: 500 xs)

C. Method of pore size distribution:

The typical methods to measure the pore size distribution of power and materials are the gas adsorption and mercury porosimetry. The pore size distribution from the gas adsorption method is commonly analyzed from the nitrogen or Ar adsorption isotherm at their boiling temperature, and it is possible to evaluate the pore size from the molecular size to a few hundred nm. The realistic largest detectable pore size is just over 100nm due to the restriction from the pressure sensor accuracy and temperature stability of coolant. Mercury porosimetry calculates the pore size distribution by pressurizing mercury, which is non-wetting, and measure the corresponding intrusion amount. By this method, it is possible to detect the pore size from a few nm to 1000µm within a short period of time. For the pore size measurement below 10nm, it requires over 140MPa of pressure for the intrusion of mercury, so it is necessary to make sure that the material has the strength to withstand the pressure. Also, by this method, it evaluates the pore size of inkbottle neck (the smallest diameter of the pore) from the principle. The realistic measurement range is from a few 10 nm. Recently, there are bubble point method and gas permeation method to measure the through pore size of filters and separation membranes.

● Determination of pore size distribution



IV. SAMPLING AND FIELD WORK

Measurements commonly made include temperature, pH, conductivity, Dissolved Oxygen (DO) and turbidity. Apart from the field observations other parameters- Alkalinity, Total solids, Dissolved and Suspended Solids, Total Hardness, Sulphate, Phosphate, Chloride, Fluoride, Nitrate, Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD). According to the united coconut Association of Philippines (UCAP), the average weight of coconut fruit is 0.4 Kg. It has been established that 30% of the husk can be obtained as commercial coir fiber.

V. CONCLUSION

Acentral composite design was conducted to study the effects of activated carbon preparation variables, which were the activation temperature, activation time and chemical impregnation ratio, activated carbon yield. Quadratic models were developed to correlate the preparation variables to the two responses. Through analysis of the response surfaces derived from the models, whereas activation temperature showed the most significant effect on activated carbon yield. Process optimization was carried out and the experimental values obtained and carbon yield were found to agree satisfactorily with the values predicted by the models. The optimal activated carbon was obtained using 300°C activation temperature, 2 h activation time and impregnation ratio, resulting in 20.16% of carbon yield and 191.73 mg/g uptake. From the SEM image obtained, large and well-developed pores were clearly found on the s urface of the activated carbon. Various functional groups on the prepared activated carbon were determined from the FTIR results.

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CUTANEOUS MANIFESTATIONS IN CHRONIC RENAL DISEASE – An observational study of skin changes, new findings, their association with hemodialysis, and their correlation with severity of CKD

Dinah Theresa Levillard, Srinath M Kambil

Abstract: Chronic Kidney Disease (CKD) is associated with various cutaneous abnormalities caused either by the disease or by treatment and can precede or follow initiation of dialysis, significantly impairing the quality of life in individuals. This study was undertaken to study the variety and prevalence of cutaneous manifestations in chronic renal disease, and their correlation with severity of CKD, and also to correlate variations in cutaneous changes with hemodialysis. 75 patients on CKD, including patients on hemodialysis, were examined for cutaneous changes. Creatinine clearance was calculated for staging of CKD. The common skin changes observed were xerosis (75%), hyperpigmentation (56%), pruritus (48%). Other changes seen were striae, purpurae, ecchymoses, Kyrle's disease, pyodermas, mucosal, hair and nail changes and other infections. One case of Calcinosis cutis was seen. There was a significant decrease in pruritus($p=0.034$) and an increase in pallor($p=0.001$) in dialysis patients compared to others. There was also a remarkable increase in the diversity of skin changes that correspond with severity of CKD ($p=0.044$). Black pigmentation of the tongue, not usually seen was observed in 41% of patients. With an almost 100% prevalence in CKD, early recognition of these skin manifestations and prompt initiation of treatment can dramatically alter their course and even detect underlying renal disease.

KEY WORDS – renal disease, cutaneous manifestations, hyperpigmentation

I. INTRODUCTION

Chronic renal failure is a pathophysiologic process with multiple etiologies, resulting in the inexorable attrition of nephron number and function, and frequently leading to end stage renal disease (ESRD). The skin is the most visible and easily accessible organ of the body, and is an important diagnostic window to diseases affecting internal organs, especially the renal system.^[1]

There are diverse ways in which the skin is affected by chronic kidney disease (CKD). Various specific and nonspecific skin abnormalities are observed in these patients, caused either by the disease or by treatment and is due to a host of factors ranging from metabolic disturbances to immunosuppressive drugs. The dermatologic complications can significantly impair the quality of life in certain individuals; therefore, early diagnosis and treatment can greatly reduce the associated morbidity .

The aim of this study was to document the prevalence of skin diseases that commonly occur in patients with CKD on medical treatment and dialysis, the effect of dialysis on the cutaneous manifestations and to observe if there is a correlation between the severity of CKD and the presence of skin changes.

II. MATERIALS AND METHODS:

In this prospective study, 75 consecutive patients with chronic renal disease (CKD), attending the Nephrology out-patient department and dialysis unit, over a period of 6 months, were examined for cutaneous manifestations of the disease. Patients of both sexes of any age group, with history of at least 6 months of chronic renal disease were included in this study.

Patients of known immunocompromised status, patients undergoing hemodialysis following renal transplant or those who had undergone peritoneal dialysis were excluded from the study.

After taking written and informed consent, a detailed clinical history including age, sex, underlying cause, medications, duration of renal disease and treatment, and duration of the present cutaneous illness was taken. A full cutaneous examination was done and investigations like serum urea, serum creatinine, Gram stain, KOH mount, bacterial culture and sensitivity, fungal culture and skin biopsy, were done where necessary, with informed consent.

Gomerular Filtration Rate(GFR) was calculated for each patient using Cockcroft – Gault formula and staging of severity of CKD was done accordingly. Staging of CKD was done according to **the Kidney Disease Outcomes Quality Initiative (K/DOQI) clinical practice guidelines as follows** ^[2]

Stage 1 - GFR > 90 ml/minute
Stage 2 - GFR 60-89 ml/minute

Stage 3 - GFR 30-59 ml/minute
Stage 4 – GFR 15-29 ml/minute
Stage 5 – GFR < 15 ml/minute

Collected data was analysed by frequency, percentage and Chi Square test and Fischer exact test.

III. RESULTS

The study included 75 patients with 48 males and 27 females. 58 of these patients were on hemodialysis. Most of the patients (23 of 75) were in the 51-60 age group, followed by 14 patients in 41- 50 age group. [Table 1]
Staging of CKD showed 56 patients in stage 5, 8 patients in stage 4, 9 patients in stage 3, and 1 each in stage 1 and stage 2.

The etiology of CKD in this study showed that hypertensive nephropathy was the cause of CKD in 34 patients followed by diabetic nephropathy (18), nephrotic syndrome (2), IgA nephropathy (2), drug induced CKD (4), obstruction(renal stones, tumors) (4), snake bite (1), post streptococcal glomerulonephritis(3), sepsis (4), chronic glomerulonephritis (1), PNET (1), rhabdomyosarcoma metastasizing to kidney(1). [Table 2]

Xerosis was the most common cutaneous abnormality (75%), which is comparable with other studies, and seen mainly in patients who were on maintenance hemodialysis (59%)[Figure 1a, 1b].

Ichthyotic skin changes of varying degree were observed in 50 of 75 patients (66.7%). Senile atrophy was present in most patients above 60 years of age.^[3]

Hyperpigmentation of skin, more marked in sun- exposed parts of body, such as the face, upper back, arms and legs, was seen in 42/75 patients (56%) with 71% of these patients being on hemodialysis[Figure 2]. Similar results were seen in studies done by Nunley et al. and Pico et al.^[4,5]

Yellowish discolouration of skin was seen in 3 patients of our study (0.04%)[Figure 1b].

Hypopigmentation in the form of Idiopathic guttate hypomelanosis was seen in 5 patients, over the extremities.

Pruritus :

Generalised pruritus was recorded in 36 patients in our study (48%) and was comparable to various other studies. There was a significant decrease in pruritus of CKD patients on dialysis as compared to those who were not, with 71% of non-dialysed CKD patients and only 41% of dialysis patients having pruritus (p = 0.034).

Pallor :

Pallor of both skin and nails was seen in 81% of patients of which 93% were on dialysis (p = 0.0001). Pallor was more common in females than males, with 19/27 females with Hb < 10g/dl. These findings correlate well with other studies.

Purpura and ecchymoses were seen on the extremities of 6 patients, of whom 4 were on hemodialysis.

Kyrle's disease was seen in 3 patients as hyperkeratotic lesions on the skin, and was confirmed by histopathological examination. 1 case of Calcinosis cutis was seen, which is a rare finding in CKD.

Mucosal changes : 31 of 75 patients (41%) had black pigmentation of the tongue, a finding not specifically mentioned finding in CKD but seen in a large number of patients in our study, often preceding the diagnosis of CKD in these patients [Figure 3].

Other mucosal changes seen were teeth indentation marks on the tongue (tongue sign of uremia) in 7 patients, xerostomia, macroglossia and balding of the tongue.

Nail changes

Pallor was seen in majority of patients on dialysis. Other nail changes observed were, Lindsay's nails (half and half nails) seen in 25 patients (33.3%)[Figure 4a, 4b]. Other nail changes included onycholysis (14.6%), onychomycosis (10.6%), and Mee's lines (16%). Beau's lines (4%), koilonychia (12%), subungual hyperkeratosis (9.3%), brown nail bed arc (4%), Splinter hemorrhage (5.3%) and hyperpigmented nails. [Table 3]

Hair changes

Diffuse hairfall and thinning of hair was seen commonly in severe CKD and initial stages of dialysis, with decrease in hairfall as dialysis was continued. Loss of body hair was also seen.

Infections such as carbuncles, furunculosis, dermatophytic infections, onychomycosis,etc. were seen in 15 patients.

The severity and number of cutaneous manifestations in patients in this study, was significantly seen to increase with duration and severity of CKD (p = 0.044). A comparison of the cutaneous manifestations seen in CKD patients requiring and not requiring dialysis, and variations seen are described in Table 4.

Other non-specific findings seen in these patients included eczema such as polymorphic light eruptions, seborrhoeic keratosis, atopic dermatitis and seborrhoeic dermatitis. Vasculitis was seen in one patient and erythroderma was seen in a patient who had previous history of psoriasis.



Figure 1a: Xerosis



Figure 1b: Xerosis with yellowish discolouration of skin



Figure 2: Hyperpigmentation over sun exposed areas



Figure 3 : Blackish pigmentation of mucosa



Figure 4 a and 4b : Nail changes – Hyperpigmentation and Lindsay's nails

IV. DISCUSSION

Chronic kidney disease (CKD) is a progressive loss of kidney function over a period of months or years through five stages. The number of patients with end-stage renal disease (ESRD) in India is increasing.

Dermatologic abnormalities are common in chronic kidney disease (CKD) and range from the nearly universal xerosis and pruritus to uncommon conditions such as hyperpigmentation of exposed areas, purpuric skin changes, acquired perforating dermatosis, and nail abnormalities.^[6] In a study by Pico *et al.*, all patients with CKD had one or more skin manifestations.^[4] This study was conducted to determine the prevalence of cutaneous abnormalities in stable and dialysis-dependent CKD patients.

Cutaneous examination of patients with ESRD has shown that almost all patients have at least 1 dermatologic condition. This may be expected, because most patients with ESRD have an underlying disease process with cutaneous manifestations, along with uremia and conditions associated with renal replacement therapy or renal transplantation.^[5]

Causes:

Hypertension and Diabetes mellitus have been seen to be responsible for close to 50% of new cases of ESRD. Cystic/hereditary kidney diseases were the next most common causes. The remaining causes of ESRD included vasculitis, infectious or rheumatologic disease, interstitial nephritis, tumors, cholesterol emboli, and systemic amyloidosis. Infectious causes of glomerulonephritis included streptococcal infections, human immunodeficiency virus (HIV), and hepatitis viruses, both hepatitis C (HCV) and hepatitis B (HBV).

Systemic lupus erythematosus (SLE) has been the most commonly reported rheumatologic cause of ESRD. Polyarteritis nodosa, Wegener granulomatosis, Henoch-Schönlein purpura, scleroderma, and otherwise nonspecified vasculitides also were reported to have caused ESRD.^[5]

Xerosis:

Xerosis was the most common cutaneous abnormality (75%), which is comparable with other studies.^[7-10] This abnormality was observed mainly in patients who were on maintenance hemodialysis (59%); this being similar to studies by Anderson *et al.*,^[11] who reported a high frequency of xerosis (50-70%) in dialysis patients

A reduction in the size and functional abnormality of eccrine sweat glands, causing epithelial dehydration may contribute to the development of xerosis. Clinical and histologic evaluations have shown an overall decrease in sweat volume in patients with uremia, as well as atrophy of sebaceous glands. Some patients may develop acquired ichthyosis.^[12,5] Dry, lusterless hair and sparse body hair could also be attributed to the decreased sebaceous activity.

High dosage of diuretics, and excessive ultrafiltration might also be responsible for the above manifestation. The water content in the stratum corneum does not correlate with severity of xerosis.^[13]

Hyperpigmentation:

Diffuse hyperpigmentation accentuated in sun-exposed areas, seen in many patients is characteristic of uraemic patients.^[14] Nunley *et al.*,^[5] reported that pigmentary alterations occurred in 25-70% of dialysis patients and increases over the duration of renal disease. An increase in melanin in the basal layer of the epidermis due to an increase in poorly dialyzable beta-melanocyte stimulating hormone can explain the pigmentation on sunexposed areas^[15] The intensity of melanin pigmentation increases with respect to the duration of end-stage renal disease.

A yellowish tinge of the skin was reported in 40% of patients by Pico *et al.*,^[4] but we encountered yellowish discoloration in only 3 (0.04%) patients, probably because of the dark complexion of Indians, which masks this finding. This has been explained by retained lipid soluble pigments such as lipochromes and carotenoids, deposited in the dermis and subcutaneous tissue.^[16]

Pruritus :

Pruritus is one of the most characteristic and troublesome symptoms of CKD. Generalised pruritus was recorded in 48% of patients in our study. It has been reported to be the **most common** cutaneous symptom in CRF, with a prevalence of 15%-49% in renal disease in various studies.^[17]

There are a number of proposed etiologies for pruritus in CKD including changes related to xerosis, uremia, calcium and phosphate dysregulation, mast cell proliferation with a concomitant increase in histamine levels, hormonal derangement and hypovitaminosis D.^[18,19] Parathyroid hormone and divalent ions (eg, calcium phosphate and magnesium ions) have been implicated, as is seen with severe secondary hyperparathyroidism but these findings lack consistent correlation.^[20,21]

Dysfunction of the transmission of itch sensations with reduction in total number of skin nerve terminals has been described in dialysis patients.^[22] Pruritus may also be a manifestation of allergy against sensitizing compounds in the dialysis set up, e.g. Ethylene oxide.^[23]

Pallor/ anemia Anemia was a common problem seen, with hemoglobin levels of even less than 5 g/dl, more common in patients on maintenance hemodialysis. Before the widespread use of erythropoietin, pallor was common and was attributed to the significant anemia and is still seen commonly in Indian population.

Purpurae and ecchymoses Defects in primary hemostasis- such as increased vascular fragility, abnormal platelet function, and use of heparin during dialysis are the main causes of abnormal bleeding in these patients.^[24]

Acquired perforating disorders (APD) such as perforating folliculitis, Kyrle's disease, and reactive perforating collagenosis have been described in CKD. APD has been reported to occur in 4.5-10%^[25] of patients receiving maintenance hemodialysis. Proteolytic enzyme release, including collagenase and elastase elaboration, may initiate the pathologic process.^[26] Although the exact pathophysiological mechanism for APD in ESRD is unknown, it is thought to be the result of dermal connective tissue dysplasia and decay.^[1]

Kyrle's disease is a chronic, genetically determined, hyperkeratotic disorder occurring in the middle forties and show a marked predisposition for the calf, the tibial region, and the posterior part of the thigh.^[27] Keratotic, partly parakeratotic plugs containing basophilic debris lying in an invagination of the epidermis are seen on histopathology.^[28]

The lesions of APD may resolve spontaneously. When treatment is desired, topical retinoids, topical and intradermal steroids, and UVB light have been tried with variable results.^[29]

Nephrogenic systemic fibrosis (NSF) also known as nephrogenic fibrosing dermopathy, is a rare, systemic fibrotic disorder found uniquely in renal failure. Nearly all known cases of NSF occur in patients with exposure to gadolinium contrast- enhanced MRI or MRA within 2-3 months of symptom onset. It is characterized by visible fibrosis of the skin with thickened, hyperpigmented and/or shiny changes. Fibrotic skin across joints leads to flexion contractures and immobility. Sclerotic changes are noted most frequently in the feet, ankles, shins, thighs, fingers, hands, and lower arms. Histopathological confirmation can be made by observing spindle-shaped cells in the background of dermal fibrosis, with deposition of collagen and mucin. Dual immunolabelling with CD34 and procollagen is diagnostic.

Unfortunately, there is also no effective treatment for NSF.^[29,30]

Infections Patients with chronic renal failure (CRF) have impaired cellular immunity due to a decreased T lymphocyte cell count; ^[4] this could explain the high prevalence of infections in these patients.

Oral mucosa changes seen are macroglossia with teeth markings (tongue sign of uremia), usually in severe disease. Other mucosal changes are angular cheilitis, ulcerative stomatitis, xerostomia, gingivitis, and uremic breath.^[13]

Nail examination reveals pallor in most of the cases. Among the nail changes observed in various studies, Lindsay's nails (half-and-half nails) were the most common. Other nail changes included onycholysis, onychomycosis, and Mee's lines, Beau's lines, koilonychia, subungual hyperkeratosis, Muehrcke's lines, brown nail bed arc, and splinter hemorrhage. ^[4] Although not pathognomonic for renal failure, half-and-half nails occur in as many as 40% of patients on dialysis and disappear several months after successful renal transplantation. Half-and-half nails are characterized by a dark distal band that occupies 20-60% of the nail bed and by a white proximal band. The distal dark band may range in color from reddish to brown and commonly involves fingernails.^[5] The discoloration does not change with nail growth, indicating the problem begins in the nail bed. The discoloration also does not fade with pressure.^[29]

V. CKD and Hemodialysis

Hemodialysis has prolonged the life expectancy of CKD patients, and has brought about an increase in the number of manifestations, by giving time for these changes to manifest. It also has improved symptoms such as pruritus.^[32]

Dermatologic conditions such as uremic frost, erythema papulatum uremicum, uremic roseola, and uremic erysipeloid are now rare. ^[31] Certain specific disorders associated with CKD such as calciphylaxis and fibrosing dermopathy of uremia were not seen in our study, and this could be attributed to shorter duration of dialysis in our patients. Changes like uremic frost is rarely seen in the present day because of early dialytic intervention. When the blood urea nitrogen (BUN) level is adequately high (usually > 250-300 mg/dL), the concentration of urea in sweat is increased greatly. Evaporation results in the deposition of urea crystals on the skin.

Porphyria cutanea tarda was not observed in this study. Plasma porphyrins are poorly dialyzed and are mildly to moderately elevated in most patients on dialysis. A bullous disease that is clinically similar to but metabolically distinct from porphyria cutanea tarda (PCT) has been described in the dialysis population. True PCT also has been reported to occur in patients on dialysis.^[5]

VI. CONCLUSION

Recent advances in the treatment have improved the quality of life and life expectancy of these patients, resulting in changes in the frequency and types of disorders observed in CKD. Some prophylactic measures can prevent some of the cutaneous manifestations, such as emollients for xerosis and pruritus, sun screens, avoidance of sun exposure and adequate clothing for pigmentary changes, and cutaneous malignancies. Ultraviolet (UV) B phototherapy probably is the most effective therapeutic choice and may have prolonged benefit in pruritus.^[5,31] Oral mucosal pigmentation maybe a significant marker of underlying disease and may precede the diagnosis of renal disease, as seen in this study. Decrease in troublesome symptoms such as pruritus has been seen as an effect of initiating hemodialysis. Specific and rare skin lesions of CKD must always be kept in mind, to aid the prompt diagnosis and possibly detect underlying renal disease early. Prompt recognition and treatment of infection in patients with CKD, especially on maintenance dialysis is useful for improving the quality of life.

TABLES –

Table 1 : Age and sex distribution of patients in the study

Age group (in years)	Number of cases	
	Males (48/75) 64%	Females (27/75) 36%
< 20 years	1	3
21-30	3	2
31-40	4	4
41-50	5	9
51-60	16	7
61-70	13	1
>70	6	1

Table 2 :Etiology of chronic kidney disease seen in our study.

Cause of CKD	Number of cases
Hypertension	34
Diabetic nephropathy	18
Drug induced CKD	4
Obstructive causes (stones, etc)	4
Sepsis	4
Post streptococcal glomerulonephritis	3
Nephrotic syndrome	2
IgA nephropathy	2
Snake bite	1
PNET	1
Chronic glomerulonephritis	1
Rhabdomyosarcoma	1

Table 3 : Nail changes observed

Nail changes	Number of cases (seen in 60/75 cases)
Pallor	50 (67%)
Lindsay's nails (half and half nails)	25 (33.3%)
Onycholysis	11 (14.6%)
Onychomycosis	8 (10.6%)
Mee's lines	12 (16%)
Beau's lines	3 (4%)
Koilonychia	9 (12%)
Subungual hyperkeratosis	7 (9.3%)
Brown nail bed arc	3 (4%)
Splinter hemorrhage	4 (5.3%)
hyperpigmented nails	35 (46.6%)

Table 4: Comparison of cutaneous manifestations seen in patients with CKD with and without hemodialysis. Significant decrease in pruritus noted in patients on hemodialysis. Significant pallor and mucosal hyperpigmentation seen in dialysis patients.

SKIN CHANGES		ON DIALYSIS (58/75) 77.3%	NO DIALYSIS (17/75) 22.7%
Xerosis	+	44	12
	-	12	5
Pruritus	+	24	12
	-	34	5
Hyperpigmentation	+	30	12
	-	28	5
Mucosal pigmentation	+	25	6
	-	33	11
Pallor	+	54	4
	-	7	10

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Importance of Task Performance Behavior on Project Success: A Study on Mass House Building Projects of Punjab-Pakistan

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Abstract- In Projects, the Project manager is single individual accountable for the success of project so measuring the performance of project manager based on appropriate skills which are widely seen as the only viable way to validate and generate better management practices. A model based on skills is to test the importance of Project Manager's (PM) performance in the construction of mass housing building Projects (MHBP) is proposed. Informed by the literature, an appropriate theoretical framework is adopted which draws on the organizational psychology theory of job performance, the conventional wisdom in project success criteria and an emerging framework of project lifecycle. Subsequently, a competency-based multidimensional conceptual model is developed. The conceptual model reflects the element of performance behaviours and outcomes in predicting the performance of PMs at the conceptual, design, procurement, construction and operational phases of the project lifecycle. The model reflects the characteristics of performance and results to predict the performance of the PM in the construction phase of the life cycle of the project. Data was collected from members of (CAP) Construction Association of Pakistan which are in Punjab, whose specialty is the construction of residential buildings. This study has also tested the validity of this model, as well as the significance and potential benefits for the development of a competency-based program for professional development of the PMs in developing countries such as Pakistan. The model then provided a basis for the development of programs of study, research and selection, team deployment and placement, career development and succession planning in order to facilitate the implementation of best practices in the management of MHBPs. Task Performance Behaviors has been used to test the importance of PM's performance on project success. These results of the study showed significant impact of these behaviors and some behaviors have insignificant impact on project success.

Index Terms- Project management, Project manager's performance, Housing, Pakistan construction industry

I. INTRODUCTION

Improved methods of (HRM) through the use of performance indicators which are recognized as the most important elements of competitiveness and improving the organization (Villa, 1992). Now a days in HRM, the development and

identification of suitable indicators is widely seen as the only viable option for the evaluation criteria against which the performance management enabled can be maintained and confirmed (Conway, Managerial performance development constructs and personality correlates, 2000); (Abraham, Karns, Shaw, & Mena, 2001); (Ford, 2004). Therefore, in project-based organization such as construction, performance is a measurement as a possible option for growth in the superior performance level of project manager's (Cheng, Dainty, & Moore, 2005). To this end, the current understanding is practicing an appropriate model represent a potentially viable option for the development of relevant indicators to develop the right professional development of PM (Dainty, Cheng, & Moore, Competency-based model for predicting construction project managers' performance, 2005); (Cheng, Dainty, & Moore, 2005); (ARJ Dainty, A competency-based performance model for construction project managers, 2004).

While the construction industry is among one of the very important industries in developing countries, it was still un-researched and under-developed with regard to the identification and development of performance indicators for effective Human Resource Management practices (Imbert, 1990); (Wachira, 2001); (Rwelamila, 2007). Generally, the industry has already adopted a passive (ad hoc) approach for benchmarking of PM's that results in lacking of a formalized and systematic framework for the development best practices which are appropriate accordingly (Rwelamila, 2007). In the view and context of the development of appropriate measures is significantly important option for the leadership excellence, so there is also the need for the project based industries in the field of construction in the most developing countries use proactive methods to measure the performance of the management company involved in key positions in the industry. In this way, the identification and improvement of performance indicators is a very important step towards the development of best HRM practices in the construction industry in mostly developing countries, especially given the increasingly important role PMs playing in Project management practices in recent times. Mass house Building projects (MHBPs) are the most important in terms of employment of workforce and adding value in most economies (Wells, 1999); (Zawdie & Langford, 2000). Furthermore in many other developing countries, these projects, in general, have proved to be the most established and largest of the project based industry in the practice of project management.

In Pakistan recently some of these large MHBPs and built / or under construction. In addition, the contribution of PM to reach the efficient management performance of these projects has also recently emphasized (Ahadzie, Proverbs, & Olomolaiye, 2005). However, in many developing countries the lack of authenticated research on the identification and development of appropriate indicators is also very clear (Ahadzie, Proverbs, & Olomolaiye, 2005). The identification and development of appropriate indicators would be the helpful for PM's working in Pakistan, to gain a clear understanding of the key skills they need to improve their professional training and development. Furthermore, Property developers in Pakistan could have the advantage of a structured environment where they can select and recruit the right profiles and performance proficiencies. To this end, this study could provide a base for effective human resource management practices in MHBPs.

Therefore, this research is based on the assertion that the meaning of the key figures of the sector in developing countries, the criteria that help PMs positive thinking on best practices will be identified in MHBPs should be improved. This study considers the emphasis on MHBPs potentially important as a basis for the promotion of the research agenda for the projects based on the construction industry in mostly developing countries. Therefore, while research has focused on MHBPs is hoping that the results will be valuable to other industries of the Pakistan and construction industry on the future development of appropriate performance indicators as benchmark. Although the particular study is very unique in Pakistan, there is also the possibility that many Project based sectors of construction industry in developing countries will find the results valuable for the development of best management practices.

II. OBJECTIVES OF THE STUDY

- To critically review the recent developments in Human Resource Management practices, in particular, Project managers towards developing a deeper understanding of their key performance measures.
- To critically review the literature on project management in developing countries towards finding the role of Project Managers in attaining project success.
- To predict the performance of Project Managers in Mass House Building Projects.
- To spread broadly the research findings for the benefit of industry and academia.

III. LITERATURE REVIEW

3.1 Performance Measures

In the field of performance management, different interpretations exist and there are many different definitions and key figures on the meaning of "performance" (Yasamis, Arditi, & Mohammadi, 2002). For example, a detailed definition of (Baldwin, 2006) provided figures as the standard for qualitative comparison or as a basis for the assessment is defined. A basis for the judgment, a behavioral approach, is reviewed by the

progress, a measure of validity, a measure of reliability: English and English (1958) also postulated four definitions as follows. (Reber, 1985) also occurs as the standard against which Judgment, assessment or classification can be made defined Scott (1917) and Zammuto (1984) are among the researchers which have other definitions (Valli Nova and Austin, 1992). Currently, still struggling with trying to evaluate what a concise definition should be. Contemporary scholars of HRM practices However, after a detailed review of some of the key definitions from 1917 to today, "modern", and Valli Nova Austin (1992) says that the indicators may be short as a measure (directly or indirectly) on the basis of the defined factors of the behavior and performance results. Valli Nova Austin (1992) also argues that the elements in the performance measures are included, should help to make the performance of a person in favor of the growth of the organization. Predictions (C. Pierce, 1994) and Liu and Walker (1998) are agreeing with this concept and suggest that the performance of the products viable measures of behavioral capacities should be supported. In the construction sector, it is an appropriate definition of indicators (within HRM) also questionable (Brown and Adams, 2000; Dainty et al, 2003; Ahadzie et al, 2005a).

During this the researchers said that it is necessary to generate performance measures of continuous performance, no effort was made to explicitly link the different phases define different life cycle projects (Ahadzie et al, 2005a), there. It is associated with the most recent to the influence that various factors significantly influenced proof (in connection with management support and personality factors) the success of the project and, in the different phases of the project to influence the resources and capabilities charger life (Lim and Mohammed 1999 Morris et al, 2000; Belout and Gavreau, 2004). This finding has led some researchers in construction management area believes force recently for a much broader and clear definition that the performance of Project Managers throughout the project life cycle (Ahadzie, Proverbs, & Olomolaiye, 2006) then reflected in s "On the basis of the general definition of Austin and Valli Nova (1992) states that the achievements in construction management (HRM) measures, and should be defined on the basis of explicit re than measures based on behavioral performance and results. Moreover, behavioral measures relate to the different stages of the project life cycle. This would be useful to predict and continuous feedback to PMs at different levels of the organization and / or phases of the project cycle (Ahadzie, Proverbs, & Olomolaiye, 2006). Through the introduction of the concepts of levels of the organization and / or the phases of the project and the main principles of contemporary HRM research states that this definition of the performance is useful in a holistic approach and / or a multi-dimensional perspective (Ahadzie, Proverbs, & Olomolaiye, 2005; Ahadzie, Proverbs, & Olomolaiye, 2006).

3.2 Overview of Project Management Practices in the Developing Countries

Use of construction projects in developing countries, some of the most difficult works in project management techniques (El Saaba, 2001) arenas. In reality, these projects, which are characterized by the crisis, uncertainty and tension that a capacity test the performance of the clock in the coordination and

management of a wide range of various functional experts (ditto) justifies tend. Therefore, regardless of their technical knowledge and know-how of the projects are encouraged some behavioral skills that will help lead the team multi organizational effective communication and successful implementation of the project (Fanira et al., 2000; El-Saaba, 2001). The evaluation, identification and maintenance of competence can be crucial for optimizing the performance of today's PM's in developing countries (Trejo et al, 2002) in actual put project management as a profession and ass research to grow and develop in many developing countries see for example (Kartam et al, 2000). There is also another growing realization that effective project management practices to potentially improve (Kuruoglu and Ergen, 2000 and Al-Abassi Mharmah, 2000). Strict concept project, while the skills of project management i.e., (measuring success in terms of, for example, the iron triangle) are critical for effective implementation of the project, we must recognize that delivering the projects rather than processes and systems (Cooke-Davies, 2002) by PMs. So the actual performance of the Project Manager is an important factor to understand and improve the related practices required (Goodwin, 1993). Suppose, however, that the project management practices across organizations, industries and sectors (Crawford, 2006) is different, everyone should try, the field of PMS performance understood in conjunction with the complex social interactions that are political and cultural and implemented predominant complex (Al Abassi & Mharmah 2000 Faniran et al, 2000; Kartam et al, 2000). So, while the skills of project management should be given support, would Pakistani projects figures are important to help identify, adapt, and implement best practices to meet the unique challenges that exist in the construction industry in developing countries effectively.

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3.4 Identifying the Performance Measures for Project Managers in Mass House Building Projects in Developing Countries

Mass housing projects (MHBPs) depicts the largest and most established based projects in many developing countries because of their contribution in GDP sector. It is also not surprising that the management of these projects often attract the highest concentration of human resources in the sector e.g. (Zawdie and Langford, 2000, Wells, 2007). In fact, involved in the activities of the various sectors also attract large socio-economic interests of all boundaries of social disruption (Keivani and Werna, 2001). At this ends effective project management as one of the most challenging phenomena that have to do with the success of the project in these roles projects. However, of the basic and primary importance for PMs aspiring and experienced challenges countries (the relatively low, socio-economic, technological and organizational set-ups in many developing countries see unique and Ofori, 1989; Keivani and Werna 2001 Abbasi et al, 2000, Faniran et al, 2000).

3.5 Definition of Project Manager

While the main place of the essential role of the Project Managers is largely recognized in the construction industry, it is very interesting to note that the interpretation of the title itself is often far from the agreement (Brin Berg, 1999). In some cases, the term was used to monitor people / and companies describe monitoring and / or offer a wide control over the projects (Lock, 1987). Some of the researchers have also tried to give the project coordinator to another interpretation is, by distinguishing the roles of PM. However, the same investigators have evaluated that the difference can be in the roll and of force (Odusami et al, 2003). Most recently, Jha (2006a, 2006b) also tried some new ideas to give and noted that usually the PM term, project coordinator, responsible for the construction, project managers and project leaders are often used interchangeably.

3.6 Task Performance Behaviors:

Borman and Motowidlo (1993) posited that in trying to understand the organizational job performance domain, the elements of the behavioural competencies involved should be grouped into two main distinctions: contextual performance behaviours and task performance behaviours. Borman and Motowidlo (1993) contended that contextual performance behaviours differ from task performance behaviours in four major ways (see also Miller and Werner, 2005). In this research we are going to check the importance of Task performance Behavior on project success.

Task behaviours contribute either directly or indirectly to the technical function, it usually vary between different jobs in the same organization In practical terms, task performance behaviours among others identifies the demonstrable behaviours associated with individuals undertaking technical functions such as the transformation of raw materials into goods and services, operating a production machine and providing management and administrative functions. Furthermore, at the managerial level, task performance behaviours could be associated with the demonstrable behaviours and/or habits exhibited while the PM is performing functions such as organizing, planning, programming, coordinating, delegating and controlling (Motowidlo et al, 1997: Ahadzie et al, 2006).

Task performance behaviors represented a side of the independent variable. Here, these operational measures were

designed from the constructs, *job knowledge, cognitive ability task proficiency and experience* identified. Four operational measures were identified under *cognitive ability*, 12 under *job knowledge*, 28 under *task proficiency* and six under the construct, *experience*. In effect, a total of 50 variables were identified to represent this dimension of the independent variables. *Cognitive ability* as mentioned already is a measure of the PMs' intelligence and how easily they are able to recall and solve problems.

Just like the dependent variables the operational measures in this section were as much as possible designed to gain the attention of management intuition in the application of the repetitive management techniques. Subsequently, in considering the operational measures for the construct *job knowledge* for instance, the key wording repetitive techniques was used as much as possible hoping that it helped the respondents to reflect on the concept while responding. Some of the questions thus read "the PMs Job knowledge in appropriate construction industry for repetitive construction works", "the PMs Knowledge of appropriate cost saving techniques for repetitive works", "knowledge of appropriate program for delivering repetitive construction works"

The same above argument applies to the construct *task proficiency* which was designed to capture the technical and functional quality of work programs for the implementation of appropriate skills and knowledge. The concept here is that technical and functional quality associated with a task can be used to establish the sort of behavior that goes into executing the task (Tett et al, 2000; Ling, 2002). Technical quality is defined as a measure of the effort that goes into the preparation of the work programs whilst functional quality is a measure of how effective or workable the program is (Ling, 2002).

With respect to the construct for *experience*, the concept was that, the kind of experience a person holds that can be used to indirectly check what kind of behavior he/she is likely to show in future. For instance, Dullaimi and Langford (1999) argued that, the job environment does influence the type of behavioral

Hypothetical Framework

TASK PERFORMANCE BEHAVIORS

skills PMs contain for their future development. Subsequently, PMs associated with particular project experience, are likely to conceptualize certain kinds of behaviors they have acquired and are more likely to repeat such behaviors on similar kind of projects.

Thus in this context, the variables were made to help establish whether the property developers consider experience acquired working specifically on MHBPs to be more important than say experience gained on the general construction projects. Similarly, it was important to establish whether experience gained specifically on MHBPs was considered more important than others and if that experience influenced the property developers' judgment of the Project Managers behavioral performance.

However, it should be pointed out here that while there is an evidence to suggest that *experience* is a very important construct for assessing the job potential of individuals (Ogunlana, Siddiqui, Yisa, & Olomolaiye, 2002) particularly in the recruitment and selection procedure, here the construct is viewed in terms of its potential impact on the judgment of property developers in respect to the Project Managers performance on the ongoing (present) job or task and not as seen on the "labour market" for the purposes of recruitment processes. Given, the potentially complex nature of behavioral measures, a large number of independent variables were identified for making sure that all the possible variables had been accounted for.

This is necessary for the potential reliability of the measures (Viswesvaran & Ones, 1996). Reasonable care was taken to ensure that the content of the operational measures reflected what is typical in Human Resource Management practices.

In particular, the theoretical constructs adopted informed the design of the measures to ensure that they reflected sound theoretical basis.

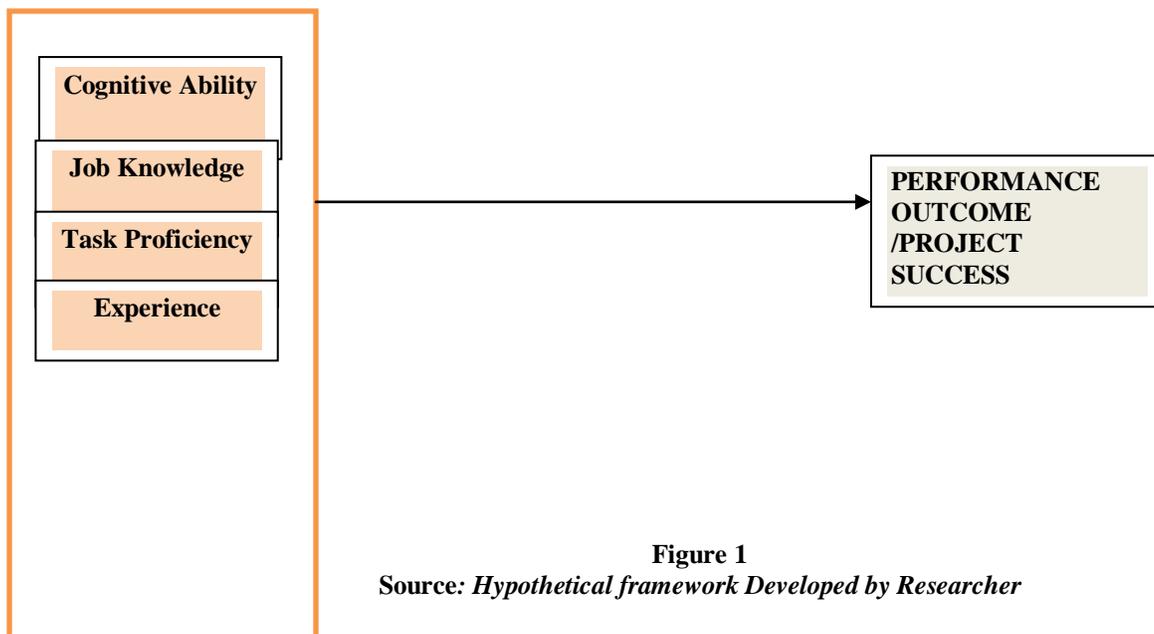


Figure 1
 Source: *Hypothetical framework Developed by Researcher*

1. HYPOTHESIS TO BE TESTED:

H₁: There is an importance of Project manager’s Task Performance Behaviors on overall performance outcome / Project Success

H₀: There is no importance of Project manager’s Task Performance Behaviors on overall performance outcome / Project Success

IV. METHODOLOGY

4.1 Research Design and procedure:

The research design of this study will include quantitative method of analysis and study on the construction companies in Punjab-Pakistan. A descriptive research will be conducted to determine the importance of Task performance behaviors of Project Managers of Pakistani Construction industry on Overall Performance outcome / Project success. Survey method will be used to conduct this research.

4.2 Population:

The population selected for this research is the construction companies Members of Constructors Association of Pakistan (CAP) which formerly was All Pakistan Construction Association (APCA) which can be get from www.cappak.org. From the population of 150 members which are in Punjab of APCA the sample will be selected.

4.3 Sampling technique and Sample:

The sampling technique used for this study will be Simple random sampling in selecting the Construction Companies from the list of companies Members of Construction Association of Pakistan (CAP). The reason to use this kind of sampling technique is because in this type of sampling everyone in population has equal chance to be selected in sample from population.

From the population of 150 members which are in Punjab of APCA the sample of 33 % will be taken which is approximately 50 Members of Punjab of Construction Association of Pakistan.

4.4 Instrument for data collection:

A well designed survey questionnaire will be used as the research instrument. It is based on the items for each factor in the model from the relevant and valid scales used by Scholars and researchers in this field. The questionnaires will be distributed among the Top level managers from construction companies in Punjab Pakistan. Their responses were measured on the 5 point Likert Scale. Likert scales are one of the most useful psychometric scaling for establishing behavioral or attitudinal measures (Carmin and Irvine, 1988). The traditional five-point rating scale was used as the evidence suggests that more complex scoring systems possess no significant advantage (Oppenheim, 1992) One to Five numbers were placed in front of each question and the respondent was asked to mark one of these options which are following

- Option 1 represents Not Very Important
- Option 2 represents Not Important
- Option 3 represents Average
- Option 4 represents Important
- Option 5 represents Very Important

4.5 Reliability of the Instrument:

The reliability of Questionnaire has been tested through Cronbach’s Alpha using SPSS 17 whose score is 0.896 which highly reliable. The questionnaire was developed after a thorough study of all the previous study on the same subject and the inventory was checked. The questionnaire was then established; keeping in mind the environment and organizational culture in Pakistan .All the constructs are in acceptable region of reliability statistics which makes this questionnaire an appropriate one to conduct this research.

Table 1: Reliability Statistics of constructs

Variable Name	Items	Cronbach α Value
Project Success	15	0.987
Cognitive Ability	4	0.967
Job Knowledge	9	0.986
Task Proficiency	19	0.995
Experience	6	0.983

V. DATA ANALYSIS AND RESULTS

Data analysis has been carried out through regression analysis. Multiple Regression analysis has been carried out to investigate the collective importance of Task Performance Behaviors in Project Success .Each variable under the Task Performance will be analyzed through the values of β.It will tell the strength of the relationship between Dependent variable and Independent Variables.

H₁: There is an importance of Project manager’s Task Performance Behaviors on overall Performance outcome / Project Success

Multiple regression analysis technique is used to investigate how independent variables collectively affect the dependent variables.

$$Y = \beta + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon \dots \dots \dots \text{Eq. 1}$$

The above equation is the multiple regression equation for this model where “Y” Stands for the Dependent Variable “β” Stands for the constant and β1, β2, β3 and β4, are the Coefficients of the Independent variables and X1, X2, X3, X4, are the Independent variables. The equation 1 can also be written as the following equation.

$$Y = \beta + \beta_1 (CA) + \beta_1 (JK) + \beta_1 (TP) + \beta_1 (EX) \dots \dots \dots \text{Eq. 2}$$

The values of the β and the coefficients of the Independent variable β (1-4) will be determined after fitting the regression model in SPSS. Which will tells us about the relationship, magnitude and the effect of that variable on Dependent variable.

Table 2: Model Summary

Model Summary

Model	R	R Square	Adjusted Square	Std. Error of the Estimate
	.997 ^a	.995	.995	.07311

a. Predictors: (Constant), EXP, CA, JK, TP

The above mentioned table 2 is showing the multiple regression analysis of independent variables on dependent variable, Four Independent Variables are tested in the first hypothesis to test their effect on Project success of construction industry .The results of the regression analysis are showing that the value of R is .997 which shows the simple correlation and this correlation is high in this study. The value of R square shows that 95 % of the dependent variable (project success) can be explained by the independent variable which is Task Performance Behaviors.

Table 3: ANOVA

ANOVA^a

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	196.021	6	32.6	611.2	.000 ^b
Residual	.994	186	.005		
Total	197.015	192			

a. Dependent Variable: POPS

b. Predictors: (Constant), EXP, CA, JD, TP

The table 3 above indicates the statistical significance of regression model applied. The ANOVA table shows that the model is significant at .000 which means that model is appropriate to analyze the outcome variable which is Project Success. Mean of the project success variable is 32.

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	.480	.040		12.144	.000
CA	-.028	.026	-.032	-1.059	.291
JK	.083	.044	.089	1.906	.048
TP	.450	.054	.516	8.301	.000
EXP	.092	.042	.099	2.205	.029

a. Dependent Variable: POPS

Table 4 Coefficients of Variables

The table 4 above shows the coefficients of the variables when regression model was applied on the data obtained through the study. Four independent variables are tested on the project success and after running regression test above results are obtained which shows that Variables of Task Performance, Cognitive ability is insignificant at .291, Job Knowledge is significant at .048, Task Proficiency is also significant at .000 and the last variable Experience is also significant at .029. The results show that Task proficiency has major impact on project success and Cognitive ability does not affect the Project success because it is showing an insignificant value after data analysis.

VI. CONCLUSION AND DISCUSSION

It is concluded from this study that project managers must possess some behaviours which play a vital role in the success of his project. Task performance behaviours were taken to check their role in the success of a project. From the data analysis taken from the top management in the construction industry of Punjab it is concluded that project manager having task proficiency, job knowledge and experience are more likely to provide a successful project and one of the variable which is interpersonal cognitive ability have shown an insignificant impact on the project success in MHBPs of Punjab in Pakistan.

Bailey (1987) suggested that the development of an appropriate conceptual model is main factor to identifying the relevant research methodology used to meet the objectives of the study. The identification of an appropriate theoretical framework was important to find out the appropriate measures which could identify the results required and development of the conceptual model paved the way towards fulfilling this objective. It was contended that, given that behaviors (as evident in the literature) are often stable and enduring over time, the operational measures which are involved can to a reasonable extent be assumed to be subjected to quantitative logic. Subsequently, in order to help establish the necessary convergence with similar studies on behavioral competencies, positivism was adopted as the underlying research paradigm that influenced the design of the research instrument. Therefore using the construct from the *contextual-task* framework and also drawing extensively on recent construction management literature, a broad range of

behavioral measures were operationalized. These operational measures represented the independent variables of the model. This study is done to conclude about Project Manager’s Performance in Mass House building projects of construction Sector in Punjab Pakistan. The Performance is measured through Task Performance Behaviors and Contextual Performance Behaviors and it is concluded that Task and Contextual performance behaviors of Projects managers have positive impact on project Success. PMs who want improve their managerial performance on MHBPs should aspire to improve their knowledge and skills in these competencies Based on the validation exercise, predictive accuracy suggests that the findings could be generalized with respect to the PMs’ performance in MHBPs in the Pakistani context. It is noted that from the empirical findings of this study that aspects of *task performance behaviors* and *contextual performance behaviors* determine the Performance of PMs. We have seen from the results of regression only two hypotheses have insignificant value at 5% significance level and remaining four have significant values at 5% significance level. So this is seen from results that Interpersonal Facilitation and Cognitive Ability of project manager’s do not make significant impact on Project Success. Based on a consensus reached by “experts” namely, simple random sampling of PMs, construction academicians on the potential relevance of the model in the Pakistani house building sector, there was an indication that the intended application of the model is in congruence with reality and could serve a useful purpose if it were to be applied in practice. The remaining variables four Cognitive ability, Job Knowledge, Task Proficiency and Experience make significant Impact on Project Success. The best predictor of PMs Performance in MHBPs is job dedication and task proficiency which show highly significant impact on the project success

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Recovery: Deleted Short Messages from SIM Memory

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Abstract- In this paper, SIM Storage Memory that is used to store Short Message Service (SMS) is discussed. In addition, different behaviours implemented by mobile manufacturers to delete a message from SIM Memory are also studied. Two solutions for recovering the deleted message (from SIM Memory) are proposed based on the FREE MEMORY available in SIM Card.

Index Terms- Electrically Erasable Programmable Read-Only Memory (EEPROM), Subscriber Identity Module (SIM), Short Message Service (SMS).

I. INTRODUCTION

Short Message Service is the service of delivering messages over the mobile networks. It is a service through which messages (text only) can be transferred between mobiles. There are storage locations for the messages on mobile as well as on

SIM Cards. On SIM card, there is an elementary file used for storing messages named as SMS File.

II. TYPES OF MEMORY USED FOR STORING MESSAGES

There are two types of memory that are being used for storing messages:

1. Phone Memory
2. SIM Memory

In this paper, I will be focusing on later one i.e. SIM MEMORY. In SIM Cards, there is a special elementary file named EF SMS File (7F10/6F3C) which is used to store SMS. Here is the structure of file:

Table I: SMS File Structure

File ID: 6F3C	Structure: Linear Fixed	Record Length: 176 Bytes
Access Condition:		
Read: PIN1	Update: PIN1 Invalidate: ADM	Rehabilitate: ADM
Bytes	Description	Length
1	Status Byte	1 byte
2-176	Remainder	175 bytes

The first byte of SMS file is Status Byte. This byte tells about the status of the SIM messages i.e. whether the message is deleted/unread/saved or read.

Following is the structure of the status byte:



Figure 1: Structure of Status Byte

III. DELETION OF MESSAGES

To understand the concept of recovering messages from SIM Memory, first there is a need to understand how messages are deleted. There are different behaviours implemented by Mobile Phones. Below are some of the different behaviours that mobile phones implement:

1. Some mobile phones delete the message by changing the status byte (first byte) to 00. This means that the data of message is still present only the record is being set as free space. And when there is any new incoming message this first byte will indicate this space as free space that can be used to store that new message.

For e.g.: Let us say there are 4 messages present in SIM Memory

Table II: Four Messages in SIM Memory

Record Number	Status Byte	Remainder
01	01 (Used Space)	Data Part of SMS
02	01 (Used Space)	Data Part of SMS
03	01 (Used Space)	Data Part of SMS
04	01 (Used Space)	Data Part of SMS

The user deleted the second message. With this deletion the data of file will now looks like:

Table III: Deleted 2nd Record (Status Byte)

Record Number	Status Byte	Remainder
01	01 (Used Space)	Data Part of SMS
02	00 (Free Space)	Data Part of SMS (Not Erased)
03	01 (Used Space)	Data Part of SMS
04	01 (Used Space)	Data Part of SMS

- Some mobile phones delete the message by updating the whole record with 00FF...FF. This means they clear both status byte as well as the data.

For e.g.: If the same message is deleted using this behaviour then the data of SMS File will look like:

Table IV: Deleted 2nd Record (Whole Record)

Record Number	Status Byte	Remainder
01	01 (Used Space)	Data Part of SMS
02	00 (Free Space)	FFFFFFFFFFFF (Erased)
03	01 (Used Space)	Data Part of SMS
04	01 (Used Space)	Data Part of SMS

The table below shows behaviour of some of the mobile brands when a message gets deleted from SIM Memory:

Table V: Behaviour of Mobile Phones on deleting a message from SIM Memory

Brands	Deletion of a message by updating Status Byte	Deletion of a message by updating full record
Nokia	<input type="checkbox"/>	×
Samsung	×	<input type="checkbox"/>
LG	×	<input type="checkbox"/>
HTC	×	<input type="checkbox"/>

IV. PROPOSED SOLUTION

Below are the two solutions that can be used to recover the deleted message from SIM Memory. The choice of the solution depends upon the memory available. Here the word “memory available” means that the memory that is being available in the SIM Card after fulfilling the customer’s requirement i.e. Free EEPROM.

1st Solution: In case the memory is available after fulfilling the customer’s requirements.

In case there is memory available in SIM Card, then a file (let’s say X) having same structure as SMS File (6F3C) can be created on SIM Card. In case a new message is added in SMS File (6F3C) then an application on SIM Card will copy that new message into the file(X) so that in future if user deletes the message then there is a copy of that message available. Using the same application the message can be copied back into the SMS File. In this way the message deleted is recovered.

The number of messages to be stored for recovery depends upon the number of records of file (X) created. Thus if we say that the user wants to store last 10 incoming messages for recovering, then the number of records of the file(X) created should be 10. And in case the file(X) gets full then at this time on receiving new message the oldest message saved in file(X) will get replaced by the new one. So using this solution the recovering of message is possible regardless of the deletion behaviour.

2nd Solution: In case there is less memory available after fulfilling the customer's requirements.

In case there is not enough memory in SIM Card to create a file, then in this case an application can be integrated on SIM Memory. This application will be responsible for updating the status byte of messages to read/un-read from deleted. Thus, if the mobile phone updates only the status byte of message to 00 (deleted) then there is an option available to recover the same until a new message comes and over-rides this memory.

Please note that this solution only works for the mobile phones having behaviour of updating the status byte for deletion and that too only till the time when no new incoming message over-rides that deleted message.

V. CONCLUSION

The above proposed 1st Solution (where there is some memory available in SIM Card) can be implemented effectively

since having a file on SIM Card will not going to be cost customers when the benefit looks like recovering of deleted message. The reasons for proposing the first solution are:

1. The current solution will be completely independent of the mobile behaviour of updating the SMS File on deletion. Thus the implementation can be adopted irrespective of the mobile behaviour i.e. whether it updates first byte or whole record.
2. In today's scenario there are very less number of mobile brands that updates only status byte for deleting a message from SIM Memory.

ACKNOWLEDGMENT

I would like to acknowledge my co-workers for supporting and encouraging me through out the course work.

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Study on Life Style Factors Determinants on Health Status of Incoming and Outgoing Medical Students of Pondicherry

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Abstract- Background: The health status of people significantly depends upon their health related behavior life style. Medical students as a distinct and young adults segment of our population need to address their health and life style problems. This study highlights the existing life style factors among incoming and outgoing medical students on their health status. **Aims & Objectives:** To determine and compare the eating habits and life style behaviors of the incoming and outgoing students. **Methodology:** This is a Cross sectional and Descriptive study conducted among the first M.B.B.S (Incoming), Final and interns M.B.B.S (Outgoing) students in the month of October and November 2013 in Sri Lakshmi Narayana Institute of Medical Science, Pondicherry. Data was collected from 302 Students using a pretested semi open ended questionnaire, self-administered to the students after obtaining their consent. The data on eating habits, various life style factors, personal expenditure pattern, time utilization on using electronic gadgets etc. were collected and analyzed using SPSS. **Results:** The incoming and outgoing students residing in hostel were 68% and 74% respectively. Fifty percent of outgoing students have own vehicle whereas incoming students own only 23%. Sixty five percent of outgoing students were owning laptop whereas incoming have only 27%. The monthly average expenditure per month of outgoing students was Rs.4316 whereas incoming students was Rs.1821. The outgoing students have more expenditure, owning laptop and vehicle, eating non vegetarian and junk foods outside at least twice in a week. On an average duration of 10 hours per day was engaged by the outgoing students on electronic gadgets. **Conclusion:** The variation in the life style factors and dietary habits of the students will have a significant effect on their health in future. Hence there is need to create awareness for their life style modification.

Index Terms- medical students, life style, diet, overweight

I. INTRODUCTION

A significant amount of the mortality and morbidity experienced worldwide today is preventable⁽¹⁾. Nearly half of all premature deaths are associated with unhealthy lifestyles. Health status and health-related practices such as lifestyle patterns are important predictors of future health, productivity

and life expectancy^(2,3). The health status of people significantly depends upon their health related behavior life style. Medical students as a distinct and young adults segment of our population need to address their health and life style problems. The medical students life style behaviors getting changes year by year due to many reasons and they are more vulnerable to many chronic health problems in addition to the professionally and socially associated stress. This study highlights the existing life style factors among incoming and outgoing medical students on their health status.

II. OBJECTIVES

To determine and compare the eating habits and life style behaviors of the incoming and outgoing students.

III. METHODOLOGY

This is a Cross sectional and Descriptive study conducted among the first M.B.B.S (Incoming), Final and interns M.B.B.S (Outgoing) students in the month of October and November 2013 in Sri Lakshmi Narayana Institute of Medical Science, Pondicherry. Data was collected from 302 Students using a pretested semi open ended questionnaire, self-administered to the students after obtaining their consent.

A pilot study was done on 30 students to test the validity, applicability and practicality of the questionnaire. Height was recorded (in cm.) using a non-stretchable tape and weight was taken (in Kg.) using a weighing machine standing upright and with shoes off. Body Mass Index (BMI) was calculated in kg/m². The data on eating habits, various life style factors, personal expenditure pattern, time utilization on using electronic gadgets etc. were collected and analyzed using SPSS.

IV. RESULTS

The Results were analysed among 302 medical students comprising of 163 outgoing and 139 incoming medical students. Their life style behaviors and eating habits were analyzed and tabulated here.

Table 1: Distribution of life style factors and dietary habits among Incoming & Outgoing students

Factors		Incoming Students			Outgoing Students		
		Male	Female	Total N (%)	Male	Female	Total N (%)
Resident	Hostel	48	47	95 (68)	43	77	120 (74)
	Day Scholar	20	24	44 (32)	25	18	43 (26)
Owning Vehicle		17	15	32 (23)	50	32	82 (50)
Owning Laptop		18	19	37 (27)	46	60	106 (65)
Diet	Veg	5	6	11 (8)	65	75	23 (14)
	Non-Veg	63	65	128 (92)	65	75	140 (86)
Frequency Of Eating Outside	Daily	34	44	78 (56)	15	46	61 (37)
	Weekly	27	15	42 (30)	30	31	61 (37)
	Occasionally	4	3	7 (5)	18	4	22 (14)
	No	3	9	12 (9)	5	14	19 (12)
Mean Monthly Expenditure (Rs.)		2047	1604	1821	5039	3798	4316

The incoming and outgoing students residing in hostel were 68% and 74% respectively. Fifty percent of outgoing students have own vehicle whereas incoming students own only 23%. Sixty five percent of outgoing students were owning laptop whereas incoming have only 27%. The monthly average expenditure per month of outgoing students was Rs.4316

whereas incoming students was Rs.1821. Majority of the incoming and outgoing medical students were on mixed diet. Based on the study, more than half of the incoming medical students were having the habit of consuming outside food daily whereas outgoing students were only 37%.

Table 2: Distribution of Body mass index among Incoming & Outgoing students

BMI (Kg/M ²)	Incoming Students			Outgoing Students		
	Male	Female	Total (%)	Male	Female	Total (%)
≤18.5	14	11	25 (18)	3	7	10 (6)
18.5 - 24.9	33	38	71 (51)	36	59	95 (58)
≥25	21	22	43 (31)	29	29	58 (36)

Above table shows, the overweight problem among incoming and outgoing medical students was 31% and 36% respectively. The incoming medical students (18%) were underweight whereas only 6% of the outgoing students were

underweight. The prevalence of overweight was high among the outgoing students whereas the prevalence of underweight was high among incoming students^(4,5).

Table 3: Distribution of time for Mobile usage among Incoming & Outgoing students

Mobile Usage	Incoming Students			Outgoing Students		
	Male	Female	Total	Male	Female	Total
Voice	1.2	1.9	1.6	2.5	1.7	2
Text Message	2.1	2.5	2.3	3.2	2.6	2.9
Internet	2.6	1.9	2.3	4.4	2.8	3.6
Games	1.9	1.5	1.7	2.5	2	2.2
Total	7.8	7.8	7.9	12.6	9.1	10.7

The mobile usage among outgoing students were high when compared to incoming students. The average time duration spend on mobiles by the incoming and outgoing students was 10.7 hours and 7.9 hours per day respectively.

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V. CONCLUSION

The outgoing students have more expenditure, owning laptop and vehicle, eating non vegetarian and junk foods outside at least twice in a week. The variation in the life style factors and dietary habits of the students will have a significant effect on their health in future. Hence there is need to create awareness for the life style modification.

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Study of biological environment and dependency of tribal people on forest near Ambaji Multimetal mine, Gujarat

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Abstract- Tribal's and their symbiotic relationship with forest and their surrounding environment has been seen from the ancient time. Their relationship with forest has crossed many centuries and forest maintained their existence until now. The nature of any type of new project in the forest area has negative and positive impacts and widen of these impacts can be minimal to significant in terms of biological environment and dependency of tribal habitat on the forest area. Therefore, mining operations essentially involves many significant impacts on deforestation, habitat destruction and biodiversity. Present study was based on study of biological environment and tribal habitat dependency on it in various sectors in the context of Ambaji Multimetal Mine project. Study of flora and fauna and tribal habitat was carried out to observe the interrelationship of these two.

Index Terms- Biological Environment, Flora, Fauna, Ethno medicinal plant, NTFP

I. INTRODUCTION

Mining of minerals is closely related with forestry and environment concerns such as land degradation, deterioration of air quality, impact on water resources, noise and affect biological environment as well as socio economic environment. Development for region and country, to fulfill the demand from market for minerals and for satisfying these demands rapid use of natural resources is being seen all over the world. The stress and threat to the wildlife and stress on tribal habitat livelihood is a big concern of these days. Mineral mining in any region has likely to deteriorate the ecological balance of the environment and its related components. Indiscriminate exploitation of natural resources is an alarming sign for biodiversity loss¹. It affects direct and indirect damage to wildlife biodiversity. Some impacts may be short-term and confined to the mine site only while others may have far-reaching, long-term effects. The most significant effect on flora and fauna is habitat destruction or displacement of valuable species in area of excavation. Wildlife species birds, predators and other animals migrate from the area of mining due to free movement space destruction. In addition invertebrates, reptiles, rodents and small mammals are more rigorously affected of that area. Wild animals often divert movement and route due to heavy vehicle machinery and high frequency of traffic on roads². The damage reported for mining activities by overburden deposits and drainage is 20 times the lease area³. Biodiversity is continually shrinking due to the anthropogenic activities⁴.

Natural flora and fauna are the two important components of the biological environment of the eco system. Flora gives many things such as food, raw materials such as fiber for clothing, materials, shelter, fertilizer, fuel and medicines and timber⁵. The tribal people are dependent on these natural resources. Both the factor is highly dependent on each other. Present study deals with the study of flora and fauna and its relationship with tribal people. Study of biological environment is one of the important aspects in view of the need for conservation of environmental quality.

II. STUDY AREA AND LOCATION

The study was carried out near and around Ambaji Multimetal mine in Ambaji village, Gujarat. A 10 Km radius area was selected and study was conducted to collect the information of flora and fauna from the near by areas. The Balaram sanctuary comes under Ambaji Multimetal mine and the distance between the sanctuary and mining is around 0.5 km. The proposed mine is situated in the vicinity at Ambaji town in the SE direction of the mine. Ambamata temple is also located in the south direction around 1.0 Km away from the mining area. This temple is one of the important pilgrimage places of the region. Another temple is located on the hillock of Gabbar hill. The entire area is very rich in biodiversity. Ambaji Multimetal mine is a part of reserved forest land for that reason it becomes more important to study the terrestrial ecosystem in depth

III. MATERIALS AND METHODS

Data was collected through extensive and widespread survey to collect the information regarding flora and fauna in the study area. The data was collected by visual observation and by the help of tribal people residing in the area. The forest and their dependency and symbiotic relationship were established by interviewing the tribal people residing in the different villages in the study area chosen. Total 10 villages were chosen for the extensive survey. Information's were also collected from different Government offices such as DFO Social Forestry, Animal Husbandry & Forest Office, District Banaskantha, and Government of Gujarat as secondary data.

IV. RESULTS AND DISCUSSION

Study of Flora

Most of the study area comprises of forestland. The type of forest was observed during the study mostly dense mixed jungle with open mixed jungle and open scrub at some of the places. The forests in general belong to the tropical dry mixed deciduous forests. The tropical moist deciduous forests are present in parts of Ambaji Range ⁶.

The floral constituents of the Banaskantha forest region can be broadly classified as tropical dry deciduous forest and tropical thorn forests as per the revised classification of forest types. The predominant flora observed near Sebalpani area & Bedopani area is fairly dense mixed jungle, mainly with Bamboo trees. Open shrubs are found at Taleti, Baldihar areas of the study area. However, the lease area in study did not have any dense mixed jungles except open shrub areas. The lease area also did not have any presence of flora.

Floral species

Among Flora *Emblica officinalis Gaerth*, *Tamarindus indica Linn.*, *Acacia catechu wild*, *Salmalia malabarica Sch. & E*, *Dalbergia latifolia Roxb.*, *Zizyphus jujuba lank* and *Diospyros melanoxylon Boxb.* etc. were found in the forest area. The observed flora species with top canopy and lower canopy are given in **Table 1**.

Grasses

During the survey *Sorghum holepense*, *Apluda mutica*, *Heteropogon contortus* etc. were major species of grasses found in the forest area. The grasses are observed during the study are given in **Table 2**.

Fauna

Some species of wild animals and birds were recorded during the survey under the study area. A variety of common reptiles, worms and insects are found in the study area. Some of them are Turtle, Earthworm, Crab, Snail, Cobra, Viper, Lizard, Scorpion, Chameleon, Centipede, Cricket, Locust, and Grasshopper etc. Herbivorous animals were scarce in the area.

Balaram Sanctuary

The sanctuary derived its name from two historical temples – Balaram and Ambaji, situated at opposite corners of the sanctuary⁷. The entire area of the sanctuary falls completely within Banaskantha district comprising of forests of 95 villages of Danta, Amirgadh, Palanpur and Vadgam talukas.

The sanctuary hills range is above the 170 to 923 m sea level. The forest tract is highly undulating and comprise of broken hills. The sanctuary rich in different species of plants including trees, herbs, shrubs, climbers, grasses and lower plants.

In Southern dry mixed deciduous forests the main species observed were *Butea monosperma*, *Acacia catechu*, *Bombax ceiba*, *Terminalia arjuna*, *Cassia fistula*, *Tamarindus indica*, *Carissa congesta*, *Capparis sapieria* etc. The grasses include *Themeda triandra*, *Aristida funiculate*, *Cynodon dactylon* etc.

Due to heavy biotic pressure on the plains, the floral diversity in the flat lands and the foothills has suffered the most and the biotic interventions with afforestation and invasion of horny species converted the plain land into thorn forests. In such areas the canopy differentiation is quite difficult. The main tree

species of this type were *Acacia senegal*, *Acacia catechu*, *Acacia tortilis* etc.

Among Fauna Sloth Bear (*Melurus ursinus*) was the main species of the sanctuary. The top carnivore inhabiting the area is Panther, *Panthera pardus*. Other major vertebrate species of the area include the striped hyaena, jungle cat, jackal, Indian fox, common langur, neelgai, palm striped squirrel, rats, hedgehog, Indian pangolin, bats, porcupine etc. The variety of birds inhabiting the sanctuary ranges from land birds to water birds. The multistoreyed forests in several parts of the sanctuary and the scrubs in other parts provide a suitable habitat for various avifaunal species.

The reptiles include the snakes, tortoises and lizards of various types. Among the non-poisonous snakes, Indian python is the rarest snake. Other non-poisonous snakes include the rat snake and John's sand boa. The poisonous snakes include the cobra, common krait, Russell's viper. Bamboo pit viper is the rarest of the poisonous snakes of the area. Lizards including monitor lizard, Indian Chamaeleon, chandan gho, etc. are also quite commonly observed.

Details of flora observed in the forest area are given in **Table 1** and different species of grasses existing in the forest area are given in **Table 2**.

The Tribal's of the area

As per the study area observations, the major tribes in the belt were

- Garasia (largely towards Gujrat border) and
- Rebaris (more towards Rajasthan border)
- Bhils (comparatively more in Rajasthan).

Gender Distribution in ST

As per the census of India 2011, the male population constitutes of 50.85% of the total ST population and female are 49.14% with respect to the total population of schedule tribes in the study area. The gender ratio is 966 among the ST population. The gender ratio of the total population in study area is 931, much lower against the Gender distribution among the ST population in the study area.

The main features were established with biological environment and tribal people.

The symbiotic relationship between forest and Tribal's

Forest is the life supporting system for the tribal's dwelling in the forest area. Therefore, play a vital role in their livelihood and economy. They know how to use the natural resources of the forest area and same time they preserve it for future uses. They exploit the natural resources for their need but they are very generous to protect the biodiversity of the area^A. They are having the dependency on the forest as follows:

Raw material from forest

Tribal is dependent on the raw material from the forest for making their house. Tribal's living in scattered habitation and the housing pattern was scattered with personal land holdings. They live in *pakka houses* with sheds and storage areas, made up of thash grass, mud, wood etc. All these raw material they found from the nearby forest area. However, a few households (E.W.S.) live in semi *puccha* houses made of *khapral* (mud baked tiles)

which is a completely indigenous housing technology widely acknowledged and practiced by all tribes. It is also a source of communal solidarity among the various tribes. There were no concrete house was seen in the tribal villages. During the survey the tribal people interviewed about the concrete houses for living and concluded that they were habitual to live in puccha and semi puccha houses because they do not need to invest much money to prepare it and also does not have any environmental hazard. They feel that are connected with nature.

Non- Timber Forest Products (Fruit and Flowers)

They collect the non - timber forest products (NTFP) from the forest area such as fruits, tree leaves, berries, and flower⁸. The tribal's gathered flower of simal (*Salmalia malabarica Sch. & E*) to make the herbal color during the festive time. Many fruit bearing plants from the forest were the main source of fruits for these people. Mahua (*Madhuca indica*) tree was seen in Taleti and Jambudi village forest area and found that the flower and fruit were used to make the liquor by fermenting them traditionally has said the tribal people during the survey. This was the local and tradition liquor they used mostly in their festive season. They also collect these flower and fruits to sell in the market, Koteshwer temples, Ambaji Temple and at Gabbar temple to pilgrims. This is the source of their day to day income in the area.

They also collect fuel wood, fibers, grass, gum, medicinal plants for their use⁸. Hence, forests are the major source for their food, shelter, employment and income source in the area.

Minor produce forest

These tribal's linked with Minor Forest produce like Timru or Tendu patta (Bidi leaves), gum, tamarind, Mahua etc. from forests which form the main base of their income and their livelihood. They had benefited for the right of gathering of minor food produce by custom⁹. The collection of minor forest products is a major money-making activity of the tribal community in the area. They also earn remuneration as forest worker. They depend upon the medicinal plants from forest and gather medical herbs from the forest area¹⁰.

Emotionally Attachment

They are emotionally attached with the forest and to protect them they perform rituals such as offering sindoor and milk to the tress and worship them. This is one of the ways they protects their environment. Apart from it they worship bushes, animals, birds⁹.

Animal Husbandry

They are found to be dependent for grazing their animals for milk production for their in - house use. They kept goats in large numbers whereas Cow and Buffalo were also found in some houses.

Knowledge about rare Herbs

The old people in the area had knowledge about the rare herbs found in the villages. But they rarely wanted to share with outsider from their communities. R.S Patel et al.⁷ also studied the herbal medicinal climbers (ethno medicinal) in the study area and also reveal that tribal's were not found very much interested to

share their knowledge. However, in general interviewed with tribal's they also used Garmala (*Cassia fistula linn.*) for diarrhea and fever, Amla (*Emblica officinalis Gaerth*) for betterment of tooth and prevent dandruff and use the juice, Jambu (*Syzygium cumini Sk*) for cure of mouth ulcer and diarrhea such as tribal's of Sabarkantha used these medicine¹¹.

V. CONCLUSION

The livelihood of the tribal's is strongly dependent on the forest and their NTFP and MFP. The biological environment and tribal's shows a positive and symbiotic strong relationship. The absence of biological environment they feel stressed. The degradation of the environment by several natural and anthropogenic activities makes the situation worsen. Hence, to protect the environment they are the chain between forest and environment. A better take care of forest diversity can make the scenario better. They are friend of forest and to enhance the forest ecosystem they can make a great role by participating in the afforestation programme by sensible use. Ethnobotanical plants also make a great part of these lives so by collecting information on rare species also can enhance the medicinal help and also can use to combat with lots of disease naturally.

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New Approach for Improving Production of *Naja haje* Snake Antivenom

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Abstract- Snake-bite is considered a neglected tropical disease that affects thousands of people worldwide. Administration of antivenom is considered the corner stone in the therapy of snake-bite. The study aimed to improve the production of antivenom using calcium phosphate nanoparticles (CPN) as adjuvant and gamma irradiation to detoxify venom. This was carried out by studying the toxicological and immunological properties of the *Naja haje* venom before and after exposure to 2 KGy gamma radiation. Furthermore, the cardiotoxic and hepatotoxic biomarkers of the envenomed rats were examined to compare the effect of native and gamma irradiated venoms. Moreover, in order to achieve the goal of the present study the immune response of immunized rabbits was evaluated through determination of antibody titer using ELISA technique as well as comparing the neutralizing capacity for lethality and enzyme activities of the serum obtained from rabbits inoculated with *Naja haje* venom in its native and γ irradiated form in presence of CPN as adjuvant or complete Freund's adjuvant (CFA). Data revealed that the toxicity of γ irradiated *Naja haje* venom was reduced 6 times as compared to the native venom. There was no change in the antigenic reactivity between both native and γ irradiated *Naja haje* venoms. Furthermore, injection of γ irradiated *Naja haje* venom did not significantly change activities of serum LDH, CPK, CK-MB, ALT and AST as compared to the normal group. In addition, serum titer produced with γ irradiated venom loaded on CPN showed highest titer as compared to other sera. Serum produced from irradiated *Naja haje* showed higher neutralizing capacity than that from native venom. All prepared antivenoms were able to neutralize the cardiotoxic and hepatotoxic biomarkers.

Index Terms- Antivenom production, ELISA, gamma irradiation, *Naja haje* venom, nanoparticles.

I. INTRODUCTION

Venomous snakes are one of the most dangerous poisoning animals in the world. Their bites may be serious depending on the amount of venom injected, the location of the bite, the size of the victim, the species of the snake and the time between the bite and the injection of the antivenin. Poisoning by snake bite is a real clinical problem, especially in tropical areas, and efficacious treatment should be available. (Chippaux, 1991). There are many varieties of snakes in Egypt, some of them cause severe damage to snake-bite victims. Cobra (*Naja haje*) is one of the major causes of snake-bites death in Egypt. (Shaaban 2005). Cobra venoms cause death by the action of their neurotoxic and

cardiotoxic components (Mebs, 2002). Serotherapy is the treatment of choice in snake-bite accidents. Clinical investigations have established that generally antivenoms are highly effective in the neutralization of toxins responsible for systemic effects such as hemorrhage, coagulopathy, hemodynamic disturbances and neurotoxicity (Warrell, 2003). The production of therapeutic antivenoms against *Elapidae* family has proven to be very difficult where, the low molecular size of the neurotoxins confers low immunogenicity, resulting in the production of antibodies of relatively low potency (Ownby and Colberg 1988). To improve antisera production and extend the useful life of immunized horse much effort has been devoted to decrease chronic venom toxicity. Several techniques have been used to detoxify venom, for preparing effective toxoid, such as mixing the venom with adjuvant which adsorbs the venom, as aluminum hydroxide gel (Christensen, 1955), using mixture of the venom with carboxymethyl cellulose (Moroz et al., 1963), adding chemical agent as formaldehyde (Costa et al., 1985), controlled iodination of the venom (Daniel et al., 1987) and encapsulation of purified toxins in liposome (Freitas and Frezard, 1997). Towards more effective and safer antivenins, one method that has been shown to be effective for attenuating venom toxicity and maintaining venom immunogenicity is gamma irradiation (Nascimento et al., 1996; Shaaban et al., 1996; Clissa et al., 1999; Souza et al., 2002; Oussedik-Oumehdi & Laraba-Djebari, 2011).

Adjuvants are substances injected along with an antigen that are intended to enhance the immune response to the antigen. The most widely used is Freund's adjuvant but it poses great problem in commercial antivenom production since they induce inflammation and lesions at the inoculum site leading to shortening the longevity of serum-producing animals (Ferreira et al. 2010). Many adverse effects were noted in horses used for the production of antivenin, mainly in the form of tissue reaction at the site of injection such as of edema, abscesses, myonecrosis and fibrosis. Micro and nanocarriers such as microspheres, liposomes and nanoparticles have many advantages concerning drug delivery and targeting. These advantages include high drug loading, lack of chemical interaction with drug, which is necessary for encapsulation and considerable protection of the drug molecules (Crommelin et al., 2001). In this respect, this study aimed to enhance the production of snake antivenom through the use of gamma irradiation of *Naja haje* venom as detoxifying tool and calcium phosphate nanoparticles as an adjuvant to minimize the adverse reactions during the hyper-immunization process and reduce manufacturing costs.

II. MATERIALS AND METHODS

Animals used in the present study included New Zealand male rabbits (2.5-3 kg), Swiss albino male mice (20-25 g) and Wistar albino male rats (180-200 g). Animals were purchased from the National Research Center (Giza, Egypt). The study was conducted in accordance with the regulations approved by the Ethics Committee at Faculty of Pharmacy, Cairo University.

Venom: Lyophilized crude venom of Egyptian cobra (*Naja haje*) snake venom was kindly supplied from the laboratory animal unit of Medical Research Center, Faculty of Medicine, Ain Shams University.

Irradiation of venom: In this study, *Naja haje* venom was dissolved in saline solution (1mg/ml). Samples were subjected to radiation dose level of 2 KGy at the National Center for Radiation Research and Technology (NCRRT) using cobalt-60 Indian gamma cell (GE 4000A). The radiation dose rate was 1.26 Gy/sec at the time of experiment. This dose was selected as it gets rid of venom toxicity while maintaining immunogenicity (*Clissa et al. 1999; Karam et al., 2010*).

Determination of lethal dose fifty (LD₅₀) of native and γ irradiated venoms. LD₅₀ of native and γ irradiated *Naja haje* venoms were determined according to Spearman-karber method as described by *Finney (1964)*.

Evaluation of the immunological properties of native and γ irradiated venoms. Effect of γ irradiation on the immunological properties of *Naja haje* venom was evaluated using double immunodiffusion technique as described by *Ouchterlony (1948)*. In immunodiffusion plates saline, native and γ irradiated *Naja haje* venoms solution (20 μ l) were placed in peripheral wells (venom concentration were 20 mg/ml), whereas the central well was filled with 20 μ l of antivenom. After developing of the precipitation bands (72 h), slides were washed and dried then stained and photographed.

Evaluation of the biochemical activities of native and γ irradiated venoms. Toxic effects of native and γ irradiated *Naja haje* venoms were evaluated through determination of the cardiotoxic and hepatotoxic biomarkers in rats. Since, the LD₅₀ of native venom was measured in mice; the equivalent rat dose was calculated according to *Paget and Barnes (1964)*. Rats were classified into three groups, each consisting of seven rats that were treated as follows

Group I: received 0.1 ml saline i.p. and served as normal control.

Group II: received native *Naja haje* venom (0.163 mg/kg; i.p.)

Group III: received γ irradiated *Naja haje* venom (0.163 mg/kg; i.p.)

After 4 h of envenomation (*Mohamed et al., 1981*), rats were anesthetized by i.p. injection of urethane (1.2 g/kg) (*Flecknell, 1987*). Blood samples were withdrawn via the retro-orbital vein using heparinized capillary tubes (*Cocchetto and Bjornsoon, 1983*) for serum separation.

Lactate dehydrogenase (LDH) activity was measured using a test reagent kit according to the method of *Stentz (2010)*, creatine phosphokinase (CPK) activity was measured using a test reagent kit according to the method of *Szasz et al. (1976)*, and creatine kinase isoenzyme (CK-MB) activity was measured using a test reagent kit according to the method of *Lott and Stang (1980)*. Moreover, serum aspartate aminotransferase (AST) and alanine aminotransferase (ALT) activities were determined using a test reagent kit according to the method of *Retiman and Frankel (1957)*.

Preparation and characterization of calcium phosphate nanoparticles (CPN) were prepared to be used as adjuvant for *Naja haje* venom in antivenoms preparation. This was performed according to the method of *He et al. (2000)*. Particle size and morphological feature of prepared CPN was observed using transmission electron microscope (TEM) (JEOL JEM-1230, Japan) according to the method described by *Van der et al. (2003)*. The structure features of venom and venom loaded on nanoparticles were estimated by Fourier transform infrared spectroscopy (FT-IR) (3600 JASCO, Colchester United Kingdom) at room temperature.

Preparation of antivenoms

Rabbits were used as antivenom producing animals. They were classified into four groups each included 3 rabbits that were treated as follows:

Group 1: was injected s.c. with native venom emulsified in 0.5 ml complete Freund's adjuvant (CFA).

Group 2: was injected s.c. with 2KGy irradiated venom emulsified in 0.5 ml CFA.

Group 3: was injected s.c. with native venom loaded on calcium phosphate nanoparticles (CPN).

Group 4: was injected s.c. with 2KGy irradiated venom loaded on CPN.

Immunization was carried out as described by *WHO (2010)*. Ten days after the final dose, rabbits were injected with a booster dose without adjuvants of native venom for groups 1 and 3 meanwhile, irradiated venom were used for groups 2 and 4. Blood samples were collected ten days thereafter. Serum was distributed in small tubes and kept at -20 °C until the moment of use for evaluation.

Evaluation of immune response post immunization using enzyme-linked immunosorbent assay (ELISA) Blood samples were withdrawn post immunization. The levels of specific antibodies in serum samples were compared using ELISA according to the method of *Nascimento (1996)*.

Neutralization of lethality

1- *In-vitro* neutralization (pre-incubation type assay)

This was done according to the method of *Gutierrez et al. (1990)*. Mixtures containing a constant amount of venom (10 LD₅₀) and varying dilutions of antivenoms were incubated at 37°C for 1h. Aliquots of the mixtures (0.5 ml) were i.p. injected into groups of six mice. Control included venom alone. Deaths were recorded after 24 h. Median effective dose (ED₅₀) was calculated by spearman-karber analysis and defined as the ratio

of antivenom (μl): venom (mg) at which 50% of mice were protected.

2- *In-vivo* neutralization (independent type assay)

This assay is considered as *in vivo* neutralization where independent injection of venom and antivenom attempted to simulate the natural route of envenomation. In these assays, a challenge dose of venom (2 LD₅₀) was i.p. injected first and then, at various time intervals, antivenom is administered i.v. according to the method of *Leon et al. (2001)*.

Neutralization of biochemical activities

It was assessed as described by *Ghazal, et al. (1975)*. Venom was incubated with each of the prepared antivenom for 1 h at 37°C in a ratio of 1: 4 (1 mg venom to 4 ml serum). Then, aliquots of the mixtures containing a challenge dose equivalent to 1 LD₅₀ of venom were i.p. injected to rats that were classified into five groups, each consisting of seven rats that were treated as follows:

Group I: received native *Naja haje* venom (0.163 mg/kg; i.p.) and served as control.

Group II: received a mixture of venom and the antivenom raised against native venom emulsified in complete Freund's adjuvant (CFA) (0.815 ml/kg; i.p.).

Group III: received a mixture of venom and the antivenom raised against 2 KGy irradiated venom emulsified in CFA (0.815 ml/kg; i.p.).

Group IV: received a mixture of venom and the antivenom raised against native venom loaded on calcium phosphate nanoparticles (CPN) (0.815 ml/kg; i.p.).

Group V: received a mixture of venom and the antivenom raised against 2 KGy irradiated venom loaded on CPN (0.815 ml/kg; i.p.).

After 4 h of envenomation, rats were anesthetized by i.p. injection of urethane (1.2 g/kg). Blood was collected and used for estimation of LDH, CPK, CK-MB, ALT and AST activities.

Statistical analysis

Values were calculated as mean \pm standard error (S.E) of the mean. Comparisons between different groups were carried out by one way analysis of variance (ANOVA) followed by Tukey-Kramer multiple comparison test. The *p* value was set at ≤ 0.05 .

III. RESULTS AND DISCUSSION

Lethal dose fifty (LD₅₀) of native and 2 KGy irradiated venoms. LD₅₀ for native *Naja haje* venom was 0.233 mg/kg (i.e. 4.66 $\mu\text{g}/20$ g mice) with 95% confidence limits of 0.198 to 0.273 mg/kg. Meanwhile, LD₅₀ for γ irradiated *Naja haje* venom was 1.39 mg/kg (i.e. 27.8 $\mu\text{g}/20$ g mice) with 95% confidence limits of 1.276 to 1.513 mg/kg.

Lethality is the most important activity in the study of the toxicity of snake venoms (*WHO, 1981*). In the present study, the toxicity of *Naja haje* venom was reduced 6 times following exposure to 2 KGy gamma radiation compared to its native venom. These results were in accordance with results of *Shaaban, (2003)* who reported that irradiated *Naja haje* venom at dose level of 15 KGy was at least 28.1 % less toxic than non-irradiated one. Furthermore, *Clissa et al., (1999)* showed that the 2 KGy dose showed to be the best radiation dose to promote

venom detoxification with maintenance of its immunogenicity. Moreover, *Bennacef-Heffar and Laraba-Djebbari (2003)* showed that when, *Vipera lebitina* venom was irradiated with 1 KGy and 2 KGy, there was significant decrease in the toxicity four and nine times, respectively. Furthermore, the study of *Caproni et al., (2009)* added that, gamma irradiation of *bothrops* toxin protein leads to significant structural modifications. There is qualitative difference in the protein composition of snake venom as a result of gamma irradiation as, both chromatographic and electrophoretic profiles of the gamma irradiated venom were drastically changed as compared with that of the native venom (*Shaaban et al., 2010*). Effects of gamma irradiation on venom solution could be attributed to its known effects on protein molecules, as venoms are mainly protein in nature, as well as, ionizing radiation can change the molecular structure and the biological properties of protein molecules (*Boni-Mitake et al., 2001*). This can occur by two forms: direct process by which ionizing radiation interacts directly on target molecules and an indirect process by which the product generated by water radiolysis, like e^- , O_2^- , H° and OH° interact with target molecules and can modify the biological activity of protein and peptides by reacting with certain sites or groups in the molecule (*Garrison, 1987; Casare et al., 2006*). These radicals act by removing hydrogen, breaking disulfide bonds, promoting deamination as well as inducing the formation of intramolecular and intermolecular covalent bonds (*Alexander & Hamilton 1962; Halliwell & Gutteridge, 1989*). These structural changes result in a decrease or loss of the enzymatic and biological activities of the proteins (*Gallacci et al., 2000*).

Immunological properties of native and γ irradiated venoms

Results of the double immunodiffusion test showed that, there was no change in the antigenic reactivity of native and 2 KGy gamma irradiated *Naja haje* venom. The visible lines obtained were identical, continuous and joined smoothly at the corner, indicating that there was no change in antigenic determinants i.e. the antivenom cannot distinguish between the native and γ irradiated *Naja haje* venoms as they are immunologically identical (Figure 1). This finding is in harmony with that of *Rogero & Nascimento, (1995)* who reported that, the part of protein responsible for toxicity of the venom was associated with the radio-labile group while, the immunogenic part of the venom was located in a confined portion, which was either resistant to gamma radiation or was structurally shielded from it. Radiation is able to induce changes in the structural and antigenic properties of egg albumin and bovine serum albumin. This finding is attributed to that, the main part of conformation dependent antigenic structures (conformational epitopes) is easily lost by radiation, but some antigenicity, which is mostly due to the amino acid sequence-dependent antigenic structures (sequential epitopes) remain, even at high doses (*Kume &*



S = Saline

A = Antivenom

N = Native *Naja haje* venom.

I = Irradiated *Naja haje* venom

Matsuda, 1995).

Figure (1): Immunodiffusion reaction of commercial polyvalent antivenom with native and γ irradiated *Naja haje* venoms.

Biochemical activities of native and γ irradiated venoms

Activities of serum LDH, CPK and CK-MB of normal group were 626.40 ± 44.01 U/l, 410.80 ± 37.17 U/l and 278.76 ± 25.08 U/l, respectively. Injection of native *Naja haje* venom significantly elevated activities of serum LDH, CPK and CK-MB by 49.82%, 267.87% and 80.15%, respectively as compared to the normal group. In addition, activities of serum ALT and AST of normal group were 70.60 ± 1.51 U/l and 132.40 ± 1.69 U/l, respectively. Injection of native *Naja haje* venom significantly elevated activities of serum ALT and AST by 208.16% and 99.98%, respectively as compared to the normal group. On the other hand, injection of γ irradiated *Naja haje* venom did not significantly change activities of serum LDH, CPK, CK-MB, ALT and AST as compared to the normal group (Table 1).

Thus, the results of this study clearly demonstrated that a single injection of native *Naja haje* venom at a dose equal its LD₅₀ caused a significant elevation in activities of serum LDH, CPK, CK-MB, ALT and AST as compared to the normal group. The present increase in enzymes activities due to *Naja haje* envenomations was in accordance with the results of the studies carried out by **Fernando et al., (1989)** who reported that *B. asper* venom caused serum AST, LDH and CPK to increase significantly, the highest peak being observed at 3h in the cases of AST and CPK, and at 6 h in the case of LDH. Furthermore, in a study by **Aguiyi et al., (2001)**, the effect of lethal *Echis carinatus* venom on serum enzyme levels and blood plasma coagulation parameters in rats subjected to (i.p.) venom injection was investigated. Measurements of the enzyme and coagulation parameter levels 4 h after venom administration showed an increase in the level of enzymes; creatinine phosphokinase (CPK), lactate dehydrogenase (LDH) and glutamic pyruvic transaminase (ALT) as well as a change in the level of coagulation parameters due to envenomation. **Mebis et al., (1983)** suggested that, the increase in enzymatic activities of CPK and CPK-MB in the serum could be explained by an increase of the permeability of the cell membrane. Elevation of creatine phosphokinase is an indication of damage to muscle, therefore indicative of injury, myocardial infarction, muscular dystrophy and myocarditis (**Wallimann & Hemmer, 1994**).

In addition, **Shaaban & Hafez (2003)** reported that, tissue destruction occurs in most of the organs secondary to venom injections. The increase in enzymatic activity of the serum attributed to the release of enzymes from liver, kidney and heart. Organ damage is followed by an increase in levels of ALT, AST and ALP.

On the other hand, the 2KGy gamma irradiated *Naja haje* venom, showed non-significant changes in the rats' serum LDH, CPK, CK-MB, ALT and AST compared to the normal rats. These findings were attributed to loss of the myotoxic activity of snake venoms as a secondary event following the exposure to gamma radiation. Previous studies have emphasized that irradiation of protein has been shown to cause several chemical changes and alterations of the physico-chemical properties and of the secondary and tertiary structure of the proteins, all these

changes are closely connected with the loss of enzymatic, hormonal and toxic activity of venom after irradiation (**Skalka & Antoni, 1970; Souza-Filho et al., 1992**). This is attributed to the disorganization of the molecular structure of venom after exposure to gamma radiation, resulting in a change in its biological activity (**Shaaban et al., 1996; Hayes, 2001**). In this respect, radiation is able to detoxify snake venoms and decrease its harmful effects. In this context, gamma radiation has showed to be a promising tool for snake venom detoxification without affecting their immunogenic properties.

Table (1): Effect of native and γ irradiated *Naja haje* snake venoms on serum lactate dehydrogenase (LDH), creatine phosphokinase (CPK), creatine kinase isoenzyme (CK-MB), alanine aminotransferase (ALT) and aspartate aminotransferase (AST) activities in rats

Groups Parameters	Normal (Saline) (0.1 ml; i.p.)	Native <i>Naja haje</i> (0.163 mg/kg; i.p.)	Irradiated <i>Naja haje</i> (0.163 mg/kg; i.p.)
LDH (U/l)	626.40 ± 44.01	938.50* ± 33.57	726.22# ± 24.27
CPK (U/l)	410.80 ± 37.17	1510.46* ± 78.82	709.57# ± 50.64
CK-MB (U/l)	278.76 ± 25.08	502.20* ± 9.58	330.21# ± 29.88
ALT (U/l)	70.60 ± 1.51	217.56* ± 1.32	83.71# ± 2.96
AST (U/l)	132.40 ± 1.69	264.77* ± 1.14	149.72# ± 2.55

Native and γ irradiated *Naja haje* were injected as single doses (a dose equivalent to native LD₅₀). Blood samples were collected 4 h thereafter.

Each value represents the mean ± S.E (n=7).

Statistical analysis was carried out by one-way ANOVA followed by Tukey-Kramer multiple comparison test.

*Significantly different from the normal group at $p \leq 0.05$.

#Significantly different from native *Naja haje* group at $p \leq 0.05$.

Characterization of calcium phosphate nanoparticles

Electron microscope scanning was used to determine the adjuvant particle characteristics (shape, size). The particles are spherical in shape and uniformly distributed (mono dispersed) without significant agglomeration. The particles size ranges from 155 to 274 nm and possess an average size of ≈ 225 nm although very tiny particles have also been observed that may be due to vigorous shaking (Figure 2).

Figure (2): The morphological characteristics of nanoparticles were investigated using transmission electron microscope (TEM). Fourier transform infrared spectroscopy (FT-IR) measurements

On the basis of the FTIR spectra, a slight difference in the width and frequency of the peaks can be observed between venom loaded and unloaded nanoparticles. In figure (3a) strong and broad peaks at the 3459 cm^{-1} correspond to O-H stretching and intermolecular hydrogen bonding. The peak at 2078 cm^{-1} belong to N-H stretching vibration. At wave numbers of 1639 cm^{-1} and 1442 cm^{-1} observed peaks belong to the C=O stretching (amide) and, N-H bending in primary amine with carbonyl group (C-N) stretching vibration in amide, respectively. The peak at 559 cm^{-1} belong to C=O bending (amide). Meanwhile, in figure (3b) appearance of P=O peak at 1014 cm^{-1} due to interaction of venom and calcium phosphate nanoparticles. Moreover, the peak in N-H stretching vibration shifted to 1388 cm^{-1} after interaction with CPN.

Figure (3a): Fourier transform infrared spectrum of *Naja haje* venom.

Figure (3b): Fourier transform infrared spectrum of calcium phosphate nanoparticles (CPN) loaded venom.

In addition, *He et al. (2000)* reported that, CPN was more potent as an adjuvant than alum, elicited little or no inflammation at the site of administration and induced high titers of immunoglobulin antibody for herpes simplex virus as compared to the commonly used aluminum adjuvants. Additional benefits that CPN is a natural constituent of the

human body. Thus, CPN is very well tolerated and absorbed. There is support for this concept in recent studies by *Maughan et al. (2015)* and *Olmedo et al. (2013)* who recorded that, the comparison of the adjuvant activity of aluminum hydroxide and calcium phosphate on the

The mechanism by which CPN act as adjuvant was explained by *He et al. (2000)* who reported that, CPN is believed to act similarly to alum by releasing the antigen slowly over an extended period of time. This is a technique in which some antigens are entrapped in the core of the final CPN formulation, which helps to boost immune responses over an extended time and which has the potential to reduce the antigen dose required for immunization. Although there was no way to show the kinetics of antigen release from CPN, it is reasonable to assume that the surface antigens are released from CPN immediately after injection. Conceivably, then, the antigens from the “core” of the CAP would continue to be released as CPN dissolves, thus making antigen available to stimulate the host’s immune system over an extended period of time.

In addition, *Maughan et al. (2015)* reported that, CPN was more potent as an adjuvant than alum, elicited little or no inflammation at the site of administration and induced high titers of immunoglobulin antibody for herpes simplex virus as compared to the commonly used aluminum adjuvants. Additional benefits that CPN is a natural constituent of the human body. Thus, CPN is very well tolerated and absorbed. There is support for this concept in recent studies by *Olmedo et al. (2013)* who recorded that, the comparison of the adjuvant activity of aluminum hydroxide and calcium phosphate on the antibody response towards *Bothrops asper* snake venom revealed that, venom adsorbed on calcium phosphate induced a higher antibody response towards all tested fractions of the venom.

Enzyme linked immunosorbent assay (ELISA)

Analysis of ELISA showed that the sera pool from hyper-immunized rabbits with irradiated venom had titers higher than those of sera pool from animals hyper immunized with native venom whatever the used adjuvant (Figure 4).

This was confirmed with the findings of *Caproni et al., (2009)*, who reported that, irradiated toxins were immunogenic and antibodies elicited by them were able to recognize the native toxin in ELISA. Other studies had already proven that, when *Vipera lebetina* venom was detoxified by gamma rays and used for active immunization, presence of antibody in the immune sera was detected by ELISA. Thus, immunogenic properties were preserved and the antisera obtained with the irradiated venoms could cross-react and were able to neutralize the toxic effect of native *Vipera lebetina* venom (*Bennacef-Heffar and Laraba-Djebari, 2003*).

This occurs because the irradiation promotes molecule oxidation, facilitating its phagocytosis due to the presence of scavenger receptors in the macrophages surface. Moreover, it is known that antigens, as they enter the organism, suffer an oxidation process by the defensive cells to facilitate phagocytosis. In irradiated samples, macrophages already find these molecules oxidized, and therefore, they eliminate this step of the process. A better processing, associated to a faster antigen presentation, makes the immune system produce more complete

antibodies against a higher number of antigen epitopes (**Rogero and Nascimento 1995**).

In this study analysis of ELISA results found that, the sera raised against irradiated venom loaded on calcium phosphate nanoparticles (CPN) showed highest titer as compared to other sera. This was in accordance with **Abde el-razek et al., (2011)** who reported that, CPN formulated vaccine showed a highly significant and long durative antibodies level than that detected post immunization with alum formulated vaccine

It must be pointed out that, in this study, five rabbits died after the first inoculation with native *Naja haje* venom emulsified in CFA and one rabbit after the first inoculation with native *Naja haje* venom loaded on CPN, meanwhile there was no mortality in other groups. It was attributed to the high toxicity of native venom which was reduced 6 times following exposure to 2 KGy gamma radiation. This is in agreement with the previous study of **Souza et al. (2002)** who concluded that the radiation is able to abolish paralysis caused by the venom. According to the same authors, these facts support the hypothesis that gamma radiation may be an important tool to improve sera production, since it reduces venoms toxicity, preserving immunogenicity. Taken together, these data indicate that CPN as adjuvant induces very little inflammation at the site of entry, and CPN loaded irradiated venom induce a higher titer relative to the responses induced by CFA. On the basis of these observations, we suggest that CPN present an improved alternative to CFA, especially for snake

limits of 33.60 to 43.01 $\mu\text{g/ml}$. ED_{50} for antivenom raised against irradiated venom emulsified in CFA was 60.26 $\mu\text{g/ml}$ with 95% confidence limits of 46.95 to 77.34 $\mu\text{g/ml}$. ED_{50} for antivenom raised against native venom loaded on calcium phosphate nanoparticles (CPN) was 39.81 $\mu\text{g/ml}$ with 95% confidence limits of 30.14 to 52.54 $\mu\text{g/ml}$. ED_{50} for antivenom raised against irradiated venom loaded on CPN was 56.23 $\mu\text{g/ml}$ with 95% confidence limits of 49.70 to 63.62 $\mu\text{g/ml}$.

This results were in accordance with **Ferrier et al. (2006)** who reported that neutralizing capacity of antivenoms raised against irradiated *Crotalus durissus* venom was higher than that of antivenom raised against native venom.

This was in harmony with **Shaaban et al., (2010)** who reported that, the antivenom raised against 1.5 kGy γ irradiated *Echis pyramidum* venom is quite as effective as the antivenom raised against the native venom in neutralizing the lethality induced by native venom.

In this respect **Guittrez et al. (1990)** reported that, when standardizing the neutralizing ability of an antivenom, pre-incubation type of experiments are used more extensively, since results do not depend on pharmacokinetics of venom and antivenom, but instead on concentration and neutralizing ability of antibodies present in the antivenom. Meanwhile, this study observed that, antivenoms prepared using complete Freund's adjuvant were equipotent to that prepared using calcium phosphate nanoparticles as adjuvant.

Serial dilution of antivenom

Figure (4): Comparative evaluation of immune response post immunization with native and 2 KGy irradiated *Naja haje* venoms with complete Freund's adjuvant (CFA) or loaded on calcium phosphate nanoparticles (CPN) using ELISA.

antivenoms production.

Neutralization of lethality

1- *In-vitro* neutralization (Pre-incubation type)

All the prepared antivenoms neutralized the lethal effects of *Naja haje* venom in pre-incubation type experiments as, ED_{50} for antivenom raised against native venom emulsified in complete Freund's adjuvant (CFA) was 38.02 $\mu\text{g/ml}$ with 95% confidence

This was in harmony with **Soares (2012)** who mentioned that, when the chitosan nanoparticles applied as an adjuvant in for venom immunization, it can provide considerably effective immune response and may promote production of antibody equivalent to aluminum hydroxide, but with the added advantage of being less or non-inflammatory and it can provide a modified

release of antigen, which can promote antibody titers in serum with the administration of a smaller amount of antigen.

2- In-vivo neutralization (independent type)

Results of *in vivo* neutralization assay revealed that, when 2 LD₅₀ of venom was injected i.p. all mice dead at 40 ± 3 min. on the other hand, when antivenom (0.2 ml) was administered i.v. immediately after envenomation, lethality was reduced markedly. However, when antivenom administration was delayed or 15 min. neutralization was partial, while when antivenom administration was delayed for 30 min. all the mice died (Table 2). The antivenom produced against irradiated venom loaded on CPN showed significant differences compared to the antivenom produced from immunization with native venom and complete Freund's adjuvant. The efficacy of antivenom for reversal of cytotoxic manifestations occurring after envenomation is time limited. This was in accordance with the finding of *Leon et al. (2001)* who showed that there was no significant differences between antivenoms concerning neutralization of lethality by either i.v. or i.m. administration of antivenoms. Moreover, results indicated that, the sooner antivenoms was injected, the higher is its neutralizing activity. In agreement with the results of *Gutierrez et al. (1991)* antivenoms were effective only when administered immediately after envenomation, and this is probably due to the rapid action of *Nigrocinctus* myotoxins on muscle cells. The principle by which independent injection type assay was described by *Lomonte et al. (2009)* who reported that, a number of factors that are extrinsic to the neutralizing ability of an antivenoms may have a major influence upon its effectiveness and final outcome. Among these factors stand pharmacodynamics and pharmacokinetic parameters for the distribution of both venom components and antivenom, as well as the velocity by which the particular toxic effects developed. Therefore, it is recommended to use antivenom as early as possible whether the systemic sign and symptoms is present or not i.e. even before the occurrence of serious cytotoxic effect on various organs (*Zayerzadeh et al. 2011*).

Table (2): Neutralization of lethality of *Naja haje* venom by the prepared antivenoms using independent injection type assay.

Antivenom	Mortality (%)		
	Delay in antivenom administration (min)		
	0	15	30
Antivenom raised against native venom emulsified in CFA	60 %	40 %	100 %
Antivenom raised against irradiated venom emulsified in CFA	40 %	60 %	100 %
Antivenom raised against native venom loaded on CPN	40 %	60 %	100 %

Antivenom raised against irradiated venom loaded on CPN	20 %	40 %	100 %

Groups of five mice were injected i.p. with a challenge dose (2 LD₅₀) then at various time intervals, mice received 0.2ml of each of the prepared antivenoms by i.v. route, death were recorded during 24 h.

CFA: Complete Freund's adjuvant.

CPN: Calcium phosphate adjuvant.

Neutralization of biochemical activities

Effect of native *Naja haje* venom and mixtures of the prepared antivenoms on serum lactate dehydrogenase (LDH), creatine phosphokinase (CPK), creatine kinase isoenzyme (CK-MB), alanine aminotransferase (ALT) and aspartate aminotransferase (AST) activities in rats.

Injection of the incubated mixture of venom and antivenom prepared from native venom emulsified in CFA (in a dose equivalent to native LD₅₀) significantly reduced the activities of serum LDH, CPK, CK-MB, ALT and AST by 17.88%, 58.92%, 26.84%, 60.54% and 47.39%, respectively as compared to the native venom (control) group.

Injection of the incubated mixture of venom and antivenom prepared from irradiated venom emulsified in CFA (in a dose equivalent to native LD₅₀) significantly reduced the activities of serum LDH, CPK, CK-MB, ALT and AST by 16.97%, 53.65%, 35.42%, 62.78% and 41.45%, respectively, as compared to the native venom (control) group.

Injection of the incubated mixture of venom and antivenom prepared from native venom loaded on CPN (in a dose equivalent to native LD₅₀) significantly reduced the activities of serum LDH, CPK, CK-MB, ALT and AST 16.18%, 52.80%, 31.73%, 59.61% and 42.68%, respectively as compared to the native venom (control) group.

Injection of the incubated mixture of venom and antivenom prepared from γ irradiated venom loaded on CPN (in a dose equivalent to native LD₅₀) significantly reduced the activities of serum LDH, CPK, CK-MB, ALT and AST by 17.07%, 62.43%, 41.16%, 62.68% and 46.61%, respectively as compared to the native venom (control) group. The percentage inhibition was calculated by considering the effect induced by venom alone as 100% activity. It was observed that, there was a significant change in the activity of serum CK-MB after the injection of the incubated mixture of venom and the antivenom prepared from γ irradiated venom loaded on CPN as compared to the group injected with the incubated mixture of venom and antivenom prepared from native venom emulsified in CFA (Figures 5 & 6).

Data of the present study indicates that, all the prepared antivenoms have a protective action against cardiotoxicity and hepatotoxicity venom almost to the same extent. It is interesting to note that, although much work was published about the protection against venom induce lethality, little and scattered work was published concerning the neutralization efficacy of antivenoms against the pharmacological and biochemical action of venoms despite, the study of the neutralization of other clinically relevant effects is highly important to gain a more comprehensive picture of the efficacy of an antivenom.

The study of *Chaves et al. (1995)* added that, antivenom neutralized venom-induced increases in serum enzyme levels following pre-incubation with venom, indicating that antivenoms contains antibodies against tissue-damaging toxins. *Gutierrez et al. (1987)* has been suggested that, the antivenoms contains

antibodies capable of preventing and neutralizing the toxic and enzymatic activities of the venom.

Figure (5): Effect of native *Naja haje* venom and mixtures of the prepared antivenoms on serum lactate dehydrogenase (LDH), creatine phosphokinase (CPK) and creatine kinase isoenzyme (CK-MB) activities in rats.

Native *Naja haje* venom (0.163 mg/kg; i.p.) and mixtures of the prepared antivenoms (0.815 mg/kg; i.p.) were injected as single doses. Blood samples were collected 4 h thereafter.

Mixture A: incubated mixture of venom and antivenom prepared from native venom emulsified in complete Freund's adjuvant (CFA) in a ratio of 1: 4.

Mixture B: incubated mixture of venom and antivenom prepared from irradiated venom emulsified in CFA in a ratio of 1: 4.

Mixture C: incubated mixture of venom and antivenom prepared from native venom loaded on calcium phosphate nanoparticles (CPN) in a ratio of 1: 4.

Mixture D: incubated mixture of venom and antivenom prepared from irradiated venom loaded on CPN in a ratio of 1: 4.

Each value represents the mean \pm S.E. (n=7).

Statistical analysis was carried out by one-way ANOVA followed by Tukey-Kramer multiple comparison test.

#Significantly different from native *Naja haje* group at $p \leq 0.05$.

@Significantly different from mixture A group at $p \leq 0.05$.

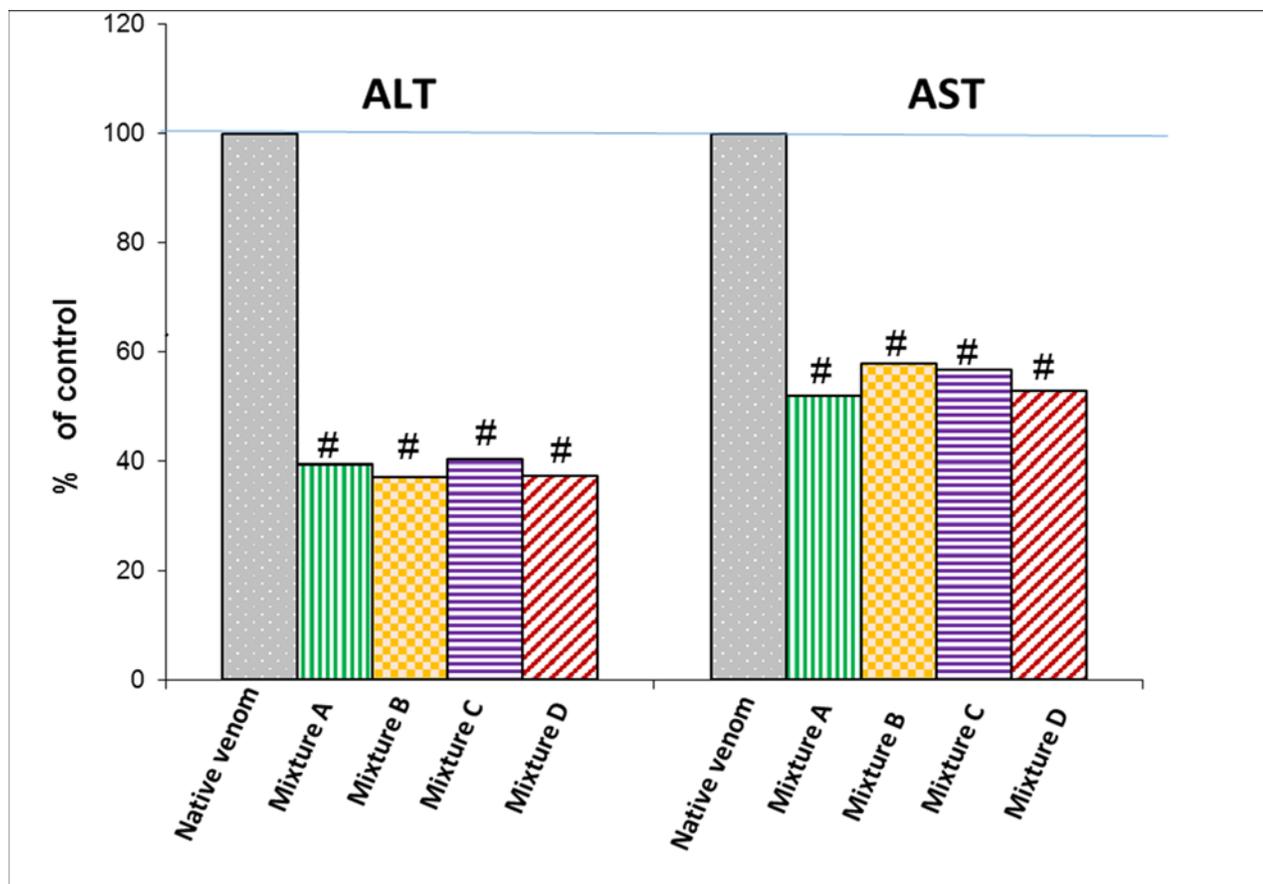


Figure (6): Effect of native *Naja haje* venom and mixtures of the prepared antivenoms on serum alanine aminotransferase (ALT) and aspartate aminotransferase (AST) activities in rats.

Native *Naja haje* venom (0.163 mg/kg; i.p.) and mixtures of the prepared antivenoms (0.815 mg/kg; i.p.) were injected as single doses. Blood samples were collected 4 h thereafter.

Mixture A: incubated mixture of venom and antivenom prepared from native venom emulsified in complete Freund's adjuvant (CFA) in a ratio of 1: 4.

Mixture B: incubated mixture of venom and antivenom prepared from irradiated venom emulsified in CFA in a ratio of 1: 4.

Mixture C: incubated mixture of venom and antivenom prepared from native venom loaded on calcium phosphate nanoparticles (CPN) in a ratio of 1: 4.

Mixture D: incubated mixture of venom and antivenom prepared from irradiated venom loaded on CPN in a ratio of 1: 4.

Each value represents the mean \pm S.E. (n=7).

Statistical analysis was carried out by one-way ANOVA followed by Tukey-Kramer multiple comparison test.

#Significantly different from native *Naja haje* group at $p \leq 0.05$.

IV. CONCLUSION

In conclusion, based on the experimental findings, irradiation was found to be a reliable tool in detoxification of venoms, minimizing the toxic effect while maintaining the immunogenicity. In addition, calcium phosphate nanoparticles when applied as adjuvant, provide enhancement of immune response with the adjuvant of being less or non-inflammatory and it can provide a modified release of antigen, which can promote obtaining antibody titers in serum with the administration of a smaller amount of antigen. Taken together, this study showed an immunization adjuvant system for *Naja haje* snake venom that should be tested with venom of other snakes. Thus, this approach achieves a new biotechnological antivenom to be used in the future.

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Battery Optimization of Android Phones by Sensing the Phone Using Hidden Markov Model

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Abstract- The paper presents a novel framework that includes an inhomogeneous (time-variant) Hidden Markov Model(HMM) and learning from data concepts. The framework either recognizes or estimates user contextual inferences called 'user states' within the concept of Human Activity Recognition (HAR) for future context-aware applications. Context-aware applications require continuous data acquisition and interpretation from one or more sensor reading(s). Therefore, device battery lifetimes need to be extended due to the fact that constantly running built-in sensors deplete device batteries rapidly. In this sense, a framework is constructed to fulfill requirements needed by applications and to prolong device battery lifetimes. The ultimate goal of this paper is to present an accurate user state representation model, and to maximize power efficiency while the model operates. Most importantly, this research intends to create and clarify a generic framework to guide the development of future context-aware applications. Moreover, topics such as user profile adaptability and variant sensory sampling operations are examined. The proposed framework is validated by simulations and implemented in a HAR-based application by the smart phone accelerometer.

Index Terms- accelerometer sensor, entropy rate , HAR based application, Hidden Markov Model.

I. INTRODUCTION

The understanding of human activity is based on discovery of the activity pattern and accurate recognition of the activity itself. Therefore, researchers have focused on implementing pervasive systems in order to create high level conceptual models to infer activities and low-level sensory models to extract context from unknown activity patterns. In this sense, a successful research has been conducted in the area of human-centric ubiquitous sensing. Specifically, smart phones could provide a large number of applications within the defined research area. Human beings involve in a vast variety of activities within a very diverse context. A specific context can be extracted by a smart phone application, which acquires relevant data through built-in sensors.

A desired activity within the context is then inferred by successful algorithmic implementations. Unfortunately, all of these operations put a heavy workload on the smart phone processor and sensors. Constantly running built-in sensors consume relatively much more power than a smart phone does for fundamental functions such as calling or text messaging.

Consequently, context-aware applications are becoming essential in our day to day life which in return implies a greater power consumption required by smart phones. In this sense, a framework is required to create a control mechanism for sensor utilizations and to help context aware applications work their functionalities properly. This paper proposes an inhomogeneous (time-variant) Hidden Markov Model (HMM) based framework in order to represent user states by defining them as an outcome of either the recognition or estimation model. Thereby, a statistical model is required to track *time-variant* user activity profiles in order to predict the best likely user state that fits into instant user behavior. As a result, user states are either recognized as an inference of actual sensor readings or as an estimation of the missing inference.

II. METHODOLOGY

The Hidden Markov Model (HMM) can be applied to a system which aims to recognize user states. In this system, sensor readings (i.e., extracted user contexts through mobile device based sensors) are seen as inputs. These readings undergo a series of signal processing operations and eventually end up with a classification algorithm in order to provide desirable inferences about user behaviors/profiles for context-aware applications. A required classification algorithm differs in terms of explanation of extracted user context through a specific sensor.

Classification algorithms produce observations (i.e., **visible states**), \mathcal{O} , of HMM. Among observations, only one observation is expected to provide the most likely differentiation in selection of instant user state representation. This observation is marked as instant observation, which also indicates the most recent element of observation sequence of HMM. On the other hand, user states are defined as **hidden states**, S , of HMM since they are not directly observable but only reachable over visible states. Therefore, each observation has cross probabilities to point any user state. These cross probabilities build an emission matrix, b_{jk} , which basically defines decision probabilities of picking user states from available observations. In addition, a user state might not be stationary since a general user behaviour changes in time. Thus, it is expected from a user state either to transit into another user state or to remain same. These occurrences build a time-variant user state transition matrix, a_{ij} , which defines transition probabilities among the user states.

The wireless network is made with different algorithms for Sensor to access the different process that may leased too many disadvantages. We propose an **HMM** scheme, which fulfills the battery lifetime of user mobility while using the multiple sensor at a time. We propose to increase the battery efficiency of 75% with the accuracy value of human activity recognition. This research intends to create and clarify a generic framework to guide the development of context aware applications. The proposed framework is validated by simulations are implemented by HAR-based application in the smart phone.

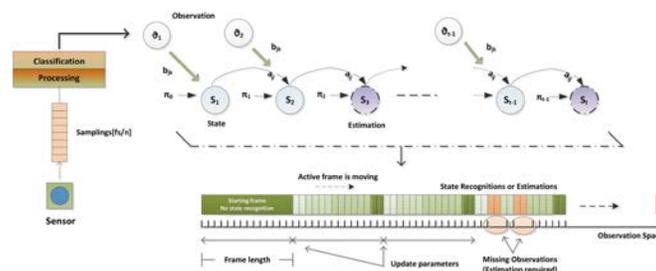


Fig. 1. Operation of the proposed framework.

III. STUDIES AND FINDINGS

ALGORITHM, BODY PARAGRAPHS , FIGURES & TABLES AND REFERENCES

A. Algorithm

The Hidden Markov Model (HMM) is a popular statistical tool for modeling a wide range of time series data. In the context of natural language processing (NLP), HMMs have been applied with great success to problems such as part-of-speech tagging and noun-phrase chunking. Hidden Markov models have close connection with mixture models. A mixture model generates data as follows. For sequence or spatial data, the assumption of independent samples is too constrained. The statistical dependence among samples may bear criticism Information. The Hidden Markov Model (HMM) is a powerful statistical tool for modeling generative sequences that can be characterized by an underlying process generating an observation sequence.

B. Body Paragraphs

The HMMs have found application in many areas interested in signal processing, and in particular speech processing, but have also been applied with success to low level NLP tasks such as part-of-speech tagging, phrase chunking, and extracting target information from documents. HMM is involved in the segment analysis along with the state transition. The main advantages of HMM are Higher Security, and Efficient in Battery life of mobile. When implementing a HMM, floating-point underflow is a significant problem. It is apparent that when applying the Viterbi or forward algorithms to long sequences the extremely small probability values that would result could underflow on most machines. Advantages in Hidden Markov chain Effective Can handle variations in record structure Optional fields, varying field ordering. Disadvantages are requiring training using an annotated data, Not completely automatic, May require manual markup, Size of training data may be an issue.

C. Figures

Like applied in simulations, only two user state scenario is taken. These are sitting and standing. The inferences related to walking and running are considered as standing since walking and running activities cause more variations over acceleration signal belonging to standing activity. To differentiate one activity to another, so many studies can be found in literature. Studies proposing online solutions mostly use decision tree based classifications with setting predefined fixed thresholds in order to cluster different states. On the other hand, some papers provide offline solutions after recording relevant observation data. These solutions propose a creation of high dimensional feature vectors at first by applying many signal processing techniques in order to extract signal characteristics such as energy, entropy, mean, rms, variance etc. in regardless of analyzing signal deeper in terms of what is really supposed to do so that a proper differentiation could be made.

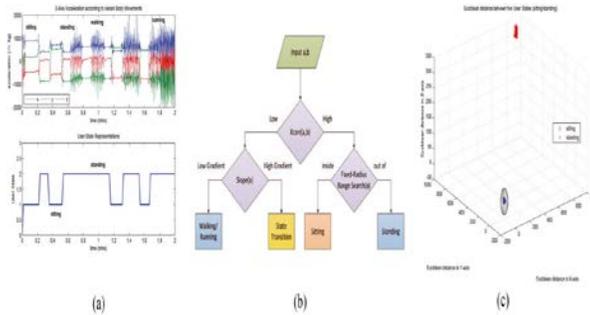


Figure 2: Observation analysis for the accelerometer sensor. (a) 3-Axis accelerometer signals. (b) User state classification. (c) Euclidean distance analysis.

D. Tables

Table 1: Filtering States While No Observation Received

Table 2: Current Consumption vs. Data Rate in Accelerometer

Filter at $t - 1$	$Pr(S_{t-1} = j \vartheta_{t-1})$
	\downarrow
Prediction at t	$Pr(S_t = j \vartheta_{t-1})$
	$\downarrow \vartheta_t$
Filter at t	$Pr(S_t = j \vartheta^t)$

$(V_{DDI/O} = 1.8 \text{ V}, V_S = 2.6 \text{ V})$	
Data Rate (Hz)	$I_{DD} (\mu A)$
100	140
50	90
25	55
12.5	40
Autosleep Mode	23
Standby Mode	0.2

E. References

Wang *et al.* who proposes a sensor management system, which is called Energy Efficient Mobile Sensing System (EEMSS). This system models user states as a discrete time Markov chain and improves a device battery life by powering a minimum set of sensors and also by applying duty cycling into sensor operation.

Rachuri *et al.* uses different sampling period schemes for querying sensory data in continuous sensing mobile systems to evaluate accuracy-power trade-offs.

IV. EQUATIONS

First order HMM is proposed for creating a statistical tool to show dependencies of states at discrete time t that are influenced directly by a state at discrete time $t - 1$. Discrete time is used to specify sensor readings which occur periodically in a system.

• **Hidden Process:**

A set of hidden states is defined as a discrete time process with a finite space of N ,

$$S_{[1:T]} = \{S_1 = i, S_2, \dots, S_T\}, \forall i \in \{1, \dots, N\}.$$

• **Initial Hidden State Probability:**

An irreducible and a periodic Markov chain that begins with its ergodic distribution:

$$\pi_i = Pr(S_0 = i), \forall i \in \{1, \dots, N\},$$
$$\pi_i \geq 0, \sum_{i=1}^N \pi_i = 1.$$

- **State Transition Probability:**

a is described as $\{N \times N\}$ state transition matrix where each element a_{ij} of a is equal to a transition probability from state i to state j ,

$$a_{ij} = Pr(S_t = j | S_{t-1} = i), \forall i, j \in \{1, \dots, N\},$$
$$a_{ij} \geq 0, \sum_{i=1}^N a_{ij} = 1.$$

- **Visible Process:**

A set of observations is defined as a discrete time process with a finite space of K ,

$$\mathcal{G}_{[1:T]} = \{\mathcal{G}_1 = k, \mathcal{G}_2, \dots, \mathcal{G}_T\}, \forall k \in \{1, \dots, K\}.$$

V. CONCLUSION

The in homogeneity is characterized by time-variant system parameters, and the user profile adaptability challenge is modelled using the convergence of entropy rate in conjunction with the in homogeneity. Simulations are run and a smart phone application is implemented in order to demonstrate how entropy rate converges in response to distinctive time-variant user profiles under different sensory sampling operations. During the recognition process, a sufficient number of signal processing techniques is applied to find out the best context-exploiting methods on the sensory signal instead of applying computationally harsh pattern recognition methods.

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Germination Response of Eggplant (*Solanum melongena* L.) Seeds to Different Vinegar Concentration as Seed Priming Agents

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Abstract- Priming materials are important to enhance germination ability of seeds. One of the materials used was vinegar. This study was conducted to determine effect of vinegar on the germination of eggplant seeds and to identify, which vinegar concentration is suitable for seeds germination. A petri dish method was used in this study with six treatments, replicated three times and arranged Completely Randomized Design (CRD). The treatments composed of five vinegar concentration (10, 1, 0.1, 0.01 and 0.001%) and a control. The parameters includes germination percentage, germination rate and germination index. The result showed that application of 0.001% vinegar concentration showed significant effects in terms of percent germination and germination rate. Application of 10% vinegar concentration has detrimental effect of eggplant seeds. Thus, application of vinegar with 0.001% concentration is effective in germination of eggplant seeds.

Index Terms- germination index, germination percentage, germination rate, priming agent, *Solanum melongena* L

I. INTRODUCTION

Eggplant (*Solanum melongena* L.) is a plant of the family Solanaceae (also known as the nightshades) and from genus *Solanum*. Eggplant is well regarded among the vegetables increasingly sought by consumers, whose demand for food with potential health promoting effects, such as disease prevention, is escalating (Cardoso et al., 2009). It is said that eggplant fruits associate good nutritional value (Ribeiro et al., 1998) and therapeutic properties (Reis et al., 2007).

According to Bajehbaj (2010) that seed priming is an efficient method for increasing seed vigor and synchronization of germination, and in addition the growth of seedlings of many crops under stressful conditions. Heydecker and Coolbear (1977) stated that one of the long known main merits of priming treatments is to increase germination and emergence rate.

The advantage of seed priming is reducing the germination time and improving emergence in field and laboratory conditions. However, few detailed studies have been reported on the performance of osmotically treated seeds under field conditions. Priming of aged seeds of okra resulted in good germination and establishment in the field trials (Sanjaykumar et al., 1996). There are a lot of benefits derived from seed priming particularly in all crops which included; faster emergence, more and uniform stands, less need to re-sow, more vigorous plants,

drought tolerance, earlier flowering, earlier harvest maturity and higher seed yield (Chavan et al., 2014; Harris et al., 2001 and Assefa, 2008.). One of priming material used in seed germination is vinegar.

Evans and Blazich (1914) stated that vinegar is safer and can be used for species that do not have an extremely hard seed coat; the technique is the same as with sulfuric acid. According to Tóbiás, et.al, (2007), vinegar types seem to be environmental friendly, cheap, and perspective dressing materials in ecological seed treatment. Acetic acid, in vinegar, is one of the most anciently used preservatives. Acetic acid is still examined in other countries as seed treating material, but it was applied only against fungi in arable cultures. Other examinations are also developed new adequate methods for seed treatment in ecological vegetable production, for example: natural compounds (Tinivella et al., 2004), plant extracts (Hartman et al., 1995), essential oils, and natural acids), antagonistic microorganisms, physical treatments (aerated steam treatment, hot water treatment (Roberts et al., 2006). Vinegar also changes pH, so the new environment is not suitable for bacteria. Acetic acid is a natural substance with low oral toxicity to humans, birds, and others who have contact with it (Borgen, 2001). Hence, this study was conducted to determine effect of vinegar as priming agents on seed germination of eggplant seeds and to identify which vinegar concentration suitable for eggplant seeds germination.

II. METHODOLOGY

A. Seed Materials

Seeds of eggplant were obtained from the Department of Horticulture, Seed Physiology Laboratory, Visayas State University, Visca, Baybay City, Leyte. Viable seeds with uniform size were selected for this experiment.

B. Seed Treatment

All the seeds of eggplant were disinfected with ethanol 70% for three minutes and rinsed three times with distilled/sterilized water, before treatments.

C. Experimental Treatment and Design

Vinegar as priming materials was used in this study using Completely Randomized Design (CRD), with the following concentration as a treatment:

Treatments:

- T1 = control (distilled water)
- T2 = 10% vinegar
- T3 = 1% vinegar
- T4 = 0.1% vinegar
- T5 = 0.01% vinegar
- T6 = 0.001% vinegar

D. Vinegar Solution Preparation

Six beakers, cleaned with a 10% bleach solution and distilled water, was labeled with their corresponding vinegar concentration. The first beaker was filled with 50 mL of 100% vinegar. A pipette was next used to transfer 5 mL of the 100% solution to the second beaker (labeled 10%). Additionally, 45 mL of distilled water was added to the second beaker, and it was gently swirled. Likewise, 5 ml of the 10% solution was transferred to the third beaker (labeled 1%). It was diluted with 45 mL of distilled water and swirled. This dilution process was repeated for the remaining three solutions (0.1%, 0.01%, and 0.001%). Eggplant seeds were soaked in a 10% bleach solution for five minutes, rinsed with distilled water, and drained. Three of the Petri plates were labeled as “control”, while the remaining Petri plates were labeled with vinegar concentration (3 Petri plates per concentration). The appropriate vinegar solution was added to each of the Petri dishes (2 ml per dish), and distilled water was added to the control dishes. In an even-spaced fashion, ten soaked eggplant seeds was added to each dish. Finally, the Petri dishes will be wrapped in bond paper and allowed to sit at room temperature for five days. After this time, seeds were examined for germination (Potts, 2008).

E. Distilled Water Application

Seeds were placed into Petri dishes with filter paper moisten with distilled water. The Petri dishes were covered with bond paper, and the seeds were incubated at 20°C in the room temperature, because the seeds germinate favorably under these conditions. The experiments were directed in triple replication with 10 seeds per replicate.

F. Measurement of Germination

After priming, seed germination tests were carried out. Ten seeds each for each treatment were placed in Petri dishes with filter paper and each experiment was replicated three times. Seeds were considered germinated when there was a visible coleoptiles protrusion through the testa.

G. Data Gathered

Germination tests

The germination percentage is an estimate of the viability of seeds. Germinated seeds were counted daily for 14 days. Seeds were also considered germinated upon emergence of radicles (≥ 2 mm) (Sharma and Sharma, 2010). The following germination parameters were recorded:

1. Germination percentage (Gp) = (# seeds sprouted/ #total seeds sprouted) x 100
2. Germination rate (Gr) was calculated using the following formula:

$$\sum GT_1/T_1 + \dots + GT_n/T_n$$

Where, GT is seeds germinated each day and T refers to the day during the trial (Siti Aishah, et al, 2010).

3. The germination index (GI) was calculated as described in the Association of Official Seed Analysts (AOSA, 1983) by following formula:

$$GI = \frac{\text{No. of germinated seed}}{\text{Days of first count}} + \frac{\text{No. of germinated seed}}{\text{Days of final count}}$$

H. Data analysis

The data was by one-way ANOVA for completely randomized design (CRD). The means were compared using Tukey’s Studentized Range (HSD) tests using the Statistical Package for Social Sciences (SPSS) ver. 15 and Statistic 6.

III. RESULTS AND DISCUSSIONS

Effect of vinegar on percentage seed germination

The number of seed germinated using vinegar as priming agent showed significant differences among treatments on the 7th and 11th day of germination but insignificant effect was observed on the 9th day after seeding (DAS) (Figure 1). On the 7th day the treatment 6 (0.001%) showed higher number of seed germinated compare other treatments but still comparable to control treatment and treatment 4 (0.1%) while on 11th day, similar pattern were observed in control, treatment 4 (0.1%), and treatment 6 (0.001%). This greatly explains that the use of vinegar as priming agent showed significant effect in germinating seeds, particularly in increasing the number of germination in early days such as on 7th day and 11th day. The result of this study was in agreement with the experiment of Borgen (2001) on vinegar in relation with concentrations’ effect and germination ability. Higher concentration have negative effect on seed germination ability seems to be proportional to the applied dose. In his study 0.5% of red and white wine vinegar and 5% of white wine vinegar have simulative effect on germination ability. In the experiments of Lövinson (1900) it retarded the germination of peas.

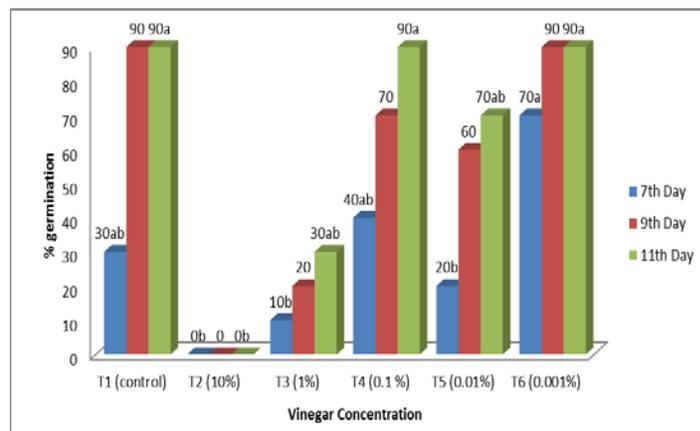


Figure 1. Effect of vinegar on seed germination percentage

Effect of vinegar on germination rate and germination index

Germination rate provides a measure of time course of seed germination (Saupe, 2009). The result showed that in treatment 6 (0.001%) of vinegar, obtained higher rate of seed

germination compared to other treatment but statistically comparable to control, T3, T4 and T5 (Figure 2). This can be noted that vinegar had significantly influenced the germination rate of eggplant seeds. This result is in agreement with the study of Tobias et al. (2007) on the germination ability test of vinegar in which the result did not show negative effect on seed germination ability with the use of vinegar except the vinegar in 5% concentration. On the other hand, the significant positive effect on was the germination ability. They also noted that the low concentration (0.5%) of red and white wine vinegar mend the germination capacity, but this effect is not significant. In the experiment of Tobias et al. (2007), results showed that the examined bacterial strains were more sensitive to acidic than alkaline circumstances and it was noticed on their experiment that the lowest examined concentration (0.5%) of vinegars had also bactericide impact. They also stated that in the alkaline materials it is necessary to use higher concentration of at least pH 13 (1.5% NaOH), but it had not impact in all case. They further noted that the highest soluble concentration of NaHCO₃ was 10% (pH 9). They concluded that all examined vinegar types could be useful in biological plant protection systems against bacterial diseases of tomato and pepper. However, Ling et al. (2009) noted that the germination indexes not only contained the number of germination, but also emphasized germination velocity and it was noticed that the seeds at different time played different roles in germination index. Therefore, germination index were a good indicator of seed vigor. However, the results of this study showed that a non-significant difference was observed on the germination index as applied with different concentration of vinegar (Figure 3).

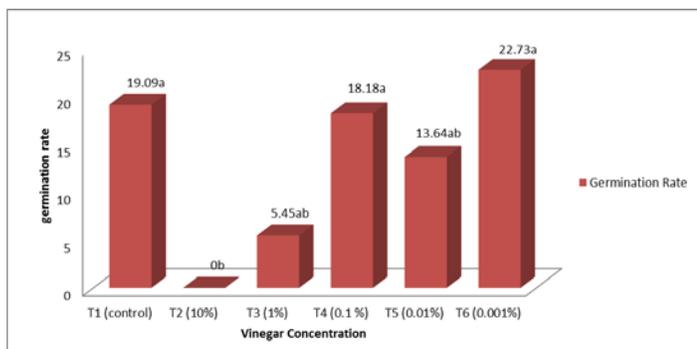


Figure 2. Effect of vinegar on germination rate

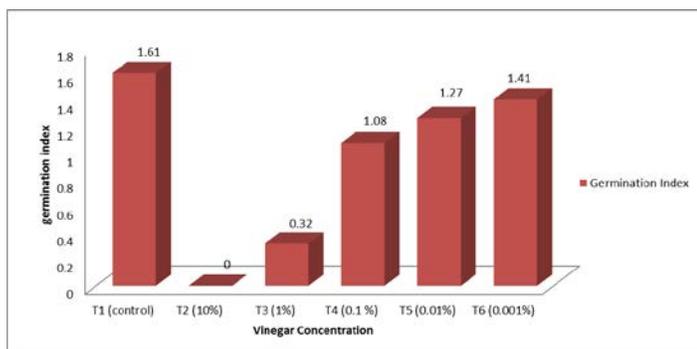


Figure 3. Effect of vinegar on germination index

IV. CONCLUSION

It can be concluded that the used of vinegar as priming material is effective in germinating the seeds. Application of 0.001% concentration showed significant effects on percent germination and germination rate. Thus, application of vinegar with 0.001% concentration has proved to have best effect on germination of eggplant seeds and application of 10% vinegar concentration showing detrimental effect.

ACKNOWLEDGMENT

I would like to acknowledge the helped of my very special friends Miss Maita L. Aban from Kanlaon Dormitory, Visayas State University, Visca, Baybay City, Leyte .

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Block wise image compression & Reduced Blocks Artifacts Using Discrete Cosine Transform

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Abstract- Image compression with DCT, quantization encoding method transform coding is widely used in image processing technique, however in these transformations the 2-D images are divided into sub-blocks and each block is transformed separately and into elementary frequency components. These frequency components (DC & AC) are reducing to zero during the process of quantization which is a lossy process. In this paper we are discussing about the image compression techniques with DCT and quantization method for reducing the blocking artifacts in reconstruction. The proposed method applies to several images and its performance is further analyzed for the reduction in image size. The picture quality between the original image and reconstructed image measured with PSNR value with different quantization matrices.

Index Terms- Discrete Cosine Transformation, Quantization Matrix, Image Processing, PSNR

I. INTRODUCTION

Data compression is defined as the process of encoding the data using a representation that reduce the overall size of the data. This reduction is possible when the original dataset contains some type of redundancy. Compression is a process to represent the image in less number of bits. This property is helpful to storage and transmission the data over internet. In the past decade many aspects of digital technology have been developed specifically in the fields of image acquisition [1, 3, 5], Data storage and bitmap printing compressing. The original image is significantly different from the compressing raw binary data image which has certain statistical properties. Encoders specifically designed for them provide the result which is less then optimal when using general purpose compression programs to compress image [19]. One of many techniques under image processing is image compression which has many applications and plays important role in efficient transmission and storage of images [14]. Digital image compression is a field that studies different methods for reducing the total number of bits required to represent an image with good picture quality. This can be achieved by eliminating various types of [1] redundancy that exist in the pixel values. The transform coding is widely used in image compression and getting more and more attention day by day [4]. Compression is useful to reduce the cost of extra use of transmission bandwidth or storage for larger size images. Hence from this we can reconstruct a good accession of the original image in accordance with human visual perception

The rapid growth of digital imaging application, including desktop publishing, multimedia, teleconferencing and high definition television has increased. Hence the needs for effective and standardized image compression techniques are still required. The discrete cosine transformation which is a close relative as the DFT large dominate role in image compression [2]. The discrete cosine transform works to separate images into parts of different frequencies in quantization process where part of compression actually occurs, the less important frequencies are discard hence the use of the term 'lossy', so that the only most important frequencies those remain are used to retrieve the image in the decompression process.

DCT is used to map an image space into a frequency. DCT has many advantages like it has the ability to peak energy in the lower frequency for the image data and also it has the ability to reduce the blocking artifact effect where the boundaries between sub images become visible. The DCT de-correlates image data. Therefore due to this each transform coefficient is encoded independently without losing compression efficiency.

The Discrete cosine transform (DCT) is a method for transforms an image from spatial domain to frequency domain. In this paper, we are presenting a lossy discrete cosine transformation (DCT) compression technique for two-dimensional images. In the several scenarios, the utilization of the proposed technique of image compression results the better performance, when compared with the different modes of lossy compression. Here we also propose the reconstruction technique of image that models compression and exploits the quantization step size information in reconstruction. The proposed algorithm allows us to use the statistical information about the quantization. The framework is especially designed for the popular discrete cosine transformation (DCT) based compression method in which the linear transformation is involved. The proposed method of DCT based coding partitions the images into small square blocks (4x4, 8x8, 16x16, & 32x32) and then DCT is obtained over these blocks to remove the local spatial correlation. The substance of these specifications is to remove the considerable correlation between adjacent picture elements to reduce the visible blocks. After applying the DCT, the quantization process in applied to reduce the redundancy of the data. At the decoder end, the received data is decoded, de-quantized, and reconstructed by Inverse DCT. The proposed technique of DCT transformation provides three important result related to image quality to perform the analysis of the proposed technique like Peak to signal noise ratio (PSNR), mean square error (MSE) and compression ratio (CR) from gray images. The

simulation and implementation of the proposed technique is performed in MATLAB.

Fourier-related transform similar to the Discrete Fourier Transform (DFT), using only real numbers. Since DCT is real-valued, it provides a better approximation of a signal with fewer coefficients.

II. DISCRETE COSINE TRANSFORM

The DCT is regarded as a discrete-time version of the Fourier-cosine series [6, 12, 20]. Hence, it is considered as a

$$f(u, v) = \frac{2}{N} C(u)C(v) \sum_{x=0}^{N-1} \sum_{y=0}^{N-1} f(x, y) \cos \left[\frac{\pi(2x + 1)u}{16} \right] \cos \left[\frac{\pi(2y + 1)v}{16} \right] \dots \dots \dots (1)$$

for $u = 0, 1, 2, \dots, N - 1$, and $v = 0, 1, 2, \dots, N - 1$

$$C(k) = \begin{cases} \frac{1}{\sqrt{2}} & \text{for } k = 0 \\ 1 & \text{otherwise} \end{cases}$$

The process of decomposing a set of block (8x8) into a scaled set of a cosine basis function is discrete cosine transform. The process of reconstructing the set of samples from the scaled set of cosine basis function is called the inverse discrete cosine transform. This can describe as:

$$f(x, y) = \frac{2}{N} \sum_{u=0}^{N-1} \sum_{v=0}^{N-1} C(u)C(v) f(u, v) \cos \left[\frac{\pi(2x + 1)u}{16} \right] \cos \left[\frac{\pi(2y + 1)v}{16} \right] \dots \dots \dots (2)$$

for $x = 0, 1, 2, \dots, N - 1$, and $y = 0, 1, 2, \dots, N - 1$

The DCT is similar to the discrete Fourier transform it transforms a signal or image from the spatial domain to the frequency domain.

III. DCT BASED IMAGE COMPRESSION

The DCT is a fast transformation method that takes an input and transforms it into linear combination of weighted basis function, these basis function are commonly the frequency, like sine waves. DCT compression seems to work better than the discrete Fourier transform method possibly because it allows smoother transitions between adjacent blocks. We know that be the DCT uses lower spatial frequencies with respect to DFT. The DCT transform is generated by dividing the pattern into square blocks and then reflecting each block about the $x \times y$ axes [6, 8, 11, 9]. A DCT block is a group of pixels of an 8x8 window. DCT grid is the horizontal and vertical lines that partition an image into blocks for the compression. After computation of image compression the IDCT algorithm is used to generate reconstructed image. The 2-D DCT transform applied separately to each block, irrelevancy reduction is then applied to the resulting transform coefficients of each block such that the most

relevant information is retained for transmission or storage while the rest is eliminated [17, 5, 15, and 18]. The DCT transforms the images of block size (4x4, 8x8, 16x16, & 32x32) pixels and the DCT is typically restricted to this size rather than taking the transformation of the image as a whole, the DCT is applied separately to blocks of the images. The DCT coefficients for each block are quantized separately by discarding the redundant and information high-coefficients. After transformation the image is applied for quantization method and receiver decodes the quantized DCT coefficients of each block separately and computes the 2D-IDCT of each block and then puts the blocks back together into a single image. The image file size is also reduced by dividing the coefficients into a quantization matrix. De-quantized and compressed image is reconstructed by using Inverse discrete cosine transformation although there is some loss of quality in the reconstructed image. It is recognizable as an approximation of the original image. The whole procedure is presented in figure 2.

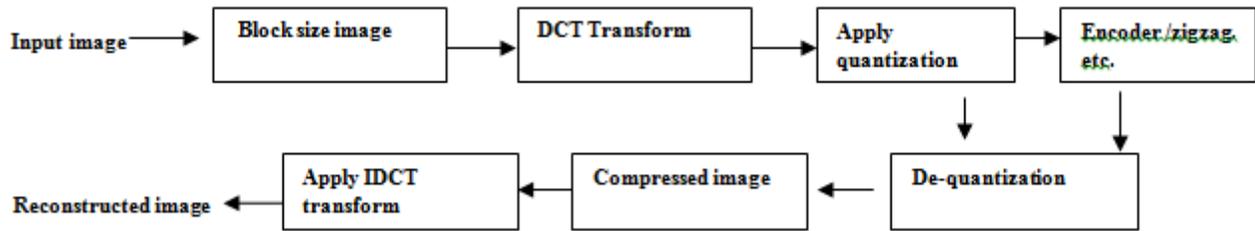


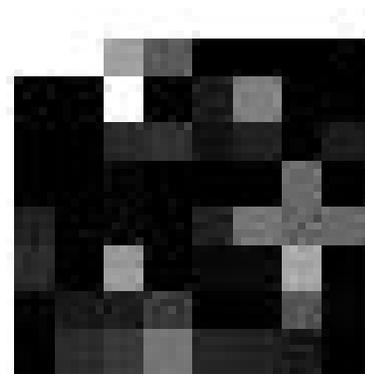
Fig.-02 Block diagram for image compression using DCT and IDCT

The 8x8 image block uses a set of 64 two-dimensional cosine basis functions that is created by multiplying horizontally oriented set of one-dimensional 8 point cosine basis function by vertically oriented set of same functions [15]. The horizontally oriented set of cosine coefficient represents the horizontal frequencies and the other set of coefficients represents the

vertical frequencies. An N×M matrix image transform to DCT an 8×8. The transform of DCT is applied to each row and column. Images are separated into part of different frequency by the DCT as seen the figure 03. Each block of 8*8 is converted to a frequency domain representation using a 2D- DCT.



Original image



DCT apply transform image

Fig.-03

The coefficient with zero frequency in both dimensions is called the DC coefficients and the remaining 63 coefficients are called AC coefficients. The DC value is a sum over the whole image coefficients. The DC [17, 16] is a term of the horizontal basis which stored to the left of the output matrix whereas DC is a terms vertical basis function stored at the top. Thus, the top left corner of the matrix is the DC coefficients. The DC coefficients

are of low bit rates, so that many high-frequency coefficients are rejected and the quantization of the DC coefficients generally causes the mention level of each block within a quantization interim. The 8 X 8 matrix of the original image can represent in table 1 and the table 2 presents the 8 X 8 matrix of the same image after applying the DCT method.

143	142	140	139	138	139	140	140
141	140	139	138	137	138	139	140
139	138	137	136	136	138	139	140
137	137	136	135	136	138	139	141
138	137	137	136	137	138	141	141
141	140	139	138	139	138	141	143
145	144	142	141	141	140	143	144
148	146	145	143	142	143	144	144

Table-1 Original image matrix (8×8)

The signal energy lies at low frequencies. It appears in the upper left corner of the DCT as shown above in table 2 [11, 9]. Therefore the compression is achieved with lower right values those represent higher frequencies.

DC coefficients		AC coefficients					AC coefficients
191.8750	18.1593	0.6253	0.3499	-0.1250	-0.0455	-0.1237	-0.2295
-11.8915	-12.2765	6.6924	-0.2246	0.0982	0.4984	-0.5590	-0.2612
-6.8943	-7.5500	0.1616	0.1920	0.0676	0.1283	-0.6402	0.1063
-7.2842	-0.0503	0.0227	-0.1053	-0.1734	-0.0789	0.4131	-0.2923
0.1250	-0.5161	0.0280	-0.2169	0.1250	0.4564	0.3943	0.4071
0.1669	-0.0613	0.6044	-0.1521	0.0345	0.0425	0.6549	-0.5074
0.0144	0.0938	0.1098	0.2190	-0.1633	0.0115	0.3384	0.0187
-0.2606	0.1656	0.2227	0.4587	0.1470	0.1289	0.0957	-0.1607

Table-2 after apply DCT transform method in image pixel value (8x8)

IV. QUANTIZATION

Quantization is the process of reducing the number of possible value of quantity. Quantization is achieved by compressing a range of [7, 13] values to a single quantum. It gives the value when the number of discrete symbols in a given stream reduced the stream image compressible. Quantization is done by dividing each of the DCT coefficients by a quantization coefficients value and then rounding off the resulting value to an integer. Higher quantization coefficients value produces more compact output data but the quality of image degrades because of the DCT values are represented less accurately. It allows varying levels of image compression and quality through selection of specific quantization matrix. Thus quality levels ranging from 1 to 100 can be selected. This allows to greatly reducing the amount of information with high frequency components. This can implement by simply dividing each component in the frequency domain by a constant for that component, and then rounding the nearest integer. This is the main loss operation in the whole process. Thus, it is typically the case that many of the higher frequency components are rounded to zero and many of the rest become small number, which take many fewer bits to store.

V. IMPLEMENTATION & SIMULATION DESIGN

In this implementation & simulation design we transformed the whole image by DCT to all image pixels and image pixels size divided in 8x8 blocks. Now, the DCT is applied to each row and columns of the each 8x8 pixels block of an image. A DCT operation on this image provides very good frequency image with low spatial details. These transformed images provide very good energy computation in the low frequency region. In this

image compression method, after applying DCT and dividing the image into 8x8 blocks the second step of quantization starts. The quantized object reduces most of the less high frequency DCT coefficients to zero. These more zeros will produce the higher image compression & lower frequencies and used to reconstruct the image. Higher frequencies are discarded by the quantization matrix recommended for luminance data (gray scale image) low frequencies in the upper left and higher frequencies in the lower right. Sub blocks in the source encoder exploit some redundancy in the image data in order to achieve better compression. The transformation sub-blocks de-correlates the image data thereby reducing (& in some case eliminating) inter pixels redundancy. The principal advantage of image transformation is the removal of redundancy between neighboring pixels. The quantization is to discard coefficients with relatively small amplitude without introducing visual distortion in the reconstructed image. DCT exhibits excellent energy computation for highly correlated images. The equation for generating the quantization matrix (QM) can represent as:

$$QM(i,j) = (1 + (i + j) * Q) \dots\dots\dots (3)$$

Where Q is the quality factor with value ranging from 1 to 100. Quality (Q) indicates the loss of data after compression. Higher value of the quality factor Q makes the coarser quantization and more loss of the information are in the image. Thus, high values of Q produce images with worse quality but more compactness. The number of coefficients used in this scheme is determined by using a performance metric for compression. Furthermore, a simple differencing scheme is performed on the coefficients that exploit correlation between high energy DCT coefficients in neighboring blocks of an image as shown in table 3.

31	46	61	76	91	106	121	136
47	62	77	92	107	122	137	152
63	78	93	108	123	138	153	168
79	94	109	124	139	154	169	184
95	110	125	140	155	170	185	200
111	126	141	156	171	186	201	216
127	142	157	172	187	202	217	232
143	158	173	188	203	218	233	248

Table-3 Quantized matrix (QM)

Each 8×8 DCT block is divided by quantization matrix and produces a resultant matrix which is nearest to the zeros value. All higher- frequency components will be rounded down to zero as shown in figure 4 and table 4.

$$quantized\ matrix(i,j) = round\left(\frac{DCT(i,j)}{QM(i,j)}\right) \dots\dots\dots (4)$$

6	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

Table-4 Quantization matrix apply after quantization formula



After apply quantization matrix image

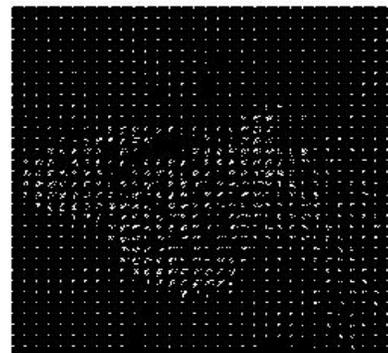


Fig.-04 After apply quantization matrix (Block wise) transformed image

De-quantization process works in reverse manner as IDCT. The image is reconstructed after the De-quantization process. De

quantization which maps the quantized value back into its original range (but not its original for precision) is achieved by

multiplying the quantized matrix with DCT transform matrix (i, j) as shown in equation 5 and table 5.

$$dequantization = quantized\ matrix(i, j) \times DCT\ matrix(i, j) \dots \dots \dots (5)$$

186	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0

Table-5 De-quantization matrix

Process of de-quantization is performed on each 8x8 block. During de-quantization process each quantized element is multiplied with corresponding element of quantized matrix and is rounded off block. After de- quantization process we have

applied IDCT transformation to reconstruct the compressed image. It is observed that the original image of size 10.8 kb is compressed to 6.73kb after applying improved method as shown in figure 5 and table 6.



Fig-05 Reconstructed image after apply IDCT

140	140	140	140	140	140	140	140
140	140	140	140	140	140	140	140
140	140	140	140	140	140	140	140
140	140	140	140	140	140	140	140
140	140	140	140	140	140	140	140
140	140	140	140	140	140	140	140
140	140	140	140	140	140	140	140
140	140	140	140	140	140	140	140

Table-6 Reconstructed image matrix

VI. RESULTS & DISCUSSION

In the proposed implementation we considered the gray scale images of sizes (128×128, 256×256 & 512×512). The images are subdivided into 4×4, 8×8, 16×16 & 32×32 blocks and transformed with DCT. Each DCT coefficient was near to 8-bit

$$MSE = \frac{1}{m, n} \sum \sum (X_{i,j} - Y_{i,j})^2 \dots \dots \dots (6)$$

Where X is original image, Y approximation of decompressed image and m, n are dimensions of the image.

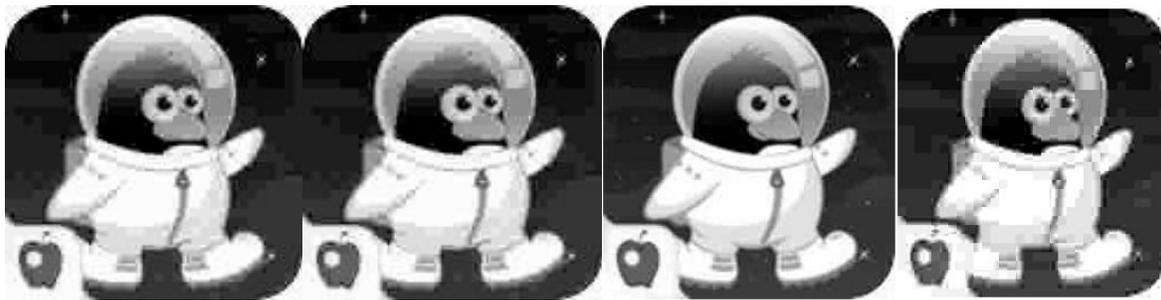
$$PSNR = 20 * \log_{10} \left(\frac{255^2}{MSE} \dots \dots \dots (7) \right)$$

$$CR = \left(\frac{\text{Original image size} - \text{Reconstructed image size}}{\text{Original image size}} \right) \times 100 \dots \dots \dots (8)$$

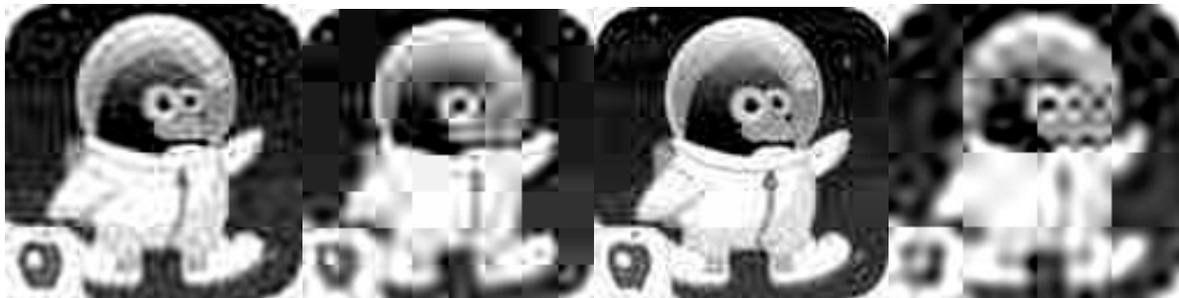
In this simulation the DCT Transformation has been applied with quantization on the images to compress the images. These methods are applied on the gray scale images of resolution size 128×128, 256×256 & 512×512. This transformation transformed the images after subdividing the images in the different block sizes. Performance is analyzed by reconstructing these images into same size of blocks. The performance is majored on the basis of three parameters i.e. PSNR, CR & MSE. The first experiment applied on an image of resolution size (128×128). The image is subdivided into blocks of 4×4, 8×8, 16×16 and 32×32. The performance of reconstructed image quality is considered after applying the DCT with quantization & inverse DCT. The obtain quantization matrix was applied corresponding to block size of image. The experiment results indicate that image after the DCT transformation is subdivided into the block size (4×4) for compression after applying quantization matrix and if quantization value (10) is increased step by step to keep block size fixed then reconstructed image picture quality shows

precision. The DC coefficients are integers in the range of [-128,127]. The AC coefficients are integers of interval [0, 256]. To evaluate the performance of image compression we used MSE (Mean Square Error), PSNR (Peak Signal Noise Ratio) and compression ratio (CR) as:

that the PSNR, MSE & CR values becomes 31.6416db, 44.457 & 2.4 respectfully. Further if the quantization matrix is multiplied by 20 then PSNR, MSE & CR becomes 27.8629db, 106.3622 & 2.4. It is also observed that if quantization matrix is increased after multiplying by 50 then PSNR, MSE & CR values become 23.3885db, 298.0070 & 8.53 respectively. The reconstructed image quality can see in figure 6(a) & 6(b). Now if image is subdivided into the 8×8 block and same procedures applied as described above, then PSNR and CR values become (if Q×10) 28.6520db & 25.6 respectively. If Q is multiplied with 20 then PSNR and CR values become 25.5273db & 40.26 respectively. If the maximum quantization value as set by the experiment is considered (Q×50) then PSNR & CR becomes 22.0002db & 55.2 respectively. Now if we increased the block size of image to 16×16 & 32×32 and applied the same process to reconstruct the images then the PSNR value decreases but compression ratio and MSE error are increased as shown in result table-I, figure 6(a) and 6 (b).



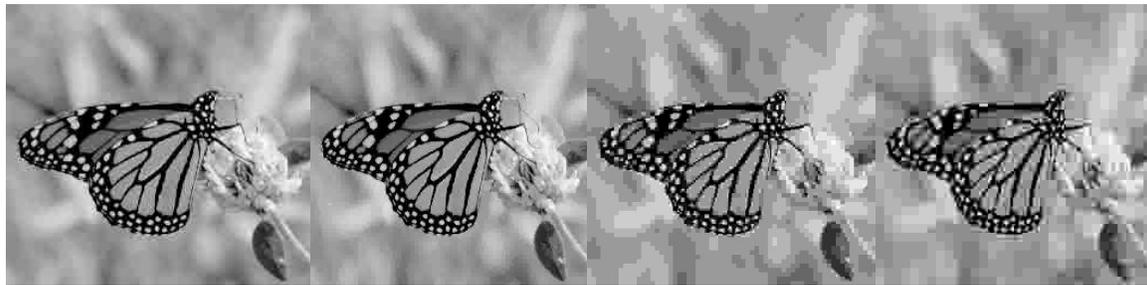
Block size 4x4 Block size 8x8 Block size 16x16 Block size 32x32
Fig.-06 (a) Minimum quantization matrix apply DCT & IDCT image reconstructed



Block size 4x4 Block size 8x8 Block size 16x16 Block size 32x32
Fig.-06 (b) nm (128x128) Maximum quantization matrix apply DCT & IDCT image reconstructed

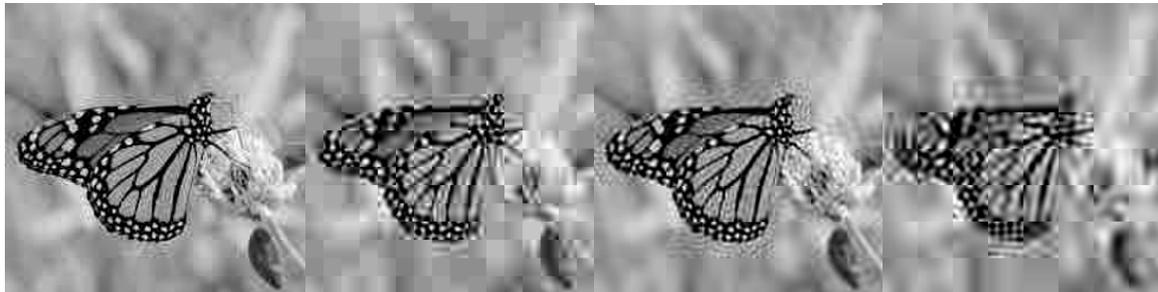
The second experiment applied on butterfly image of resolution size (256x256). The image is subdivided into blocks of 4x4, 8x8, 16x16 and 32x32. Performance is analyzed by reconstructing these images into same size of blocks. The performance is majored on the basis of three parameters i.e. PSNR, CR & MSE. The obtain quantization matrix was applied corresponding to block size of image. The obtain quantization matrix was applied corresponding to block size of image. The experiment results indicate that image after the DCT transformation is subdivided into the block size (4x4) for compression after applying quantization matrix and if quantization value is increased step by step to keep block size fixed then reconstructed image picture quality shows that the PSNR, MSE & CR values (seen result table-I) becomes 31.9516 db, 44.457 & 0.92 respectively. Further if the quantization matrix is multiplied by 20 then PSNR, MSE & CR becomes

28.3462db, 106.3622 & 2.77 respectively. It is also observed that if quantization matrix is increased after multiplying by 50 then PSNR, MSE & CR values become 24.0497db, 298.0070 & 5.55 respectively. The reconstructed image quality can see in figure 7(a) & 7(b). Now if image is subdivided into the 8x8 block and same procedures applied as described above, (according result table-II) then PSNR and CR values become (if Qx10) 29.3524db & 29.35 respectively. If Q is multiplied with 20 then PSNR and CR values become 24.4702db & 46.38. If the maximum quantization value as set by the experiment is considered (Qx50) then PSNR & CR becomes 22.9886 db & 61.75 respectively. Now if we increased the block size of image to 16x16 & 32x32 and applied the same process to reconstruct the images then the PSNR value decreases but compression ratio and MSE error are increased as show in result table-II figure 7(a) & 7(b).



Block size 4x4 Block size 8x8 Block size 16x16 Block size 32x32

Fig.-07(a) Minimum quantization matrix apply DCT & IDCT reconstructed image



Block size 4x4 Block size 8x8 Block size 16x16 Block size 32x32

Fig.-07(b) Butterfly (256x256) Maximum quantization matrix apply DCT & IDCT image reconstructed

In the last stage of experiment we used a maximum resolution size image of Barbara (512x512). The image is subdivided into blocks of 4x4, 8x8, 16x16 and 32x32. Maximum dimension of image Barbara is divided into a maximum block size & compressed the image and we observed the reconstructed image quality as shown in figure 8(a) & 8(b). Now after obtaining the transformed image we analyzed the reconstructed

image quality. Therefore if quantization matrix is multiplied with 10 then image quality PSNR values, coming maximum. Respectively Now if quantization matrix is multiply with 20 then image quality PSNR value are decreasing, but compression ratio CR & MSE values are increasing respectively, seen result table-III



Block size 4x4 Block size 8x8 Block size 16x16 Block size 32x32

Fig.-08 (a) Minimum quantization matrix apply DCT & IDCT image reconstructed



Block size 4x4 Block size 8x8 Block size 16x16 Block size 32x32

Fig.-08 (b) Woman (512x512) Maximum quantization matrix apply DCT & IDCT image reconstructed

Now if we increased the block size of image to 16×16 & 32×32 and applied the same process to reconstruct the images then the PSNR value decreases but compression ratio and MSE error are increase as show in figure 8(a) & 8(b). It is also observed that if block size is fixed for compressed image and the quantization matrix are increased step by step then the PSNR of reconstructed block size image decreases. It is also observed that when the quantization matrix assigns the maximum value then reconstructed image gets blurred because its MSE value increases.

VII. CONCLUSION

In this paper the technique of DCT and quantization is used to compress the images of different sizes. The inverse DCT is used to reconstruct the images on the varying block sizes i.e. 4×4 , 8×8 , 16×16 , 32×32 . The quantization matrix is constructed and increased until the best result is not obtained for reconstructed compressed images. The 256×256 size of butterfly image as shows above is reconstructed. This image is containing higher PSNR value among all the experiment with minimum error. It indicates that DCT compress the image with high quality when the original image is of 256×256 resolution size. It is also observed that the minimum quantization matrix is used for lossy compression to improve the picture quality. In this case the PSNR value becomes maxima with minimum CR and MSE values. The vice-versa results were also obtained if the maximum quantization matrix is used. The original image was reconstructed after DCT, quantization, de-quantization and IDCT with verifying the accuracy of implementation that reduce the blocking artifacts and simultaneously improve PSNR value of reconstructed image.

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A Review on Memristor MOS Content Addressable Memory (MCAM) Design Using 22nm VLSI Technology

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Abstract- Large capacity content addressable memory (CAM) is a key element in wide variety of applications. A major challenge in realization of such systems is the complexities of scaling MOS transistors. Convergence of different technologies, which are well-matched with CMOS processing may allow extension of Moore's law for a new years. This paper provides a new approach towards the design and modeling of memristor based CAM (MCAM) using a combination of MOS devices to form a core of a memory or logic cell that forms the building block of the CAM architecture. The non volatile characteristics and the nanoscale geometry together with compatibility of the memristor increases the packing density with CMOS processing technology, provides for the new approaches towards power management through disabling CAM blocks without loss of stored data, reduces power indulgence, and has scope for speed improvement as the technology matures.

The memristor behaves as a switch, greatly like a transistor. However, not like the transistor, it is a two terminal instead of three-terminal device and does not need power to retain either of its two states. A memristor changes its resistance between two values and this achieved via the movement of mobile ionic charge within an oxide layer. This behaviour influences the architecture of CAM systems, there is no loss of stored data even if the power supply of CAM blocks are disabled. Therefore, memristor-based CAM cells have the potential for major saving in power dissipation.

Index Terms- Content addressable memory(CAM), memory, memory resistor-based CAM (MCAM), SRAM.

I. INTRODUCTION

The research for a new model that will attain processing speed in order of an exa flop and further into zeta flop order is a major challenge for both circuit designers and system architects. The evolutionary growth of networks such as Internet also brings about the need for realization of new components and related circuits that are compatible with CMOS process technology as CMOS scaling begins to slow down. As Moore's law becomes more complicated to fulfill, integration of considerably different technologies such like spintronics, carbon nano tube field result transistors, optical nano circuits based on meta material, and more recently the memristor, are in more focus thus creating new possibilities towards realization of innovative circuits and systems within the system on system (SOS) domain.

In this project we explore conceptualization, propose, and

modeling of memory cell as a part of a memristor based content addressable memory (MCAM) architecture using a combination of switch as memristor and n-type MOS devices. A typical content addressable memory cell forms a SRAM cell that has two p-type MOS transistors. Construction of a SRAM cell that use memristor technology, which has a non volatile memory behaviour and can be fabricated as an extension to a CMOS process technology with nanoscale geometry, addresses the main thread of current CAM research towards reduction of power utilization. The design of a CAM cell is based on fourth inactive circuit element, the memristor predicted by Chua in 1971 and generated by kang. Chua postulated that a replacement circuit component outlined by the one valued relationship $d\phi = Mdq$ must exist; where by current moving through memristor is proportional to the flux of magnetic field that flows through the material. So memristor-based CAM cells have the potential for vital saving in power dissipation.

A. Conventional CAM Structures:-

A content addressable memory takes a search word and returns the matching memory location. Such an approach can be considered as a mapping of the large space of the input search word of that smaller space of output match location in a single clock cycle. There are various application as well as translation look aside buffers (TLV), image coding, classifiers to forward internet protocol (IP) packets in network routers, etc. Inclusion of memristors in the architecture ensures that data is retained if the power source is removed enabling new possibility in the system design including the all important issue of power management.

B. Conventional CAM :-

To better appreciate some of the benefits of our proposed structure we provide a brief overview of conventional CAM cell using static random access memory. It comprises of the two inverters that form the latch use four transistor including two p-type transistors that normally require more silicon area. Problems such as comparatively high leakage current particularly for nano scaled CMOS technology and the need for inclusion of both VDD and ground lines in each cell bring further challenges for CAM designers in order to increase the packing density and still maintain sensible power indulgence. Thus, to satisfy the grouping ultra dense designs, low, high-performance. The SRAM cell is the focus of architectural design considerations.

For instance, one of the known problems of conventional 6-T SRAM for ultra low-power applications is its static noise margin (SNM). Fundamentally, the main technique use to design an ultra-power memory is voltage scaling that brings CMOS operation down the subthreshold rule. Verma and Chandrakasan show that at very low supply voltages the static noise margin for SRAM will disappear due to process variation to address the low SNM for subthreshold supply voltage Verma and Chandrakasan proposed 8-T SRAM. This means, there is a need for significant increase in silicon area to have reduced failure when the supply voltage has been scaled down. Failure is a major issue in designing the ultra dense memories. Therefore, a range of fault tolerance techniques are usually applied. As long as the defects and failure results from the SRAM structure, a usual approach such as duplication of memory cells can be implemented. observably it causes a large transparency in silicon area which exacerbates the issue of power consumption.

II. LITERATURE REVIEW & RELATED WORK

From the rigorous review of related work and available literature, it is experimental that many researchers have designed MOS content addressable memory by applying special techniques. Researchers have undertaken special systems, processes or phenomena with consider to design and analyze MOS content addressable memory and attempted to find the unidentified parameters. Since in the real world today VLSI/CMOS is in very much in command, from the cautious study of reported work it is observed that very few researchers have taken a work for designing MOS content addressable memory with CMOS/VLSI technology.

Memristor was originally envisioned in 1971 by circuit theorist Leon Chua as a missing non-linear passive two terminal electric component relating electric charge and magnetic flux relation. Leon Chua more freshly argued that the definition should be generalized to cover all forms of 2-terminal non-volatile memory devices based resistance switching effects although some experimental evidence contradicts this claim. In 2008 team at HP labs announced the development of switching memristor based on a film of titanium dioxide this devices are intended in nano electric memory, and computer logic

On January 2009 Di ventra, Pershin, Chua extended the notion of memory system to capacitive and inductive element namely capacitors and inductors whose properties depend on the state and history of system. On April 20 Memristor-based content addressable memory (MCAM) was introduced. On June 1 Mouttet argued that the interpretation of the memristor as a fourth fundamental was incorrect and that the HP Labs device was part of a broader class of memristive systems.

On September-October 2010 Ujwala A. Belorkar has researched on application of 45nm VLSI technology to design layout of static RAM memory.

In October 2011 Tse demonstrated printed memristive counters based on answer processing, with possible applications as low-cost packaging components (no battery needed; powered by energy scavenging mechanism). On March 23, 2011 HRL laboratories and the university of Michigan announced the first functioning memristor array built on a CMOS chip for

applications in neuromorphic computer architectures. On July 31, 2012 Meuffels criticized the generalized memristor concept.

On February 27, 2013 Thomas et al., designed a memristor which is easy for learning. The approach utilizes memristors as key components in a blueprint for an artificial brain. On April 23, 2013 Valov, et al., said that the current memristive theory must be extended to a whole new theory to properly.

Depict redox-based resistively switching elements (ReRAM). The main reason is the existence of nanobatteries in redox-based resistive switches which violates the memristor theory's requirement for a pinched hysteresis. Both the conventional CAM and MCAM circuits have been implemented using Dongbu HiTech 0.18- μ m technology where 1.8 V is the nominal operating voltage for the CAM. The MCAM cell is implemented with nMOS devices and memristors without the need for voltage source.

From the careful study of reported work, it is observed that researchers have planned various techniques to design the chip and to improve its characteristics and various parameters but up to the result of my survey regarding memristor based MCAM design.

It is also well known to that; VLSI technology is the fastest growing field today. And according to Moore's law which state that the number of transistors on an integrated circuit will double every 18 months. By scaling behind the technology, we can optimize the parameters like power utilization. The modern technology up to 2008 was lower range of nm technology. Hence considering the improvement of future technology and the advantage of 45 nm technology over 65 and 90 nm technology, the proposed project has been determined to do with the selection of higher order of nm technology.

Considering all this constraint about the demand of today's fast communication world, the research has been taken to design low power MCAM using 22nm VLSI technology.

III. DESIGN METHODOLOGY

Memristor is a new- found fundamental circuit element whose behaviour is predicted is using either the charge dependant function called memristance or flux dependant function called memductance. Therefore, it is important to find the memristance or memductance function of memristor. The methodology advise first doing numerous experiment with a memristor using a square-wave signal to acquire data and then using algorithm inspired by the experiment on ionic memristor. The keywords use for this design is content addressable memory (CAM), memory, memory-resistor based CAM (MCAM), memory-resistor based MOS hybrid design, modeling. Every step of design follows the design flow of microwind 3.1 software. The design methodology will be according to VLSI backend devise flow. The main objective is to design and examine the hybrid architecture of MCAM for future high performance engines .To achieve the proposed target following steps are included in the design and analysis of proposed MCAM.

1. Schematic design of proposed MCAM using CMOS transistors.
2. Performance verification of the above for different parameters.

3. CMOS layout for the proposed MCAM using VLSI backend.
4. Verification of CMOS layout and parameter testing.

If the aim is achieved for all planned parameter including detail verification, sign off for the design analysis and design will be ready for IC making.

If detail authentication of parameters would not finished then again fallow the first step with different methodology.

To achieve the proposed MCAM, different methodology and techniques can be used for research. The MICROWIND3.1 program allows to design and simulate an integrated circuit at physical description level. The package contains a records of common logic and analog ICs to analysis and simulate. MICROWIND3.1 includes all the commands for a mask editor as well as original tools never gathered before in a single module (2D and 3D method read, VERILOG compiler, tutorial on MOS devices). We can add access to circuit simulation by pressing one single key. The electric removal of circuit is mechanically performed and the analog simulator produces voltage and current curves immediately.

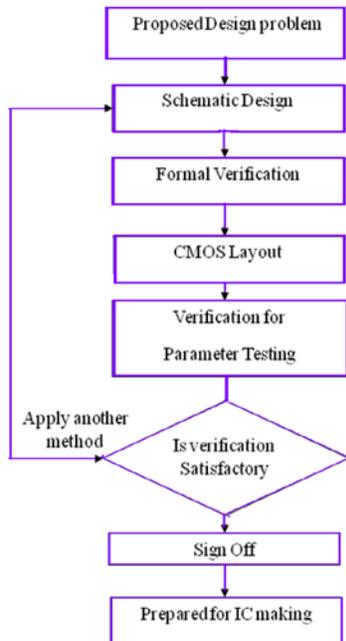


Fig 1: Design Flow Chart.

VI. CONCLUSION

To the best of our knowledge this is the first power consumption analysis of a memristor-based structure that has been presented using a behavioral modeling approach. Because the technology is better understood and matures additional enhancement in performance may be expected.

The local power supply of the read and write amplifier can be easily re-connected, resulting in both low leakage and high performance.

A complete functional and theoretical analysis is given to explain how the proposed cell operates with respect to timing, stability, variation, and cache implementation. In addition, a design methodology is presented for creating portless SRAM

cells along with its associated merits compared to standard 6T cell techniques.

Considering the advancement of future technology and the advantage of 22 nm technology over 65 and 90 nm technology, the future project has been decided to do with the selection of higher order of nm technology.

Considering all this constraint about the demand of today's fast communication world, the research has been taken to design low power MCAM using 22nm VLSI technology.

ACKNOWLEDGEMENT

I would like to express my sincere gratitude to Dr. Ujwala A. Kshirsagar who guided and supported me throughout the work.

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Performance Evaluation of DSDV, AODV and DSR Routing Protocol in MANET

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Abstract- A mobile Ad-Hoc network is a collection of wireless nodes that can dynamically be set up anywhere and anytime without using any pre-existing network infrastructure. It is an autonomous system in which mobile hosts connected by wireless links are free to move randomly and often act as routers at the same time. Mobile ad-hoc network have the attributes such as wireless connection, continuously changing topology, distributed operation and ease of deployment. The most important feature of a routing protocol, in order to be efficient for WSNs, is the energy consumption and the extension of the network's lifetime. The distributed nature and dynamic topology of Wireless Sensor Networks (WSNs) introduces very special requirements in routing protocols that should be met. An analytical survey on energy efficient routing protocols for WSNs is provided. Energy efficient routing protocols are classified into four main schemes: *Network Structure, Communication Model, Topology Based and Reliable Routing*. In this paper, the classification is expanded, in order to enhance all the proposed papers earlier and to better describe which issues/operations in each protocol illustrate/enhance the energy efficiency issues. In this paper we have compared the performance of three MANET routing protocol DSDV, AODV and DSR by using NS-2. DSDV is proactive (Table driven routing Protocol) whereas AODV and DSR share similar On Demand behavior, but the protocol's internal mechanism leads to significant performance difference. A detailed simulation has been carried out in NS-2. The metrics used for performance analysis are Routing Overload, Delivery Ratio, And Average Delay.

Index Terms- MANET, UDP, Burst Time, Pause Time, Routing Overload, Delivery ratio, Avg. Delay

I. INTRODUCTION

The Ad-Hoc network is set up with multiple wireless devices without any infrastructure. Its employment is favored in many environments. Thus, many efforts are put on Ad-Hoc networks at both the MAC and routing layers. Meanwhile, QoS aware issues are considered in both MAC and routing layers for Ad-Hoc networks. In Ad-Hoc networks, communications are done over wireless media between stations directly in a peer to peer fashion without the help of wired base station or access points. Lots of efforts have been done on Ad-Hoc networks. One of the important and famous groups developing Ad-Hoc networks is Mobile Ad-hoc network Group (MANET) [2]. With the popularity of Ad-hoc networks, many routing protocols have been designed for route discovery and route maintenance. They

are mostly designed for best effort transmission without any guarantee of quality of transmissions. Some of the most famous routing protocols are DSDV, Dynamic Source Routing (DSR) and Ad-Hoc on Demand Vector (AODV).

A number of protocols have been developed to accomplish this task. Several performance evaluation of MANET routing protocols using UDP traffic have been done by considering various parameters such as mobility, network load and pause time. In this paper we have investigated the performance of DSDV (Proactive), AODV (Reactive) and DSR On-Demand (reactive) routing protocol for performance comparison in the scenario. The purpose of this work is to understand their working mechanism and investigate that which routing protocol gives better Performance in which situation. The rest of the paper is organized as follows. In section 2, we have given the brief introduction of DSDV, AODV and DSR routing protocol. Section 3 and 4 deals with the simulation parameters and results obtained on the execution of simulation. Finally, conclusion is drawn in section 5.

II. DESCRIPTION OF ROUTING PROTOCOL

A. Destination-Sequenced Distance-Vector Routing Protocol

The Destination-Sequenced Distance-Vector (DSDV) Routing Algorithm [3] based on the idea of the classical Bellman-Ford Routing Algorithm with certain improvements. Every mobile station maintains a routing table that lists all available destinations, the number of hops to reach the destination and the sequence number assigned by the destination node. The sequence number is used to distinguish stale routes from new ones and thus avoid the formation of loops. The stations periodically transmit their routing tables to their immediate neighbors. A station also transmits its routing table if a significant change has occurred in its table from the last update sent. So, the update is both time-driven and event-driven. The routing table updates can be sent in two ways: - a "full dump" or an incremental update. A full dump sends the full routing table to the neighbors and could span many packets whereas in an incremental update only those entries from the routing table are sent that has a metric change since the last update and it must fit in a packet. If there is space in the incremental update packet then those entries may be included whose sequence number has changed. When the network is relatively stable, incremental updates are sent to avoid extra traffic and full dump are relatively infrequent. In a fast-changing network, incremental packets can grow big so full dumps will be more frequent. Each route update packet, in addition to the routing table information, also contains

a unique sequence number assigned by the transmitter. The route labeled with the highest (i.e. most recent) sequence number is used. If two routes have the same sequence number then the route with the best metric (i.e. shortest route) is used. Based on the past history, the stations estimate the settling time of routes. The stations delay the transmission of a routing update by settling time so as to eliminate those updates that would occur if a better route were found very soon.

B. Ad-Hoc on Demand Distance Vector (AODV)

Ad-Hoc On-demand Distance Vector Routing (AODV) [6] is an improvement on the DSDV algorithm discussed in section 2.1. AODV minimizes the number of broadcasts by creating routes on-demand as opposed to DSDV that maintains the list of all the routes. To find a path to the destination, the source broadcasts a route request packet. The neighbors in turn broadcast the packet to their neighbors till it reaches an intermediate node that has recent route information about the destination or till it reaches the destination. A node discards a route request packet that it has already seen. The route request packet uses sequence numbers to ensure that the routes are loop free and to make sure that if the intermediate nodes reply to route requests, they reply with the latest information only. When a node forwards a route request packet to its neighbors, it also records in its tables the node from which the first copy of the request came. This information is used to construct the reverse path for the route reply packet. AODV uses only symmetric links because the route reply packet follows the reverse path of route request packet. As the route reply packet traverses back to the source, the nodes along the path enter the forward route into their tables. If the source moves then it can reinitiate route discovery to the destination. If one of the intermediate nodes move then the moved nodes neighbor realizes the link failure and sends a link failure notification to its upstream neighbors and so on till it reaches the source upon which the source can reinitiate route discovery if needed.

C. Dynamic Source Routing Protocol (DSR)

The Dynamic Source Routing Protocol [5] is a source-routed on-demand routing protocol. A node maintains route caches containing the source routes that it is aware of. The node updates entries in the route cache as and when it learns about new routes.

The two major phases of the protocol are: route discovery and route maintenance. When the source node wants to send a packet to a destination, it looks up its route cache to determine if it already contains a route to the destination. If it finds that an unexpired route to the destination exists, then it uses this route to send the packet. But if the node does not have such a route, then it initiates the route discovery process by broadcasting a route request packet. The route request packet contains the address of the source and the destination, and a unique gentrification number. Each intermediate node checks whether it knows of a route to the destination. If it does not, it appends its address to the route record of the packet and forwards the packet to its neighbors. To limit the number of route requests propagated, a node processes the route request packet only if it has not already seen the packet and its address is not present in the route record of the packet. A route reply is generated when either the

destination or an intermediate node with current information about the destination receives the route request packet. A route request packet reaching such a node already contains, in its route record, the sequence of hops taken from the source to this node.. Creation of record route in DSRP As the route request packet propagates through the network, the route record is formed. If the route reply is generated by the destination then it places the route record from route request packet into the route reply packet. On the other hand, if the node generating the route reply is an intermediate node then it appends its cached route to destination to the route record of route request packet and puts that into the route reply packet. To send the route reply packet, the responding node must have a route to the source. If it has a route to the source in its route cache, it can use that route. The reverse of route record can be used if symmetric links are supported. In case symmetric links are not supported, the node can initiate route discovery to source and piggyback the route reply on this new route request. DSRP uses two types of packets for route maintenance: - Route Error packet and Acknowledgements. When a node encounters a fatal transmission problem at its data link layer, it generates a Route Error packet. When a node receives a route error packet, it removes the hop in error from its route cache. All routes that contain the hop in error are truncated at that point. Acknowledgment packets are used to verify the correct operation of the route links. This also includes passive acknowledgments in which a node hears the next hop forwarding the packet along the route .

D. Efficient Ad-Hoc on Demand Distance Vector (E-AODV)

As in AODV each Mobile Host acts as a router and routes are obtained on demand with little or no periodic advertisements. It uses destination sequence numbers to ensure loop freedom at all times. EAODV reduces hop count, Latency time and enhances throughput, packet delivery ratio of packets in ad hoc networks. It maintains more than one route to the required destination. Also, the shortest route is selected to send the data packets to the destination.

III. PROBLEMS WITH CURRENT MOBILE NETWORKS

As users are increasingly mobile it is more and more common for users to meet and communicate without prior planning and in environments where there is little or no networking infrastructure. For example, business meetings often require documents to be exchanged and it could happen in a cafe or at the airport. In such situations it is difficult and inconvenient to set up a local area network (LAN) as the network will need to be created on the fly. Such a network is known as an ad hoc network where the network is of a dynamic nature without centralized administration.

Current technologies can form ad hoc networks but is limited in that only single hop networks can be formed. This means that each node can only act as a host sending directly to the destination. In a multi-hop ad hoc network, all nodes act as routers and neighboring nodes will forward packets to the final destination.

A fundamental problem in ad hoc networking is how to deliver data packets among nodes efficiently without predetermined topology or centralized control, which is the main

objective of ad hoc routing protocols. Because of the dynamic nature of the network, ad hoc routing faces many unique problems not present in wired networks. In addition, ad hoc networking is inherently a multi-layer problem. For example, to vertically optimize protocol layers, ad hoc routing is often jointly considered with power control in the physical layer, multiple access control in the link layer, and quality of service support for applications. Therefore, issues in multiple layers should be addressed with a cross-layer approach. Most existing ad hoc routing protocols build and utilize only one single route for each pair of source and destination nodes. Due to node mobility, node failures, and the dynamic characteristics of the radio channel, links in a route may become temporarily unavailable, making the route invalid. The overhead of finding alternative routes may be high and extra delay in packet delivery may be introduced. Multipath routing addresses this problem by providing more than one route to a destination node. Source and intermediate nodes can use these routes as primary and backup routes. Alternatively, they can distribute traffic among multiple routes to enhance transmission reliability, provide load balancing, and secure data transmission.

IV. SIMULATION ENVIROMENT & PERFORMANCE ANALYSIS

Network simulator 2 is the result of an on-going effort of re- search and development that is administrated by Researchers at Berkeley. It is a discrete event simulator targeted at networking research. It provides substantial support for simulation of TCP, routing, and multicast protocols. The simulator is written in C++ and a script language called OTcl. NS uses an Otcl interpreter towards the user. This means that the user writes an OTcl script that defines the network (number of nodes, links), the traffic in the network (sources, destinations, type of traffic) and which protocols it will use. This script is then used by ns during the simulations. The result of the simulations is an output trace file that can be used to do data processing (calculate delay, throughput etc) and to visualize the simulation with a program called Network Animator (NAM). NAM is a very good visualization tool that visualizes the packets as they propagate through the network.

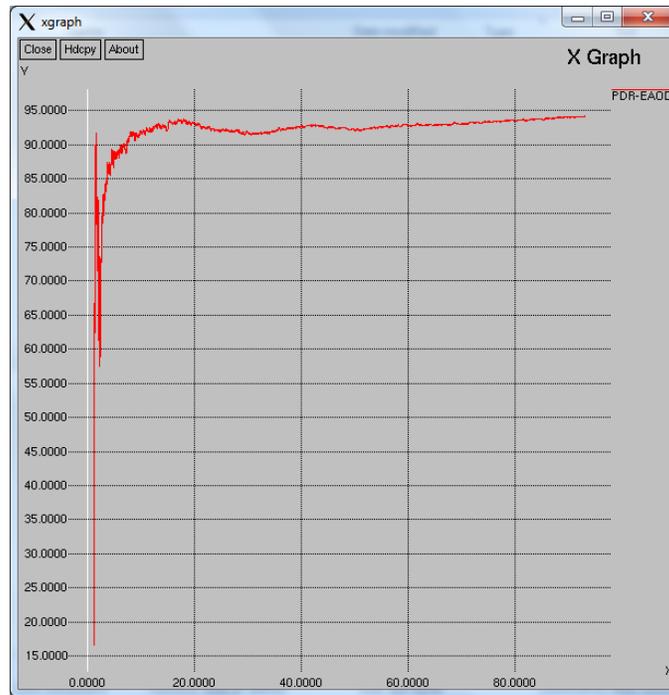
A. Following graphs shows performance of AODV and DSDV protocols:



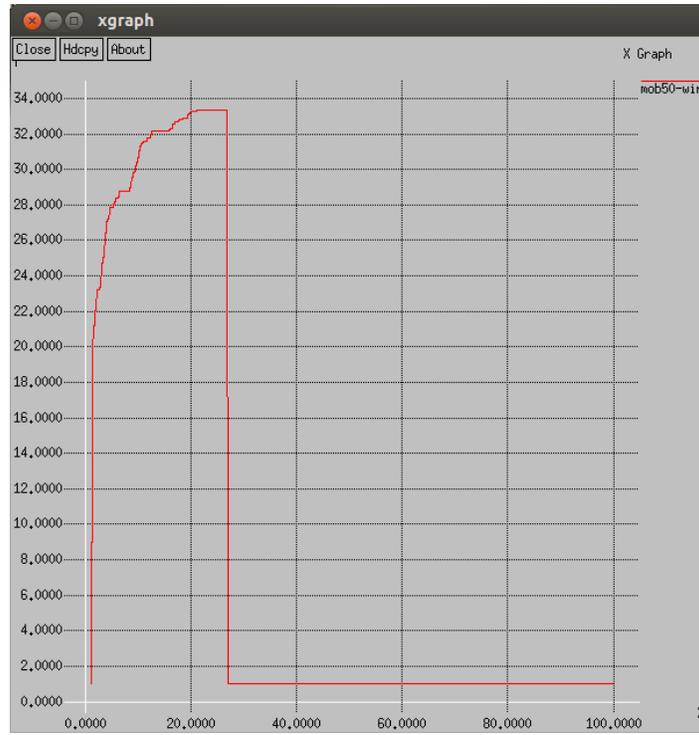
Graph 1. Udp Analysis of E-AODV



Graph 2. Udp Analysis of DSDV



Graph 3. Packet Delivery Ratio of E-AODV



Graph 4. Packet Delivery Ratio of DSDV

The packet delivery ratio of EAODV gives much better performance than conventional AODV, 94 Percent packet received here the graph plots between percentage of received packets and the simulation time.

B. Following table shows performance analysis of AODV and DSDV protocols:

SEND	9703
RECV	7299
ROUTING PACKTS	1148
PDF	75.22
NRL	0.16
Avg. End to End Delay(ms)	531.73
No. of Dropped Packets	2395

Table1. Performance parameters results of DSDV protocol for 50 nodes

SEND	7819.00
RECV	7362.00
ROUTING PACKTS	893.00
PDF	94.16
NRL	0.14
No. of Dropped Packets	440

Table2. Performance parameters results of AODV protocol for 50 nodes

V. CONCLUSION

This paper compared the performance of DSDV, AODV, and DSR routing protocols for Ad-hoc networks using ns-2 simulation. We have presented a detailed performance comparison of important routing protocols for mobile Ad-Hoc wireless networks. AODV and DSR are reactive protocol while DSDV proactive protocols. Both AODV and DSR use reactive approach to route discovery, but with different mechanism. DSR uses source routing and route cache and does not depend on their timer base activity. On other hand AODV uses routing tables, one route per destination, sequence number to maintain route. The general observation from simulation is that DSDV has performed well compared to all other protocols in terms of Delivery ratio

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Prevalence of diabetic retinopathy in diabetics of rural population belonging to Ramanagara and Chikkaballapura districts of Karnataka

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Abstract- AIMS: To estimate the prevalence of diabetic retinopathy among the diabetics of Chikkaballapur and Ramanagara Districts of Karnataka, India.

METHODS: A descriptive population based cross sectional study for a period of six months from October 2013 to March 2014 was carried out. All diabetics from five taluks of Chikkaballapur and four taluks of Ramanagara were examined on predetermined date and time at taluk hospitals. Detailed history, detailed ocular examination, height, weight, blood pressure, fasting blood sugar were recorded in a proforma with structured questionnaire on awareness of diabetes and diabetic retinopathy(DR). DR was clinically graded according to Early Treatment Diabetic Retinopathy Study (ETDRS) classification.

RESULTS: 321 patients (642 eyes) were examined with male preponderance and prevalence of DR was found to be 21.2% (68), out of which 85.3% (58) was non proliferative DR, 14.7% (10) was proliferative DR.

CONCLUSION: DR is becoming an important cause for visual disability in India. Rural communities have limited access to medical services. Preventive measures have to be taken by creating awareness, screening programmes for detecting early disease. Early intervention and timely management are required to reduce the burden of visual loss due to DR.

Index Terms- Diabetic retinopathy, rural diabetes screening, diabetic macular edema

I. INTRODUCTION

Diabetes mellitus is defined as a metabolic disorder of multiple etiologies characterized by chronic hyperglycemia with disturbances of carbohydrate, protein and fat metabolism resulting from defects in insulin secretion, insulin action, or both.¹ Epidemiologic data suggest that diabetic retinopathy is the leading cause of new cases of blindness in people between the age group of 20-74 years.² The prevalence of diabetic retinopathy (DR) in the Chennai Urban Rural Epidemiology (CURES) Eye Study in south India was 17.6 per cent, which is significantly lower than age-matched western counterparts. Prevalence of diabetic macular edema (DME) in the total diabetic population was 5.0 per cent while among the known diabetic subjects it was 6.3 and 1.1 per cent among the newly diagnosed diabetic subjects. This study also showed that the major systemic risk factors for onset and progression of DR are duration of diabetes, degree of glycaemic control and hyperlipidaemia.³ Visual impairment associated with diabetes mellitus and diabetic eye

disease may result from macular ischemia, DME, vitreous hemorrhage, or tractional retinal detachment. Of these, macular edema is the most common cause of visual impairment. Further data from the Wisconsin Epidemiologic Study of Diabetic Retinopathy suggest that the 14-year incidence of DME is 26%.⁴ DR is the commonest cause of blindness in the age group of 45-65 year old in developed countries. Further this is a consequence of diabetic maculopathy or proliferative diabetic retinopathy and its sequelae. Of these two, diabetic maculopathy is more frequent and is the cause of visual loss in over 75% of adults with diabetes mellitus.⁵ DR is a vascular disorder affecting the microvasculature of retina. Capillary damage is apparent in the earliest stages of DR by loss of the retinal pericytes that is the mural cells and capillary basement membrane thickening.⁶ With increasing duration and severity of hyperglycemia, there occurs eventual capillary closure and microaneurysm formation.⁷ Majority of diabetics have no symptoms until late stages by which it may be too late for effective treatment. It is one of major cause of morbidity in patients suffering from diabetes mellitus of longer duration.

WHO estimates the global prevalence of diabetes mellitus will increase from 2.8% to 4.4% for the year 2000 to 2030. India is known as 'Diabetic capital of the World' with a diabetic population of 40.9 million, projected to rise to 79.4 million by year 2030. With 41 million Indians having diabetes, every fifth diabetic in the world is an Indian.⁸ This is fast becoming an important cause for visual disability in India. The associated systemic risk factors being hypertension, high glycosylated hemoglobin, systolic blood pressure, pulse pressure, lipoprotein level and body mass index. The significant sight threatening risk factors are chronic kidney disease, cardio vascular disease and hyperlipidaemia. An international clinical severity scale was developed for diabetic retinopathy and diabetic macular edema (DME). This is based on Early Treatment Diabetic Retinopathy Study (ETDRS) which is graded into mild, moderate, severe, very severe, proliferative diabetic retinopathy, high risk and advanced diabetic retinopathy.^{9,10} The screening tools used to stage the disease are Direct Ophthalmoscope, Indirect Ophthalmoscope, Slit Lamp Biomicroscope and Fundus Photography. Frequent follow ups and control of hyperglycemic states are required for reducing the visual loss due to diabetic retinopathy.

II. MATERIALS AND METHODS

A descriptive cross sectional study for period of 6 months was conducted from October 2013 to March 2014. Two districts

of Karnataka i.e. Ramanagara and Chikkaballapura were selected for pilot project. Each district had 4-5 taluks each. Every month one taluk of each district were selected for visit at predetermined time and date by ophthalmologists, ophthalmic assistants, and refractionist. The taluk Medical Officer, community workers, block health educators would direct all diabetics for screening at taluk head quarter hospital. All patient details were documented in the proforma containing name, age, contact details, detailed history, family history, risk factors, diabetic status, height, weight, FBS (fasting blood sugar), co morbidities, life style and awareness level was assessed with a structured questionnaire. Visual acuity was tested with snellens' chart or illiterate E-chart. Detailed anterior and posterior segment evaluation was done with direct and indirect ophthalmoscope. FBS checked at the taluk hospital. The patients clinically graded according to ETDRS

Study. The patients with no diabetic retinopathy changes were asked for regular annual check-up. Mild to moderate diabetic retinopathy patients were asked to review with HBA₁C, Lipid profile, FBS and PPBS reports after three months. Very severe and PDR patients were referred to base hospital for further management. The awareness meetings were conducted for all diabetics, educated about frequent follow-up, life style modification, diet, control of hyperglycemic state.

III. RESULTS

321 rural diabetic patients were examined and the overall prevalence was found to be 21.2%. Of these, 85.3% patients had NPDR and 14.7% had PDR.

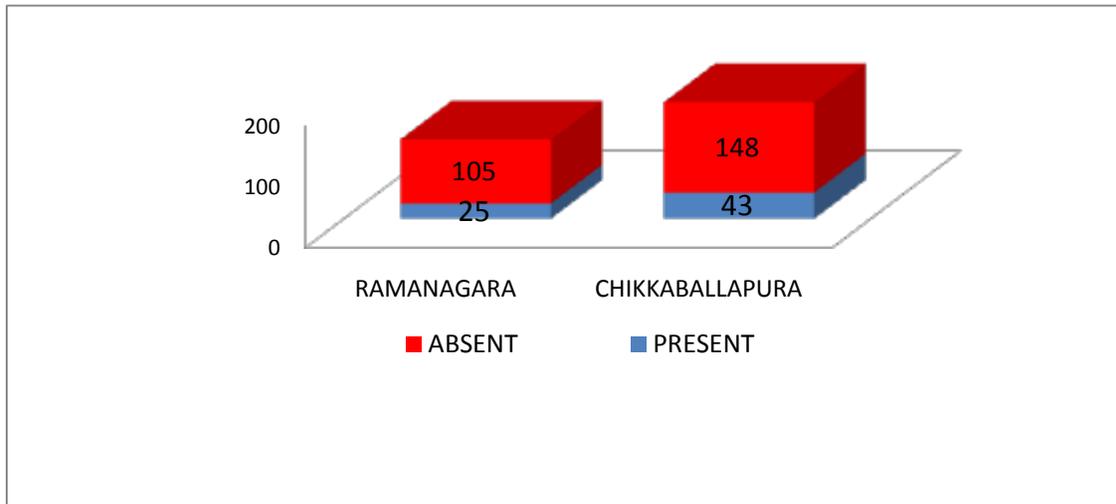


Figure 1: District wise prevalence: 321 patients

Retinopathy changes are significantly increased with duration of diabetes and male preponderance.(Figure 2)

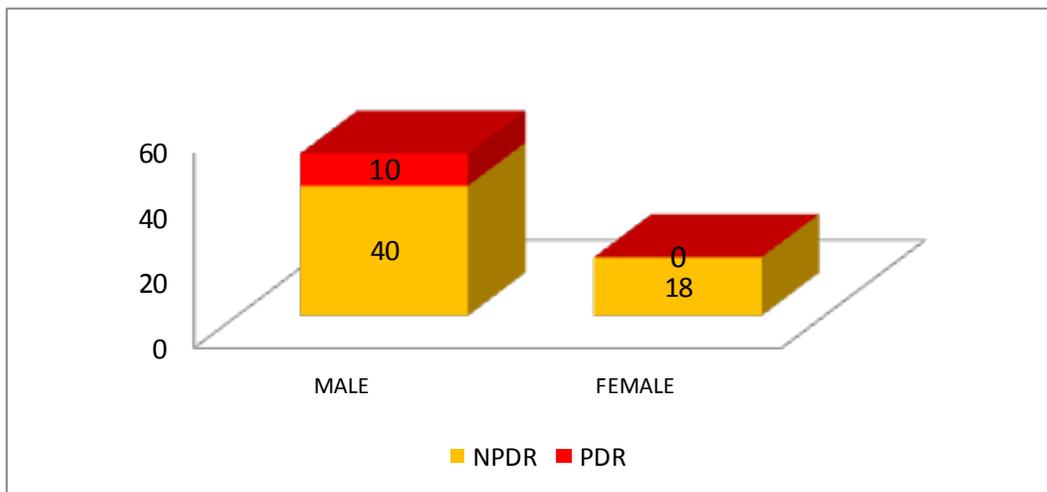


Figure 2: Gender wise distribution of diabetic retinopathy
p=0.052

DR was found to be the maximum (45%) in patients with diabetes mellitus for more than 15 years. While only 11.5% of the diabetics with duration of DR less than five years had diabetic retinopathy. (Figure 3)

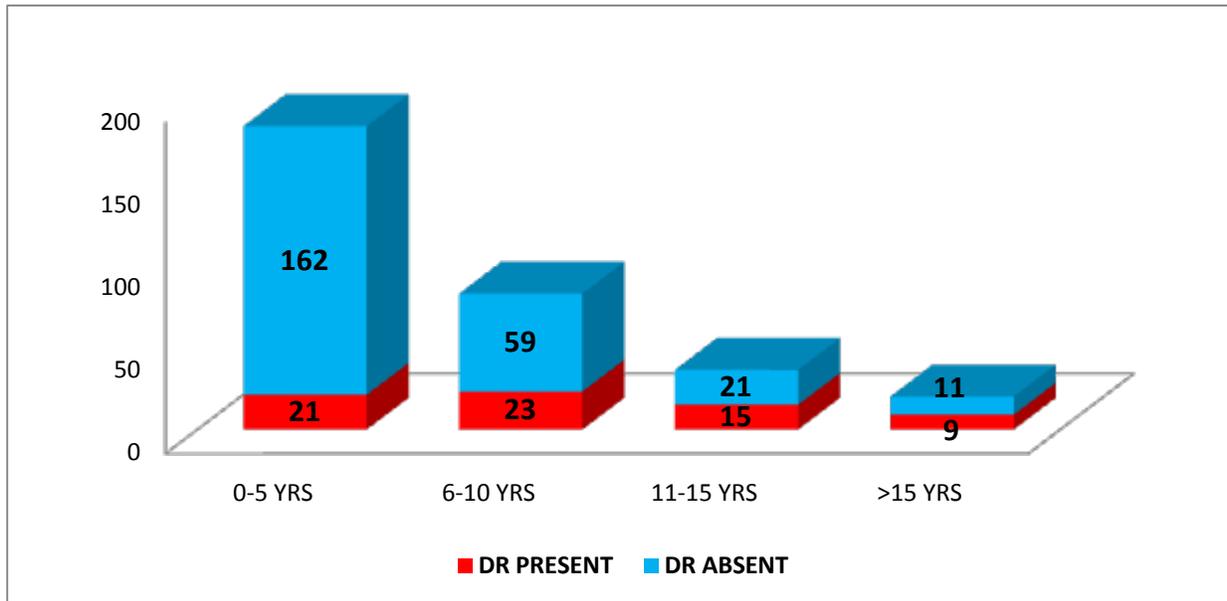


Figure 3: Prevalence according to duration of diabetes. $p < 0.001$

The glycaemic control too had an effect on the presence of DR. Patients with a fasting blood sugar more than 140 mg/dl had 24.5% DR prevalence as compared to 14.3% in those with fasting sugar less than 140 mg/dl. (Figure 4)

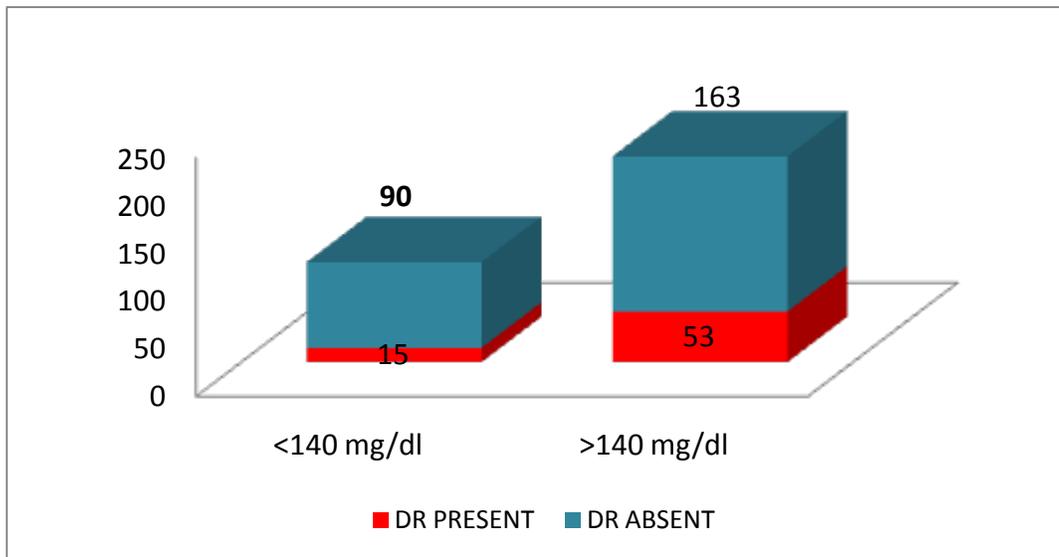


Figure 4: Prevalence according to FBS levels $p = 0.035$

BMI (Body mass index) was also associated with DR. Patients with BMI more than 25 had a higher prevalence of DR. (Figure 5)

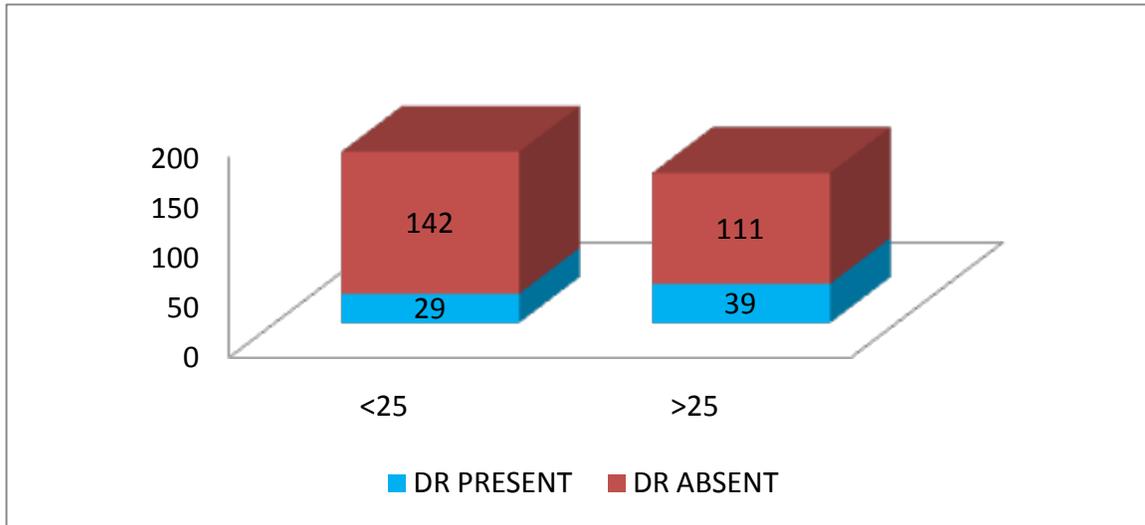


Figure 5: Diabetic retinopathy prevalence according to BMI p=0.048

Smokers are found be having a higher prevalence of DR as compared to the non-smoking population. (Figure 6)

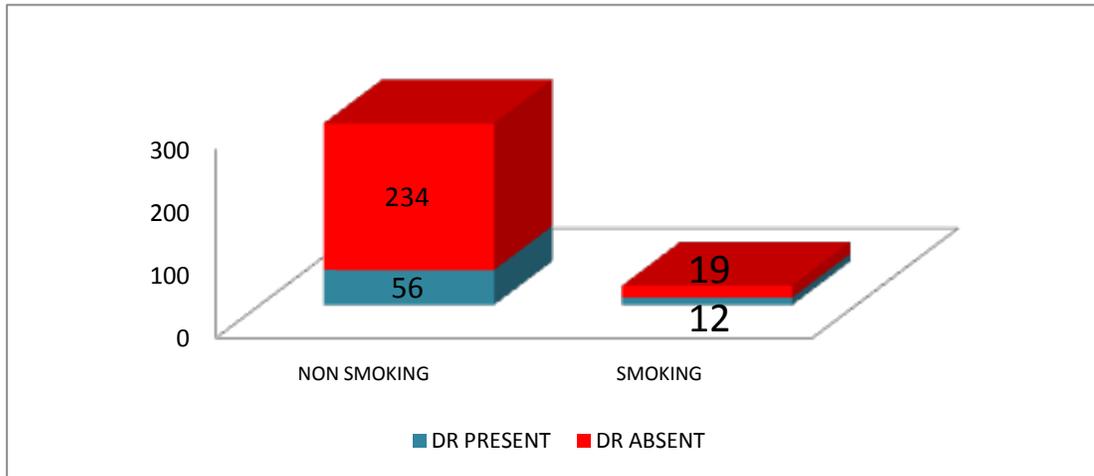


Figure 6: Diabetic retinopathy prevalence according to smoking. p=0.012

Table 1. The prevalence of diabetic retinopathy in our study is 21.2% which is more compared to previous studies

Study	Prevalence	Duration of dm(yrs)				Prevalence with FBS (mg/dl)	
		<5	5-10	10-15	>15	<140	>140
Present study	21.2%	11.5%	28%	41.7%	45%	14.3%	24.5%
SN-dreams iii11	10.3%	6.3%	18.1%	27.8%	37.1%	-	-
Suraj eye hospital 12	9.6%	-	-	-	-	-	-

IV. DISCUSSION

The prevalence of adult diabetes worldwide is anticipated to rise from 4.0% in 1995 to 5.4% by 2025.¹³ Given this rising prevalence, it is expected that diabetic retinopathy and diabetic macular edema will continue to be common and will be important causes of vision impairment. DR is the leading cause of legal and functional blindness for people in their working years (ages 25–75 years) worldwide. The overall incidence of DR continues to be in the rising trend looking at the population with new onset diabetes mellitus.¹⁴ Present study conducted in the rural areas points towards rising trend of diabetic retinopathy. A similar population based study conducted by Narendran et al. among 260 diabetics found a prevalence rate of DR to be 26.8%.¹⁵ A study conducted in the urban population of Andhra Pradesh had 22.4% prevalence of DR amongst the diabetics.¹⁶ The Diabetes Control and Complications Trial (DCCT) reported that 27% of patients with DR develop macular edema within nine years of diabetes onset.¹⁷ The rural areas are underprivileged in terms of medical facilities in the form of screening as well as treatment. This calls for an urgent need of attention towards this less fortunate part of our society. This sight threatening condition can be controlled with timely intervention and thus, spreading awareness and provision of good eye care facilities can reduce the burden of visual handicap in the so called urbanizing rural population.

V. CONCLUSION

Prevalence of diabetic retinopathy in rural population is significantly high as compared to previous studies which is affected by the glycaemic control state and associated risk factors. Considering the large burden of diabetic retinopathy is important to identify them at the earliest by screening programmes to modify the course of the disease. There is a need to create awareness among health professionals about timely referral for evaluation. Patient education and formulation of appropriate health care policies is need of the hour to prevent this burden of visual impairment.

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India-China in Shaping Regional Economic and Security Architecture

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Abstract- The growing strength of India-ASEAN relations has created unease for China with the improvement of India-US relations. China's main concern is that the new focus of US foreign policy toward the Asia-Pacific region - the so-called "pivot" - is aimed at containing China's rise. This paper is oriented towards assessing as to why India needs to involve China in shaping the future of Asia as the powerhouse of the world so much so that the world is redrawing its focus in Asia. India and China need to acknowledge each other's strengths and weaknesses and contribute to shaping regional economic and security architecture. It is also in India's interest to develop a strategy and build a peaceful environment conducive to both India and China's aspirations rather than to be perceived by China to have any kind of a role in the so-called US led containment of China.

Index Terms- India ASEAN relations, India China relations, US Rebalancing, Regional Economic and Security Architecture, US Pivot Policy

I. INTRODUCTION

It has been said that 21st century belongs to Asia.¹ Home to emerging economies such as China, India, ASEAN, Japan and so on it has been said that Asia is going to be the centre of world trade and politics, with China increasingly challenging US dominance. In an Asian Development Bank report, it has been said that Asia would account for over half of global output by the middle of this century with the additional three billion Asians expected to enjoy living standards similar to those in Europe today.² In this context, with US having been embroiled with the Middle-East for long, needed a new direction and focus to restructure its foreign policy, keeping in mind its dwindling economy and China's growing assertiveness. It has been argued that US had never left Asia, nevertheless it is a significant shift in US's foreign policy. The economic and security architecture of East Asia and South-East Asia in particular will largely depend on how US-China relationship plays out in the future. The underlying assumption is whoever controls Asia will control the world. China has been very critical of US's Asia pivot or rebalancing through its official and non-official responses³. US is

wary of China's potential and assertiveness in the South China Sea dispute and it has been very difficult for both the countries to find a common ground in most aspects. The much hyped G-2 model did not take much shape either. There have been recent reports that China will overtake US⁴ in Purchasing Power Parity (PPP) though China downplayed⁵ the reports.

In this context, it is interesting to note with the urgency with which India and ASEAN are forging close strategic ties. India and ASEAN upgraded their relationship into strategic partnership in 2012. ASEAN countries have always called upon India to play a greater role in Asia. India being a reluctant power seems to lack vision, unlike China, in its foreign policy initiatives. China and ASEAN signed their Free Trade Agreement in 2002, and their trade amount to 400 US billion dollars⁶ while India's trade with ASEAN amounts to 80 US billion dollar and is expected to reach 125 US billion dollar by 2015.⁷

With China dominating the ASEAN market and the presence of Chinese diaspora wielding considerable amount of influence, most ASEAN countries has been very suspicious of China's intentions in the South China Sea dispute.

US response towards South China Sea dispute, which involves its allies, has been very cautious, basing its arguments on freedom of navigation. However, the US rebalancing in Asia is a policy-shift in direct response to China's rise. US has been very vocal about wanting India to play a pivotal role in shaping Asia's security and economic architecture and has been very supportive of India's Look East Policy.

What is happening in the region today is a classic example of power politics.

http://www2.gwu.edu/~sigur/assets/docs/BalancingActs_Compiled1.pdf (assessed on 5 August, 2014)

⁴ The Guardian. 2013. 'China poised to overtake US as world's largest economy, research shows', 30th April,

<http://www.theguardian.com/business/2014/apr/30/china-overtake-us-worlds-largest-economy> (assessed on 16 May, 2014)

⁵ The National Interest. 2014. 'Why Does China Downplay its economic might', 16 May, <http://nationalinterest.org/blog/why-does-china-downplay-its-economic-might-10382> (assessed on 5 July, 2014)

⁶ Economic Times. 2013. 'Target \$125 billion India-Asean Trade by 2015', 2013, http://articles.economictimes.indiatimes.com/2013-10-29/news/43495849_1_10-nation-asean-bloc-india-asean-trade-brunei-darussalam (accessed on 5 July 2014)

⁷ English People Daily. 2013. 'China-ASEAN trade to Bloom on New Target', 2013, <http://english.peopledaily.com.cn/90883/8421398.html> (accessed on 6 August 2014)

¹ British Broadcasting Cooperation. 2009. 'Does the 21st Century belong to Asia', 18 November, <http://news.bbc.co.uk/2/hi/programmes/newsnight/8366465.stm> (accessed on 1 August, 2014)

² Asia 2050, 'Realizing The Asian Century | Asian Development Bank', <www.adb.org>, (accessed on 26 April 2013)

³ See Eliot School of International Affairs. 2013. 'Balancing Act: The US rebalance and Asia-Pacific Stability', August,

In this backdrop of power-play between US and China, the paper attempts to examine the various factors which can engage both India and China in the maintenance of regional economic and security architecture in the region. The paper is divided into three parts. The first part of the paper analyses US's Asia pivot policy and India, China and ASEAN's perceptions and responses to it. The second part of the paper will examine US, India and ASEAN's perception of China's growing assertiveness. The third part of the paper will examine what is at stake for India and China and why both the countries should contribute in shaping regional economic and security architecture.

II. US'S REBALANCING ACT AND ITS PERCEPTIONS

The announcement of 'Pivot to Asia' strategy by US in 2010 marked a new direction for US foreign and strategic policy in the Asia Pacific region. The 'Pivot to Asia' strategy was intended as a new direction for US foreign and strategic policy in the Asia-Pacific region and was also a policy designed under the assumption that US policies in other regions namely Middle East and Europe were winding down.⁸ Though the military aspect of the policy has been highlighted, the other important aspects of US's Pivot Policy include, improving relations with its traditional allies in Asia Pacific, building partnership with emerging powers including India, economic factor, engaging with multilateral institutions such as ASEAN and promoting universal values.⁹ US plan to deploy 60 percent of its navy in the Asia Pacific waters. However, critics have questioned US's disciplined commitment towards Asia Pacific in the light of budget cuts in military spending. The East Asian region, and Southeast Asia in particular lie at the core of the US Rebalancing towards Asia strategy.

The Obama administration has made efforts to replace the word 'pivot' with a more toned-down word 'rebalancing'. Hillary Clinton used the word 'pivot' in a *Foreign Policy* article she wrote in November, 2010. An example would be National Security Advisor Thomas Donilon in his speech 'The United States and the Asia Pacific in 2013' at the Asia Society, the word "pivot" was not mentioned even once and replaced it with 'rebalancing'.¹⁰

Rebalancing seems to represent a holistic US policy encompassing military, trade, commerce, diplomacy, security and other aspects. US rebalancing towards Asia strategy and consequent Chinese responses is being increasingly referred to as the 'New Great Game' with an East Asia twist and generated debates on the likely future of global and regional politics.¹¹ As

for Washington's rebalancing and its military dimensions to it, Beijing considers it as an euphemism for contain China policy. So far the responses from Southeast Asia is concerned, it seems to be largely influenced by the South China Sea issue. This could be seen in the Annual Regional Ministerial meeting at Phnom Pehn in July 2012, where Cambodia, Laos, Thailand and Myanmar were either silent or supportive of Cambodia's pro-China stance of not including South China Sea issue in the joint declaration, where as Philippines and Vietnam objected to it.¹² The Philippines, Thailand and Vietnam have welcomed the US's move; countries such as Indonesia and Malaysia have given measured response.¹³ It is well known at Southeast Asian countries which are in direct territorial conflict with China have been doubtful of China's regional aspirations. But these countries cannot go whole hog in embracing US's rebalancing act considering China is their biggest trading partner.

It seems Southeast Asian countries are divided on accommodating both China and US's interest in the region. It looks like US is aware that whoever controls Asia is going to control the world politics eventually. Thus, Beijing's aspirations to be a dominant power are challenged by US's rebalancing act. India, Vietnam and Burma have improved relations with the US in recent years. It looks like the countries are wary of China's rising and do not want to disrupt economic relations with China, at the same time they seem to want to balance China's might by positioning themselves in US's loop. It can be argued that countries such as Vietnam, Philippines and Singapore and others which have officially supported or quietly acknowledges US rebalancing has got more to do with rebalancing China rather than be in agreement with US policies. Countries in the region are adhering to the balance of power theory in embracing a less-threatening power. However it is interesting to note that countries such as Malaysia, Indonesia, Thailand (a formal US ally) have been walking a tight rope not having been openly supportive of US or China.

During the past six and a half decades, Southeast Asia has been vitally dependent on US leadership for maintaining regional stability and security. In 1967, five key Southeast Asian states joined together and founded ASEAN. All were anti-Communist in orientation and either formally allied with or inclined toward the United States.¹⁴ However, after the end of the cold war Southeast Asian engagement with the US was not at the peak and the US rebalancing act is a major policy shift.

China has reacted at two levels to the US rebalancing act. At the official level, Chinese government representatives and official media have accused US of playing double standard game by openly supporting its allies that that have maritime and territorial disputes with China, despite assuring China that it supports China in wanting to solve the South China sea issue amicably with the respective countries. It is pertinent to note that in the recently held ASEAN Regional Forum, 2014, in Myanmar US's call for a freeze in South China Sea issue was met with a

⁸ Clinton Hillary. 2013. 'America's Pacific Century', *Foreign Policy*, 10 November, http://www.foreignpolicy.com/articles/2011/10/11/americas_pacific_century (accessed on 26 June 2013)

⁹ Campbell, Andrews Brian. 2013. 'Explaining the US 'Pivot' to Asia', August, Catham House Occasional Paper, The Asia Group

¹⁰ Remarks By Tom Donilon, National Security Advisor to the President. 2013. 'The United States and the Asia-Pacific in 2013' <http://www.whitehouse.gov/the-press-office/2013/03/11/remarks-tom-donilon-national-security-advisory-president-united-states-a> (assessed on 23 August 2014)

¹¹ RSIS Commentaries. 2012. 'The New Great Game: ASEAN's Balancing Act?', 17 January, <http://www.rsis.edu.sg/publications/Perspective/RSIS0142012.pdf> (accessed on 16 June 2014) (Accessed January 17, 2012).

¹² Op.cit. See Eliot School of International Affairs

¹³ Op.cit. See Eliot School of International Affairs

¹⁴ Thayer Carlyle. 2011. 'The Rise of China and India: Challenging or Reinforcing Southeast Asia's Autonomy?', in Ashley J. Tellis (ed) *Asia responds to its rising power*, National Beureau of Asiatic Research, Seattle and Washington DC, pp. 315

cool response.¹⁵ In China's non-official responses against US rebalancing, allegations of a conspiracy to contain China have been leveled against US.¹⁶

It has been debated that India is in a unique position of being wooed by both the US and China.¹⁷ So far India has been very cautious in its official responses to US rebalancing. The possible reasons could be it does not want to upset China, India's largest trading partner with which it has a huge gap in military capacity, though it is considered one of the main balancing power to China in Asia. The other plausible reason is that India does not want to disrupt the balance of power in the region by playing a third wheel to the power tussle between US and China to gain regional supremacy. In his bilateral discussion with the US Defense Secretary, the Indian Defence Minister sought to caution his counterpart about hastening the process of strengthening the multilateral security architecture in Asia-Pacific, suggesting instead that it be allowed to develop at its own pace.¹⁸

III. PERCEPTIONS TOWARDS CHINA'S GROWING AGGRESSIVENESS

China's growing assertiveness can be broadly associated with three issues. First, it could mean China's challenge to US hegemony. Secondly, it could mean China's increasing non-negotiable stand in its 'core issue' of sovereignty and territorial integrity. Thirdly it is often associated with China's new naval strategy to control South-China Sea. A number of unofficial foreign and Chinese observers have increasingly identified South China Sea issue as China's core interest, though there have been no official statements.

South China Sea is a contentious issue between many South-East Asian countries, and classifying South-China Sea issue as China's core interest sends out a very staunch message to regional and global powers. Most Southeast Asian countries are wary of China's intentions in the South-China sea issue, however their responses have been rather mild, not wanting to upset a regional power such as China as discussed above. It is well known that China's military spending has increased multiple folds over the years and so is the case with the Southeast Asian countries.¹⁹ This arms race is most likely to continue considering the economies of Southeast Asia and China are growing. According to an opinion survey among Asia's 'strategic elites', China is perceived to be a threat to peace and security in Asia in next 10 years.²⁰

India, a significant power in Asia which cannot be ignored, has been very cautious in its response towards the South China Sea issue. India and China have ongoing border issues and there is a widening gap in its military capabilities. Moreover China is India's largest trading partner. India has always spoken on the lines of open access to navigation. However, it is pertinent to note that if China controls the South China Sea it invites China in the Indian Ocean which is accessible from the Malacca Straits.²¹ This is of concern to India. India ignored China's warning and signed a deal with Vietnam in 2011 for oil exploration off the coast of South China Sea. However India's response has been measured on trade and resource considerations.

The elevation of India's engagement with the ASEAN to strategic partners was well received by the ASEAN community. In an editorial *The Nation* of Thailand it was said that, "It took two decades for the leaders of ASEAN and India to have the courage to say that they are strategic partners in the truest sense of the world...In the past, ASEAN also wooed China, thinking that it would help to strengthen the regional security. However the rising tension in the South China Sea accompanied by Beijing's tough talk has recently changed the thinking within the region. ASEAN wants to make sure that along with US, India will walk side by side with the grouping to increase its support when it is placed on a line-up with China. In similar vein, ASEAN's increased engagement with India will intensify in proportion to the degree of cooperation the region gets from Beijing on the code of conduct for the South China Sea and other areas."²²

For some ASEAN countries, greater interaction with India could help dilute Chinese influence in line with the organization's philosophy of engaging all interested powers and not being dominated by any single country. For example, Indonesia and Singapore's proposal to bring Australia, India and New Zealand into the East Asian Summit was widely perceived as a way to dilute 'Chinese dominance' in regional architecture.²³ India's move to deepen its ties with the ASEAN countries have certainly caused significant concern to China as it has maintained that some kind of axis is in operation in the region, which will have deeper implication for the security environment particularly in Asia. The ex- Indian Prime Minister, Dr Manmohan Singh has reiterated several times that 'ASEAN is the heart of Look East

¹⁵ Mooney Paul, Wroughton Lesley. 2014. 'U.S. Call for South China Sea 'Freeze' Gets Cool Response from China', 9 August, <http://www.reuters.com/article/2014/08/09/us-asean-southchinasea-idUSKBN0G904O20140809> (accessed on 15 August 2014)

¹⁷ Gordon Sandy. 2012. 'India: Which Way Will the Swing State Swing', 24 June, East Asia Forum

¹⁸ Chari PR. 2012. 'Antony and Panetta: A Shakespearean Drama', 13 June, <http://www.defpro.com/news/details/36438/> (accessed on 25 July 2014)

¹⁹ CSIS Report. 2009. http://csis.org/files/media/csis/pubs/090217_gill_stratviews_web.pdf. (assessed on 12 June 2014)

²⁰ *Ibid*

²¹ Mary Carras. 2014. 'The Impact of Chinese Maritime Policies on India',

Foreign Policy in Focus, 1 July, <http://fpif.org/impact-chinese-maritime-policies-india/> (accessed on 23 August 2014)

²² The Nation. 2012. 'ASEAN Woos India During Uncertain Times', 23 December, <http://signin.nationmultimedia.com/opinion/Asean-woos-India-during-uncertain-times-30196641.html?PHPSESSID=2a4e9b5fb6f34ffc150218911ae1eb38> (assessed 23 November 2014)

²³ Dick K Nanto. 2006. 'East Asian Regional Architecture: New Economic and Security Arrangements and U.S. Policy', <<http://fpc.state.gov/documents/organization/75280.pdf>> (accessed on 13 April 2014)

Policy²⁴ and the whole dynamics of India-ASEAN relations provide credibility to India's Look East Policy.²⁵

ASEAN and India have also much to gain from security cooperation as India shares maritime borders with Indonesia and Thailand, and land border with Myanmar. In the sea, the primary shared security interest is protecting the Strait of Malacca, which connects the South China Sea to the Indian Ocean, and is one of the world's busiest sea routes carrying vital goods and energy security of India and ASEAN.

In the words of Masagos Zulkifli, Singapore's Senior Minister of State, "India's presence in ASEAN would create a more prosperous, peaceful and stable region and with India emerging as a global power, the relationship has become more indispensable to ASEAN"²⁶. ASEAN's perception is to engage India to dilute the Chinese influence in South East Asia on the basis of the philosophy that by engaging all interested powers such as Korea, China, Australia and India, the region will not be dominated by any single power.²⁷ When Indonesia and Singapore proposed to bring New Zealand, Australia and India into ASEAN summit it was widely perceived as a way to dilute Chinese influence.²⁸

To curb China's growing military influence in Southeast Asia, India and selected ASEAN countries began holding joint military exercises. ASEAN's economic success and mutual unease over China's rise are said to be responsible for bringing India and ASEAN together. ASEAN had no defence-related problem with India, but was conscious of China's ambitions and intentions in Southeast Asia. India and ASEAN countries seem to have common problems with China.

In this context, the growing friendship between India and the US has caused China to allege that it as an attempt by the leadership of the US to engage other parties to leverage it for its own strategic interests. China's main concern is that the new focus of US foreign policy toward the Asia-Pacific region - the so-called "pivot" - is aimed at containing China's rise.²⁹ China's 'String of Pearls' policy in the Indian Ocean is said to be aimed at countering US moves in the region and also India's growing influence over the ASEAN countries.³⁰ The String of Pearls refers to the network of Chinese military and commercial facilities and relationships along its sea lines of communication, which extend from the Chinese mainland to Port Sudan.³¹ India has avoided any reference to China being the reason for deepening of ties with the ASEAN countries over trade and

investment and has always rationalised it in terms of complementarities in their economic structure. According to former Indian Ambassador to Thailand, Pinak Ranjan Chakravarty, "The process of integration that is undertaken through FTA is not just economic, but is closely tied to the shape the evolving regional security architecture may take in the future."³²

IV. US NUDGING INDIA

It is well known that there has been a paradigm shift in India-US relations after the signing of the Indo-US civil nuclear deal. It is seen by some observers as strategic move from both US and India's side to harness India's potential in global and regional politics. US and China have always shared a uneasy relationship, and it was clear that US sees India as a potential ally in Asia to counter China.

US's renewed call on India to play a key role in Asia-Pacific affairs was evident in President Obama's speech in the Indian Parliament in 2010. He said, "India and the United States can partner in Asia. Today the United States is once again playing a leadership role in Asia-strengthening old alliances; deepening relationships, as we are doing with China; and we are reengaging with regional organisations like the ASEAN and joining the East Asia Summit—organisations in which India is also a partner. Like your neighbours in South-East Asia, we want India not only to 'Look East'; we want India to 'Engage East' because it will increase the security and prosperity of all our nations."³³

On Hilary Clinton's visit to India, she said, "Much of the history of the 21st Century will be written in Asia which, in turn, will be influenced by the partnership between the US and India and its relationship with neighbors."³⁴ President Barack Obama in his address to the Australian Parliament in November 2011 welcomed India's 'look east' policy and urged India to play a greater role as Asian power.³⁵ The US ex-Secretary of Defence Leone Panetta in his address at the Institute for Defence Studies and Analyses in 2012, said defence cooperation with India as a 'linchpin' in US rebalancing strategy.³⁶

³² The Bangkok Post. 2010. 'In Pursuit of Mutual Prosperity', 16 August, http://www.bilaterals.org/spip.php?page=print&id_article=17890 (accessed on 6 August 2014)

³³ Rediff News. 2010. 'The Critical Points that Obama made in Parliament', 8 November, <http://www.rediff.com/news/report/obama-visit-the-critical-points-that-made-in-parliament/20101108.htm> November 8 2010 (accessed on 11 July 2014)

³⁴ Hindustan Times. 2011. 'As China looms large US tells India to lead Asia', 20 July, <http://www.hindustantimes.com/India-news/Chennai/As-China-looms-US-tells-India-tolead-Asia/Article1-723313.aspx> (accessed on 4 July 2014)

³⁵ National Affairs. 2011. 'US President Barack Obama's speech to parliament', 17 November,

<http://www.theaustralian.com.au/national-affairs/obama-in-australia/obamas-speech-toparliament/story-fnb0o39u-1226197973237> (accessed on 21 October 2013)

³⁶ Binod Singh. 2011. 'Clinton's India visit reached no consensus on fighting terrorism', *China Daily*, July 27, http://www.chinadaily.com.cn/opinion/2011-07/26/content_12985144.htm (accessed on 18 August 2014)

²⁴ Assam Tribune, 'PM for Fast Track Open Skies

Policy' <<http://www.assamtribune.com/scripts/details.asp?id=oct2509/at02>>, accessed on May 18th 2013.

²⁵ Rajiv Sikri. 2010. 'Challenges and opportunities in South East Asia: India's options and Challenges', SEARP seminar held on 5 March 2010, New Delhi. 6.

²⁶ Keynote address by the Minister of State for Foreign Affairs Masagos Zulkifli at the inaugural session of the Delhi dialogue IV, 13 February 2012, New Delhi, <http://www.mfa.gov.sg/content/mfa/overseasmission/new_delhi/press_state_ments_speeches/2012/201202/press_20120213.html>

²⁷ Amitav Acharya. 2009. 'Constructing a Security Community in South East Asia: ASEAN and the Problem of Regional Order', Routledge, London and New York, 73

²⁸ *Op.cit.* Dick K Nanto

²⁹ The Washington Times. 2005. 'China Builds up Strategic Sea Lanes', 17 January, <http://www.washingtontimes.com/news/2005/jan/17/20050117-115550-1929r?page=all> (accessed on 4 May 2014)

³⁰ *Ibid.*,

³¹ *Ibid.*,

Though it been perceived that China prefers a multipolar world order at the global and regional level, it seems to be reminiscent of its past glory of middle kingdom. US seem to can't afford to just watch and see China having an upper hand in the South China Sea issue. Southeast Asia is the US's third-largest Asian trading partner after China and Japan (and the fifth-largest partner overall). It is also the largest destination for US investment in Asia. Most of this trade takes place through South China Sea.

V. WHAT IS AT STAKE FOR INDIA AND CHINA AND THE WAY FORWARD

The Indian Ocean region and South China Sea, has become economically, strategically and politically important for all the powers. The Chinese media has referred to it as the second 'Persian Gulf' because of its oil resources.³⁷ It is one of the world's busiest international sea lanes. Over half of the world's merchant fleet sails through it.³⁸

It has been predicted that India and China's maritime interaction will grow and both the countries should not afford to delay in finding complementary grounds of cooperation and look beyond border issues. It is evident that both China and India would not want to play second fiddle to the US in shaping regional economic and security architecture.

While the long-running boundary dispute across the Himalayas has remained at the focus of attention for most observers, the fast-expanding engagement - and encounters - between their navies as they spread their presence across the Indian and Pacific Oceans has sometimes been ignored.³⁹ With China under President Xi Jinping paying more attention to 'going west', and as India 'looks east', there will be more interaction in the Indian and Pacific oceans.⁴⁰

In the economic front, both the Regional Comprehensive Economic Partnership (RCEP) and the Trans-Pacific Partnership (TPP) will pose political challenges for both China and India. It is well known that both RCEP and TPP will influence ASEAN and its free trade agreement (FTA) partner countries, including China and India, and this will indirectly impinge on China-India relations as the region will witness new dimensions of power politics.⁴¹

A secure and prosperous Asia Pacific region is conducive to both India and China's rise, therefore it is both in China's and India's interest that that they work together for a stable regional

economic and security architecture. Both China and India need to do away with mutual suspicion of containing each other. As former Prime Minister Manmohan Singh in his speech in Beijing puts it "We should engage with each other in a spirit of equality and friendship and with the confidence that neither country is a threat to the other. This is the essential premise of India's external engagement. Our strategic partnerships with other countries are defined by our own economic interests, needs and aspirations. They are not directed against China or anyone else. We expect a similar approach from China".⁴²

However, the trust deficit still looms large in India-China relations but there are also growing non-traditional security challenge which require cooperation from both the countries, and for comprehensive security, comprehensive solutions are required. Security and military cooperation need be encompassed with economic cooperation, for a stable regional economic and security architecture.

Officially China has called on India to joining hands in shaping regional economic and security architecture and clarified its stand on the South China Sea issue. In an official speech by Chinese Vice Foreign Minister, he said, "On issues of territorial sovereignty and maritime interests, China does not believe in provoking others. Nor would we allow provocation against China's principles and bottom line. On the issue of South China Sea, China's claims that its activities is legitimate and should not be seen as an attempt to gain regional supremacy."⁴³

In international politics, it is now recognised that regionalism is nothing but an expression of a common sense of identity and purpose for initiation of collective action by the concerned member states within a geographical region to benefit from the ongoing process of globalisation, both India and China cannot ignore this. Hence regional cooperation has assumed greater significance and has motivated states to cooperate with each other to resolve common problems or achieve certain objectives beyond the capacity of individual national attainment.⁴⁴

With the world redrawing its focus on Asia, US and China has had a very uneasy relationship. India should restructure its focus and involve the powers in the region in shaping the future of Asia as the powerhouse of the world. The concept of regionalism has a very important role to play in the regard. Rather than accepting being nudged by the powers outside the region such as the US to take leadership in shaping the future of Asia, India should have a firm stand of its own. India need to look within the region for cooperation in today's world of regionalism to foster goodwill partnership. India and China need

³⁷ Jian Yang, 2011. *The Pacific Islands in China's Grand Strategy: Small States, Big Games*, Palgrave Macmillan, pp.40

³⁸ Rosenburg, David. 1999. The South China Sea. Accessed at <http://www.middlebury.edu/SouthChinaSea/> on 23 February 2002.

³⁹ Krishan Ananth. 2014. 'In Indian Ocean Water, Chia show Maritime Prowess', 23 March, <http://www.thehindu.com/news/international/world/in-indian-ocean-waters-india-china-show-maritime-prowess/article5819007.ece> (accessed on 1 August 2014)

⁴⁰ Ibid

⁴¹ Panda P Jagannath. 2014. 'Factoring the RCEP and the TPP: China, India and the Politics of Regional Integration', 12 February, <http://www.tandfonline.com/doi/abs/10.1080/UwHTAmKSzuE#.VAIUqfmSxOw> (accessed on 4 August 2014)

⁴² The Hindu. 2013. 'Manmohan Singh's Speech on India-China Relations at the Central Party School, Beijing' 24 October, <http://www.thehindu.com/news/resources/manmohan-singhs-speech-on-indiachina-relations-at-the-central-party-school-beijing/article5268097.ece> (2 January 2014)

⁴³ Ministry of Foreign Affairs of the Peoples Republic of China. 2013. 'Speech by H.E. Vice Foreign Minister Liu Zhenmin' 3 December, <http://www.whitehouse.gov/the-press-office/2013/03/11/remarks-tom-donilon-national-security-advisory-president-united-states-a> (assessed on 4 May 2013)

⁴⁴ Weigall David. 2002. 'International Relations-A Concise Companion', Arnold Publishers, Great Britain, 191

to acknowledge each other's strengths and weaknesses and contribute regional economic and security architecture.

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Mobile Learning Application.

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Abstract- This paper presents the design and development of Mobile Learning Application on Android Platform using Java Programming Language to help students in computer courses at the Department of Computer Engineering. Our approach is to incorporate multimedia animations concept with command language to create the pervasive learning environment in presenting the mobile learning application. With this mobile learning application, student could learn at his or her own pace, anywhere and anytime. This mobile learning application intends to complement the current traditional classroom and e-learning systems.

Index Terms- Android Platform, Java Programming Language, Mobile Learning Application, Social Engineering.

I. INTRODUCTION

The use of computing technology for learning has been observed in various ways. In the past few decades, electronic learning or e-learning had been adopted and used by public schools and university students in many parts of the world. They were familiar with both the e-learning terminology and technology but in recent years, the rapid progress in mobile technology has created a new area which is known as mobile learning technology. Mobile learning is the next generation of e-learning that are based on mobile devices (Sharples, M.,2005). Wireless technologies such as IEEE 802.11, Bluetooth, and GPRS are used in a project for development of informal classroom and eSchoolbag system at the Aletheia University in Taiwan (Chang C., Sheu J., 2007). A pilot case study called Math4Mobile was conducted in a novel environment to support mobile learning (Botzer, G., 2007). The Math4Mobile environment includes cellular applications designed to support mathematics learning. The main steps in development of a distributed mobile learning application for Android presented by P. Pocatilu, F. Alecu and M. Vettrici (2010). The client application communicates with the server using Web services. The prototype developed includes the testing module. Using Web services for mobile learning applications helps the process of development by providing a standardized way of communication between mobile clients and servers. It is a research on how to use mobile devices and mobile application development as a mechanism to teach introductory programming to computer science students (Mahmoud, Q.H and Popowicz, P.,2010). The objective of their research is to integrate mobile devices into computing education that could provide more benefits to the students than other teaching techniques. In their research the approach involves Java Micro Edition (ME) platform and the Blackberry smartphone as a device. The application associated software tools such as Blackberry Java Development

Environment for building Java ME and Blackberry based applications and Blackberry Smartphone Simulator. There is a project from University of Tennessee at Martin that has developed mobile learning applications for the Googles Android and Apples iOS platforms to be used in electrical engineering courses will be investigated their effects on student performance. These applications are quiz style and touch based applications that ask students questions relevant to electrical engineering subjects. There are several different problems to choose from, including digital logic gate analysis, discrete signal convolution, and digital filter design. Once students complete the work, the score results can be sent to the instructors email automatically (Potts, J, Moore, N and Sukittanon, S., 2011).

1.1 Need Of Mobile Learning

E-Learning exploits interactive technologies and communication systems to improve the learning experience. It has the potential to transform the way we teach and learn across the board. It can raise standards, and widen participation in lifelong learning. It cannot replace teachers and lecturers, but alongside existing methods it can enhance the quality and reach of their teaching. Social networking services (SNS) are increasingly popular amongst Australian young people regardless of geographical location, background and age. They include services such as Facebook.com, MySpace.com and Bebo.com which have many millions of members each. It also includes services, such as Elftown.com (for fans of fantasy and science fiction) and Ravelry.com (for fans of knitting!) with small numbers of members, often connected by a specific common interest. Furthermore, many services created for media sharing (e.g. Flickr for photo sharing, Last.FM for music listening habits and YouTube for video sharing) have incorporated profile and networking features and may be thought of as part of this wider conceptualization of SNS themselves (boyd Ellison 2008:216). Indeed, SNS in a Web 2.0 environment have transformed processes of communication and social interaction particularly with the increasing integration of social media functionality to these services. Research on the introduction of ICT in education (Salomon, 1990; Welch Brownell, 2000) has shown that it is effective only when developers understand the strengths and weaknesses of the technology and integrate technology into appropriate pedagogical practices. To address these concerns, an application framework is proposed for m-learning. This framework consists of two levels of research and analysis. First, is the mobile connectivity which focuses on the applications and technology used by commercial establishments to extend electronic commerce and second is the e-learning, which focuses on the use of Internet and other ICT in education.

II. LITERATURE SURVEY

Today over 6 billion people have access to a connected mobile device and for every one person who accesses the internet from a computer two do so from a mobile device. Mobile technology is changing the way we live and it is beginning to change the way we learn. Mobile learning involves the use of mobile technology, either alone or in combination with other information and communication technology (ICT), to enable learning anytime and anywhere. Learning can unfold in a variety of ways: people can use mobile devices to access educational resources, connect with others, or create content, both inside and outside classrooms. Mobile learning also encompasses efforts to support broad educational goals such as the effective administration of school systems and improved communication between schools and families. Social Engineering (SE) is a blend of science, psychology and art. While it is amazing and complex, it is also very simple. We define it as, Any act that influences a person to take an action that may or may not be in their best interest. We have defined it in very broad and general terms because we feel that social engineering is not always negative, but encompasses how we communicate with our parents, therapists, children, spouses and others. A survey on US mobile industry found that mobile device sales grew by 402003, and predicted that PDA/mobile phone sales will outstrip PC sales by 2005 with the majority of companies switching to wireless networks by 2008 (Ellis, 2003). Computing devices have become ubiquitous on today's college campuses. From notebook computers to Wireless phones and Handheld devices 1 (or W/H devices for short), the massive infusion of computing devices and rapidly improving Internet capabilities have altered the nature of higher education (Green, 2000). Computer Assisted Learning (CAL) has proliferated tremendously in the last few decades with the use of Internet, email, multimedia technology, and intelligent tutoring system on campus. A 2000 Campus Computing Survey revealed that the majority of college professors use email to communicate with their students, and approximately one-third of college courses utilize CAL technology (Green, 1999). Similarly, Jones (2002) reports that a great majority of college students own computers and wireless devices with almost 80 percent believing that Internet use has enhanced their learning experience.

III. OVERVIEW OF THE MOBILE LEARNING APPLICATION

Our application can be installed only on android platform phones. This application consists of the real time e-learning plus social engineering concept that provide a reliable mobile learning application. In case you are offline then also one can learn from this app. This application basically consist of two part first part has tutorial part where the learning contents are place and in second part chat room is available for user. If any query occurs to user then he/she will fire it on the chat room. The user (expert) on the other side will provide the solution to the user's query thus this application is real time application and provide free of cost e-learning. The application we are going to develop is reduces all the drawbacks of existing system. This application is basically based on the smart phone. Now days most of people uses it . So

the application has lots Scope area. The Application provides the reliable and convenient way for the mobile learning.

3.1 Technology Used

In this application we are using the following technology.

3.1.1 Android

Android is a mobile operating system (OS) based on the Linux kernel and currently developed by Google. With a user interface based on direct manipulation, Android is designed primarily for touchscreen mobile devices such as smartphones and tablet computers, with specialized user interfaces for televisions (Android TV), cars (Android Auto), and wrist watches (Android Wear). The OS uses touch inputs that loosely correspond to real-world actions, like swiping, tapping, pinching, and reverse pinching to manipulate onscreen objects, and a virtual keyboard. Despite being primarily designed for touchscreen input, it also has been used in game consoles, digital cameras, and other electronics. Android is the most popular mobile OS. As of 2013, Android devices sell more than Windows, iOS, and Mac OS devices combined, with sales in 2012, 2013 and 2014 close to the installed base of all PCs. As of July 2013 the Google Playstore has had over 1 million Android apps published, and over 50 billion apps downloaded. Androids source code is released by Google under open source licenses, although most Android devices ultimately ship with a combination of open source and proprietary software. Initially developed by Android, Inc., which Google backed financially and later bought in 2005, Android was unveiled in 2007 along with the founding of the Open Handset Alliance a consortium of hardware, software, and telecommunication companies devoted to advancing open standards for mobile devices. Android is popular with technology companies which require a ready-made, low-cost and customizable operating system for high-tech devices. Androids open nature has encouraged a large community of developers and enthusiasts to use the open-source code as a foundation for community-driven projects, which add new features for advanced users or bring Android to devices which were officially released running other operating systems. The operating systems success has made it a target for patent litigation as part of the so called smartphone wars between technology companies.

3.1.2 2G and 3G network

2G (or 2-G) is short for second-generation wireless telephone technology. Second generation 2G cellular telecom networks were commercially launched on the GSM standard in Finland by Radiolinja (now part of Elisa Oyj) in 1991. Three primary benefits of 2G networks over their predecessors were that phone conversations were digitally encrypted; 2G systems were significantly more efficient on the spectrum allowing for far greater mobile phone penetration levels; and 2G introduced data services for mobile, starting with SMS text messages. 2G technologies enabled the various mobile phone networks to provide the services such as text messages, picture messages and MMS (multi media messages). All text messages sent over 2G are digitally encrypted, allowing for the transfer of data in such a way that only the intended receiver can receive and read it. After 2G was launched, the previous mobile telephone systems were

retrospectively dubbed 1G. While radio signals on 1G networks are analog, radio signals on 2G networks are digital. Both systems use digital signaling to connect the radio towers (which listen to the handsets) to the rest of the telephone system. 2G has been superseded by newer technologies such as 2.5G, 2.75G, 3G, and 4G; however, 2G networks are still used in many parts of the world. 3G, short form of third Generation, is the third generation of mobile telecommunications technology. This is based on a set of standards used for mobile devices and mobile telecommunications use services and networks that comply with the International Mobile Telecommunications-2000 (IMT-2000) specifications by the International Telecommunication Union. 3G finds application in wireless voice telephony, mobile Internet access, fixed wireless Internet access, video calls and mobile TV. 3G telecommunication networks support services that provide an information transfer rate of at least 200 kbit/s. Later 3G releases, often denoted 3.5G and 3.75G, also provide mobile broadband access of several Mbit/s to smartphones and mobile modems in laptop computers. This ensures it can be applied to wireless voice telephony, mobile Internet access, fixed wireless Internet access, video calls and mobile TV technologies. A new generation of cellular standards has appeared approximately every tenth year since 1G systems were introduced in 1981/1982. Each generation is characterized by new frequency bands, higher data rates and no backward-compatible transmission technology. An application on an Android device doesn't need to be running to receive message. The system will woke up the application via Intent broadcast when the message comes, as long as the application is set up with the proper broadcast receiver and permissions. It requires devices running Android version 2.2 or higher that also have the Market applications installed. However, you are not limited to deploy your applications through Market. It uses an existing connection for Google services. This requires users to set up their Google account on their mobile devices. C2DM has been officially deprecated as of 26 June 2012. This means that C2DM has stopped accepting new users and quota requests. No new features will be added to C2DM. However, apps using C2DM will continue to be working . Existing C2DM developers are encouraged to migrate to the new version of C2DM, called Google Cloud Messaging for Android (GCM).

IV. SYSTEM ARCHITECTURE

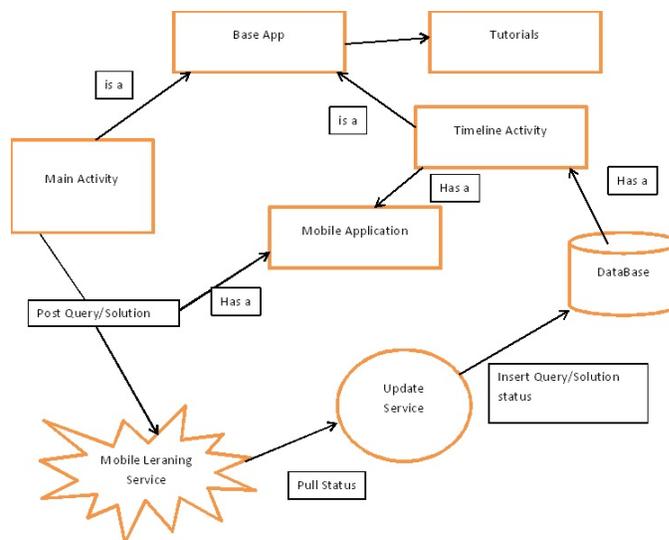


Fig. 4.1 System Architecture.

4.1 Existing System

As discussed in the introduction the existing systems are available in Mobile Learning are the Stand alone an Very Small Concept this system provide the services to the user for standalone mobile learning application from his mobile phone. In some cases both the system work same, and they provided much of services to the user. But because of the some problems they losing their popularity.

4.2 Proposed System

This application consists of the real time e-learning plus social engineering concept that provide a reliable mobile learning application. In case you are offline then also one can learn from this app. This application basically consist of two part first part has tutorial part where the learning contents are place and in second part chat room is available for user. If any query occur to user then he/she will fire it on the chat room .The user (expert) on the other side will provide the solution to the user's query thus this application is real time application and provide free of cost e-learning.

V. REVIEW

The development of mobile applications is not an easy task. In this paper we presents the main steps in development of a mobile learning application for Android. The client application communicates with the server using Web services to download the application. The system developed includes the testing module. The testing result showed that the system worked correctly. Next step, we are going to conduct an evaluation on the prototype to assess the learning efficiency and effectiveness of this system. This system will persist to grow and the future work will include improving the content of the system by adding more modules and multiple choice questions, creating more assortments of interactive learning options for the system, continuous enhancement of the system to continuously suit the students' needs and further experiments will be conducted for a longer period of time.

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Effects of coaching programmes on employee performance in business process outsourcing subsector of Nairobi city county, Kenya.

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ABSTRACT

Research has demonstrated that there are a variety of factors that influence performance at the work place, such as team coaching, Business Coaching, Executive Coaching and self/personal coaching. This study aimed at determining the effects of coaching Programs on employee performance and the reduction of staff attrition in the BPO industry in Nairobi, Kenya. Both Primary and Secondary data sources were adopted. Quantitative research methodology was employed to inference an effect of the four coaching techniques on employee performance by use of 2 ways ANOVA and Multiple regression analysis. Stratified sampling method was used to select respondents while qualitative methodology was used to facilitate an in-depth description of the experiences and perceptions of the participants of the four coaching programs. The samples were drawn from the staff population of Direct Channel Simbitech Kenya Limited and Kencall Kenya Limited employees. Content analysis was used to analyze qualitative data while quantitative data was analyzed by use of the statistical package for social sciences (SPSS) computer software -later organized into themes, and presented by use of frequency distributions, percentages and presented in graphs and charts. Pilot study was conducted to determine instrument validity. The study found out that executive coaching and business coaching reduces on average employee performance. Team and self-personal development coaching increases average employee performance. The 2-Way ANOVA test at 0.01 level of significance indicated that there was no statistically significant difference in mean employment performance between the use of executive coaching technique and business coaching technique ($P = 0.097$). However, there was statically significant difference in mean employee performance between the use of Team coaching technique and Self-personal development coaching technique ($P = 0.004$). The study recommends that both team coaching and self-personal development coaching should be employed on the employees for exceptional results.

1. INTRODUCTION

1.1 Background Information

Coaching is now widely accepted in a field wider than sport and has emerged into the arena of personal development. Although the earliest literature in coaching is in the context of an organizational setting and is not directly connected to the current research, it is interesting to note that coaching is referred to as 'psychological consultation with executives' and is described as 'psychology in action' (Glaser, 1958). However, this study lacked scientific integrity as no scientific measurement was available to assess the effectiveness of the intervention (Glaser, 1958).

Grant (2001) nonetheless, acknowledged the significance of this study and the contribution it made to early coaching research. Leedham (2005) also recognized the contribution made to early coaching research by Gallwey (1975) as forming a valuable foundation for coaching. Gallwey's study indicated that performance improved where there is improved concentration, reduced anxiety, coupled with the ability to overcome mental obstacles.

Coaching approaches Brockbank and McGill (2006) have identified four different approaches to coaching; Functionalist coaching, Engagement coaching, Revolutionary coaching and Evolutionary coaching. The functionalist approach focuses on efficiency and balance. In this approach the world is thought to be completely objective and neutral. The approach aims to improve performance and it suppresses challenge and questioning (Brockbank, 2006). The engagement approach on the other hand accepts the fact that the learner lives in a subjective world. This approach is non-directive approach and tries to maintain the status quo.

1.1.1 Definition of Coaching

Coaching has been defined in many ways; the International Coaching Federation (ICF) describes coaching as "partnering with clients in a thought provoking and creative process that inspires them to maximize their personal and professional potential" (International Coach Federation, 2010). Brockbank and Ian McGill (2006) posit that the one purpose of coaching is: "the learning and development of an individual, a process that involves change". Brockbank (2006), the International Institute of Coaching

says: "Coaching is a simple yet effective form of personal development where the Client and Coach create an alliance that promotes and sustains the Client's personal growth and competence. This powerful relationship enables the Client to give up who they are for who they want to become."

One thing that most definitions of coaching already have in common is that it recognizes the person as a whole, believing that the client is in possession of all the qualities and resources required for development. It is the coach's job to find and release that potential in the client (Brockbank, 2006). Coaching is considered as one of the key elements of success in all major competitive fields ranging from sports to business and personal life. That is why coaching is a fast growing business today. The coaching process helps the client to establish effective personal and business relationships and it can lead the way to more effective decision making. Coaching is conducted by dialogue and inquiry, which improves the client's communication skills, creates awareness and competence.

This study will concentrate on Coaching for individuals and Work teams (Example, marketing teams, sales teams, Call centre teams etc.); the importance of team work and members has taken on a greater role in organizational performance. Because teams are an integral part of many organizations, understanding team performance and how it can be improved has become increasingly important to organizations.

Team coaching has been recommended as one of the potential ways in which organizations can improve team functioning, team performance and ultimately individual performance. This study will attempt to explore the effects of Team Coaching on individual Performance, Executive, Business and self/personal coaching. Broadly speaking, team coaching refers to the act of a coach providing leadership to a team. Specifically, Hackman and Wageman (2005) define team coaching as "direct interaction with a team intended to help members make coordinated and task-appropriate use of their collective resources in accomplishing the team's work".

According to Hackman and Wageman (2005), among the variety of leadership behaviors available to coaches, team coaching is utilized less than other aspects of team leadership. Executive coaching emerged as a leadership development practice a little over two decades ago and is now among the most widely used executive development techniques (McGovern, 2001).

Executive coaching is defined as a helping relationship formed between a client who has managerial authority and responsibility in an organization and a consultant who uses a wide variety of behavioral techniques and methods to help the client achieve a mutually identified set of goals to improve his or her professional performance and personal satisfaction and, consequently, to improve the effectiveness of the client's organization within a formally defined coaching agreement.

1.1.2 Coaching in Kenya

1.1.2.1 Destiny Life Coach

It's a coaching program that helps individuals to achieve their dream of becoming certified coaches. The Destiny Life Coaching program is designed to empower one with the focus, training and accountability they need to achieve the consistent results they demand in the most important areas of life. Other coaching Services include: Personal Development sessions (3 months, 1hr once a week), Corporate Training & Workshops, Youth Mentorship, Motivational and Inspirational talks.

1.1.2.2 Dolphins Training and Consultants Ltd

Is the leading Training and Consultancy house in Africa and a member of Dolphins Group of companies? Dolphins Training & Consultants Ltd specializes on executive corporate trainings including: Simplified Strategic Planning, The Hands-off Manager skills training, Executive Marketing training, Effective sales delivery and management training, Executive public speaking and presentation skills training, High Impact Team Building, Top Image, dressing and etiquette, Professional Writing Skills, Perfect PA and Effective Office Administrator, Reinventing Yourself, Professional writing skills, Diligent Interviewing skills.

1.1.2.3 Business Process Outsourcing

Business process outsourcing (BPO) is a subset of outsourcing that involves the contracting of the operations and responsibilities of specific business functions (or processes) to a third-party service provider. Business process outsourcing (BPO) is the contracting of a specific business task, such as payroll, to a third-party service provider.

Chandra (1999) defines outsourcing as an organization's purchase of any service activity from an external source. The firm buying the service is the outsourcer or client. The firm supplying the service is the outsourcer, outsourcing vendor or outsourcing service provider. The term BPO usually indicates an outsourcing arrangement that concerns an entire business unit as opposed to a narrow activity such as IT or facility management. Accenture defines BPO as "contracting with an external organization to take primary responsibility for providing a business process or functions (United Nations, 2003)

BPO benefits both the client and the service provider. For the client, the benefit can be significantly greater than the cost savings from the pure information technology (IT) outsourcing frequently deployed in the past. BPO allows some outsourcer to pass saving between 15% and 85% of their end customer. Companies increasingly partner with outsourcing service provides "to gain access to competitive skills, improve service levels and increase their ability to respond to changing business needs (Linder, 2002). The worldwide spending for outsourcing is expected to grow dramatically through 2008 (Crane, 2004), and business process outsourcing is "the hottest growth area in the outsourcing space" (Information Week, 2004). BPO includes a broad

spectrum of back-office and customer facing functions eg data processing, account receivable, customer analytics, and tax processing and equity research. The year BPO is considered a priority by 20 to 35% of small medium and large enterprise.

1.2 Statement of the Problem

The purpose of this study is to explore the effect of coaching on employees work performance to reduce attrition in the BPO industry in Nairobi, Kenya. The purported benefits of coaching remain mostly testimonial in nature and the majority of studies done to date are based on phenomenological research. Grant (2004) argued that coaching has outgrown its current proprietary knowledge-based status, and many coaches are advocating a shift toward more research that will provide theoretically grounded, evidence-based knowledge to support it. There is a need to unify what is currently known about coaching into a coherent, well-defined body of knowledge with shared terminology and theoretical base so that consumers, researchers, professional associations and any interested individual can have a concrete and verifiable source of information to turn to.

This study therefore sought to determine the effect of coaching Programmes on employee performance in the BPO industry in Nairobi, Kenya. In recent past the BPO industry in Nairobi has expanded with fully fledged operations centers. The ICT Authority of Kenya has been the Government arm charged with the responsibility of marketing BPO industry in Kenya to the outside world. The marketing activities are geared towards selling Kenya to the world with an objective of making Kenya the next preferred outsourcing destination from India the Philippines and China.

The existing BPO organizations have however, been faced with the challenge of employee performance levels. Another major challenge facing this industry in Nairobi is substandard services and lack of capacity building. In 2012 Direct channel Simbitech in partnership with Jomo Kenyatta University of Agriculture & Technology– Research, Production and Extension (RPE) department developed Certificate and Diploma training programmes in order to build capacity for the industry.

Due to this challenges' organizations are not able to justify high cost of coaching and capacity building as they experience high employees attrition that definitely affects the growth of individual organizations as well as the BPO industry This study therefore, seeks to determine the effects of Coaching Programmes on employee's performance in selected BPO operators in Nairobi, Kenya.

1.3 Objectives of the Study

1.3.1 General Objective

The general objective of this study was to determine the effects of coaching Programmes on employee performance in the BPO sub-sector in Nairobi.

1.3.2 Specific Objectives

The study was guided by four specific objectives which were;

1. To determine the effects of executive coaching on employee performance in the BPO sub-sector in Nairobi.
2. To establish the effects of business coaching on employee performance in the BPO sub-sector in Nairobi.
3. To establish the effects of team coaching on employee performance in the BPO sub-sector in Nairobi.
4. To determine the effects of personal development/life coaching on employee Performance in the BPO sub-sector in Nairobi.

1.4 Research Questions

The study was guided by the following research questions:

1. What is the effect of executive coaching on employee performance in the BPO sub-sector in Nairobi?
2. What is the effect of business coaching on employee performance in the BPO sub-sector in Nairobi?
3. How does team coaching affect the employee performance in the BPO sub-sector in Nairobi?
4. How does personal development/life coaching affect employee performance in the BPO sub-sector in Nairobi?

1.5 Justification

Grant (2003) has indicated that life coaching is at a 'cross-roads'. The reason for this cross roads is that in recent years coaching has evolved in a number of ways. First, as the coaching industry evolves, and matures, those who are seeking coaching are asking questions about its efficacy and effectiveness. Secondly, this is coupled with the fact that within the human resource industry those who are now hiring coaches have rigorous assessment procedures. Finally, there is a growing discontent among those who were trained in schools who practiced their own proprietary models of coach training without the foundation of empirically research Grant and Cavanagh (2004). In addition to the above the coaching industry has taken a 'paradigm shift'. Previously those who engaged in the intervention of coaching were perceived as being 'flawed' (Peterson, 2002). In the light of the above the wish to establish the effects of coaching on performance in the BPO sub-sector in Nairobi, so as to guide the BPO organizations, business owners and the stakeholders on the most appropriate coaching programmes that would improve work performance.

1.5.1 Organizations under Study

These organizations will benefit from this study by being able to obtain feedback directly from their employees which may otherwise be difficult to obtain. At the same time these organizations will be able to implement the provided recommendations upon data analysis and provided report.

1.5.2 Listed BPO Operators

The listed BPO operators will benefit from this study by understanding the impact of coaching to employees in the subsector under study. These operators will also be able to make informed coaching decisions.

1.5.3 The ICT Authority of Kenya

The ICT Authority of Kenya has been charged with the responsibility of promoting the BPO Subsector in Kenya to the international countries with an aim of making Kenya the next outsourcing destination in the world from the Philippines and India. One of the challenge identified by the Authority has been capacity building in this subsector, the findings and recommendations of this research will enable the Authority to identify the most ideal coaching method that would contribute to capacity building.

1.6 Scope of the Study

The study focused on the effects of coaching programmes on the performance of employees in the BPO sub-sector in Nairobi. This study was carried out in Nairobi's Westlands and Mombasa road locations where the BPO operators are situated.

2. LITERATURE REVIEW

2.1 Introduction

This chapter will give an overview of the field of inquiry. The literature review will provide information on what has already been said on and written on Team Coaching, Executive Coaching, Business Coaching and personal coaching. The prevailing theories and hypotheses, questions which have been asked, and methodologies and methods are appropriate and useful will be studied. According to Tobias (1996), the term coaching was first used as a substitute word to describe the practices of consulting and counseling in an effort to make both seem less threatening and remedial. Apparently, the re-labeling of this intervention to promote professional development worked, as media coverage in the late 1990s characterized coaching as a much sought after benefit being offered by companies and corporations willing to invest in an employee's individual growth and progress (Stern, 2001).

Kilburg's (1996) supported the re-labeling theory of how coaching originally spawned from the field of consulting and counseling. The reasons provided for the increased popularity of coaching have been speculative at best with some authors suggesting that bringing therapy into the workplace under the guise of coaching was one way for psychologists to revitalize their practices after the damaging effects of managed care (Filipczak, 1998; Tobias, 1996); however, Witherspoon and White (1996) provided a simpler, more direct explanation for its popularity.

2.1 Theoretical Framework

2.2.1 Coaching and Existing Established Theory

As with any new field of study, coaching draws upon existing established theory and knowledge. As they underpin coaching some of the main psychological theories that are credited as forming the basis of coaching will now be outlined. Positive psychology has provided some structure for the foundation of coaching and is the science at the heart of coaching (Kauffman, 2006).

The emphasis in positive psychology is on functional as opposed to dysfunctional behaviours thereby encouraging resourcefulness and capacity for change, coupled with a focus on optimism, strengths and happiness (Feltham, 2006). The role of the coach in positive psychology is to focus the coachees on using their existing strengths to capitalize on what energises and pulls coachees forward towards goals and ultimately toward optimal functioning (Kauffman, 2006). Humanistic psychology, founded on an optimistic view of the individual, also plays an important part in coaching (Stober, 2006).

According to Stober (2006), "the humanistic theory of self actualization is a foundational assumption for coaching with its focus on enhancing growth rather than ameliorating dysfunction". The key concepts of coaching, namely; the trusting relationship between the coach and coachee and, the acceptance of the coachees as unique individuals, with an inherent capacity for growth, have all evolved from the humanistic perspective. Stober (2006) indicated that it would be difficult to imagine a model of coaching that had not integrated these concepts into its processes. The contribution of cognitive therapy within the field of cognitive psychology is acknowledged by Auerbach (2006). The main constructs of cognitive therapy are; mood is closely linked to cognitions of the individual; the role of the cognitive therapist is to help individuals identify errors in the way they think and assist them to identify and adopt more useful and productive thoughts.

Auerbach (2006) cited Burns (1980) who stated that there is often an irrational element in the way individuals think which may ultimately distort their thinking patterns thereby leading to difficulties in adopting new behaviour. However, through the process of cognitive therapy which seeks to identify and eliminate the irrational and distorted thoughts, the individual's mood and ultimately performance could be improved Auerbach, (2006). In drawing comparisons between coaching and cognitive therapy, the role of the coach is to assist the coachee to see themselves realistically, and weigh up options to achieve goals which were identified as 'cognitive coaching techniques' Auerbach (2006). As can be seen from the above no one psychological theory alone can be taken as underpinning the foundation of coaching, as ultimately "coaching is a derivative of many fields and the innovative thinking of great pioneers" (Williams, 2003).

2.2.2 Sandwich Theory

The theory is aimed at improving individual performance. Here's how it works: if the participant/team player/employee is not performing in one area. Instead of using the "praise in public, criticize in private" method, think of at least two areas in which he/she is performing well. Have a chat, starting with praise for one area in which they excel. Then move to the area that needs work. Finish with the second good skill they have. You've delivered not one, but two instances of praise, yet made your employee aware of the area that needs improvement. If you are working or had worked with a group of people, most likely, you are familiar with performance appraisal period.

This is the time when the employees are coached by the supervisor or the manager regarding his performance. If you are a supervisor handling several people, you might have noticed that after a coaching session, only few of your subordinates try to improve in their duties. Sometimes, after coaching, some employees just seemed to ignore your message. Feedback in sandwich theory, at some point after task performance feedback is provided by the individual. Task feedback as defined by Iigen, Fisher, and Taylor (1979), is a message an individual receives from a source that contains information about the individual's task performance. Feedback can be actively sought out through inquiry or monitoring to supplement the feedback that has already been provided (Ashford, 1986; Ford and Cummings, 1983).

Therefore, for almost all tasks, some knowledge of performance is available (Ammons, 1956). The way that feedback is acquired and processed varies, however according to the person's awareness (Taylor, 1983). Conscious processing of feedback is most likely to occur when an individual is unfamiliar with a situation or when the feedback obtained is dramatically incongruent with expectations, and when others cue the individual to attend to feedback (Taylor, 1983). All these factors would serve to increase the salience of the feedback. How feedback is processed is important because it influences the nature of subsequent information processing and because unconsciously processed feedback may be biased towards the recipient's expectations (Taylor, 1983). Two conditions thought to decrease the likelihood that feedback will be ignored are valued goals (Powers, 1973), concept of controlled quantity) and self-focus or self attention individuals high in self-focus are more aware of inconsistencies between their ideal and actual selves (Wicklund, 1975) and this awareness increases the desire for consistency (Taylor and Fiske, 1978).

2.2.3 Control Theory

Multiple factors affect coaching such as motivation, cultural differences, goals, and feedback. Control theory focuses on goals and feedback. Control theory focuses on goals and feedback. The basic premise of control theory is that people attempt to control the state of some variable by regulating their own behavior. With behavioral regulation, first compare the goal with feedback. After comparing the two you can now evaluate if there is a behavior that can be changed to increase performance which will help reach your goal (Spencer, 2012). Control theory, present for some time (Wiener, 1984), has been a useful framework for theoretical development in many fields (Carver & Scheier, 1981).

According to the cybernetic hypothesis Wiener (1948), the feedback loop is the fundamental building block of action. In its simplest form, the feedback loop consists of four elements; a referent standard or goal, a sensor or input function, a comparator and an effect or output function. In Human control system the feedback involves much more than the mechanical sensing of the environment, goals are not predetermined in flexible standards, and there are several alternatives for reducing discrepancies (Lord & Hanges, 1987) as a result, control theory can represent a very flexible, non mechanical view of behavior (Lord & Hanges, 1987). Although human control systems are more complex, they do operate in the same basic way – utilizing feedback to ensure the attainment of goals.

When framed as a theory of behavior, control theory has two primary elements; one cognitive, the other affective (Carver & Scheler, 1981) the cognitive component consists of internal goals the processing of information about one's current state and the comparison of that state with those goals. The affective component arises from perceived discrepancies between one's desired and current states and behavior is initiated from one's desire to resolve those discrepancies (Carver & Scheler, 1981). Complex behaviors can be explained by hierarchies of feedback loops.

2.2.4 Integral Theory

Integral means inclusive balanced comprehensive. The integral approach does not advocate one particular value system over another but simply helps leaders assemble the most comprehensive overview available so that they can more adequately and sanely address the pressing issues facing all of us (Wilber, 2003). As collective human consciousness has generally evolved new understandings can be seen to have been taken on board. In this way we can identify the evolution of integral avant garde (Wilber, 2003).

The integral approach carries an injunction to practice (Wilber, 2000) this theory is a philosophy promoted by Ken Wilber that seeks a synthesis of the best of pre-modern, modern, and postmodern reality. It is portrayed as a "theory of everything," and offers an approach "to draw together an already existing number of separate paradigms into an interrelated network of approaches that are mutually enriching." The word integral means comprehensive, inclusive, non-marginalizing, and embracing. Integral approaches to any field attempt to be exactly that: to include as many perspectives, styles, and methodologies as possible within a coherent view of the topic.

In a certain sense, integral approaches are “meta-paradigms or ways to draw together an already existing number of separate paradigms into an interrelated network of approaches that are mutually enriching”. Ken Wilber. Integral theory weaves together the significant insights from all the major human disciplines of knowledge, including the natural and social sciences as well as the arts and humanities. As a result of its comprehensive nature, integral theory is being used in over 35 distinct academic and professional fields such as art, healthcare, organizational management, ecology, congregational ministry, economics, psychotherapy, law, and feminism. In addition, integral theory has been used to develop an approach to personal transformation and integration called Integral Life Practice (ILP).

The ILP framework allows individuals to systematically explore and develop multiple aspects of themselves such as their physical body, emotional intelligence, cognitive awareness, interpersonal relationships, and spiritual wisdom. Because integral theory systematically includes more of reality and inter relates it more thoroughly than any other current approach to assessment and solution building, it has the potential to be more successful in dealing with the complex problems we face in the 21st century. In an integral perspective evolution is considered going through four domains, matter (cosmos), life (biosphere) mind (noosphere) and spirit (theosphere). The biosphere evolution to the noosphere is especially important as it the movement from images, symbols, concepts to a linguistic world (Wilber, 2000).

2.3 Conceptual-Framework

A conceptual framework is a theoretical structure of assumptions, principles and rules that hold together the ideas comprising a broad concept. It is used to outline possible courses of action or to present a preferred approach to an idea or thought. Likewise conceptual frameworks direct the collection and analysis of data. It’s the way ideas are organized to achieve a research project’s purpose (Shields and Rangarajan, 2013).

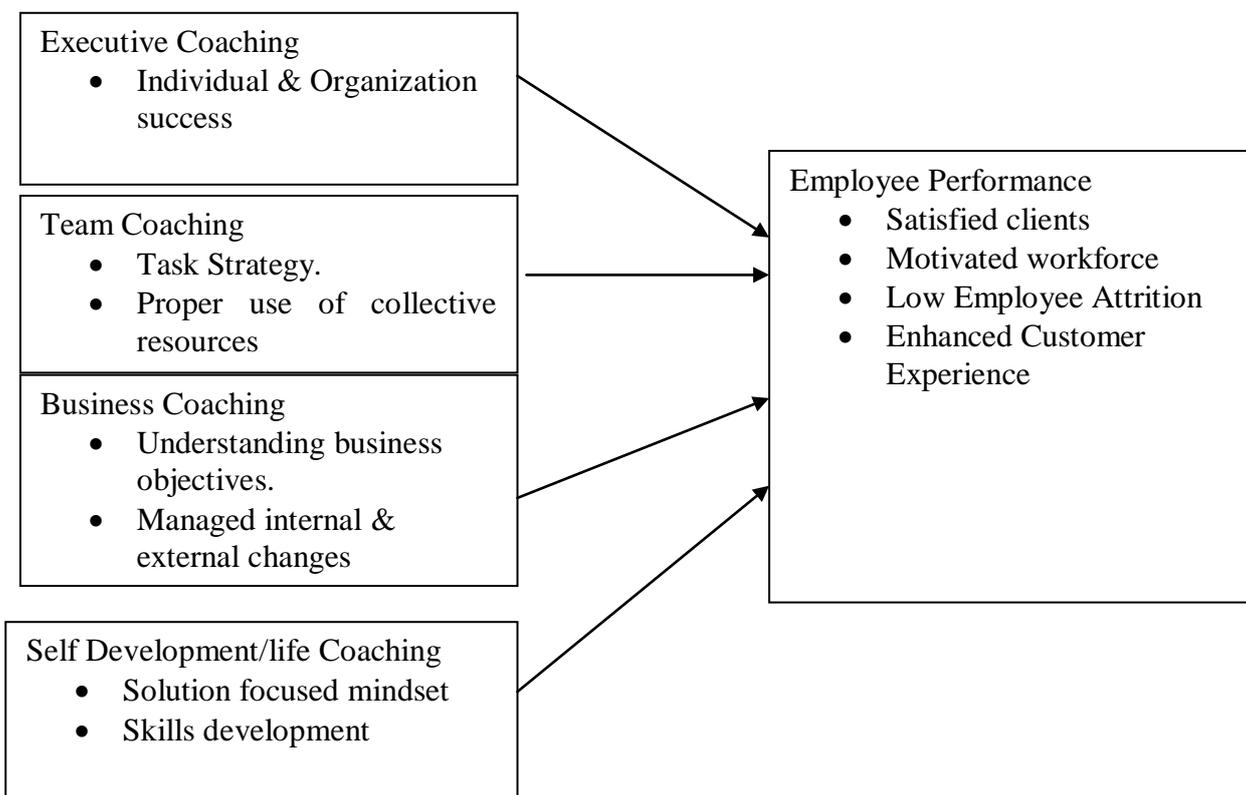


Figure 2. 1: Conceptual Framework

Independent Variables

Dependent Variable

2.3.1 Executive Coaching

Emerged as a leadership development practice a little over two decades ago and is now among the most widely used executive development techniques (McGovern, 2001). To critically examine executive coaching research, this chapter commences by presenting an Introduction to the field of executive coaching. The origin of executive coaching is difficult to pinpoint precisely (Kampa-Kokesch & Anderson, 2001), although it appears to be an outgrowth of corporate executive development programs requiring a more individual focus and flexible structure in a rapidly changing world of business.

The term was first used in the late 1980s (Tobias, 1996). Since then its growth has been rapid and widespread, with many of the world’s most admired corporations investing significant sums in coaching of executives thereby creating a global US\$2 billion per

annum market (Passmore and Gibbes, 2007; Sherman and Freas, 2004). The corresponding growth of related literature has not been as rapid, so executive coaching is an area where practice is leading theory (Joo, 2005). executive coaching may be simply defined as A process of one-on-one relationship between a professional coach and an executive (coachee) for the purpose of enhancing coachee's behavioral change through self-awareness and learning and thus ultimately for the success of the individual and organization (Joo, 2005) The profession of psychology has contributed much to the field of executive coaching, defining the process with greater precision.

The definition by Joo (2005) highlights the coach's standing external to the organization, the executive's learning and behaviour change, and the organizational benefit. Grant (2001) emphasizes the systematic process which results in improved work performance. However, neither definition specifically states the significance of neither the executive role nor the relation to a defined coaching agreement nor the involvement of the executive in forming the goals of the coaching.

Kilburg (1996) Executive coaching is defined as a helping relationship formed between a client who has managerial authority and responsibility in an organization and a consultant who uses a wide variety of behavioral techniques and methods to help the client achieve a mutually identified set of goals to improve his or her professional performance and personal satisfaction and, consequently, to improve the effectiveness of the client's organization within a formally defined coaching agreement.

This definition by Kilburg (1996) includes the strengths of the other definitions and also aspects that were missing. Accordingly, the definition by Kilburg (1996) will be used in this study to define the executive coaching variable. Executive coaching is seen as a confidential personal learning process that focuses on both interpersonal and intrapersonal issues (Kiel, 1996) in an ongoing relationship that may last from a few months to a few years (Kampa Kokesch & Anderson, 2001).

With executive coaching becoming more clearly defined and widely accepted as a commercial practice, it has become increasingly distinct from other forms of executive development which may be closely related example mentoring, training, consulting and counseling. Executive coaching is distinct from other forms of development by virtue of a confidential one-on-one relationship between an executive and a coach external to the organization, conducted for a defined time period. Furthermore a holistic or systems perspective is adopted with a view to achieve both individual and organizational benefits. It is generally focused on specific leadership competencies or solving specific problems and includes regular follow-up on progress to monitor behaviour change (Garman, 2000; Hall, 1999; Judge & Cowell, 1997; Kampa-Kokesch & Anderson, 2001). A unique feature of coaching, unlike other methods of executive development, such as conferences and training sessions, is that behavioral practice is its central component (Kombarakaran, 2008).

Through coaching the executive is encouraged to develop new approaches and behaviors, practice them, re-evaluate their impact and try a revised approach for improved effectiveness. A major strength of coaching is that it respects the individual style and the authority of the executive and provides constructive feedback on the impact of the executive's behavior Kombarakaran, 2008). Executive coaches Executive coaching is an unregulated field and the qualifications of executive coaches vary greatly. Because of the increased demand executive coaching has attracted professionals from business consultancy, management, teaching, workplace training, and psychology (clinical, organisational, sports) amongst others. Each of these professions has its own knowledge base and significant contribution to make to the emerging field of executive coaching (Feldman and Lankau, 2005; Grant and Cavanagh, 2004). There has been few studies of the qualifications of coaches (Grant and Cavanagh, 2004) and fewer relating to executive coaches in particular (Binstead and Grant, 2008; Brooks, 2007).

The approach to executive coaching adopted by any practitioner generally consciously or subconsciously reflects their professional background (Bluckert, 2005). Scholars and practitioners from the psychology field typically define coaching in terms of behavioural change (Bluckert, 2005). Generally, their concern is with identifying and accurately implementing the theoretical foundation which serves to guide the coach/client relationship and coaching process.

2.3.2 Business Coaching

The main reason for a business to use a coach is that there is unreleased potential or goals that are not yet achieved. Deeper understanding of the objective of the business is one common reason for a business to opt for coaching. When a business has been operating for years, employees as well as the management fall into a comfort zone and usually do not question the things they take for granted (Brockbank, 2006). When the business is faced with internal or external changes in its environment, coaching can become crucial. External changes can be changes in the economic climate; customers purchase habits, competition etc. Internal changes could include a rethinking of business strategy, management structure, product lines, company mission or vision, potential merger etc.

Hirvihuhta (2006) argues that the world is changing rapidly and businesses are faced with multiple issues, example keeping up with constant technological development, competition for skilled employees, shortage in employees in certain industries, unrest with the employees about job security and the managers about target achievement etc. Businesses dealing with these kinds of situations often benefit from coaching. Change isn't the only reason for a business to want coaching. Other reasons include desire for organizational development, individual or teamwork development. They may want to have a deeper commitment to the business or task. The business probably desires to improve its results or to expand the business. It can hope for improvement in skill and knowledge or confidence.

There may also be a need to clarify the objectives of the business, to soften the imbalance between work and life and find the unidentified core strengths etc. (International Coach Federation). All businesses can benefit from coaching. When an employee gets a deeper understanding of the business and the dynamics of his or her role in the business, it can lead to person's deeper commitment to the organization (Hirvihuhta 2006). Cook and Marshall (1998) list several benefits that can come from coaching, example developing employees' competence, helping to identify and diagnose problems with performance, helping to correct unsatisfactory performance, helping to identify behavioral problems, enhancing productive working relationships, providing opportunities, conveying possible positive feedback, providing opportunity for self coaching behaviour (such as employees may become more competent due to coaching) and improving employees performance and morale.

2.3.3 Team Coaching

This coaching has been recommended as one of the potential ways in which organizations can improve team functioning, team performance and ultimately individual performance. This study will attempt to explore the effects of Team Coaching on individual Performance. Coaches help individuals and groups of individuals, such as teams, carry out specific task. A coach, or leader, can utilize a variety of different techniques to cultivate team effectiveness, and coaching style varies based on the attention the coach gives to these different techniques. Broadly speaking, team coaching refers to the act of a coach providing leadership to a team. Specifically, Hackman and Wageman (2005) define team coaching as "direct interaction with a team intended to help members make coordinated and task-appropriate use of their collective resources in accomplishing the team's work". According to Hackman and Wageman (2005), among the variety of leadership behaviors available to coaches, team coaching is utilized less than other aspects of team leadership. A study conducted by Wageman, Hackman & Lehman (2004) found that among 268 task-performing teams from 88 organizations, team coaching was ranked as getting the least attention of four categories of leadership behaviors—structuring the team, arranging for resources, helping individual members contribute to the team, and working with the team as a whole (team coaching).

The results from their study suggest that leaders underestimate the potential benefits of team coaching or more likely, that leaders do not know how to provide effective team coaching. Based on past research and theory, Hackman and Wageman (2005) propose a new model of team coaching that identifies the functions, specific times, and conditions under which team coaching will ultimately help teams perform more effectively.

The theory of team coaching proposed by Hackman and Wageman (2005) revolves around three components—the functions that coaching serves for a team, the specific times during the task performance process when coaching is most effective, and the conditions under which team coaching is and is not likely to improve performance. Addressing the first of the three components, there are specific functions that are critical to team and individual performance effectiveness.

For the purpose of identifying the most critical functions served by coaches of work teams, Hackman and colleagues highlight three features of group interaction that impact group performance—level of effort of group members, appropriateness of group performance strategies to the task, extent of knowledge and skill of group members (Hackman and Morris, 1975; Hackman and Walton, 1986).

In other words, these researchers state that team effectiveness is a joint function of these three performance processes. Therefore, a team that adequately fulfills these three criteria will be likely to perform better than a team that may leave one or more of these functions unfulfilled. As with other processes, these three performance processes are susceptible to "process loss" (Steiner, 1972) but also present an opportunity for "process gain" (Hackman & Wageman, 2005), which is where coaching functions come into play. Coaching functions are interventions, made by the coaches that can inhibit process losses and promote process gains for each of the performance processes (Hackman and Wageman, 2005).

Hackman and Wageman (2005) break down the coaching functions as such: Coaching that addresses the level of effort of group members is motivational, coaching that addresses the appropriateness of group performance strategies is consultative, and coaching that addresses the knowledge and skill of the group members is educational (Hackman and Wageman, 2005).

Unlike past theories and models developed about team coaching, the team coaching model proposed by Hackman and Wageman (2005) addresses a team's task performance processes rather than members' interpersonal relationships. Moreover, Hackman and Wageman (2005) argue that performance drives interpersonal processes rather than vice versa.

The second component of the team coaching model addresses the specific times during the task performance process when coaching is the most effective. Here, Hackman and Wageman (2005) claim that coaching interventions do not depend solely on the focus—team effort, strategy, and knowledge and skill—but also on the time during the task process when they are made. In the past, theories on group life cycles have generally treated group development as following a series of stages (example Tuckman's "forming-storming-norming-performing" model, 1965). More recently, however, research has found that stage models may not accurately represent group development. Gersick (1988) conducted a field study in which she tracked and observed a number of project teams whose performance periods ranged from days to months. She found that each of the project teams developed a unique approach to its task and stayed with this approach until the midpoint of the group's life cycle (halfway between first meeting and project deadline).

At the midpoint, groups changed dramatically. They dropped old patterns of behavior, reconnected with outside supervisors, and assumed a different perspective on the task. From the midpoint until near task completion, groups were focused on completing the

task. Gersick's field studies and her laboratory studies replicating these findings support the possibility that the readiness of work teams for coaching interventions changes across their life cycles (Hackman and Wageman, 2005). Hackman and Wageman (2005) define "readiness for coaching" as the degree to which the issues to be addressed are on the team members' minds at the time of the intervention and the degree to which the team is not preoccupied with other important matters.

In other words, coaching interventions are more effective when the team is ready to address two possible coaching interventions at one of two time points (beginning or midpoint). One coaching intervention was meant to improve group members' interpersonal relationships, while the other was meant to provide assistance in formulating a task-appropriate strategy (Woolley, 1998; Hackman and Wageman, 2005). Woolley's (1998) findings indicated that the strategy-based coaching intervention was effective at the midpoint yet not at the beginning. In other words, teams need to first experience the task before they are ready to discuss how best to proceed.

The third opportunity for a coaching intervention, as presented in the team coaching model, is at the end, when the work or an important subtask has been completed (Kozlowski, Gully, Salas, and Cannon-Bowers, 1996). At this point, the team may be more ready than before to reflect back on their performance and learn from their experiences. Because of this, the end is the optimal time for educational coaching interventions (Hackman and Wageman, 2005; Ellis, Mendel, Nir, and David, 2002; Blickensderfer, Cannon-Bowers, and Salas, 1997). When educational coaching interventions come at the end of a team's performance, they can reinforce the team's talent and contribute to learning of individual team members (Hackman and Wageman, 2005).

As research has shown, competent, well-timed coaching interventions can increase task team effectiveness. Specifically, the second proposition of the team coaching model states that motivational coaching is most effective when given at the beginning, consultative coaching is most effective when given at the midpoint, and educational coaching is most effective when given at the end (Hackman and Wageman, 2005).

As discussed above, the impact of coaching interventions depends on the type of intervention as well as the timing of the intervention, but it also depends on the degree to which two other conditions are met. As stated in the team coaching model, the first condition is the degree to which key performance processes are externally constrained, and the second condition is the degree to which the group is a well-designed unit (Hackman and Wageman, 2005).

The proposition based on the first condition states that "coaching interventions are helpful only when they address team performance processes that are salient for a given task. Here, salient processes refer to those processes that are directly relevant for the team to successfully complete the task.

If coaching interventions address processes that are not salient, they will be ineffectual at best. The proposition based on the second condition states "competent coaching interventions are more beneficial for groups that are well structured and supported than for those that are not" (Hackman and Wageman, 2005).

2.3.4 Self Development/Personal Coaching

Life coaching is a series of conversations facilitated by a coach where the primary aim is to assist coachee's to achieve fulfilling and sustaining results in their lives. These interactions between the coach and coachee are based on mutual respect between the two parties (Edwards, 2003). In these coaching conversations the attention is focused towards the creation of solutions (as opposed to analyzing problems), leading ultimately toward the development of the 'solution focused mindset' (Grant, 2006). Coaching therefore focuses on 'possibilities' and gives the coachee full ownership of the outcome of the conversations through a facilitative opposed to an instructional process (Edwards, 2003).

Coaching is promoted as a tool for skills development, performance enhancement and personal development normal non-clinical populations such as those who do not have mental health issues (Grant, 2001, 2003, and 2006). Therefore the emphasis in coaching is on view in Clients as 'well and whole' with a focus on 'optimal functioning' of the coachee (Williams, 2003; Joseph, 2006).

2.3.5 Employee Performance

Employee performance is of high relevance for organizations and individuals alike. Showing high performance when accomplishing tasks results in satisfaction, feelings of self efficacy and mastery (Bandura, 1997; Kanfer 2005). Moreover, high performing employees get promoted, awarded and honored. Career opportunities for employees who perform well are much better than those of moderate or low performing individuals (Van Scotter 2000). Researchers agree that performance has to be considered as a multi-dimensional concept.

On the most basic level one can distinguish between a process aspect (such as behavioral) and an outcome aspect of performance (Borman and Motowidlo, 1993; Campbell, McCloy, Oppler, and Sager, 1993; Roe, 1999). The behavioral aspect refers to what people do while at work, the action itself (Campbell, 1990). Performance encompasses specific behavior (example sales conversations with customers, teaching statistics to undergraduate students, programming computer software, assembling parts of a product). This conceptualization implies that only actions that can be scaled (such as counted) are regarded as performance (Campbell 1993).

Moreover, this performance concept explicitly only describes behavior which is goal-oriented, like behavior which the organization hires the employee to do well as performance (Campbell, 1993). The outcome aspect in turn refers to the result of the individual's behavior. The actions described above might result in contracts or selling numbers, students' knowledge in statistical procedures, a software product, or numbers of products assembled. Empirically, the behavioral and outcome aspect are related. However, there is no complete overlap, as the outcome aspect is affected by other determinants than the behavioral aspect.

Moreover, performance must be distinguished from effectiveness and from productivity or efficiency (Campbell 1993; Pritchard, 1992). Effectiveness refers to the evaluations of the results of performance (such as financial value of sales). In comparison, productivity is the ratio of effectiveness to the cost of attaining the outcome. For example, the ratio of hours of work (input) in relation to products assembled (outcome) describes productivity.

A great deal of attention has been paid to the distinction between task and contextual performance. There are three basic differences between task and contextual performance (Borman and Motowidlo, 1997; Motowidlo, 1997; Motowidlo and Schmit, 1999): Contextual performance activities are comparable for almost all jobs, whereas task performance is job specific, Task performance is predicted mainly by ability, whereas contextual performance is mainly predicted by motivation and personality, Task performance is in-role behavior and part of the formal job-description, whereas contextual performance is extra-role behavior and discretionary (Le. not enforceable), and often not rewarded by formal reward systems or directly or indirectly considered by the management.

2.4 Empirical Review

Since the late 1930s, three major research trends in coaching have been observed (Grant, 2004). The first trend concerns internal coaching, which is defined as coaching that is supported by the organization and provided by a boss, mentor, or colleague (Frish, 2001). The second and third trends incorporate external coaching or coaching that is done by individuals outside the organization, generally when confidentiality is a concern (Hall 1999).

The first trend, from the late 1930s to the late 1960s, consisted of published reports of internal coaching. Peer-reviewed literature during this time described how internal coaching was implemented and the results that were observed. Authors from this period described coaching techniques utilized in supervisory training (Lewis, 1947), managerial development (Allen, 1957; Perley, 1958) and executive advancement (Parkes, 1955; Glaser, 1958).

According to Grant (2004), the second trend in peer-reviewed literature started in the late 1960s and continued until the 1990s. This period produced more rigorous academic research, and increasing numbers of doctoral dissertations began to appear in the literature. The first to appear was authored by Gershman (1967) who evaluated the effectiveness of coaching techniques to improve employee attitude and job performance; however, the literature remained extensively phenomenological rather than quantitatively experimental, with case studies and narratives presented on internal coaching scenarios. Empirical evaluations on the effectiveness of coaching slowly began to emerge during this time and additional doctoral dissertations were produced (Duffy, 1984; Filippi, 1972; Gant, 1985; Wissbrun, 1984).

Grant (2004) defined the third trend as the emergence of increased empirical studies and the acceleration of doctoral dissertations being written on external coaching starting in 1990 (Conway, 2000; Delgado, 1999; Hancyk, 2000; Kleinberg, 2001; Laske, 1999; Miller, 1990; Peterson, 1993; Sawczuk, 1991; Wachholz, 2000; Wilkins, 2000). Three doctoral dissertations were written during this period specifically on the use of peer coaching to facilitate change (Coggins, 1991; DeVilliers, 1990; Dougherty, 1993). Case studies still form the basis for most recent empirical research (Blattner, 2005; Cocivera & Cronshaw, 2004; Kilburg, 2001; Kralj, 2001; Lowman, 2005; Orenstein, 2000; Peterson & Miller, 2005; Schnell, 2005; Wasylyshyn, 2005; Winum, 2005). The majority of research to date is still phenomenological in nature, using only small numbers of participants in an attempt to develop patterns and relationships of meaning by studying the client's coaching experience and the results obtained. Group studies using statistical analysis of variables began to emerge in the 1990s (Graham, 1993; McGibben, 1995; Olivero, 1997).

Smither, London, Flautt, Vargas and Kucine's, (2003) group study produced the first quasi-experimental field study conducted over an extended period of time, using multi-source feedback ratings to evaluate the effects of coaching on executive performance. The first empirical study to assess the effectiveness of coaching was conducted by Gegner (as cited by Grant, 2004) using both qualitative and quantitative research methods. Related studies to assess the efficacy of coaching have consisted of analyzing results obtained from coaching individuals for employment interviews (Maurer, Solamon, Andrews, and Troxtel, 2001; Maurer, Solamon, and Troxtel, 1998), coaching strategic learning in the classroom (Hamman, Berthelot, Saia, and Crowley, 2000), coaching motivational interviewing techniques (Miller, Yahne, Moyers, Martinez, and Pirritano, 2004), and coaching parenting skills (Corrin, 2003).

2.5 Critique of the existing Literature relevant to the Study

There are gaps in the previous research carried out as times have changed since, the dynamism of the coaching programmes and needs has not been well mapped in previous researches thus information seem to be outdated and not useful for current coaching needs and assessments. The available coaching literature is quite general and does not give a clear focus on specific coaching needs.

2.6 Summary

Individuals seeking to improve the quality of their personal and professional lives are being drawn to coaching, rapidly creating a demand for this new service; however, research to support the efficacy of this service has lagged. Since most coaching outcomes

require facilitating behavioral change, psychological principles and the theoretical foundations of various coaching models are identified. What the literature revealed was a variety of theoretical foundations upon which coaching is built, all of which have impacted the development of coaching. When examined closely, Coaching and Motivation theories relates most closely to the majority of coaching models.

3. RESEARCH METHODOLOGY

3.1 Introduction

This section deals with the methodology used in carrying out the study. It is sub divided into the research design, target Population, sample size and sampling procedure, research instruments, instrument validity, instrument reliability, data collection procedures and data analysis techniques.

3.2 Research Design

Research design is a scheme, outline or plan that is used to generate answers to research problems (Orodho, 2004). The study adopted survey research design. Oso and Onen (2005) define survey method as method used to investigate populations by selecting samples and discovering occurrences. Survey design was used in this study since it allows the cross referencing of data collected from various respondents using questionnaires. The study selected this type of research due to its convenience and accuracy, especially in data collection and analysis.

3.3 Population

Mugenda and Mugenda (2003) define population as the entire group of individual's, events or objects having common observable characteristics. This further explains that the target population should have some observable characteristics, to which the study intends to generalize the results of the study. The study focused on Direct Channel Simbitech Company and Kencall Company which are active BPO operators in Nairobi. These operators have a total of two hundred and seventy (270) employees. The study population formed the total number of employees in the two most active BPO operations with a total number of two hundred and seventy (270) employees. Currently there are six (6) active BPO operations in Nairobi as per table 3.1

The target population for this study constituted employees from Direct Channel Simbitech Company and Kencall Company which are the most active BPO operations in Nairobi. See table 3.2 below.

Table 3.1: Study Population

No	Organization	Location	No. Of Employees
1	Direct Channel Simbitech (K)	Nairobi Westlands	185
2	Horizon	Nairobi Mombasa Road	100
3	Kencall	Nairobi Mombasa Road	85
4	Ison	Nairobi Mombasa Road	100
5	Technobrain	Nairobi Westlands	100
6	Kentech Data	Nairobi Mombasa Road	100
Total			670

(Source: BPO & Contact Centre Society of Kenya)

3.4 Sample and Sampling Techniques

3.4.1 Sampling Frame

A sampling frame is the population from which a sample is drawn; this is basically the target population. It includes a numerical identifier for each individual, and other identifying information about characteristics of the individual to aid in analysis and to allow for division into further frames for more in-depth analysis. Kombo and Tromp (2006) define a sample as a finite part of a statistical population whose properties are studied to gain information about the whole sample. At least 30% of the total population is representative (Borg and Gall, 2003) Thus, 30% of the accessible population was considered to be good enough for the study.

3.4.2 Target Population

Table 3. 2: Target Population

No	Organization	No. Of Employees per Department	Total No. Of Employees	Sample Size (30%)
Direct Channel Simbitech (K)				
1	Customer Care	100		

	Back Office	35		
	Telemarketing	50		
	Sub Total		185	56
	Kencall			
	Customer Care	50		
2	Back Office	10		
	Telemarketing	25		
	Sub Total		85	25
	Grand Total		270	81

3.4.3 Sampling Techniques

The study employed the Stratified Sampling technique for population-based surveys. In stratified sampling the population is partitioned into Stratas, and sampling is performed separately within each stratum. Stratum variables are mutually exclusive (non-overlapping), example urban/rural areas, economic categories, geographic regions, race, sex, etc. the population (elements) should be homogenous within-stratum, and the population (elements) should be heterogeneous between the strata. The study selected this sampling technique because it provides opportunity to study the stratum variations - estimation could be made for each stratum, Disproportionate sample may be selected from each stratum, The precision likely to increase as variance, may be smaller than SRS with same sample Size, Field works can be organized using the strata (example by geographical areas or regions), Reduce survey costs. One of the key goals of research was to be able to make conclusions pertaining to the population from the results obtained from a sample. Stratified Sampling technique was used in this study.

The study identified a sample frame that comprised of employees from the Direct Channel Simbitech and Kencall companies which are the most active BPO operations in Nairobi. A study sample of 81 employees was identified for the study. This number represented a 30% percent of the target population of 270 employees. By selecting this sample size the accuracy level of the information required was sufficiently met and the value of the information in the study was achieved.

3.5 Data Collection Instruments

Data collection tools are the instruments which are used to collect the necessary information needed to serve or prove some facts (Mugenda & Mugenda, 2003). Primary data was collected through the use of questionnaires. A questionnaire is a set of systematically structured questions used by a researcher to obtain needed information from respondents. According to Brown questionnaires are any written instruments that present respondents with a series of questions or statements to which they are to react either by writing out their answers or selecting from among existing answers. The study preferred questionnaires because they were cheap to administer to respondents and are moreover convenient for collecting information within a short span of time according to (Mulusa, 1990).

Questionnaires are highly versatile, easy to construct and convenience to work with, data collection is easy to process as the questionnaire is straight forward and produces superficial data touching on comprehensively to specificity. The questionnaire was divided into the main areas of investigation except the first part which captured the demographic characteristics of the respondents. Other sections were organized according to the major study objectives. Secondary data was collected by use of desk search techniques from published coaching and training journals and books. Secondary data included statistics and coaching journals internationally.

3.6 Data Collection Procedures.

Data collection involved the use of self-administered questionnaires. The questionnaires were pre-tested to establish their reliability and validity before conducting the study. The questionnaires were distributed by email to the sample number of respondents through the Human Resource managers in the two organizations and they were sent back electronically through mail. Further the questionnaires were accompanied by a brief introduction of the study and purpose of the study for the respondent. According to Mugenda and Mugenda (2003), breaching confidentiality, is a matter of concern to all respondents. In view of this, the study withheld the names of the respondents and their respective view with utmost confidentiality. During the data collection emphasis was given to the primary and secondary data. The method of data collection was selected due to its cost effectiveness and reliability. All the respondents had access to the electronic mail.

3.7 Pilot Test

The study conducted a pilot study to 1% (2 respondents) of the respondents from the two BPO organizations. This was mainly to ascertain the validity and reliability of the instrument. According to Berg and Gall (1989) validity is the degree by which the sample of test items represents the content the test is designed to measure. Content validity employed by this study is a measure of the degree to which collected data using a particular instrument represents a specific domain or content of a particular concept. Mulusa (1990) observes that the purpose of the pilot study is to assess the clarity of the instruments and the validity and reliability of each item in the instruments. Orodho (2004), piloting addresses several questions including, are the questions measuring what they are supposed to? Do the respondents interpret all the questions the same way? And do the questions provoke a response? A pilot study was conducted.

The pilot test helped to confirm if the study is ready for full-scale implementation. The pilot test served as a trial run for this study and helped to determine if any adjustments to implementation plan, any adaptations to the study were necessary and revealed unforeseen challenges that would arise during implementation and ensured that the study was well prepared to handle the issues that came up during the full-scale implementation.

3.7.1 Instrument Validity and Reliability

According to Shanghverzy (2003) reliability refers to the consistency of measurement and is frequently assessed using the test-retest reliability method. Reliability was increased during many similar items on a measure, by testing a diverse sample of individuals and by using uniform testing procedures. Nunnally (1978) stated that reliability of a study instrument was indicated at a minimal Alpha value of 0.7. The pilot study will allow for pre-testing of the study instrument. The clarity of the instrument items to the respondents is necessary so as to enhance the instrument’s validity and reliability.

To enhance content validity, the study has modified some ambiguous questions based on the results of pilot study. The study instruments have been appraised by the project supervisors. In this study, the results of the pilot study were compiled and correlation calculated. The instrument was split into two tests. The split involved Section II only of the questionnaire. The odd numbered items were placed into one sub-test and even numbered items into another sub-test. The scores of all the odd and even numbered scores for all items were computed separately. The odd numbered scores for all items were correlated with the even numbered scores. This was done using the Pearson’s Product-Moment Correlation Coefficient formula indicated below (Mugenda & Mugenda, 2003).

$$r = \frac{\sum xy - \frac{(\sum x)(\sum y)}{N}}{\sqrt{[\sum x^2 - \frac{(\sum x)^2}{N}][\sum y^2 - \frac{(\sum y)^2}{N}]}}$$

Y = odd number scores

X = even number scores

Where : $\sum xy$ = sum of the gross product of the values of each variable

$(\sum x)(\sum y)$ = Product of the sum of y

\sum - Sum of the values

The correlation coefficient obtained represents the reliability of only half of the instrument. In order to obtain the reliability of the entire instrument, the Kuder-Richardson reliability coefficient formula of internal consistency was used.

3.8 Data Analysis and Presentation

3.8.1 Data Analysis

Data analysis is the process of bringing order structure and meaning to the mass of information collected. In this study, it involved examining what has been collected and making deductions and inferences (Kombo and Tromp, 2006). Data was analyzed using quantitative analysis and the first process was by use of descriptive statistics. The study used frequency distributions, pie charts and percentages in analyzing the data.

The study also sought to make inferences about the population based on results obtained from the survey. This involved applying inferential statistics techniques such as Analysis of variance test (ANOVA) and multiple regression analysis in analyzing the relationship between the dependent and independent variables (Francis, 1998). The reason for choice of ANOVA test is because it provides the same result as the t test in a situation where more than two means are compared (Francis, 1998). This is because of generalizes the t test to more than two groups. ANOVA test also minimizes the chance of committing a type 1 error which will result by performing multiple sample t tests (Francis, 1998). The study carried out a two way ANOVA test result. In this study data was collected and analyzed to respond to the hypothesis on whether coaching programmes have an impact on the employee performance. An analysis of variance (ANOVA) strategy to statistically analyze results was used. This method of analysis has been chosen as both the dependent and independent variables have met the following criteria for increased validity as suggested by Isaac and Michael (1997): The dependant variable (employee performance) was compared to all the respondents who received coaching; The independent variables (executive, business, team and self development coaching) are with-in subject in nature and are quantitative; The independent variables have been rated on a Likert-type scale consisting of eight questions of satisfaction and importance for each individual participant.

The multiple regression model was of the following form:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + E_t$$

Where:

Y : Employee performance (Dependent Variable)

X₁ : Executive coaching technique (Independent Variable)

X_2 : Business coaching technique (Independent Variable)

X_3 : Team coaching technique (Independent Variable)

X_4 : Self personal development coaching technique (Independent Variable)

E_t : Error term

The advantage of using multiple regressions was because it has a high level of familiarity as one of the most commonly used statistical techniques and is especially useful in inferencing social behaviour. The other advantage of using multiple regression test technique was because it is a very flexible method whereby the independent variable can be numeric or categorical and interactions between the variables can be incorporated. The questionnaire was coded and the data was entered into the computer using the Statistical Package for Social Science (SPSS V-20) statistical software (Mugenda & Mugenda, 1999). This software was used in analyzing descriptive and inferential statistics.

3.8.2 Data Presentation

The study presented data using frequency tables, contingency tables, and charts. The tables were in the form of frequency tables, contingency tables and cross tabulation tables. The charts presented were in the form of pie charts. Both descriptive statistics and inferential statistics results were presented using the forms described above.

4. DATA PRESENTATION AND ANALYSIS

4.1 Introduction

This chapter covers the data analysis, results and discussion of the study findings. The study sought to determine the effects of coaching Programmes on employee performance in the BPO sub-sector in Nairobi, while focusing on Direct Channel Simbatech (K) and Kencall two of the most active BPOs in Nairobi. The presentation of the data analysis, results and discussion is based on the order of study objectives.

4.1.1 Pilot Test Results

The study carried out a pilot test on 1% (two respondents) of the respondents prior to carrying out the actual survey. The Kuder-Richardson reliability coefficient obtained from the pilot study was $KR_{20} = 0.7$. This indicated that the items in the survey questionnaire correlated highly among themselves thus showing a high level of consistence among the items in the measuring concept of interest.

4.2 General and Background Information

4.2.1 Response Rate

The study administered 100 questionnaires with 81 of them being appropriately filled for analysis. This response constitutes 81% of the responses and was considered appropriate for analysis as supported by Mugenda and Mugenda (2003) which states that a response rate of 70% and above is excellent. The study surveyed the target two Business Process Outsourcing Organizations namely Direct Channel Simbatech Company and Kencall Company.

4.2.2 Respondent Organizations

Table 4. 1: Respondents Organization

Name of Organization	Frequency	Percentage	Cumulative Percent
Direct Channel Simbatech	55	68%	68%
Ken call	26	32%	100%
Grand Total	81	100%	

The respondents were drawn from two most active BPO setups in Nairobi, of which Direct Channel Simbatech had the highest number of respondents contributing to a 68% of the total respondents. Kencall had 26 respondents out of the 81 total respondents contributing to 32% of the total response received to this study. The way that feedback is acquired and processed varies, however according to the person's awareness (Taylor 1983). See Table 4.1 above.

4.2.3 Educational Background of Respondents

The respondent's level of education was of importance to this study. 99% of the respondents had degree and diploma certificates while only 1% of the respondents held a professional certificate. See Table 4.2 below.

Table 4. 2: Educational Background of Respondents

Educational Background	Frequency	Percentage	Cumulative Percentage
University Degree	54	67%	67%
Diploma	26	32%	99%
Certificate	1	1%	1%
Grand Total	81	100%	

4.2.4 Age Bracket of Respondents

The age bracket of the respondents was noted to a greater extent that youths are more in this sub sector contributing up to 83%, while only 18% of the respondents were above 35 years of age. See Table 4.3 below.

Table 4. 3: Age Bracket of Respondents

Age Bracket	Frequency	Percentage	Cumulative Percentage
31-35 Years	54	67%	67%
25-30 Years	13	16%	83%
36-40 Years	11	14%	97%
Above 41 Years	3	4%	100%
Grand Total	81	100%	

4.2.4 Respondents Departments

The study targeted four key departments within the BPO operations. All the four departments were represented in this study. Customer care was the highest represented department with 74%, while the back office operations were represented at 17%. The telemarketing representation was at 6% while the Information Technology had a representation of only 2%. See Table 4.4 below.

Table 4. 4: Department of Respondents

Department	Frequency	Percentage	Cumulative Percentage
Customer Care	60	74%	74%
Back Office	14	17%	91%
Telemarketing	5	7%	97%
IT	2	3%	100%
Grand Total	81	100%	

4.2.5 Duration of Service of Respondents in Organizations

The study established that the highest number of employees have been in service for the specific organization for 2 years which is relatively high. Respondents who have been in service for 1 year was noted to be at 25% while those who have been in service for 4 years. See Figure 4.1 below.

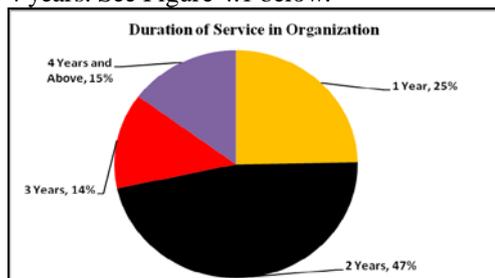


Figure 4. 1: Duration of Service of Respondents

4.2.6 Duration of Service of Respondents in Current Position in Organizations

At least 56% of the respondents have been in their current position for 2 years which is an indication of stability. Respondents who have been in their current position for a period of at least 1 year was recorded at 26%. Those that have been in the current position for at least 3 years was recorded at 10% while a small number of respondents have been in their current position for 4 years and above which was recorded at 9%. See Figure 4.2 below.

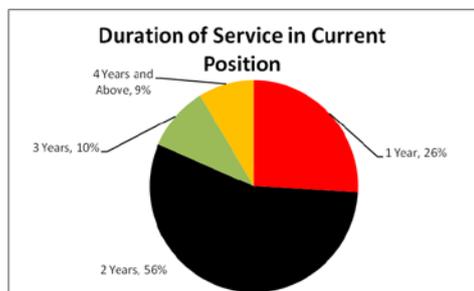


Figure 4. 2: Duration of Service in Current Position

4.3 Descriptive Statistics

4.3.1 Information on Executive Coaching

In an effort to establish the effect of executive coaching on employee performance, the respondent was asked whether the executive coaching was conducted at the most appropriate time. The highest percentage of the respondents indicated that the coaching was really conducted at the most appropriate time, while a 4% of the respondents strongly disagreed, 10% of the respondents neither agreed nor disagreed. It is evident from the responses that a major strength of coaching is that it respects the individual style and the authority of the executive and provides constructive feedback on the impact of the executive’s behavior (Kombarakaran, 2008).

When the respondents were asked whether the coaching was synchronized with their job descriptions 30% of the respondents strongly agreed, while a 51% of the respondents agreed. 17% of the respondents neither agreed nor disagreed. 2% of the respondents disagreed that the executive coaching was conducted at the most appropriate time. The coaching has enhanced my work performance, 47% of the respondents strongly agreed that the coaching enhanced their work performance. A 37% of the respondents also agreed that executive coaching an interesting response of 2% of respondents disagreed that the coaching enhanced their performance. 14% neither agreed nor disagreed. This concurs with Bluckert (2005) statement that the approach to executive coaching adopted by any practitioner generally consciously or subconsciously reflects their professional background.

There was an overwhelming response to whether the coaching content was well aligned with the respondents work performance target, 53% strongly agreed that this was the case. A 32% of the respondent agreed while 3% of the respondents strongly disagreed. Only a single percent disagreed while a 11% neither agreed nor disagreed. It was evident from the response that the executive coaching improved the decision making skills of the respondents at 31% strongly agreeing to this, and 54% of the respondents agreeing to having received improved decision making skills. However 2% of the respondents disagreed to have improved their decision making skills as a result of the executive coaching. 1% of the respondents joined to disagree that the executive coaching improved their decision making skills.

On the same quest 12% of the residents neither agreed nor disagreed to this statement. A 58% of the respondents agreed to that the executive coaching enhanced their communication skills; a further 32% agreed that indeed the coaching enhanced their communication skills. However 2% of the respondents strongly disagreed to this statement, a further 1% disagreed to that executive coaching enhanced their communication skills. Only 7% of the respondents neither agreed nor disagreed to that the coaching enhanced their communication skills.

Time management is a key component and contributes to performance, 44% of the respondents agreed to that the executive coaching improved their time management skills; a further 42% agreed that indeed the coaching improved their time management skills. Only a 2% of the respondents disagreed with a further 1% joining in that the coaching did not improve their time management skills. Only an 11% of the respondents neither agreed nor disagreed to have improved their time management skills as a result of the coaching. According to Carver & Scheler, (1981), the effective component arises from perceived discrepancies between one’s desired and current states and behavior is imitated from one’s desire to resolve those discrepancies See Table 4.5 below.

Table 4. 5: Information on Executive Coaching

No	Information on Executive Coaching	Strongly Agree	Agree	Strongly Disagree	Disagree	Neither Agree nor Disagree	Total
1	The coaching was conducted at the most appropriate time	44%	42%	4%	0%	10%	100%
2	The coaching was well synchronized with my job description	30%	51%	2%	0%	17%	100%
3	The coaching has enhanced my work performance	47%	37%	2%	0%	14%	100%

4	The Coaching content was well aligned with my work performance target.	53%	32%	3%	1%	11%	100%
5	The coaching improved my decision making skills	31%	54%	2%	1%	12%	100%
6	The coaching enhanced my communication skills	58%	32%	2%	1%	7%	100%
7	The coaching improved my time management skills	44%	42%	2%	1%	11%	100%
8	The coaching helped to plan for productive meetings	31%	54%	2%	1%	12%	100%

4.3.2 Information on Business Coaching

As pertains to achieving goals, a 35% of the respondents agreed that business coaching really assisted them to achieve such potential and goals, an additional 53% of the respondents agreed that the coaching helped them reach such goals. 1% percent of the respondents disagreed to this while an 11% of the respondents neither agreed nor disagreed. Change management is key to business operations, 51% of the respondents agreed to this fact, while a further 38% joined to agreed to that the business coaching helped them manage change better.

A 1% of the respondents disagreed to that the business coaching assisted them to manage change better. 10% of the respondents neither agreed nor disagreed. A deeper understanding of the business and the dynamics of individual roles in the business is key to performance improvement, 35% of the respondents agreed to this fact while a further overwhelming 54% of the respondents agreed. 3% of the respondents did not get deeper understanding of the business and the dynamics of their role in business on their performance. 10% neither agreed nor disagreed to this statement. This is well described by Hirvihuhta (2006) with his statement that when an employee gets a deeper understanding of the business and the dynamics of his or her role in the business, it can lead to person's deeper commitment to the organization (Hirvihuhta, 2006).

Cook and Marshall (1998) list several benefits that can come from coaching, example developing employees' competence, helping to identify and diagnose problems with performance, helping to correct unsatisfactory performance, helping to identify behavioral problems, enhancing productive working relationships, providing opportunities, conveying possible positive feedback, providing opportunity for self coaching behaviour (such as employees may become more competent due to coaching) and improving employees performance and morale.

As pertains commitment 44% of the respondents agreed to that the business coaching led them to deeper commitment to the organization that they worked for, a further 41% also agreed to this, while 1% disagreed to have got into deeper commitment to the organization that they worked for as a result of the business coaching. A 14% of the respondents neither agreed nor disagreed to having obtained deeper commitment to the organization that they worked for. The individuals capabilities according to a 41% of the respondents were developed as a result of the coaching, an additional 47% agreed to have developed their competencies as a result of the coaching. 1% of the respondents disagreed to have enhanced their capability as a result of the coaching, while 11% did not agree nor disagreed to this statement.

Planning is a key ingredient to performance, 35% of the respondents to this study agreed that the business coaching helped them to identify their planning challenges while a 53% joined to agree to this. 12% of the respondents neither agreed nor disagreed to have identified their planning challenges. Growth opportunities contribute to motivation and thus improved performance, an overwhelming 33% and 49% of the respondents agreed to have received growth opportunities through business coaching which thus presented growth opportunities with their organization and this boosted their work morale. A 1% disagreed to have improved their work performance as a result of the business coaching. 17% of the respondents neither agreed nor disagreed to this statement.

In the BPO industry schedule adherence is key to performance, thus an overwhelming 46% and 43% respectively agreed to that the coaching improved their level of discipline on schedule adherence. None of the respondents disagreed and only 11% of the respondents neither agreed nor disagreed. According to Brockbank, (2006), when the business is faced with internal or external changes in its environment, coaching can become crucial. See Table 4.6 below.

Table 4. 6: Information on Business Coaching

No	Information on Business Coaching	Strongly Agree	Agree	Strongly Disagree	Disagree	Neither Agree nor Disagree	Total
1	Business Coaching is conducted to achieve unreleased potential and goals	35%	53%	1%	0%	11%	100%
2	The Business coaching helped to manage change better.	51%	38%	1%	0%	10%	100%

3	As an employee Business Coaching made me get a deeper understanding of the business and the dynamics of my role in the business on improved performance	33%	54%	3%	0%	10%	100%
4	Business Coaching has led me to deeper commitment to the organization that I work for.	44%	41%	1%	0%	14%	100%
5	The business coaching helped me to Develop my competence	41%	47%	1%	0%	11%	100%
6	Business Coaching helped to identify my planning challenges	35%	53%	0%	0%	12%	100%
7	Business Coaching provided me with growth opportunities within the organization thus boosting my morale	33%	49%	1%	0%	17%	100%
8	The coaching improved my level of discipline on schedule adherence	46%	43%	0%	0%	11%	100%

4.3.3 Information on Team Coaching

The respondents level of agreement to enhance employee performance. Most of the respondents 86% agreed to that team coaching enhanced team performance, none of the respondents however disagreed to the enhanced team performance as a result of the team coaching. 14% of the respondents neither agreed nor disagreed that team coaching enhanced their team performance. This agrees to Hackman and Wageman (2005) definition of team coaching as “direct interaction with a team intended to help members make coordinated and task-appropriate use of their collective resources in accomplishing the team’s work”

An overwhelming 81% of the respondents agreed that team coaching helped them as teams to identify their strengths and weakness which contributes to enhanced performance. The rest of the respondents neither agreed nor disagreed. According to Taylor (1983) the way that feedback is acquired and processed varies, however according to the person’s awareness Conscious processing of feedback is most likely to occasion when an individual is unfamiliar with a situation or when the feedback obtained is dramatically incongruent with expectations, and when others cue the individual to attend to feedback (Taylor 1983). All these factors would serve to increase the salience of the feedback.

The respondents agreed in a larger extent that coaching cultivated team effectiveness at 85% while the rest neither agreed nor disagreed. An 85% of the respondents agreed that the team coaching helped them to improve on task coordination while the rest of the respondents neither agreed nor disagreed. As team members 88% of the respondents agreed that the team coaching helped them identify individual strengths and leverage their weaknesses while 12% of the respondents neither agreed nor disagreed. A majority 85% of the respondents said the team coaching was helpful because it addressed their team performance processes that are salient for given tasks. One person (1%) disagreed to this statement while 14% neither agreed nor disagreed.

Performance appraisal is directly related to performance a large number of the respondents (73%) said that their teams were appraised higher after taking the team coaching. However 3% of the respondents disagreed while the rest neither agreed nor disagreed. The coaching improved my communication skills on this particular statement, the study aimed at finding whether the team coaching improved the team members’ communication skills which is very key to achieving team goals and performance targets. The response was that majority 83% said that the coaching actually improved their communication skills. None of the respondents disagreed, while the rest neither agreed nor disagreed. Hackman and colleagues highlight three features of group interaction that impact group performance—level of effort of group members, appropriateness of group performance strategies to the task, extent of knowledge and skill of group members (Hackman and Morris, 1975; Hackman and Walton, 1986). See Table 4.7 below.

Table 4. 7: Information on Team Coaching

No	Information on Team Coaching	Strongly Agree	Agree	Strongly Disagree	Disagree	Neither Agree nor Disagree	Total
1	Team coaching enhanced team performance.	35%	51%	0%	0%	14%	100%
2	Team coaching helped me as a team member to identify strengths and weaknesses	22%	59%	0%	0%	19%	100%
3	The coaching cultivated team effectiveness	42%	43%	0%	0%	15%	100%
4	The coaching helped to improve task coordination	27%	58%	0%	0%	15%	100%

5	The coaching helped to identify individuals strengths and leverage their weaknesses	46%	42%	0%	0%	12%	100%
6	The coaching was helpful because it addressed the team performance processes that are salient for a given task	32%	53%	0%	1%	14%	100%
7	My team was appraised higher after taking the coaching programme	18%	56%	1%	2%	23%	100%
8	The coaching improved my communication skills	37%	46%	0%	0%	17%	100%

4.3.4 Information on Self Personal Development Coaching

On this particular question the study aimed at finding whether the personal coaching conversations enhanced the individuals’ level of resolving performance matters at work. The response was that 86% said that the coaching enhanced their level of resolving matters. Only 14% of the respondents neither agreed nor disagreed where none. When asked if the self development coaching made the respondents responsible for their actions an overwhelming 81% of the respondents said the coaching made them responsible for their action while a 19% of the respondent did not agree nor disagree.

This agrees with the control theory in that there are two primary elements; one cognitive, the other affective (Carver & Scheler, 1981) the cognitive component consists of internal goals the processing of information about ones current state and the comparison of that state with those goals. The effective component arises from perceived discrepancies between one’s desired and current states and behavior is imitated from one’s desire to resolve those discrepancies (Carver & Scheler, 1981).

Complex behaviors can be explained by hierarchies of feedback loops. 85% of the respondents agreed that the coaching was a tool for their personal development and performance skills while only 15% of the respondents neither agreed nor disagreed. When asked if the coaching helped to address personal performance gaps 85% of the respondents agreed while the rest neither agreed nor disagreed.

An interesting finding was made when 88% of the respondents agreed to that the personal development coaching helped them address their work performance challenges while the rest neither agreed nor disagreed. In these coaching conversations the attention is focused towards the creation of solutions (as opposed to analyzing problems), leading ultimately toward the development of the ‘solution focused mindset’ (Grant, 2006).

There was an overwhelming response in regards to what made the respondents understand expected deliverables for enhanced performance. The respondents agreed that the personal development coaching assisted them understand the expected deliverables for enhanced performance with an 85% of the respondents agreeing to this statement. Only 1% disagreed while the rest neither agreed nor disagreed.

Further 73% of the respondents agreed to attend a self development coaching programme every year while 4% of the respondents disagreed. The rest neither agreed nor disagreed. When asked whether the coaching enhanced the respondent’s relationship with other team members 83% of the respondents agreed to this statement while the rest neither agreed nor disagreed. Coaching is promoted as a tool for skills development, performance enhancement and personal development normal non-clinical populations such as those who do not have mental health issues (Grant, 2001, 2003, and 2006).

This confirms that coaching is promoted as a tool for skills development, performance enhancement and personal development normal non-clinical populations such as those who do not have mental health issues (Grant, 2001, 2003, and 2006). See Table 4.8 below.

Table 4. 8: Information on Self Personal Development Coaching

No	Information on Self Personal Coaching	Strongly Agree	Agree	Strongly Disagree	Disagree	Neither Agree nor Disagree	Total
1	The coaching conversations enhanced my level of resolving matters.	35%	51%	0%	0%	14%	100%
2	Self Development coaching led me to being responsible for my actions	22%	59%	0%	0%	19%	100%
3	The coaching was a tool for my skills personal development and performance	42%	43%	0%	0%	15%	100%
4	The coaching helped to address my personal performance gaps	27%	58%	0%	0%	15%	100%
5	The coaching helped to address my work performance challenges	46%	42%	0%	0%	12%	100%
6	The coaching made me understand expected deliverables for enhanced performance	32%	53%	0%	1%	14%	100%
7	I attend a self development coaching programme every year	17%	56%	2%	2%	23%	100%
8	The coaching enhanced my relationship with other team members	37%	46%	0%	0%	17%	100%

4.3.5 Information on Employee Performance

My improved performance has resulted to satisfaction, feelings of self efficacy and master was what 87% of respondents agreed to in relation to employee performance. 1% of the respondents disagreed with this statement while 12% of the respondents neither agreed nor disagreed. Showing high performance when accomplishing tasks results in satisfaction, feelings of self efficacy and mastery (Bandura, 1997; Kanfer 2005).

When asked if the respondents felt motivated to attend to their daily tasks an overwhelming 81% of the respondents agreed while 2% disagreed to have felt motivated to attend to their daily tasks. Only 7% of the respondents neither agreed nor disagreed. When asked whether the respondents’ career opportunities were much better due to the improved work performance an overwhelming percentage 93% agreed to this, 1% disagreed while the rest neither agreed nor disagreed. According to Van Scotter (2000) high performing employees get promoted, awarded and honored. Career opportunities for employees who perform well are much better than those of moderate or low performing individuals.

The coaching improved my time management skills thus high schedule adherence is what 89% of the respondents said, with one (1%) individual disagreeing to this statement while 10% of the respondents neither agreed nor disagreed. The task turnaround time had improved according to an overwhelming 92% of the respondents, while 1 respondent (1%) disagreed with this statement. 7% neither agreed nor disagreed. On work commitment 82% of the respondents agreed to have had an improvement to their work commitment as a result of the coaching programmes undertaken, while 2% disagreed and only 17% of the respondents neither agreed nor disagreed. Ashford, (1986); Ford and Cummings, (1983) states that feedback can be actively sought out through inquiry or monitoring to supplement the feedback that has already been provided.

Performance appraisal conducted at the end of the year 2013, saw 56% of the respondents record better performance while 7% disagreed to have recorded better performance as a result of the coaching they had participated in during that year. The rest of the respondents neither agreed nor disagreed that 2013 performance was as a result of the coaching received during the year. 65% of the respondents agreed to have met all their key performance indicators for the year 2013 as a result of the coaching received in the year while 1 respondent (1%) disagreed to this statement. According to Campbell, (1990), the behavioral aspect refers to what people do while at work, the action itself. This conceptualization implies that only actions that can be scaled (such as counted) are regarded as performance (Campbell 1993).

Table 4. 9: Information on Employee Performance

No	Information on Performance Coaching	Strongly Agree	Agree	Strongly Disagree	Disagree	Neither Agree	Agree	Total
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		Agree	Disagree	nor disagree		
1	My improved performance has resulted to satisfaction, feelings of self efficacy and mastery	36%	51%	0%	1%	100%
2	I feel motivated to attend to my daily tasks	33%	58%	1%	1%	100%
3	My career opportunities are much better due to my improved work performance	51%	42%	1%	0%	100%
4	The coaching improved my time management skills thus high schedule adherence	40%	49%	1%	0%	100%
5	My Task turnaround time has improved	44%	48%	1%	0%	100%
6	The coaching improved my work commitment	41%	40%	1%	1%	100%
7	I recorded better performance at the end of the appraisal year 2013 compared to 2012	24%	26%	6%	1%	100%
8	I met all my Key Performance Indicators for the year	27%	38%	0%	1%	100%

4.4 Inferential Statistics

4.4.1 Analysis of Variance (ANOVA) Test Results

The study carried out two way analysis of variance tests on all the variables.

4.4.1.1 Two Way Analysis of Variance (ANOVA) Test Results

The two way analysis of variance was performed to determine the effect of the independent variables (executive coaching technique, Business coaching technique and Team coaching technique) on the employment performance which is the dependent variable. The level of significance considered for the two way analysis of variance analysis was 0.01 at 99% confidence interval.

The results in Table 4.10 indicate that there was no statistically significant difference in mean employment performance between the use of executive coaching technique and business coaching technique ($P = 0.097$). Therefore, we reject the null hypothesis that there was no statistical significance difference in mean employee performance between the use of executive coaching techniques and business coaching techniques.

There was statically significant difference in mean employment performance between the use of Team coaching technique and Self personal development coaching technique ($P = 0.004$). Therefore, we accept the null hypothesis that there was a statistical significance difference in mean employee performance between the use of team coaching and self personal development coaching techniques.

Table 4. 10: Two Way Analysis of Variance Test Results

Variable	Type II Sum of Squares	Degrees of Freedom	Mean Squares	F Statistic	Significance Value (P Value)
Executive Coaching Technique	659.484	16.000	41.218	0.992	0.484
Business Coaching Technique	564.437	14.000	40.317	0.970	0.499
Executive Coaching & Business Coaching Technique	741.221	10.000	74.122	1.783	0.097

Team Coaching Technique	770.210	18.000	42.789	9.244	0.000
Self Personal Development Coaching Technique	822.503	14.000	58.750	12.692	0.000
Team Coaching & Self Personal Development Coaching Techniques	174.465	12.000	14.539	3.141	0.004

4.4.2 Multiple Regression Test Results

Regression test was performed to describe the relationship between the dependent variable and independent variables. The dependent variable in this case was Employee performance. The independent variables were Executive coaching techniques, Business coaching techniques, Team coaching techniques and Self personal development coaching techniques. Table 4.11 below illustrates the model summary result output from SPSS V.20. The correlation coefficient R = 0.819 indicates that the dependent variable and independents variables have a high degree of correlation. The(R Squared) coefficient of determination value of about 0.671 indicates that 67.1% of the variation in Employee performance was explained by Executive coaching techniques, Business coaching techniques, Team coaching techniques and self personal development coaching techniques. The adjusted coefficient of determination (Adj R Squared) was less than the un adjusted Coefficient of determination as it should always be (Adj R Squared=0.654 < R Squared = 0.671). This still implied that 64.5% of the variations in employment performance were explained by the variation in executive coaching, business coaching, and team coaching and self personal development coaching techniques.

Table 4. 11: Multiple Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.819	0.671	0.654	4.25662

The analysis of variance results are presented in Table 4.12 below. The result predicts the dependent variable by showing how well the regression equation fits the model. The significance value P = 0.00 of the regression model was less than the level of significance of 0.01 at 99% confidence level. This indicates that the overall regression model statistically significantly predicts Employee performance.

Table 4. 12: Analysis of Variance Test Results

Item	Sum of Squares	Degrees of freedom	Mean Square	F Ratio	Significance Value (P Value)
Regression	2,810.78	4.00	702.69	38.78	0.00
Residual	1,377.03	76.00	18.12		
Total	4,187.80	80.00			

The multiple regression model with employment performance as the dependent variable and executive coaching, business coaching, team coaching and self personal development coaching as independent variables was estimated in the study. The standardized Beta coefficients were considered because the raw units of the dependent and independent variables are not generally familiar in terms of commonly used standardized units of measurement (for example, years, income and currency units among others). The standardized Beta coefficients are convenient since they represent the dependent and independent variables in terms of t scores such that the information is conveyed in terms of standard deviation and hence the question of strength of association relative to the variation in this distribution is answered.

The regression results based on the beta coefficients indicate that;- executive coaching reduces employee performance by 0.018 standard deviations on average, business coaching reduces employee performance by 0.086 standard deviations on average , team coaching increases employee performance by 0.458 standard deviations on average and self personal development coaching increases employee performance by 0.489 standard deviations on average. See Table 4.13 below.

Table 4. 13: Multiple Regression Coefficient Results

Variable	Un standardized Coefficients		Standardized Coefficients	t Statistic	P Value	99 % Confidence Interval f	
	Beta Coeff	Std Error	Beta			Lower Bound	Upper B
Constant Term	2.643	1.39	0	1.901	0.061	-1.03	6.310

Executive Coaching	-0.017	0.094	-0.018	-0.183	0.856	-0.264	0.23
Business Coaching	-0.083	0.102	-0.086	-0.815	0.418	-0.352	0.18
Team Coaching	0.416	0.088	0.458	4.703	0	0.182	0.65
Self Personal Development Coaching	0.559	0.117	0.489	4.763	0	0.249	0.87

5. SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents summary of the findings, conclusion, recommendations and areas for further study which are based on the results of the study. The findings followed the chronological sequence based on the objectives and study questions.

5.2 Summary of the Findings

The utilization of coaching as a development tool for business and industry has a history that exceeds half a century, yet evidence-based models for its use have been slow to develop. Proprietary material offered by consulting and development firms, such as PAS International (Blattner, 2005), Periscope and Leadership Development (Brotman et al., 1998), Palus et al., 2003), The Hay Group (Diedrich, 1996; MODOONO, 2002), Personnel Decisions International (Peterson, 1996; Peterson & Millier, 2005), Leadership Development (Wasylyshyn, 2005), Performance and Leadership Development, Ltd. (Witherspoon & White, 1996), and RPW Executive Development, Inc. (Witherspoon & White, 1996) is prevalent in the early literature and continues to be a source of information for those seeking to learn more about coaching. Non-proprietary information in the form of dissertations and empirical research, however, is rapidly becoming more available.

This study had a significant number of respondents who were 81 in number from the two Business Processing Outsourcing Centers. So as to ensure information richness, the study collected information from respondents who had diverse education backgrounds, different age brackets and who were from different departments and had different years in terms of duration of service in the organization and in the current position which they served.

5.2.1 Executive Coaching

The study measured how the respondents rated the list of information on executive coaching presented by strongly agreeing, agreeing, strongly disagreeing or neither agreeing nor disagreeing. The two way ANOVA and Multiple regression results indicated that executive coaching had a negative effect on employee performance.

5.2.2 Business Coaching

The study measured how business coaching is conducted to achieve potential goals, how it helps manage change better, how it enables employees get a deeper understanding of the business and dynamics of his/her role, how it leads to deeper commitment by the employee to the organization, how it assists employees develop their competencies, how it assists employees develop competencies, how it assists in identifying planning challenges, how it enables employees grow with opportunities thereby boosting morale and how the coaching improves the level of discipline on schedule adherence. The two way ANOVA and Multiple regression results indicated that business coaching had a negative effect on employee performance.

5.2.3 Team Coaching

The study measured how employees rate team coaching on enhanced performance, identification of strengths and weaknesses, cultivation of team effectiveness, identification of strengths and leveraging their weaknesses, how it addresses team performance processes that are more salient for a given task, results of appraisal after taking the coaching program and whether the coaching improved communication skills. The two way ANOVA and Multiple regression results indicated that team coaching had a positive effect on employee performance.

5.2.4 Self Development Coaching

The study analyzed if coaching conversations enhanced employees level of resolving matters, if self development coaching led employees to be responsible for their actions, if the coaching was a tool for skills personal development and performance, if coaching addressed personal performance gaps and work performance challenges, if the coaching enabled the employee understand expected work deliverables and finally, if the coaching enhanced the relationship of the employee with other team members. The two way ANOVA and Multiple regression results indicated that personal development coaching had a positive effect on employee performance. In a nutshell, on one hand executive coaching and business coaching had a negative effect on

employee performance while on other hand team coaching and self development coaching had a positive effect on employee's performance.

5.3 Conclusion

In view of the findings, this study established the effects of coaching programmes on employee work performance in BPO subsector. Coaching has played a major role in building capacity and developing skills in the BPO industry in Nairobi although it has its limitations and thus the study brought into light some of the main effects of the coaching programmes on employee work performance. Majority of the respondents said that coaching has positively contributed to their work performance alongside the identified parameters that formed the basis of the questionnaire. Specifically executive coaching is a necessary ingredient. However it doesn't improve significantly employee performance.

On Business Coaching some of the key contributing factors to enhanced employee performance are achieving goals, better understanding of the business and dynamics of employee roles, commitment to performance, enhanced business skills that included planning, decision making and both change and time management skills. Although, the results in the study indicated that business coaching does not significantly improve on employee performance.

On team coaching what contributed to the enhanced employee performance is that the coaching was conducted at the most appropriate time for the employees and this coaching was conducted to all the team members. With full participation of team members the coaching was successful thus meeting its key goal to enhance employee work performance. Team effectiveness was also identified as a key result of the coaching. It emerges that this coaching helped team members to identify strengths and weakness of their mates making it easier to complement each other in their engagement as individual team members and as teams. The results indicated that team coaching had a significant effect on overall employee performance.

On personal development coaching a better understanding of the individual employee's personality is addressed. Sense of responsibility is assessed as well as the level of resolving matters within ones domain. The coaching goes little further on to assisting employees have a deeper understanding of their roles and contributions towards the success of their organizations which can be measured by their output which is their performance. The results from the study indicated that self personal development coaching is a necessary ingredient. However, it doesn't improve significantly employee performance.

5.4 Recommendations

The following are recommendations of the study based on the objectives and study questions.

5.4.1 Executive Coaching

Executive Coaching as a leadership development practice is among the most widely used executive development technique today, this study suggests that executive should be regularly done especially for the key decision makers in the BPO operations in order to deliver both individual and organization's success in Nairobi City County.

5.4.2 Business Coaching

Business coaching is key to the business operation objects, internal and external changes that are likely to occur within and around the organization. This is key in helping the entire workforce to understand the business objectives and goals which when harmonized will deliver the team work, managed internal and external changes, motivated workforce and low employee attrition. This study recommends that BPO organizations in Nairobi City County engage Business coaching in their operations.

5.4.3 Team Coaching

Team Coaching is the fundamental for developing task coaching is a necessary ingredient. However it doesn't improve significantly employee performance, and proper use of collective resources within the organization. This coaching should be developed to be organization specific. By achieving the organization, team coaching programme employees will be able to deliver on their KPIs which will thus enhance the customers experience and deliver client satisfaction. This study recommends that BPO organizations in Nairobi City County engage their employees in team coaching programmes as it has been proved to improve employee performance significantly.

5.4.4 Personal Development Coaching

Personal development coaching which deal with individual's programmes, character, conduct, attitude and skills should be enhanced in organizations so as to encourage employees embrace the right attitude and improve their individual performance. This study recommends that BPO organizations in Nairobi City County engage their employees in personal development coaching programmes as it has been proved to improve employee performance significantly.

5.5 Suggestions for Further Research

The study recommends that a study be done focusing on the rest of the BPO operations to further explore the effects of Coaching Programmes on employee performance in Business Process Outsourcing Subsector in Nairobi City County, Kenya.

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Appendix 2: Questionnaire

Section I: Background Information

Name of Organization: _____

Education Background: _____

Age; 25-30 yrs 31-35 yrs 36-40yrs Above 41yrs

Which department do you represent?

Sales & Marketing Contact Centre Administration IT

How long have you served in your current organization?

1yr 2yrs 3yrs Above 5yrs

How long have you served in your current position?

1yr 2yrs 3yrs Above 5yrs

Section II:

A. Information on Executive Coaching

For this section, use a likert Scale ranging from 1 to 5 (Where 1- strongly agree, 2- Agree, 3-Strongly disagree, 4-Disagree, 5- Neither Agree nor Disagree)

		1	2	3	4	5
		Strongly Agree	Agree	Strongly Disagree	Disagree	Neither Agree nor Disagree
1	The coaching was conducted at the most appropriate time					
2	The coaching was well synchronized with my job description					
3	The coaching has enhanced my work performance					
4	The Coaching content was well aligned with my work performance target.					
5	The coaching improved my decision making skills					
6	The coaching enhanced my communication skills					
7	The coaching improved my time management skills					
8	The coaching helped to plan for productive meetings					

In your opinion what other executive coaching factors not captured above affect performance?

How else do you think coaching affects employee performance?

B. Information on Business Coaching.

For this section, use a likert Scale ranging from 1 to 5 (Where 1- strongly agree, 2- Agree, 3-Strongly disagree, 4-Disagree, 5- Neither Agree nor Disagree)

		1	2	3	4	5
		Strongly Agree	Agree	Strongly Disagree	Disagree	Neither Agree nor Disagree
1	Business Coaching is conducted to achieve unreleased potential and goals					
2	The Business coaching helped to manage change better.					
3	As an employee Business Coaching made me get a deeper					

	understanding of the business and the dynamics of my role in the business on improved performance					
4	Business Coaching has led me to deeper commitment to the organization that I work for.					
5	The business coaching helped me to Develop my competence					
6	Business Coaching helped to identify my planning challenges					
7	Business Coaching provided me with growth opportunities within the organization thus boosting my morale					
8	The coaching improved my level of discipline on schedule adherence					r.

In your opinion what other business coaching factors not captured above affect performance?

C. Information on Team Coaching

For this section, use a Likert Scale ranging from 1 to 4 (Where 1 Strongly Agree, 2-Agree, 3-Strongly disagree, 4-disagree, 5-Neither Agree nor Disagree

		1	2	3	4	5
		Strongly Agree	Agree	Strongly Disagree	Disagree	Neither Agree nor Disagree
1	Team coaching enhanced team performance.					
2	Team coaching helped me as a team member to identify strengths and weaknesses					
3	The coaching cultivated team effectiveness					
4	The coaching helped to improve task coordination					
5	The coaching helped to identify individuals strengths and leverage their weaknesses					
6	The coaching was helpful because it addressed the team performance processes that are salient for a given task					
7	My team was appraised higher after taking the coaching programme					
8	The coaching improved my communication skills					

In your opinion what other team coaching factors not captured above affect performance?

D. Information on Self/Personal Coaching

For this section, use a Likert Scale ranging from 1 to 4 (Where 1 Strongly Agree, 2-Agree, 3-Strongly disagree, 4-disagree, 5-Neither Agree nor Disagree

In your what self		1	2	3	4	5	opinion other
		Strongly Agree	Agree	Strongly Disagree	Disagree	Neither Agree nor disagree	
1	The coaching conversations enhanced my level of resolving matters.						
2	Self Development coaching led me to being responsible for my actions						
3	The coaching was a tool for my skills personal development and performance						
4	The coaching helped to address my personal performance gaps						
5	The coaching helped to address my work performance challenges						
6	The coaching made me understand expected deliverables for enhanced performance						
7	I attend a self development coaching programme every year						
8	The coaching enhanced my relationship with other team members						

development coaching factors not captured above affect performance?

In your opinion what other coaching factors affect employee performance in the BPO industry in Nairobi?

E. Information on Employee Performance

For this section, use a Likert Scale ranging from 1 to 4 (Where 1 Strongly Agree, 2-Agree, 3-Strongly disagree, 4-disagree, 5-Neither Agree nor Disagree

In your what factors		1	2	3	4	5	opinion other
		Strongly Agree	Agree	Strongly Disagree	Disagree	Neither Agree nor disagree	
1	My improved performance has resulted to satisfaction, feelings of self efficacy and mastery						
2	I feel motivated to attend to my daily tasks						
3	My career opportunities are much better due to my improved work performance						
4	The coaching improved my time management skills thus high schedule adherence						
5	My Task turnaround time has improved						
6	The coaching improved my work commitment						
7	I recorded better performance at the end of the appraisal year 2013 compared to 2012						
8	I met all my Key Performance Indicators for the year						

contributes to enhanced employee performance levels in the BPO industry in Nairobi?

Possibilities of Sharing Multi Species in a Cage Based on Their Food Preference Using Graph Coloring Technique

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Abstract: Clustering has become a special tool in the case of identifying homogeneous groups among large population of dynamic species. Graph coloring technique plays the main role in clustering procedure in many real world problems', since dynamic objects can represent by a graph using a set of vertices, V and a set of edges, E and the graph formed can be clustered in to several number of homogeneous subgraphs according to any considered variable using the graph coloring technique. Basically during this research a vertex coloring

algorithm has been used for finding subgraphs (clusters) from the initial graph according to certain order. Our main contribution in this research is investigating the possibilities of multi species sharing the same cage (multi species exhibits) based on their food preference using graph coloring technique at the National Zoological Gardens, Dehiwala, Sri Lanka and proposing an algorithm that can be used to achieve that target for any zoological garden using graph coloring technique for clustering.

I. INTRODUCTION

During the evaluation of zoos, most of zoological gardens were presented a certain collection of species using single species exhibits. As the number of different species getting increased then they have been faced physical problems due to the space limitation when arranging single species exhibits. As a result the idea of mixing different species by considering some factors has become popular increasingly. Presently most of zoos have considerable experience of presenting mixed species exhibits for several fish, reptiles and some for several species of aves class animals. In Sri Lanka also they have considered that option for fish, some aves and some reptiles and presently it has been a successful effort to overcome the space limitation problem up to a certain level. But most of zoos have identified that single species exhibits of mammals were affected for the occurrence of space limitation problem mainly. Then they have focused on mixed species exhibits of two or more mammal species. It is relatively young concept and also it was a new concept to Sri Lanka.

In this case mainly it should be focused on predator - prey relations, feeds, feeding type and the dominant characters. If it is possible to overcome these factors somehow, it can be seen as a special enrichment, which leads a complex, attractive, educable and fantastic experience for visitors. In the case of finding mixed species exhibits of animals can be seen as clustering of dynamic objects in statistically since clustering has become a special tool in the case of identifying homogeneous groups among large population of dynamic species. In many real world problems', graph coloring technique plays the main role of clustering procedure since dynamic objects can represent by a graph using a set of vertices, V and a set of edges, E and graph formed can be clustered in to several number of homogeneous subgraphs according to any considered variable using the graph coloring technique. Basically during this research a vertex coloring algorithm was used for finding subgraphs (clusters) from the initial graph according to a certain order. As a result, it can be obtained mixed exhibits which are homogeneous within

exhibits and heterogeneous between exhibits according to the above considered factors. The graph coloring technique can be easily used for clustering for a dynamic population of species as explained above. Similarly during this research the aim was investigating the possibilities of multi species sharing the same cage (multi species exhibits) at the National Zoological Gardens, Dehiwala, Sri Lanka using graph coloring technique and proposing an algorithm that can be used to achieve that target for any zoological garden. The main objectives of this research can be presented as follow.

- The main goal is to educate its visitors about the natural behavior of each animal when different species sharing the same cage.
- Overcome the space limitation problem as much as possible.
- To achieve the second goal it should be determined the minimum number of mixed species exhibits with maximum number of species (using graph coloring technique).
- To present an algorithm which can be determined the cage or cages relevant to a newcomer according to same technique that used before.

II. METHODOLOGY

Graph formed by a set of vertices and edges where each edge having a physical meaning. The set of edges are the connections between vertices. During the clustering of a graph into several subgraphs, the task is grouping a set of heterogeneous vertices into clusters (subgraphs) by consideration of the structure of the edges. In that case there should be many edges within each cluster and relatively few between the clusters. During this research it has been over viewed the definitions and techniques for graph clustering, that is finding highly related vertices using vertex coloring technique. Finally it has been presented a local algorithm for producing clusters for the selected population of vertices of species of the input graph.

Any non-uniform data set can be divided into homogeneous clusters using graph coloring technique. So during this thesis always clustering method has been discussed based on the concept of coloring of a graph. A graph coloring is a process of assigning colors to the vertices of the graph such that, (Witold, 2008)

- No two adjacent vertices (vertices joined by an weighted edge representing the dissimilarity between objects) have the same color, and
- For each color, there exists at least one vertex which is adjacent (has a sufficient dissimilarity degree) to all other colors. This vertex is called a dominating vertex; there can be many within the same class.

Those are the main constraints in coloring of a graph. Even the number of clusters not specified, the coloring based clustering method enables to build a fine partitioning of the data set in to subgraphs (clusters).

A coloring of a graph is an assignment of colors to vertices such that every pair of adjacent vertices receives different colors. The graph coloring problem, whose objective is to minimize the number of colors used. By the way the greedy sequential coloring method is effective in practice when the population of vertices being relatively large. During the sequential coloring method a greedy coloring is applied to again and again over the set of vertices in some order.

Graph coloring and its generalizations are useful tools in modeling a wide variety of scheduling and assignment problems. About a specific application of graph coloring is discussed in this section.

Chemicals store application:

The improper storage or mixing of chemicals can result in serious accidents and even disasters. When keeping several chemicals together at the same place (within same store) it should be consider the incompatibility of Chemicals. Therefore chemicals should be placed by considering the minimum distance among each pair of chemical which is incompatible. Due to the space limitation of the store it is required that placing all the compatible chemicals together (in the same rack). By using the graph coloring technique it can be decide the minimum number of racks that should be used in such cases. Consider the example below. This is only a partial list that includes some of the more common academic laboratory chemicals. Please note that the absence of a chemical from the list does not mean that it is necessarily safe to mix it with any other chemical!

Table 1: List of incompatibility of common chemicals

Chemical	Incompatible with
Ammonia	Mercury(e.g., in manometers), Chlorine, Calcium hypochlorite, Iodine, Bromine, Hydrofluoric acid (anhydrous)
Chlorine	Ammonia, Acetylene, Butadiene, Butane, Methane, Propane (or other petroleum gases), Hydrogen, Sodium carbide, Benzene, Finely divided metals, Turpentine
Iodine	Acetylene, Ammonia (aqueous or anhydrous), Hydrogen
Silver	Acetylene, Oxalic acid, Tartaric acid, Ammonium compounds, Fulminic acid

Mercury	Acetylene, Fulminic acid, Ammonia
Fluorine	All other chemicals

It can be obtain the minimum number of rack should be used in the same store for the above chemicals using graph coloring technique as below. (Figure 1) Since fluorine is incompatible with all the other chemicals it has been separated first (red).

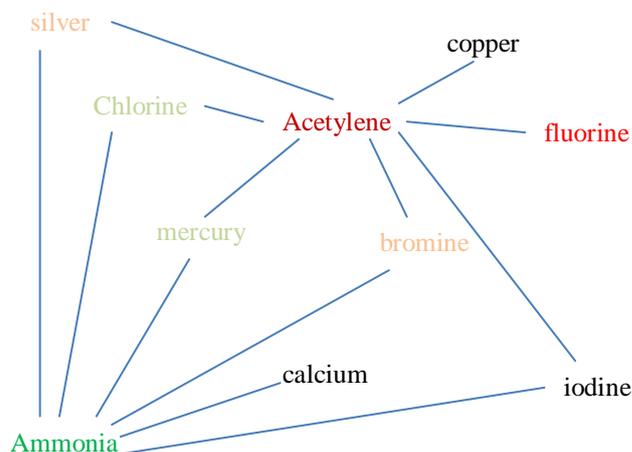


Figure 1: Solution for the incompatibility chemical example with 6 minimum racks.

As discussed above several types of mixed species exhibits were obtained by considering several factors of the species mainly multi species competition for re- sources such as food, space, etc. Although when mixing several species together it should be addressed for disease transmission specially from high risk species. Anyhow if those main effects and factors can be overcome, then the concept of mixed species exhibits provides an interactive and dynamic experience for the animals, visitors and zoo management.

Combining mammals with birds or reptiles within the same exhibit will provide that interactive effect and several benefits for visitors and animals too. But in that case it would be caused to a high risk about the species due the above discussed main effects and factors. Because of that this research was set up to established mixed species exhibits in National Zoological gardens of Sri Lanka by considering concept of mixing species relevant to mammals, aves and reptilia classes separately.

This research was based on some attributes of the animals in the National Zoological Gardens, Dehiwala, Sri Lanka. A complete set of data relevant to the following factors were collected for 220 animals,

- Animal inventory

Class, Order, Common Name & Initial group structure.

Eg. Mammalia, Primates, Toque Monkey, Male-1, Female-2, Unknown-1

- Provided diet list

Common Name, Meal time, Food type & provided amount in g

Eg.

Table 2: Example for the data collected relevant to the animal's diet list

Common Name	Meal time	Food type	Amount in g
Toque Monkey	Morning	Amberalla	7
		Gram	57
		Plantain	121
		Water melon	100
		Apple	11
		Guava/Mango	64

Using the above data a graph was modeled by considering all the animals and all the food types as vertices and edges as the attribute which food type they are consuming. Then the observed clusters can be extracted as a subgraph at each step below by considering the animals as the vertices and considered attribute in the relevant step as the edges using the above modeled graph. A database was created to store the above data and all the partitioning parts were preceded using the graph coloring technique. Since the original graph consists with end vertices of each edge sharing the common attribute, graph coloring was applied for the compliment graph. The basic steps of the data analysis is given below and the number of exhibits obtained in each step is given within brackets compare to diet and using graph clustering proceed all the steps on whole population of animals.

A). Grouped all the animals in to three classes namely Mammals, Aves and Reptiles. [3 exhibits]

This step has been proceeded to avoid the predator-prey effect to a certain level between each pair of class. As discussed earlier the whole population of species should be clustered according to the diet combination of each species using graph coloring technique. So the graph coloring technique should be applied for the initially produced graph in the previous section step by step as shown in the above charts. This is known as sequential coloring.

The initial graph was built for the whole population of species and graph coloring was applied to the complement graph for proceed the step 1 to obtain initial three clusters relevant to three classes Mammalia, Aves and Reptilia.

As a result a graph was built by considering each species as vertices and their class (Mammalia, Aves, and Reptilia) as edges.

Example : Let a combination of two mammals (M- Black), two birds (A- Blue) and two reptiles(R- Red). Then there were six vertices and which were connected by edges considering their class. (Figure 2)

Here the identified three clusters (classes) were considered as three separated graphs hereafter.

B). Grouped by carnivore order (Separated those mammals into different exhibits). [25 exhibits]

This step has been proceeded to avoid the predator-prey effect with a high percentage as discussed in the above step. It can be avoid the predator-prey effect within mammal species by separating carnivore ordered species in to single species exhibits. For that graph coloring technique was applied for the subgraph of Mammalia class species that found above to identify the species of the carnivore order by considering those species as vertices and the order carnivore as edges.

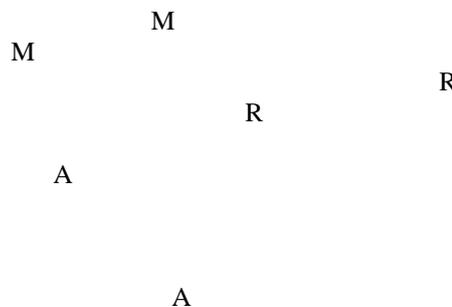
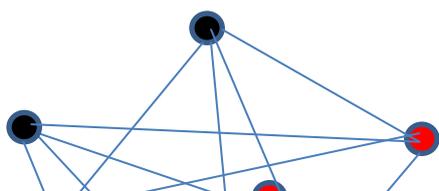


Figure 2: Colored complement graph: Three classes were separated as Mammalia, Aves and Reptilia.

C). The popular feed or feed combination as Papaw, Plantain and Guava/Mango was identified.

Overall 45% of all provided 45 varieties of food types represent from those combinations. It can be justified by considering the percentages of consuming those varieties. Those percentages were as follow.

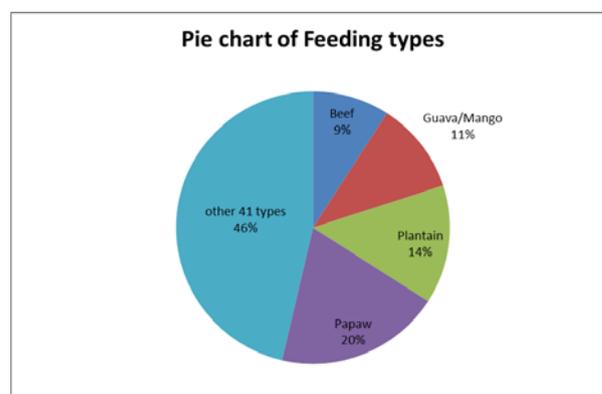


Figure 3: Pie chart of food types

- . Papaw 19:5%
- . Plantain 14:1%
- . Guava/Mango 10:9%
- . Beef - 9% (For carnivore species)

All the remained 46% represents 41 types of remained varieties of food types. So it can be roughly negligible.

The same procedure of graph coloring was followed for the three subgraphs obtained for three classes by considering the species as vertices and the attribute of consuming papaw as edges as discussed in the above step of clustering carnivore animals hereafter. For that it should be considered,

- The subgraph obtained in the initially before step for the relevant class of species
- Rebuild the considered subgraph for the same vertices (species) by considering the attribute of consuming the relevant food type as edges
- Take the complement graph
- Apply the graph coloring technique

The above procedure has been repeated for each subgraph obtained after the each step to get the final result. According to that procedure the following steps of clustering were preceded.

D). Again grouped the each exhibit obtained in first step into two exhibits as having papaw and not having papaw for feeding. [6 exhibits]

E). Again grouped the each exhibit obtained above into two exhibits as having Plantain and not having Plantain for feeding. [12 exhibits]

F). Again grouped the each exhibit obtained above into two exhibits as having Guava or Mango and not having Guava or Mango for feeding. [24 exhibits]

Using a Java programme the final result was obtained easily according to the above procedure and an interface to display the output was created too.

III. RESULTS OF THE RESEARCH

Finally the fifty number of mixed species exhibits were obtained instead of 220 individual exhibits but one of those exhibits consist the animals,

- Mullary
- Budgerydar

This separation occurred at the first stage of clustering since the class couldn't specify relevant to those animals. So those two animals were considered as outliers during the analysis. All the other 218 animals were involved in the analysis and complete results of all 49 exhibits.

Eg.

1. For class Mammalia and relevant to the feed combination papaw, plantain and not having guava/mango.

Red giant kangaroo, Red necked wallaby, Mouse deer, Squirrel monkey, Long haired spider monkey, White fronted brown lemur, and Slender loris.

2. For class Mammalia and relevant to the feed combination papaw, guava/mango and not having plantain.

Silver pheasant, Malay great argus pheasant, Chinese ringed necked pheasant, Silky bantam, Eurasian collared dove, Diamond dove, victoria crowned pigeon, Green imperial pigeon, Domestic pigeons, and Spotted dove.

IV. CONCLUSIONS AND RECOMENDATIONS

In this study the method of graph coloring technique was used to a real world problem and it has been successfully completed up to certain level with 49 exhibits of mixed animals instead of 220 individual cages. The final results leads to build a new zoological garden which consists with 49 mixed species exhibits of more space than before since the total number of exhibits has been reduced to 1/4 from the initial number of exhibits approximately. Because of that this method will provides a zoological garden with beautiful surrounding, full of freedom for animals and so calming experience for its visitors. As a result of this study a beautiful opened architectural design can be modeled for each exhibit by considering the real world habitat of each animal. If there is a new comer then the information of it can insert in to the database and by considering the procedure again the exhibit relevant to the new comer could be identified.

This study was set up to support the exchange of expertise in establishing and maintaining mixed species exhibits in zoos of Sri Lanka, as well as to promote the out- standing value of this concept for future animal keeping and exhibition facilities. Mainly this presents mathematical concept behind the clustering of species. Using this concept it can be improved the interface and the grouping procedure based on any other zoological base concept upon several attributes that should be considered during such type of clustering such as size, gestation period, dominant character and feeding method etc. for further studies. Practically it should make high attention 52 for the exhibits which consists with high percentage of all species mainly about the dominant characters on feeding.

ACKNOWLEDGMENT

Foremost, I would like to express my sincere gratitude to my supervisor Dr. G. H. J. Lanell for the continuous support of my M.Sc. study and this research, for his patience, motivation, enthusiasm, and immense knowledge. His guidance helped me throughout research and while writing this thesis. Besides my supervisor, I would like to thank the rest of my thesis committee: Prof. Sunethra Weerakoon and Dr. R. Sanjeeva, for their encouragement, insightful comments, and hard questions. My sincere thanks also go to the Director and the Assistant Director of the National Zoological Gardens, Dehiwala for offering me the opportunity to collect data from the National Zoological Garden and conduct my M.Sc. research upon the data collected from there. Also sincere thanks go to all the other staff members in the National Zoological Garden, Dehiwala who supported me to collect the data that I needed. I wish to thanks specially Mr. Gratien De Almeida for the stimulating discussions and support in making the database, interface and helping to write several programs needed for this study.

Last but not least, I would like to thank my parents and spouse for their immense support during this study.

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