ISSN 2349-3089

NeJCR

NORTHEAST JOURNAL OF CONTEMPORARY RESEARCH

Vol. 4 Number 1, December 2017

DARRANG COLLEGE RESEARCH JOURNAL

NeJCR Vol 4 Number 1 December 2017

Northeast Journal of Contemporary Research (NeJCR)

A multidisciplinary research journal

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Publisher :

Principal, Darrang College, Tezpur, Assam

ISSN 2349-3089

Northeast Journal of Contemporary Research

Vol. 4 Number 1, December 2017

NeJCR, Darrang College,
Tezpur-784001, Assam, India
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Editorial

ENVIRONMENTAL AUDITING IN HIGHER EDUCATIONAL INSTITUTIONS: A SOCIAL RESPONSIBILITY

Environmental Audit is a process of systematic identification, quantification, recording, reporting and analysis of components of environmental diversity of various establishments. It aims to analyze environmental practices within and outside of the concerned sites, which will have an impact on the eco-friendly ambience. In recent time, the Green Audit of an institution has been becoming a paramount important for self assessment of the institution which reflects the role of the institution in mitigating the present environmental problems.

Defining the environmental auditing we rely on the following definitions: "*the process, whether voluntary or imposed by external regulations that leads to the production of document information related to the impact of the organization or company on the environment*" (De Moor *et al*., 2005). Another definition is ''*reporting on environmental issues that usually goes beyond financial reporting and might take place in a separate report or in separate sections of the glossy brochure. Such reporting may include environmental balance sheets*'' (Collison *et al*., 1996). Formally environmental auditing was conceptualized in 1991 by the International Chamber of Commerce (ICC, 1991), as a "management tool that provides systematic documentation and evaluation of how the entity, equipment and technologies involved in its activity protects natural environment".

Effective and efficient management of environmental protection is a outcome for sustainable development in the world (Shil and Iqbal, 2005). Today we have a distinctive trend towards a compliance of environmental and social reporting following the guidelines provided by the Global Reporting Initiative (GRI). Globally, concerns about sustainable development have resulted the last decade in an exponential increase in confidence from the organizations in the systems that audit environmental impact and environmental performance, based on information provided by green accounting, as a competitive advantage in strategic positioning. In corporate sector the practice of saving environment through the various programmes like CSR (Corporate Social Responsibility), GO Green, Save Water, Save Trees, Plantation of trees are to be taken. It will definitely work for the future (Bețianu, 2008). In this moment world-wide there are two renown schemes to certify the environmental information of organizations: the Eco-Management and Audit Scheme (EMAS) is the EU's voluntary scheme designed for companies and other organizations committing themselves to evaluate, manage and improve their environmental performance, and the second one is the international recognized ISO 14001 – belonging to the ISO quality set of standards.

The rapid urbanization and economic development at local, regional and global level has led to several environmental and ecological crises. On this background it becomes essential to adopt the system of the Green Campus for the institutes which will lead for sustainable development and at the same time reduce a sizable amount of atmospheric carbon-di-oxide from the environment. The Na-

tional Assessment and Accreditation Council, New Delhi (NAAC) has made it mandatory that all Higher Educational Institutions should submit an annual Green Audit Report. It is part of Corporate Social Responsibility of the Higher Educational Institutions to ensure that they contribute towards the reduction of global warming through Carbon Footprint reduction measures.

Green Audit is the most efficient and ecological way to solve environmental problems. It provides a baseline assessment of instruction's environmental sustainability performance and carbon footprint. It records the measurement of inputs such as electricity and water and makes recommendations regarding operational efficiencies, and technical and best practice improvements. It is necessary to conduct a green audit in college campus because student aware of the green audit, its advantages to save the planet and they become good citizen of our country. Thus Green audit Become necessary at the School, college and University level.

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Science Section

Northeast Journal of Contemporary Research, December 2017. Vol. 4 No. 1, pp 1-9
ISSN 2349-3089

Mixture of Some Poisson-Lindley Distributions: Revisited

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ABSTRACT

Some mixture of Poisson Lindley (PL) distribution namely Inflated Poisson Lindley (IPL) Poisson Poisson Lindley (PPL), Poisson Lindley Poisson (PLP), and Short Poisson Poisson Lindley (SPPL) are further investigated by working out the recurrence relations for probabilities, factorial moments etc. Estimation of parameters by different methods are worked out. Distributions are further fitted to some well known accident and biological data for an empirical comparison.
Key words: PL distribution, inflated distribution, short distribution and parameter estimation.

INTRODUCTION

Sankaran (1970) obtained the PL distribution by mixing Poisson distribution with Lindley(1958). Further he studied its goodness of fit by using (I) Distribution of mistakes in copying groups of random digit and (II) Accident to 647 women working an H.E. shells during 5 weeks. Borah and Deka Nath(2000) studied one finite mixture distribution namely IPL and applied it successfully to the problem of biological data. Borah and Deka Nath(2001) further studied two mixture distributions namely PPL and PLP and applied it to the accident data. SPPL which is an extension of PPL distribution, was studied by Deka Nath and Borah (2000).

In this paper an attempt is made to compare all these mixture distributions of PL distribution by fitting them to some accident and some biological data. It is found that SPPL distribution always gives a better fit to accidents data.

IPL Distribution

The major motivating force behind the development of inflated distributions is that, many distributions obtained in the course of experimental investigations often have an excess frequency of the observed event at zero point. Singh (1963) obtained the inflated Poisson distribution as a special case of contagious distribution. Further Singh (1965) indicated that there might exist analogous situations in binomial distribution. The inflated distribution is a finite mixture of original distribution. The probability generating function (pgf) of IPL distribution may be written as

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$$G(t)=\beta+\alpha g(t)$$

where $g(t)=\frac{\theta^2(\theta+2-t)}{(\theta+1)(\theta+1-t)^2}$ is the pgf of Poisson-Lindley (PL) distribution and $\alpha+\beta=1,\ 0<\beta<1$ and $\theta>0$ (see Borah and Deka Nath,2001),

with recurrence relation for probabilities given as

$$P(X=r)=\frac{(\theta+2+r)}{(\theta+1)(\theta+1+r)}P(X=r-1)\ ,\qquad r=2,3,...$$

where $P(X=0)=\beta+\frac{\alpha\theta^2(\theta+2)}{(\theta+1)^3}$, $P(X=1)=\frac{\alpha\theta^2(\theta+3)}{(\theta+1)^4}$

The recurrence relation for factorial moments can be written as

$$\mu'_r=\frac{\alpha\{(\theta+3)-2^r\}}{\theta(\theta+1)}+\sum_{j=0}^{r-1}\frac{(3a-3.2^{j+1}a^2+2^{j+1}a^3)}{(1-a)^3}\binom{r}{j+1}\mu'_{r-j}\ ,r>1$$

where $a=\frac{1}{(\theta+1)}$

Hence $\text{mean}=\frac{\alpha(\theta+2)}{\theta(\theta+1)}$, $\text{variance}=\frac{\alpha\{\theta^3+4\theta^2+6\theta+2+\beta(\theta+2)^2\}}{\theta^2(\theta+1)^2}$

PPL Distribution

It is a Poisson mixture of PL distribution (using Levy's theorem) with pgf which can be written as

$$G(t)=e^{\lambda\left\{\frac{\theta^2(\theta+2-t)}{(\theta+1)(\theta+1-t)^2}-1\right\}}$$

where $\lambda>0$, $\theta>0$.

Hence the recurrence relation for probabilities may be written as

$$P_{(r+1)}=\frac{1}{(r+1)}\left[\left\{3\alpha r+\lambda\theta^2\frac{\alpha(\theta+3)}{(\theta+1)^3}\right\}P_r-\left\{3\alpha^2(r-1)+\frac{\lambda\theta^2\alpha}{(\theta+1)^3}\right\}P_{r-1}+\alpha^3(r-2)P_{r-2}\right],$$

r=2,3,...

where $\lambda>0$, $\theta>0$, $\alpha=\frac{1}{\theta+1}$, $P_0=e^{\lambda\left\{\frac{\theta^2(\theta+2)}{(\theta+1)^3}-1\right\}}$ (see Borah and Deka Nath,2001)

Putting r=2,3,... higher order probability may be computed easily

$$\mu'_{(r+1)}=\left\{\frac{3r}{\theta}+\frac{\lambda(\theta+2)}{\theta(\theta+1)}\right\}\mu'_{(r)}-\left\{\frac{3r(r-1)}{\theta^2}+\frac{\lambda r}{\theta(\theta+1)}\right\}\mu'_{(r-1)}+\frac{r(r-1)(r-2)}{\theta^3}\mu'_{(r-2)}$$

for r=2,3,…

where $\mu'_{(r)}$ denotes the r[th] factorial moment of Poisson-Poisson-Lindley distribution and

$$\text{mean}=\frac{\lambda(\theta+2)}{\theta(\theta+1)},\qquad \text{Variance}=\mu_2=\frac{\lambda(\theta^2+4\theta+6)}{\theta^2(\theta+1)}$$

PLP Distribution

It is PL mixture of Poisson distribution with pgf may be written as

$$G(t)=\frac{\theta^2\{\theta+2-e^{\lambda(t-1)}\}}{(\theta+1)(\theta+1-e^{\lambda(t-1)})^2}$$

$$=A\frac{\theta+2-e^{\lambda(t-1)}}{\{1-\alpha e^{\lambda(t-1)}\}^2},\qquad \text{where } \lambda>0,\ \theta>0$$

and $A=\frac{\theta^2}{(\theta+1)^3}$, $\alpha=\frac{1}{(\theta+1)}$ (see Borah and Deka Nath,2001)

The recurrence relation for probabilities for PLP distribution may be written as

$$P_{r+1}=\frac{B}{(r+1)}\left[A\left\{\frac{(\theta+3)}{(\theta+1)}\lambda e^{-\lambda}-2^r\alpha\lambda e^{-2\lambda}\right\}\frac{\lambda^r}{r!}+3\alpha e^{-\lambda}\sum_{j=1}^{r}(1-2^j\alpha e^{-\lambda}+3^{j-1}\alpha^2e^{-2\lambda})\right.$$

$$(r-j+1)\frac{\lambda^j}{j!}p_{r-j+1}\Bigg]$$

where $B=\frac{1}{\left(1-3\alpha e^{-\lambda}+3\alpha^2 e^{-2\lambda}-\alpha^3 e^{-3\lambda}\right)}$, $P_0=\frac{A\left(\theta+2-e^{-\lambda}\right)}{\left(1-\alpha e^{-\lambda}\right)^2}$ and

$$P_1=AB\lambda e^{-\lambda}\left\{\frac{(\theta+3)}{(\theta+1)}-\alpha e^{-\lambda}\right\}$$

The factorial moment recurrence relation of PLP distribution may be written as

$$\mu'_{(r+1)}=\frac{A}{(1-\alpha)^3}\left\{\frac{(\theta+3)}{(\theta+1)}\lambda^{r+1}-2^r\lambda^{r+1}\alpha+\sum_{j=1}^{r}\left(3\alpha-3\alpha^2 2^j+\alpha^3 3^j\right)\binom{r}{j}\lambda^j\mu'_{(r-j+1)}\right\}$$

for r=1,2,3,...

mean= $\mu'_1=\frac{\lambda(\theta+2)}{\theta(\theta+1)}$ and

$$\text{variance}=\mu_2=\frac{\lambda^2\left(\theta^3+4\theta^2+6\theta+2\right)}{\theta^2(\theta+1)^2}+\frac{\lambda(\theta+2)}{\theta(\theta+1)}$$

SPPL Distribution

While deriving the 'Short' distribution from accident data, some assumptions were made by Cresswell & Froggatt (1963). In the same manner, the `SPPL distribution (Deka Nath and Borah (2000)) has been derived. It is a convolution of PPL and Poisson distribution. This convolution has been made by assuming that the number of spells in a given time period is assumed to be Poisson variable with parameter λ_1 and the probability of accidents within a spell have a PL distribution with parameter θ, and accident occurring outside this spell are independently distributed as Poisson distribution with parameter λ_2 . The pgf of this distribution may be written as

$$G(t)=\exp\left[\lambda_1\left\{\frac{\theta^2(2+\theta-t)}{(\theta+1)(\theta+1-t)^2}-1\right\}+\lambda_2(t-1)\right],$$

where $\lambda_1, \lambda_2>0$ and $\theta>0$ (see Deka Nath and Borah, 2000)

The recurrence relation for probabilities may be written as

$$P_{r+1}=\frac{1}{r+1}\left[\left\{\frac{\lambda_1\theta^2(\theta+3)}{(\theta+1)^4}+\frac{3r}{(\theta+1)}+\lambda_2\right\}P_r-\left\{\frac{\lambda_1\theta^2}{(\theta+1)^4}+\frac{3(r-1)}{(\theta+1)^2}+\frac{3\lambda_2}{\theta+1}\right\}P_{r-1}\right.$$

$$\left.+\left\{\frac{3\lambda_2}{(\theta+1)^2}+\frac{r-2}{(\theta+1)^3}\right\}P_{r-2}-\frac{1}{(\theta+1)^3}P_{r-3}\right],$$

where $P_0=exp\left[\lambda_1\left\{\frac{\theta^2(\theta+2)}{(\theta+1)^3}-1\right\}-\lambda_2\right]$

$$P_1=\left\{\lambda_1\frac{\theta^2(\theta+3)}{(\theta+1)^4}+\lambda_2\right\}P_0$$

Putting r=3,4,... in above recurrence relation, the higher order probabilities may be derived.

The recurrence relation for factorial moments of SPPL distribution may be written as

$$\mu'_{(r+1)}=\left\{\lambda_1\frac{(\theta+2)}{\theta(\theta+1)}+\frac{3r}{\theta}+\lambda_2\right\}\mu'_{(r)}-\left\{\lambda_1\frac{r}{\theta(\theta+1)}+\frac{3r(r-1)}{\theta^2}+\lambda_2\frac{3r}{\theta}\right\}\mu'_{(r-1)}+$$

$$\left\{\frac{r(r-1)(r-2)}{\theta^3}+\lambda_2\frac{3r(r-1)}{\theta^2}\right\}\mu'_{(r-2)}-\lambda_2\frac{r(r-1)(r-2)}{\theta^3}\mu'_{(r-3)}$$

where $\mu'_{(r)}$ denotes the r^{th} order factorial moments of SPPL distribution.

Hence mean=$\lambda_1\frac{(\theta+2)}{\theta(\theta+1)}+\lambda_2$ and variance=$\lambda_1\frac{(\theta^2+4\theta+6)}{\theta^2(\theta+1)}+\lambda_2$.

If $\lambda_2\to 0$, the moments become same as those of Poisson-Poisson-Lindley distribution.

Parameter Estimation

The estimation of parameters of inflated distribution other than $\beta=1-\alpha$ can be carried out by ignoring the observed frequency in the zero class, and then using a technique appropriate to the original distribution truncated by omission of zero class. After the other parameters have been estimated, parameter β can then be estimated by equating the observed and expected frequencies in the zero class (see Johnson et al.(1992)). Method of moments

and ratio to first two frequencies with mean are used for all these mixtures of PL distributions. But for IPL distribution, method of maximum likelihood is also considered.

Fitting of mixture of PL distribution to data

To illustrate the applications of IPL,PPL,PLP and SPPL distribution, firstly in Table 1, we have considered the data on number of accidents to 647 women on high explosive shells during 5 weeks period [Data from Greenwood and Yule (1920)]. In Table 2 we consider data on home injuries of 122 experienced men during 11 years period [data from Adelstein (1952)]. Again in Table 3, the data on Pyrausta nibilais is considered for which Neyman Type A distribution was fitted by Beall and Rescia (1953).

Table 1 Comparison of Observed Frequencies for Accidents to 647 Women on High Explosive Shells during 5 weeks with Expected Frequencies of SPPL, PPL[Borah & Deka Nath (2001)] and Negative Bionomial(NB) distribution[Plunket & Jain (1975)]. [Data from Greenwood and Yule (1920)].

No. Of accidents	Observed Frequency	Expected Frequency			
		SPPL	PPL	PLP	NB
0	447	445.959	442.52	444.58	445.89
1	132	131.692	137.79	134.78	134.90
2	43	47.698	46.57	46.17	44.00
3	21	15.218	14.57	14.85	14.69
4	3	4.124	4.32	4.62	4.96
≥5	2	2.309	1.70	2	2.56
	647	647.00	647.00	647.00	647.00
χ^2		2.981	4.04	3.56	3.7109

In Table1, the original data together with the expected frequencies of SPPL, PPL PLP and Negative binomial [Plunket & Jain (1975)] distribution are considered. We get $\hat{\theta}$ =5.3066, $\hat{\lambda}_1$ =2.4117 and $\hat{\lambda}_2$ =-0.061 for SPPL and $\hat{\theta}$ =5.163, $\hat{\lambda}$ =2.066 for PPL and $\hat{\theta}$ =0.567, $\hat{\lambda}$ =0.161 for PLP distribution. From Table 1, it is seen that SPPL distribution provides a better fit to this data as compared to the other distributions.

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	647	647.00	647.00	647.00	647.00
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Table 2 Comparison of observed frequencies for home injuries of 122 experience men during 11years (1937-1947) [data from Adelstein (1952)].

No. Of accidents	Observed Frequency	Expected Frequency		
		SPPL	PPL	PLP
0	58	57.053	57.051	56.430
1	34	33.441	33.443	34.530
2	14	17.521	17.486	17.351
3	8	8.161	8.158	7.911
4	6	3.404	3.525	3.411
5	2	2.428	2.337	2.367
	122	122.00	122.00	122.00
χ^2		1.542	1.503	1.554

In Table 2, when the SPPL distribution along with PPL and PLP are applied to the above set and it provides a good fit like GPD [Consul (1989)] model in all the cases. Here we get $\hat{\theta}$=4.0447, $\hat{\lambda}_1$ =3.359 and $\hat{\lambda}_2$=-0.0115 for the SPPL distribution and $\hat{\theta}$ =3.976, $\hat{\lambda}$=3.259 for PPL and $\hat{\theta}$ =0.094, $\hat{\lambda}$=0.084 for PLP distribution.

It is apparent from the results of the above tables that the SPPL distribution can be applied very successfully in case of accident data. In all the cases the SPPL distribution provides a good fit.

Table 3 Observed and fitted Inflated Poisson-Lindley (IPL), Poisson-Poisson-Lindley (PPL) and Poisson-Lindyey-Poisson (PLP) distribution. [Data on the Pyrausta nibilais, to which NTA was fitted by Beall & Rescia (1953)

No. Of accidents	Observed Frequency	Expected Frequency		
		IPL	PPL	PLP
0	33	33	32.503	32.212
1	12	12.41	12.796	13.191
2	6	5.84	6.079	6.094
3	3	2.66	2.703	2.642
4	1	1.18	1.147	1.107
5	1	0.91	0.772	0.754
	122	122	122	122
χ^2		0.029	0.065	0.037

Again in Table 3, the data on Pyrausta nibilais is considered for which Neyman Type A distribution was fitted by Beall and Rescia (1953). Here IPL, PPL and PLP distributions are fitted to this biological data. All these mixture distributions provide good fit to above data.

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Northeast Journal of Contemporary Research, December 2017. Vol. 4 No. 1, pp 10-15
ISSN 2349-3089 ©NeJCR, 2017

A Study on Ornamental Fish Species of Dhing Area, Nagaon, Assam

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ABSTRACT

Ornamental fishes usually mean attractive colourful fishes of different characteristics or of various patterns. The present study was undertaken from March 2013 to July 2013 in Dhing area of Nagaon district of Assam. These are also known as aquarium fishes kept as pets in confined spaces for fun or fancy. Assam, a north-eastern state, is blessed with abundance of ornamental fishes in nature and contributes the lion's share of total ichthyospecies in North Eastern region of India. However there are vast unexplored potential for indigenous ornamental fishes in Assam. Scientific & systematic exploration of these potential will definitely ensure employment generation & will help to earn foreign exchange. Henceforth, this paper investigates the varieties of ornamental fishes found in four water bodies of Dhing area of Nagaon district in Brahmaputra valley of Assam.
Key words: Dhing; ornamental fish; IUCN.

INTRODUCTION

Fishes are the most ancient and most numerous among the vertebrates comprising about 30,000 species with global distribution. They live in every conceivable type of aquatic habitat and exhibit great variation in size, shape and colour and behaviour. Apart from forming an important item of human diet since the dawn of human civilization they also occupy an important part in our lives for their sporting and aesthetic qualities fishes are conserved as the as the most beautiful cheerful and fascinating among the aquatic creature and it is no wonder that they find a place in many house hold and different public places as decorative item (Das and Biswas, 2005). Ornamental fishes form an important commercial component of aquaculture providing for aesthetic requirement and upkeep of the environment. Ornamental fishes mean attractive colourful fishes of various characteristics. These fishes are kept as pets in confined spaces like aquarium or a garden pool for fun and fancy but this living jewels need not always have bright colours as sometimes their peculiar characteristics such as body colour morphology, mode of taking food etc. may also add to their attractiveness. Ornamental fishes are usually kept in glass aquarium and hence popularly known as aquarium fishes. (Bailey and Standford, 1998). Already 217 fish species belonging to 136 genera have been identified in

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Assam, of which about 150 species have been reported to ornamental value, which over 50 species have huge overseas demand (Biswas and Baruah, 2000). All these species are high demand in international market. Assam is gifted with many extensive water bodies commonly known as Beels (Jhingran, and Pathak. 1987) that are the only source of fish for the poor people in the surrounding villages. Beels (wetlands) are major fishery resources contributing to about 25 % of the fish production in Assam. However, major portions have been rendered unproductive due to excessive siltation and growth of weeds and only about 33 % of the potential is being utilized for fisheries (Chakravartty *et al*., 2012). But, now- a- days, the production of the fish species is declined and according to the fishermen communities living in and around wetlands are of the opinion that this is because of the degradation of the Beel. So, it is very important to list out the ornamental fish species available in the wetland. Only a detailed study of ornamental fish population of the wetland can help us to determine the present productivity or the status of the wetland. We may then, able to propose some valuable measures for the better productivity of the wetland, if necessary. Keeping these in view, an attempt has been made to study on the diversity of ornamental fish species in and around Dhing area, Nagaon, Assam.

Study Area

Assam is located in the tropical latitudes (24.3^{O}N and 28^{O}N) and Eastern longitudes 89.5^{O}E and 96.1^{O}E) and it is surrounded by hills and mountains on its three sides .The state of Assam has an area of 78,434 km^2 representing 2.39 percent of the Indian landmass. Dhing is situated in the Nagaon district of Assam, India at 26.47^0 N 92.47^{0}E in the flood plains of the river Brahmaputra. Dhing is about 25 km from Nagaon town, the district headquarter of the Nagaon district of Assam. The survey area includes four wetlands of Dhing in Nagaon district of Assam. Locations of these four wetlands are Brahmaputra River, Talibarh Beel, Salkata Beel, and Roumari Beel. During the study period the total tributaries were divided into four stations on the basis of geographical variation as follows:

Station: 1.Brahmaputra River
Station: 2.Talibarh Beel
Station; 3.Salkata Beel
Station: 4.Roumari Beel

MATERIALS AND METHODS

To study of the ornamental fish species of the four stations of Dhing area were studies during the period starting from March to July, 2013. Fish samples were collected throughout this month from this wet lands i.e. Talibarh beel, Salkata beel, Roumari beel and the river Brahmaputra. The fish were collected with the help of skilled local fishermen by using various fishing gears like Cast net (Khewali) Dip net (Dhekijals), Langi net, Tongi net, Sip net, Fasi net, Gill nets(gill nets are of three varieties-Puthilangi, Garoilangi and Kawoilangi locally), Drag nets, local Bamboo trap, Chepa(valve trap), Hook, Jakoi, Polo, Hapa, Juluki, Ghoni, Dolonga, Ghukuta, Saloni and other local contrivances with different baits according to the food of choice and the on the basis of their habitat.

Survey was conducted by active searching and trial guided by local people, especially fisherman in this region. Survey was done during morning hour and evening also. The fish species were also collected from the local market of Dhing area during this period and this were also preserved in formalin solution in the department of Zoology, Dhing College for identification purpose. Some living species were kept in aquariums. On the other hand the secondary information was gathered through the local fisherman and experienced person in this field.

Collected fishes were preserved in 5%

formalin solution by following the methods of Jayaram, 1999 directly in the department of Zoology, Dhing College and the identification of collected fish samples were done by the subject experts of Department of Zoology, Gauhati University and with reference to Vishwanath Singh (2002), Jayaram (2000), Nath & Day (2000) and Kar & Sen (2007). On the other hand the latest scientific names of the fish species were followed with the website Www.fishbase.org also. Photographs are taken by digital camera (Sony DSC-W710).

The fish statuses were defined by the IUCN search engine through internet.

RESULTS & DISCUSSION

The collected fish were kept in Glass jar for identification as well to study their morphology by following standard procedure. The fish were collected mainly from the said four stations where, Station: 1 is Brahmaputra river and the other 3 stations i.e. Talibarh Beel, Salkata Beel, Roumari Beel were wetland.

Descriptions of some of the fishes are as follows:

Table: List of collected fish species and their status :

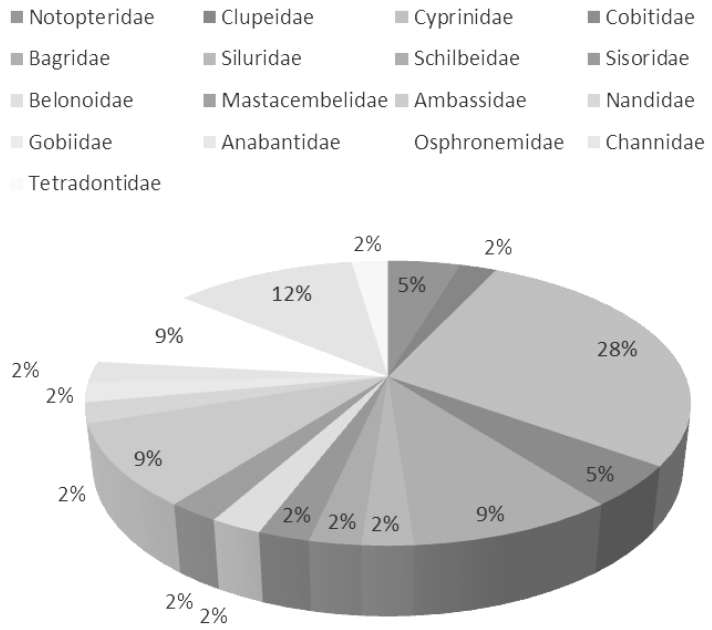
Sl. No.	Scientific Name	Collecting Spot	Availability	IUCN Status	Local name
1.	*Chitala chitala*	Brahmaputra	Rare	NT	Chital
2.	*Notopterus notopterus*	Salkata	High	DD	Kanduli
3.	*Gudusia chapra*	Brahmaputra	Rare	Decreasing	Koroti
4.	*Amblypharyngodon mola*	Talibarh	High	LC	Mowa
5.	*Aspidoparia morar*	Roumari	Moderate		Boriola
6.	*Chela laubuca*	Salkata	High	Yet to be assessed	Haarbhagi
7.	*Esomus danricus*	Talibarh	High	LC	Darikana
8.	*Puntius sophore*	Do	High	LC	Puthi
9.	*Salmophasia bacaila*	Brahmaputra	High	LC	Selekona
10.	*Botia Dario*	Roumari	Rare	LC	Gethu(Koina)
11.	*Mystus menoda*	Brahmaputra	Rare	Yet to be assessed	Gagal
12.	*Mystus villatus*	Talibarh	High	Do	Singora
13.	*Xenentedon cancila*	Brahmaputra	Moderate	Do	Kokila
14.	*Macrognathus aral*	Salkata	High	LC	Tura
15.	*Pseudambassis baculis*	Talibarh	High	LC	Chanda
16.	*Glossogobius giuris*	Salkata	Do	Do	Patimutura
17.	*Tetradon cutcutia*	Salkata	Moderate	Yet to be assessed	Gangatop
18.	*Channa gachua*	Talibarh	High	LC	Chengeli
19.	*Channa marulius*	Do	Do	Do	Sol
20.	*Channa punctata*	Do	Do	Do	Goroi
21.	*Barlius bendelisis*	Brahmaputra	Moderate	Do	Korang
22.	*Devario aequipinnatus*	Talibarh	High	Do	Sal darikana
23.	*Rasbora daniconius*	Do	Do	Do	Darikana
24.	*Puntius conchonius*	Roumari	Do	Do	Puthi
25.	*Puntius ticto*	Do	Do	Do	Chakariputhi

26.	*Rasbora* *rasbora*	Brahmaputra	Rare	Do	Eleng
27.	*Lepidocephalichthys guntea*	Roumari	High	Yet to be assessed	Botia
28.	*Mystus tengara*	Salkata	High	LC	Ronga Singora
29.	*Mystus cavasius*	Do	Do	Do	Singora
30.	*Ompok pabda*	Roumari	Rare	NT	Pavo
31.	***Pseudeutropius atherinoides***	Brahmaputra	Moderate	Yet to be assessed	Borduwa
32.	*Pseudambassis baculis*	Talibarh	High	LC	Chanda
33.	*Pseudambassis lala*	Do	Do	NT	Chanda
34.	*Chanda nama*	Roumari	Do	LC	Chanda
35.	*Nandus nandus*	Do	Rare	Do	Gedgedi
36.	*Anabus testudineus*	Talibarh	High	Yet to be assessed	Kawoi
37.	*Polyacanthus fasciata*	Salkata	Do	LC	Kholihona
38.	*Polyacanthus labiosus*	Do	Rare	Yet to be assessd	Kholihona
39.	*Polyacanthus sota*	Do	High	Not found	Vecheli
40.	*Ployacanthus lalia*	Do	Moderate	Do	Ronga vecheli
41.	*Channa aurantimaculata*	Brahmaputra	Rare	Do	Cheng
42.	*Channa striata*	Talibarh	High	Do	Sal
43.	*Gagata cenia*	Brahmaputra	Rare	Do	Kyaketta

N. B. **DD**- Data deficient, **LC**- Least Concern, **NT**- Near threatened

It is found that Dhing area harbours a great variety of ornamental species. For the better convenience of the study about the fishes available, it is very essential to place them into some groups. After completion of the study a total of 43 species belonging to 31 genera, 17 families and 8 orders have been recorded from the Dhing area. The species of area belong to following orders: i.e. Osteoglossiformes, Clupeiformes, Siluriformes, Cypriniformes, Beloniformes, Synbranchiformes, Perciformes and Tetradontiformes. Out of these 43 species, 2 species belong to the family Notopteridae (Featherfin knife fishes or Old world Knife fishes), Clupeidae (1 no), Cyprinidae (Minnows or Carp, 12 no's), Cobitidae or Loaches(2 no's), Bagridae or Bagrid catfishes(4 nos) , Siluridae(1 nos), Schilbeidae or Schilbeid catfishes(1 no), Sisoridae or Sisorid catfishes (1 no), Belonoidae or Needlefishes (1 no), Mastacembelidae or Spring eels(1 no), Ambassidae/Chandidae or Asiatic glassfishes(4 nos), Nandidae or Loaf fishes(1 no), Gobiidae or Gobies) (1 no), Anabantidae or Climbing gouramies(1 no), Osphronemidae (4 nos), Channidae or Snakeheads (5 nos) and Tetradontidae or Puffers(1 no).

Fig. Percentage contribution of different orders of fish in Dhing area



Photographs of collected Ornamental Fish Species

CONCLUSION

The present study is the first ever documentation of potential ornamental fish species from the Dhing area in Nagaon District, Assam, which exhibits a good number of ornamental fishes. The illegal fish capturing methods for food fishes are the major cause of depletion of ornamental fishes. So, for conservation of these living jewels of aquatic world, a long term and effective management plan should be adopted to control the illegal fishing and export trade. Further works particularly in the following areas will yield valuable results and findings in determining detailed status of fresh water ornamental fish and will very much helpful in conservation of these valuable species.

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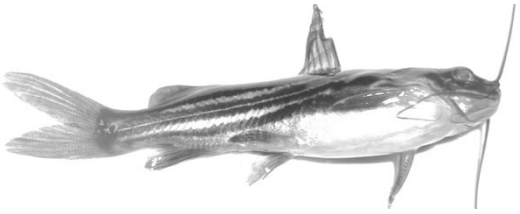
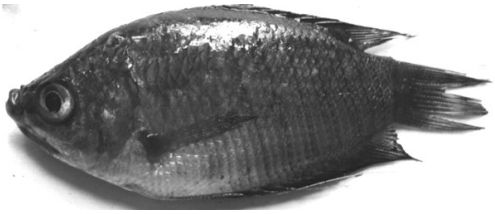
Plate1: Photographs of collected Ornamental Fish Species



Mystus tengara

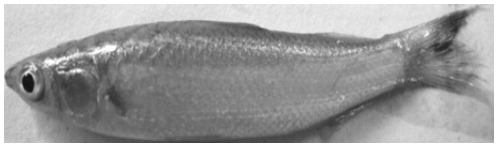


Polyacanthus fasciatus

Glossogobius giuris

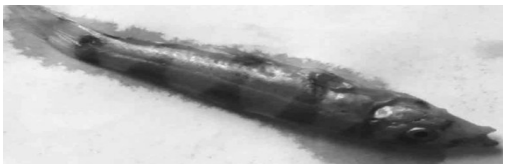
Channa punctata

Botia guntea



Aspidoparia morar

Anabas testudineus



Botia dario

Northeast Journal of Contemporary Research, December 2017. Vol. 4 No. 1, pp 16-22
ISSN 2349-3089 ©NeJCR, 2017

Effects of lindane(δ- isomer) on adrenal glands in mice (*Mus musculus*)

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ABSTRACT

Lindane is a broad spectrum organochlorine pesticide contains wide range of application such as in crops protection, treatment of lice and others. Lindane given subcutaneously in mice shows decrease in cortisol level and marked regression in zona fasciculata region of adrenal glands.
Keywords: Lindane, cortisol, zona fasciculate and adrenal glands.

INTRODUCTION

Lindane (1,2,3,4,5,6-hexachlorocyclohexane) is the only stereoisomer with insecticidal efficacy and has a variety of applications, including protection of crops, prevention of insect borne diseases such as malaria, diseases removal of ectoparasites such as lice and mites, and treatment of human pediculosis. The widespread use of insecticides has caused the scientific community and the public at large to consider more seriously the influence of these agents as environmental pollutants and their possible effects on wildlife and human health.Lindane (g-HCH) organochlorine pesticide extensively employed for public health and agricultural purpose in developing countries. Lindane is a white, crystalline organic solid. Its formula is $C_6H_6CI_6$ and has a molecular weight of 290.8 Its melting point is at 112.5^0C, boiling point 323^0C, water solubility 7.3 mg/L at 25^0C, vapour pressure 4.2×10^{-5} mm Hg at 20^0C, 4.4×10^{-3} Pa at 24^0C (Source HSBD). Lindane is stable to heat, light, air, carbon dioxide and strong acids. Technical HCH is an isomeric mixture that contains mainly five forms differing only by the chlorine atoms orientation (axial or equatorial positions) around the cyclohexane ring. The five principal isomers are present in the mixture in the following proportions: alpha-hexachlorocyclohexane (53%–70%) in two enantiomeric forms ((+)alpha-HCH and (-)alpha-HCH), beta-hexachlorocyclohexane (3%–14%), gamma - hexachlorocyclohexane (11%–18%), delta-hexachlorocyclohexane (6%–10%) and epsilon-hexachlorocyclohexane (3%–5%).

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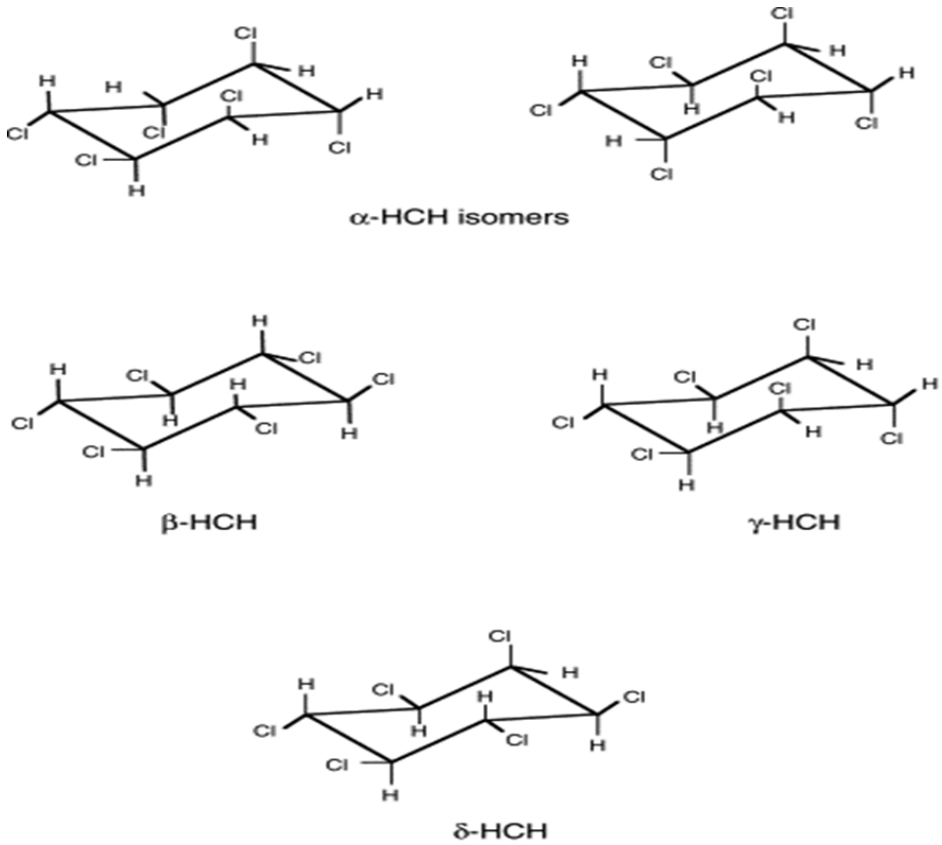

Fig 1. Isomers of lindane (Source:IPOL_STU(2016)571398_EN(1))

Lindane has been reported to induce oxidative stress (Videla, L.A., S.B. Barros and V.B. Janquer, 1990), membrane perturbation (Bhalla,P. and D. Agarwal, 1998) , functional impairment in blood brain barrier disturbance in glutathione homeostatis (Sahoo, A. and G.B.N Chainy, 1998) and alteration in cyt P450monooxygenase enzymes (Parmar, D., S. Yadav, M. Dayal, A. Johri, A. Dhawan and P.K. Seth, 2003)

Aims and objectives:

1. To study the effects of lindane in adrenal gland (cortisol level) in serum of mice.
2. To study the histological change in adrenal glands in mice.

MATERIALS AND METHODS

Animals:

Adult albino mice weighing 28-35 gm and approximately 8 weeks of age were procured from Animal House Facility of Department of Zoology, Gauhati University, Assam, India. The animals were housed in properly labelled steel mesh plastic cages with solid bottom containing saw dust and maintained under uniform condition of natural photoperiod (12 hr. light and 12 hr dark),relative humidity, 75%-87% and temperature, 27-30 C. Animals were acclimatized to normal environmental conditions in the laboratory for two weeks before use.Standard diet (pellet diet) and water at libitum were supplied regularly.

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Chemicals:

Lindane (δ-HCH) is being procured from Zenith India Guwahati, Assam, India. The analytical grade alcohol and distilled water is being supplied by the Department of Zoology, Gauhati University.

Preparation of experimental doses:

Two doses 100 mg/kg bw and 50 mg/ kg bw of Lindane were preparedand used in the study. Initially two stock solutions were prepared. For high dose (100mg/kgbw), of test chemical (lindane) was prepared by adding 1 ml of ethanol (Analar Grade) and 9 ml of distilled water to 0.1 ml of the above mentioned doses were injected once daily with the help of 1 ml syringe of 29G (Romson syringe) for 7 and 14 days.

Experimental grouping of animals:

Thirty healthy adult mice were weighted and randomly categorized into ten groups (n=6) in ten properly labelled separate cages with steel mesh as lid. The cages were labelled as control group, vehicle control group, estradiol group,50 mg/kg bw and 100 mg/kg bw respectively. 0.1 ml of the above mentioned doses were injected subcutaneously once daily in the morning around 9 am to 10 am by 'Romson syringe' (29 G) for 7and 14 days. After 7 days, 15 mice ie., 3 mice from the each of the groups were sacrificed for estimation of effect lindane on various parameters, while the rest 15 mice were dissected after 14 days.

Table1. Showing treatment schedule

Experimental Group (n=6)	Treatment (mg/kg bw/animal/ day)	Volume Administered (ml)	Duration of treatment (Days)
Control			7 and14
Vehicle control (Ethanol:water: 1:9 v/v)		0.1	7and 14
Estradiol 17β	0.1	0.1	7 and 14
Low dose	50	0.1	7 and 14
High dose	100	0.1	7 and14

Albino mice were taken in 5 different groups (6 animals per group) and treated with two different doses, 50mg/kg bw (considered as low) and 100mg/kg bw (considered as High) respectively for consecutive 7 and 14 days. A control group was maintained without any treatment. A vehicle control was given ethanol:water(1:9 v/v) l .Another group of animals were treated with oestradiol 17β (considred as positive control).
Treatment schedule: 0.1 ml of test chemical was administered subcutaneously to animals daily in the morning hr daily regularly.

Fig 2. Mice weight measurement

Fig 3. Narcotization and pinning of mice

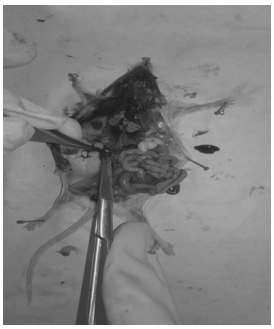

Fig 4. Dissection of adrenal gland

Fig 5. Adrenal gland of mice

Blood and tissue collection:

Blood samples were drawn by using 2ml Nypro syringe (26G) using cardiac puncture procedure. Approximately 200 µl of blood was collected and kept separately in micro-centrifuge tubes. The blood samples were then subjected to centrifugation (Eppendorf mini spin centrifuge) at 5000 rpm for 15 min to obtain clear serum. The serum was then collected in newly labelled micro-centrifuge tubes and stored at -20^{0}C for estimating cortisol level.

Following proper laboratory procedure animals were sacrificed one batch on the day 7 and 14 respectively. In the first batch of animals after treatment day 7, all animals were taken in to the laboratory from the animal house. Animals were anesthesised with mild chloroform. Then they were placed on dissecting tray and pinned properly. Adrenal gland was located and taken out to petridishes in normal saline. The weights of the adrenal gland taken using the Sartorius electronic balance(0.1 mg sensitivity). The adrenal gland transferred to Bouin's fluid for histology.

Acute toxicity:

The oral LD50 of mice is 86 mg/kg (PulakLahiri and Sipra Sircar, 1990). The acute dermal LD50 of mice is 896 mg/kg.

Cortisol hormone assay:

By electrochemiluscence technique in "Apex diagonistics , Guwahati -781005, Assam", cortisol hormone assay was done.

Histopathological study:

The sample tisssues of adrenal gland that is kept in Bouin's fluid for 18-24 hours. The fixed specimens were then washed and dehydrated in ascending grades of alcohol(30%, 50%, 70%, 90% and 100%).The specimens were then cleared in xylene, infiltrated and embedded in molten paraffin (60•C),sectioned at 4 micron thickness using microtome(Ernst Leitz Wetzlar GMBH, Germany). The sections were taken in properly affixed slides i.e., fixed with 70% alcohol. The sections were stretched in warm water bath, temperature being maintained at 50-60^0 centrigrade. Proper spreading of the sections done using a hot plate. The sections were then stained with Haematoxylin and eosin (H & E), and mounted with DPX. The slides were examined under light microscope. Photomicrographs were taken in Microscope (Leica).

RESULTS

Following are the findings of effect of lindane on adrenal gland

Table 2. Effect of different doses of lindane on serum cortisol level. Values are expressed in Mean±SD

Experimental group	nmol/L (Mean±SD)
Control	58.26±3.46
Vehicle control (7 days)	56.86±3.27
Vehicle control (14 days)	54.79±2.03
50 mg/kg bw (7 days)	52.92±2.46
50 mg/kg bw (14 days)	51.89±1.86
100 mg/kg bw (7 days)	50.88±1.29
100 mg/kg bw(14 days)	46.04±1.14
Experimental group	nmol/L (Mean±SD)
Control	58.26±3.46
Vehicle control (7 days)	56.86±3.27
Vehicle control (14 days)	54.79±2.03
50 mg/kg bw (7 days)	52.92±2.46
50 mg/kg bw (14 days)	51.89±1.86
100 mg/kg bw (7 days)	50.88±1.29
100 mg/kg bw(14 days)	46.04±1.14

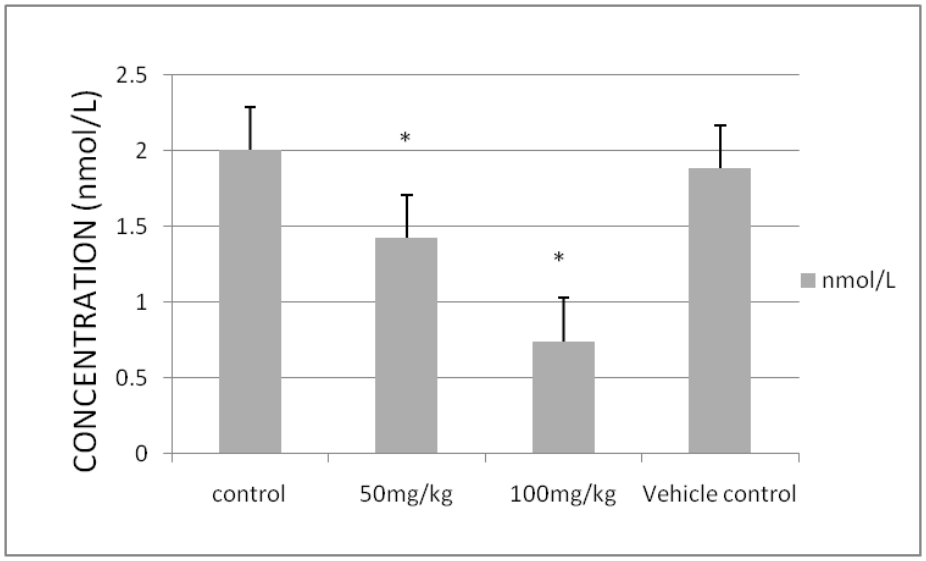

Fig 6. Effect of lindane on the serum cortisol level at 7 days in four animal groups viz., control, 50 mg/kg bw, 100 mg/kg bw and vehicle control. Values expressed in mean ± SD.Valuesare significant at P <0.05(* indicates value is significantly different at p <0.05 level compared to the respective control values determined by one way ANOVA analysis).

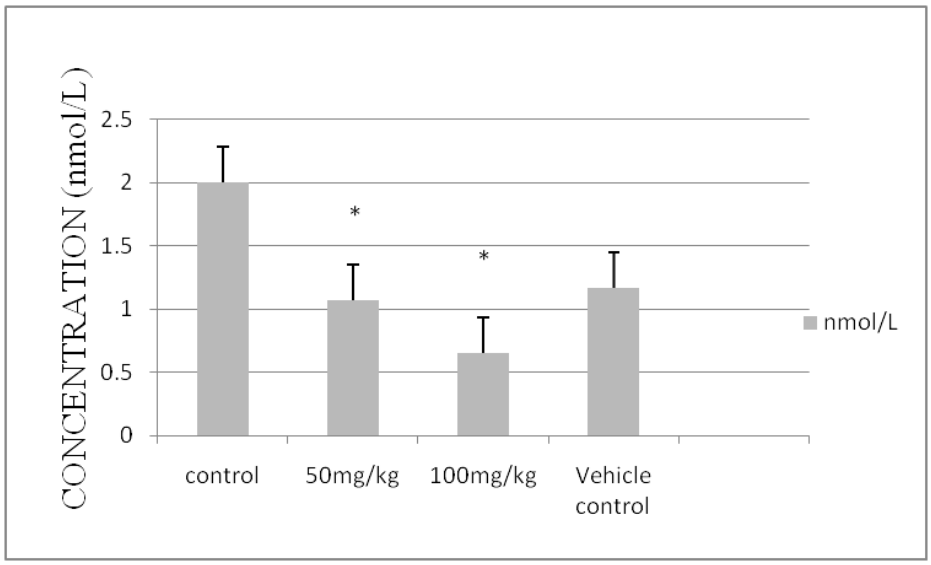

Fig 7 : Effect of lindane on the serum cortisol level at 14 days in four animal groups viz., control,50 mg/kg bw,100 mg/kg bw and vehicle control. Values expressed in mean ± SD.Values are significant at P <0.05(* indicates value is significantly different at p <0.05 level compared to the respective control values determined by one way ANOVA analysis).

Histology

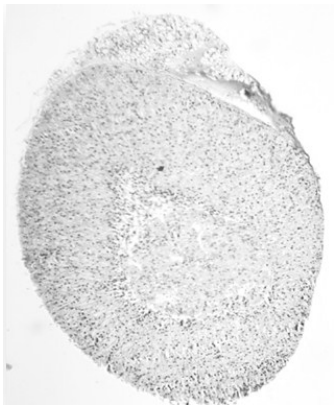

Fig8. T.S control adrenal gland 4x magnification

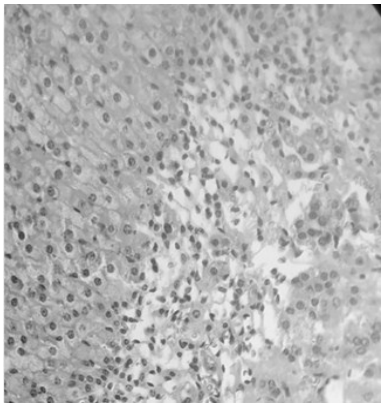

Fig 9:T.S control adrenal gland 10x magnification

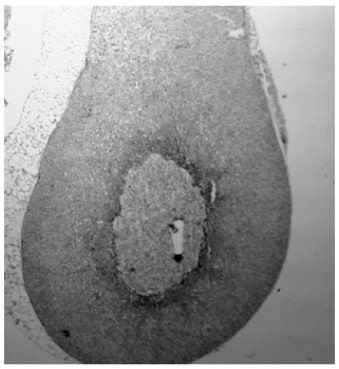

Fig 10:T.S low dose adrenal gland 4x magnification

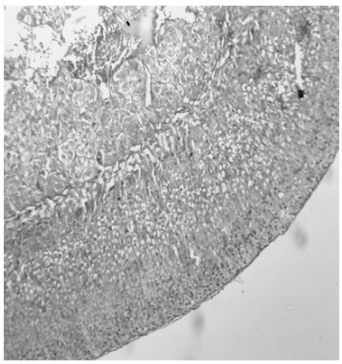

Fig 11:T.S low dose adrenal gland 10x magnification

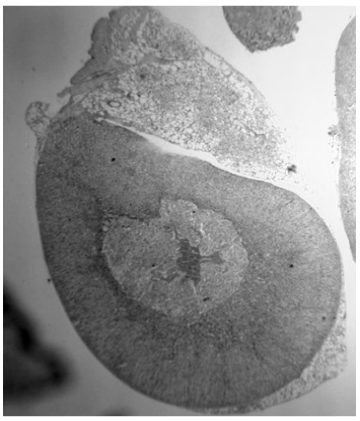

Fig 12: T.S high dose adrenal gland 4x magnification

Fig 13: T.S high dose adrenal gland 10x magnification

DISCUSSION

The experimental result of the present study indicates that cortisol secretion from the adrenal gland in the treated group decreases which is represented graphically in fig 6 and fig 7. Compared to the low dose of lindane there is marked decrease of cortosol level in high dose . Similar result found by Agneta Oskarsson et.al (2006), at the highest lindane concentration cortisol secretion was reduced almost to the baseline levels.

It was also observed when the mice were treated with high dose of δ-lindane there is marked regression in the zona fascicula region of the adrenal gland (fig 12 & 13). In low dose of δ HCH no prominent regression was being observed(fig10-11). According to Pulak Lahiri and Sipra Sircar,1990 also fasciculata and reticularies zones markedly regressed when treated with ɣ-lindane.

CONCLUSION

Pesticides are widely used in agriculture mainly to increase crop yields to cater huge supply of food products for increasing world population as well as to protect crops from pests and control insect-borne diseases. Increased use of pesticides result in contamination of the environment and the excess accumulation of pesticide residues in food products, which has always been a matter of serious concern. Pesticide residues in food and crops are directly related to the irrational application of pesticides to the growing crops. Accumulated pesticide residues in food products have been associated with a broad variety of human health hazards, ranging from short-term effects to long term toxic effects.

The present study firmly established that lindane has many deleterious effects on adrenal glands in mice. Lindane is a persistent organochlorine compound which is widely distributed in the environment. Lindane is considered to be highly toxic. People are exposed to lindane mainly from ingestion of foods contaminated with this pesticide. Additional exposure may come from breathing air contaminated with lindane, dermal contact with contaminated soil or in drinking water. Some people, especially children, may also come into contact with lindane through the use of lotions for scabies or lice control. Infants are also contact with lindane through the use of lotions for scabies or lice control. Infants are also exposed to lindane and other HCH isomers via their mother's milk.

As from my experiment and secondary sources of data lindane is found to have health hazards effect so its use must be reduced to prevent from its ill effects.

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Northeast Journal of Contemporary Research, December 2017. Vol. 4 No. 1, pp 23-28
ISSN 2349-3089

A report of Herpetofauna in the collection of Chaiduar College, Gohpur

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ABSTRACT

In recent years, awareness is being created all over the world for the conservation of biodiversity so that these vitally important phenomena receive further study immediately. Research on biodiversity, identity, distribution, conservation and monitoring in local level in North East Region including Assam are very limited. It is due to the fact that most of the biodiversity rich area are still unexplored or under explored. It is necessary to obtain current and accurate in formation regarding floral and faunal species in order to conserve and manage them holistically. The present work attempt to describe the collected and recorded species of amphibian and reptiles in Chaiduar College, Gohpur . Assam. The present study suggested the need of involvement of higher education sector in taxonomic studies for conservation of local biodiversity.

INTRODUCTION

Chaiduar College is one of the oldest colleges situated in the Biswanath district of Assam. It is affiliated to Gauhati University having 16 numbers of departments and a number of skill development and value added courses. **Accredited 2.82 CGPA by NAAC** in **2017**, the college is preparing for celebration of Golden Jubilee, having sufficient research facilities including **Advanced Biotech Hub** and **Star College** Programmes. A great number of major and minor research projects have been successfully completed by different departments till date. The college has an approximately 5 Hectares of open land and several ponds. The department of Zoology was established in 1987 and since then, the department has maintained good academic and research tradition. The Zoology department has to its credit a well equipped AC room having different types of digital Microscopes, Digital P^H meter, microtome, Digital balance, Incubator, spectrophotometer, PCR, Gel documentation system, Elisa reader, Deep refrigerator, Distillation unit, Hot air oven, autoclave, centrifuge, lux meter, hygrometer, gel del unit, different aquatic and plankton nets, etc. A rich library, museum with over 4000 specimens and an animal house are attached to the department.

The author conducted several taxonomic research projects and maintain animal collections. A work on database on the collected specimen is in progress which is supposed to help in research community. The growing collection document the place and time of collection along with relevant data for biosystematics study. The paper highlights the amphibian and reptilian species diversity based on field collection and recorded species.

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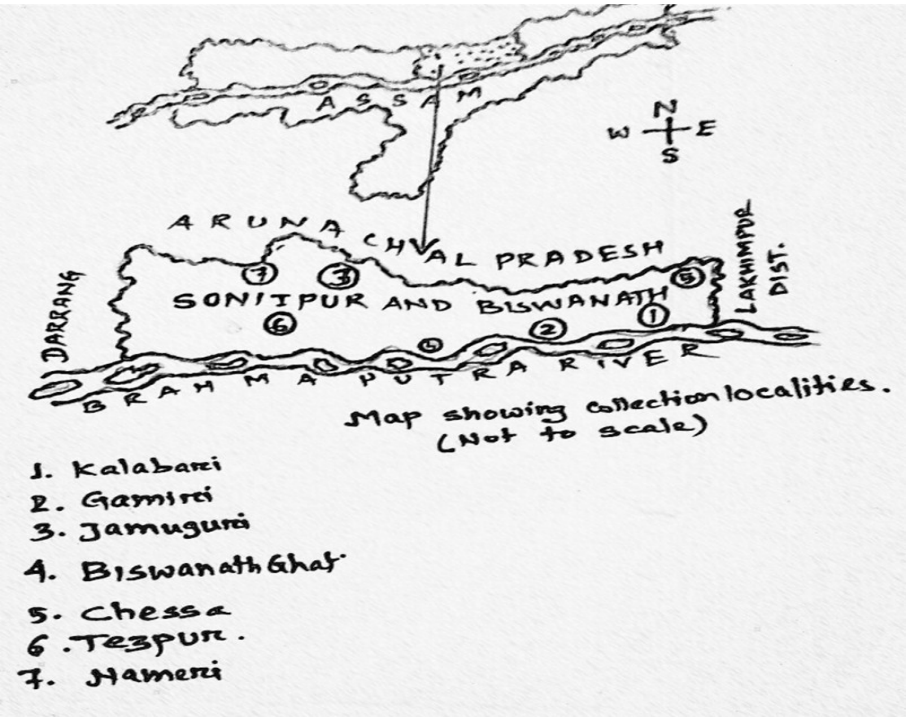

Fig 1. Map showing collection localities

Amphibian collection:

Earliest report on record on amphibian fauna of north east region dates back to Annandale (1912) who published zoological results of Abor expedition. Other important workers who worked on amphibian fauna of this region are Boulenger (1890-1920),Smith (1921) and Sarkar and Sanyal(1985) who studied the amphibians of Namdapha National Park of Arunachal Pradesh. They reported 14 species belonging to 5 genera distributed in 3 families. Chanda (1994) reported 23 species from Arunachal Pradesh based on his own collection and earlier reports. Bordoloi and Borah(1999) reported *Hoplobatrachus crassus* from north east region of Assam and Arunachal Pradesh. Few works on amphibian of this region are: Borah,(2000), Sinha, Chakravorty, Borah and Bordoloi,(2000), Bordoloi, Borah, Sarma and Kalita (2000), Borah and Bordoloi (2001), Bordoloi, Borah, Chakravorty and Sinha. (2001), Borah and Bordoloi (2001), Borah, Bordoloi and Borkotoky(2001), Chakravarty, Borah and Bordoloi (2002) : Bordoloi,Borah, Sarmah and Sarmah (2002), Borah and Bordoloi (2003), Borah (2004) : Borah and Borkotoki (2008): Borah and Kakati (2010), Borah (2010,11,12) Kakati and Borah(2013), Borah (2013,16,17).

COLLECTION METHODS

Collections were made from different habitats such as agricultural fields, human habitation sites (urban and rural), natural forests, wetlands, tea gardens, seasonal pools, river banks, swamps etc. during day light and early

night hours.

Besides hand collection, aquatic nets, fishing nets and plankton nets were used for collection of specimens. Tadpoles and eggs were collected during day time from various water bodies and whenever possible few samples were brought to the laboratory for completion of life cycle. While collecting specimen guidelines of Declining Amphibian Task Force (DAPTF) of the world conservation union (IUCN), Species Survival Commission (SSC) were strictly followed.

The amphibian fauna identified belonging to 7 families, 18 genera and 31 species. The family Bufonidae is represented by 3 species, followed by Dicroglossidae 8 species, 3 species of Megophridae, 2 species of Microhylidae, 1 species of Occidozyginae**,** 6 species of Ranidae and 8 species of Rhacophoridae .Collected specimens have been well preserved along with of morphometric record .Following are the list of species collected and recorded by the author-

Class : Amphibia
Order :Anura
I. Family : Bufonidae
1.*Duttaphrynus himalayanus*(Gunther,18*3*).
2.*Duttaphrynus melanostictus* (Schneider,1799)
3.*Duttaphrynus stomaticus*(Lutken,1862)

II. Family :Dicroglossidae
4.*Euphlyctis cyanophlyctis*(Schneider,1799)
5.*Euphlyctis hexadactylus*(Lesson,1834)
6.*Fejervarya nepalensis* (Dubois,1975)
7.*Fejervarya syhadrensis*(Annandale,1919)
8.*Fejervarya teraiensis*(Dubois ,1984)
9.*Hoplobatrachus crassus*(Jerdon,1854)
10.*Hoplobatrachus tigerinus*(Daudin,1802*)*
11.*Limnonectes leticeps* (Boulenger, 1882)

III.Family :Megophrydae
12.*Xenophrys major* (Boulenger,1908)
13.*Xenophrys parva* ((Boulenger,1893)
14.*Xenophrys robusta*(Boulenger,1908)

IV.Family :Microhylidae
15.*Microhyla ornata*(Dumeril & Bibron,1841)
16.*Uperodon globulosus*(Gunther,1864)

V. Family :Ranidae
18.*Amolops formosus*(Gunther,1875)
19.*Clinotarsus alticola*(Boulenger,1882)
20.*Humerana humeralis* (Boulenger ,1887)
21.*Hylarana taiphensis*(Van Denburgh, 1909)
22.*Hylarana tytleri* Theobald, 1868
23.*Pterorana spp.*

VII. Family :Rhacophoridae
24.*Chiromantis spp.* 25.*Chiromantis vittatus* (Boulenger,1887) 26.*Philautus spp*. 27..*Polypedates megacephalus* 28.*Polypedates taeniatus* (Boulenger, 1906) *29.Rhacophorus spp.* 30.*Rhacophorus maximus,* Gunther,1858

Collection of Reptilian Fauna:

Explorations of both amphibian and reptilian species have been carried out simultaneously during the field surveys conducted. For reptiles, active searching in vegetations, turning of rocks, logs , bricks, digging through leaf litter, excavating burrows and termite mounds have been done depending on diverse habitat condition of the species. Whenever needed, help of local people and other field worker, expert snake catcher were hired for this purpose.

The equipments like stout canvass bags of different sizes were used for capturing specimen. Snake catching sticks with an iron hoop at one end have been made locally and were used for handling snakes. Likewise geology picks made of iron are used for turning rocks, removal of barks, splitting open old logs and bamboo, tearing up rodent burrows, termite mounds while searching reptilian species. Large funnel traps, fish nets and hooks were also used during collection of specimen. Some collections were obtained from local markets, road killed and killed by local inhabitants. Following are the list of species collected and recorded by the author-

Class : Reptile
Order: Testudine (Tortoises & Turtles)
I. Family :Geomydidae
1.*Cuora amboiensis,* Daudin,1802. 2.*Cuora mouhotii,* Gray,1831 3.*Cyclemys gemeli,* Fritz,et al,2008 4.*Pangchura smithi, (*Gray,1831) 5.*Pangchura sylhetensis,* Jerdon,1870 6.*Pangchura tecta,* Gray,1831

II. Family :Testudinidae
7. *Manouria emys, (*Schlegel & Mouller, 1844)

III. Family :Trionychidae
8. *Lissemys punctata*, (Lacepede,1788*)*
9 *..Nilssonia gangaticus*,(Cuvier,1825*)*
10*..Nilssonia hurum*, (Gray, 1831)11.*Nilssonia nigricans* (Anderson,1875)

Order: Order: Squamata (Lizards and Snakes)
Sub-Order : Sauria
IV. Family :Agamidae
12.*Draco blanfordii* Blanford,1878
13.*Ptyctolaemus gularis*(Peters, 1864)
14. *Japalura Andersoniana* Annodale,1905
15.*Calotes versicolor, (*Daudin,1802)
16.*Calotes jerdoni* Gunthur, 1870

V. Family :Anguidae
17.*Ophisaurus gracillis (Gray, 1845)*

VI. Family :Gekkonidae
18.*Cyrtodactylus khasiensis* (Jerdon,1870)
19.*Hemidactylus frenatus* ,Dumeril & Bibron, 1836
20.*Hemidactylus garnotii,*Dumeril & Bibron, 1836 21.*Hemidactylus platyurus* (Schnider,1792)
22. *Gekko gecko*(Linnaeus ,1758)

VII. Family :Scincidae
23.*Eutropis dissimilis (*Hallowell,1857)
24.*Eutropis macularia, ,*Blyth, 1853
2 5.*Eutropis carinata* (Schneider, 1801)
26.*Eutropis multifasciata* (Kuhl, 1820)
27.*Sphenomorphus indicum* (Gray, 1853)
28.*Sphenomorphus maculatus* (Blyth, 1853)

VIII. Family :Varanidae
29.*Varanus bengalensis* (Daudin, 1802)
30.*Varanus flavescens*(Hardwicke & Gray,1827)
Order: Squamata(Snakes)Sub-Order: Ophidia(Serpentes)

IX. Family :Boidae
31.*Python molurus bivittatus,* Kuhl, 1820

X. Family :Columbridae
32.*Rhadinophis frenatum*, (Gray, 1853)
33.*Coelognathus radiatus*, (Schlegel, 1837)
34.*Pytas korros*, (Schegel,1837)35.*Oligodon albocinctus,* (Cantor, 1839)
36.*Oligodon cinereus,* Gunther, 1864
37.*Dendrolaphis pictus,* (Gmelin, 1789)
38.*Dendrolaphis gorei,* (Wall, 1910)
39.*Amphiesma stolatum,* (Linnaeus, 1758)
40.*Amphiesma platyceps,* (Blyth, 1854)
41.*Xenochrophis piscator,* (Schneider,1799)
42.*Rhapdophis himalayanus,* (Gunther, 186)
43.*Rhapdophis subminiatus,* (Schlegel,1837)
44.*Blythia reticulate,*(Blyth, 1854) 45.*Boiga gokool,* (Gray,1835)
46.*Boiga quincunciatus,* (Wall,1908) 47.*Boiga cyanea,*(Dumeril,Bibron & Dumeril,1854)
48.*Ahaetulla prasina ,* (Boie, 1827)
49.*Enhydris enhydris,* (Schneider, 1799)

XI. Family :Elapidae
50.*Bangurus fasciatus,* (Schneider, 1801)
51.*Ophiophagus hannah,* (Cantor, 1836)
52.*Naja kaouthia,*Lesson,1831

XII. Family :Typhlopidae

53.*Rhamphotyphlops brahminus*,(Daudin,1803)
54.*Typhlops jerdoni*, Boulenger, 1890
55.*Typhlops diardi,* Schlegel, 1839

XIII. Family : Viperidae

56. *Cryptelytrops albolabris,* (Gray, 1842)

Pressure and threats on amphibian and reptile species:

During the present survey following threats have been come to the notice –

1. The Chaiduar reserve forest of Gohpur sub division is under critical threat of habitat alteration, deforestation and agricultural expansion.

2. Gohpur township has been upgraded to a sub division and there has been a steady influx of population subject to urbanization and utilization of large area of wet lands.

3. Expansion of four lane highway and gradual developmental activities are one of the potential threats which will in long run destroy herpetofaunal habitat.

4. The shifting cultivation practices along the northern boundary of the study site is not considered environmental friendly as reduction of p^H of amphibian breeding habitat could have detrimental effect (Bordoloi and Borah 2009).

Some other identified stresses are natural stresses and human induced stresses.

Natural stresses:

Among the natural stresses land slide and seismicity play important role as the earth of this region is extremely unstable and falls under the highly seismic zone.

Human induced stresses:

In course of the exploration it has been reveal that there are large scale killing of *Hoplobatracus tigerinus ,H. crassus* and *Euphlictis cyanaphlictis* during breeding season in different study localities. Indiscriminate hunting and poaching of monitor lizard, turtles, python and even other snakes for food and medicinal use in certain localities which have been known during survey period.

CONCLUSION

The north east region is a wonder land with regard to richness of biodiversity in general and the herpetofauna in particular. The Zoology teachers of colleges and universities can identify some species of animals. They may encourage few students to take projects on taxonomic work for the description of common local species. A network of biodiversity information among the institution of higher education would be appreciable as well as necessary for the gaps in our knowledge.

ACKNOWLEDGEMENT

I express my profound gratitude to Dr. A. K. Ozah, Principal, Chaiduar College, Gohpur who provided the infrastructural facilities to start and carry out the work. The author gratefully acknowledges the financial support from University Grants Commission, New Delhi for granting a Major Project (2011-2013) .

I thank my wife Swapna Kakati whose suggestions and guidance were instrumental in planning this research work.

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Northeast Journal of Contemporary Research, December 2017. Vol. 4 No. 1, pp 29-33
ISSN 2349-3089

A study on Human - Elephant conflict in Udalguri, Assam

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ABSTRACT

Big areas of forests are being lost throughout Asia as a result of agricultural expansion which is destroying elephant habitat pushing them to move through populated areas occupied by people's homes and crops. In the main it is a competition for resources in which people and elephants are struggling to share. Determining if, how and why this conflict has changed over time will be an important step towards managing landscapes where people and elephants Elephas maximus coexist. . Over last two decades, the problem has only intensified because of growing population, development activities, both privately and publicly run. Often these development activities lack interdepartmental co-ordination or advanced planning. Environmental Impact Assessment are often not carried out or implemented effectively. The study based on secondary data collected from relevant sources and analyzed with reasonable methods. Assam's Udalguri district administered by Bodoland Territorial Council (BTC) has seen a steady rise in Human Elephant Conflict (HEC) over the past decade. The district was in the news during 2009 when a total of 14 persons and 10 elephants died in the Dhansiri Forest Division, in and around the Bornadi – Neoli - Khalingduar Forest complex.

INTRODUCTION

Assam's Udalguri district administered by Bodoland Territorial Council (BTC) has seen a steady rise in Human Elephant Conflict (HEC) over the past decade. The district was in the news during 2009 when a total of 14 persons and 10 elephants died in the Dhansiri Forest Division, in and around the Bornadi – Neoli - Khalingduar Forest complex. Forest Department records show a total of 23 elephant deaths between 2003 and 2009 from this area, of which only four deaths were attributed to 'natural' causes. The rest were recorded as suspected poisoning, electrocution (both retaliatory and accidental), and falls into trenches. It was also observed that the cases of retaliatory killings of elephants went up in 2009 as human death figures also reached an all time high of 14. The North Bank Landscape (NBL) conservation programme of WWF-India has been carrying out a study in the area on the issue and the initial outcomes show a distinct shift in land cover pattern over the past decade. The unusual rise in number of causalities - both human and elephants, can be attributed to this land cover change and forest degradation.

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OBJECTIVE

i. To highlight the cause of conflict in Udalguri District.
ii. To study about the consequences of conflict in between man and elephant.
iii. To highlight the remedies taken by the Forest Department and NGO's.

METHODOLOGY

The study is mainly based on primary as well as secondary data. The primary data was collected with the help of interviews with the local communities, local NGO workers, forest officials and resource persons in Udalguri. On the other hand, secondary data is also collected from relevant books and journals.

STUDY AREA

Udalguri district Bodo, is one of the 27 districts of Assam state in north-eastern India. Udalguri town is the headquarters of the district. The area of the district is 1,852.16 km^2 (715.12 sq mi). The name of the district is derived from its headquarters, Udalguri. There are three traditions regarding the etymology of Udalguri. According to one tradition, the name is derived from Odal (a tree) and Guri (roots or surrounding) and it was named because originally the town developed around an Odal tree. According to another tradition, this town derived its name because this place was originally a hermitage of sage Uddalaka. According to the third tradition, the name is derived from two Bodo words *Ordla* (wide and spacious) and *Gundri* (powdered object). This district was formed on June 14, 2004 as one of the four districts under the Bodoland Territorial Council. This district was carved out by bifurcating Darrang district.The territory of the present district was earlier Udalguri sub-division of the undivided district. There are Hindu,Christians and Muslim population living together in the district. This was a very peaceful place till mid 80s but various communal clashes took place from time to time. Late Jojaram Sharma was one of the prominent India freedom fighters from Assam lived here. is district is bounded by Bhutan and West Kameng district of Arunachal Pradesh state in the north, Sonitpur district in the east, Darrang district in the south and Baksa district in the west. Area of the district is 1852.16 km^2.

CAUSES OF CONFLICT

Elephant-human conflict poses a grave threat to their continued existence. Studies on conflict between elephants and humans in Asia and in Africa have identified crop raiding as the main form of conflict.

Elephant-human conflict is a result of habitat loss and fragmentation. When elephants and humans interact, there is conflict from crop raiding, injuries and deaths to humans caused by elephants, and elephants being killed by humans for reasons other than ivory and habitat degradation.

Fig. 1. Man and Elephent conflict, Udalguri

The conflict between the two parties is due to the food shortage to the elephants caused by:

- Reducing forest area due to development works
- Villagers encroaching into forests
- Grasslands being used by farmers' cattle
- Low forest quality

i) Reduced forest area

During the past few centuries forest are was reduced due to cultivations, depriving elphants their natural habitats. The lands consist of mountainous and valleys or rolling lands with highlands and low valleys. Over the centuries, top soil from mountains and highlands got washed off due to rain and sediments were deposited in valleys. These fertile valleys support lush vegeta tion and provide most food to elephants. During the development schemes, the lands below the irrigation canals were allocated to settlers, and mountains and highlands with poor soils were earmarked as animal sanctuaries. But none looked into the ability of the high lands to supply animal needs.

iii) Village encroachment

During colonisation, landless families were settled in development schemes. After dec ades, with children grown up and raising families of their own, original lands are in sufficient. They encroach into low fertile valleys depriving elephants from their food supply. While villagers encroach into forests, authorities under political pressure turn a blind eye. When elephants enter their traditional lands, villagers complain and demand electric fences to keep elephants at bay. Even the elephant corridors are not safe from encroachment.

iv) Grasslands being used by farmers' cattle

Grass are a major component of elephant's food and is found mostly in lands undergo ing periodical floods, also reservoir beds when water levels go down. Cattle farmers have found convenient to drive their cattle into traditional elephant grasslands, depriving elephants their food.

v) Low forest quality

With the forests being deprived of their tall trees for human needs, their slow growth give rise to gaps being filled with shrubs. The eating habits of elephants reduce foliage of consumable plants, meanwhile non-consumables, especially thorny shrubs continue to expand. Currently, most forests are being filled with thorny shrubs.

Consequences of conflict in between man and elephants

Official statistics reveal that of 19,892 hectares of reserved forest area in Udalguri district, over 5,100 hectares has been either under encroachment or cleared of forests, causing rapid loss of elephant habitat and blocking of corridors. "In Rowta reserved forest, 2,342 hectares out of 7,739 hectares has been encroached or destroyed. But the worst case of encroachment is the Bharabkunda proposed reserved forest, which comprises of 3,543 hectares. The villagers in the Indo-Bhutan border had been rendering sleepless nights in fear of the wild jumbos. In the villages under Harisinga revenue circle of Udalguri district namely Bamunjuli, Kalikhola, Orangajuli, Garuajhar, Satgaria, Attarekhat, Nalapara, Rajagarh, Dharamjuli, Borengajuli, Suklai, Gosala, Dimakuch, Ghagra, Bhutiachang, Sonajuli, Naobandha every year a sizable number of people have lost their lives, property and crops. Within a night the human dreams and lives become shattered.

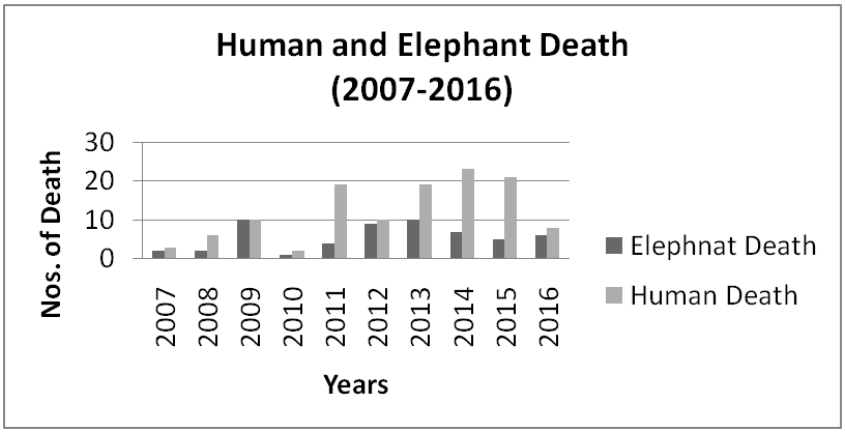

Fig 2. Statistical data showing of Elephant Death/Human Death (2007-16).

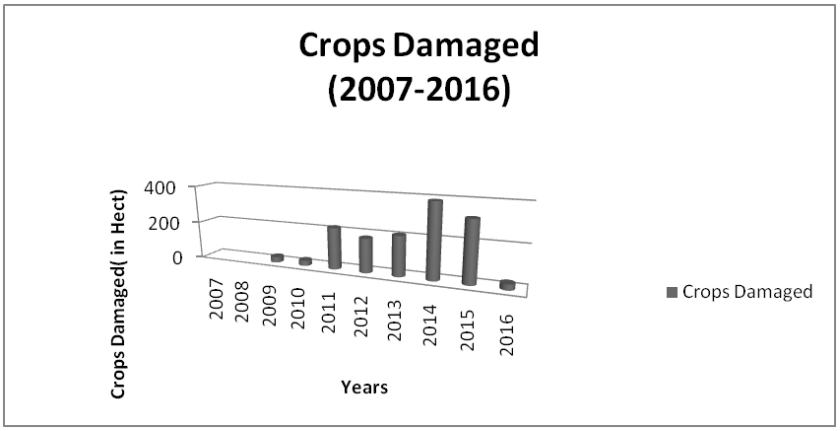

Fig 3. Data showing crops damaged due Human Elephant conflict in Udalguri (2007-16).

The panic stricken villagers have appealed the local authorities and government to build houses in form of watch towers under Indira Awaas Yojana in the affected areas.

Efforts by forest department and NGOs

Alarmed at the retaliatory killing of elephants, WWF-India advocated the release of an *ex-gratia* financial compensation for the affected families. The NBL programme extended its HEC mitigation activity to Udalguri and supported the Forest Department and the BTC to bring the situation under control. A number of awareness meetings were organized in the district and communities were sensitized on the issue. Pamphlets on *'Dos & Donts'* during HEC situations and posters were used to effectively communicate this message to the communities living on the fringes of Bornadi Wildlife Sanctuary, Khalingduar Reserve Forest (RF) and Neoli RF. During the 2009 conflict season, NBL programme worked to implement short term measures to mitigate HEC. This was done in close collaboration with the Forest Department as well as civil society organizations of the

district like Green Valley Forest & Wildlife Protection Society apart from student bodies and interested individuals. Basic support in the form of searchlights and noise creating devices were provided by WWF-India to the affected communities through the local NGOs. WWF-India intends to reduce the intensity of the current HEC levels and a mitigation strategy is underway with the Forest Department to ensure this.

Ex-gratia released for victims

In 2010, the Dhansiri Forest Division under the BTC extended a helping hand towards the people of the Udalguri district affected by HEC by releasing ex-gratia and compensation for injuries or damages to crop/ property caused by wild elephants. With the government distributing Rs. 5,89,000 for a period between 2002-2009, a total of 249 cases of injuries or damages to crop/ property were settled. *Ex-gratia* payment of RS. 9,99,000 was also released to 29 families who had lost their family members to wild elephant attacks outside forest areas during the same period. While Rs. 40,000 is paid in case of a human death, up to Rs. 20,000 is paid for every injured individual. In case of damage to crops, farmers are paid between Rs. 1,000 to 5,000. Also, property damage is compensated between Rs. 1,000 to 5,000.

CONCLUSION

It is needless to mention that in the last few years the people of Udalguri are encroaching the forest areas which lead to the drastic change in the habitat of wild elephants resulting in **habitat loss and fragmentation** and man elephants conflict in the district. The problem has only intensified because of growing population, development activities, both privately and publicly run. Although forest department And NGO's have taken steps to create awareness regarding the clearance of forest cover and habitat loss. But such steps taken by the Forest departments and NGO's however are not sufficient enough for development of the region. More of Government support are expected in the near future.

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Humanities & Social Science Section

Northeast Journal of Contemporary Research, December 2017. Vol. 4 No. 1, pp 34-43
ISSN 2349-3089

A Study on Population Dynamics and Forest Degradation in Assam

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ABSTRACT

The biological and environmental processes driving changes in the population structure such as birth rate, death rate and migration in return cause a complementary change in the environment of any particular location. Assam the most populous state among all the North Eastern states cannot be exempted by this cause and effect relationship of man and environment. Physiographically plain area in the state is higher as compare to other states of the North East and thus exihibits the highest level of interaction of both dynamics ie population and environment respectively. 'In the parameters of population dynamics' here, migration plays a significant role. The growing pressure of human population is the prime factor for forest degradation and change in landuse pattern of the state.

The paper attempts to investigates the causes resulting degradadation of forest cover due to increasing population pressure in Assam. It also provide some possibilties and prospects of sustainable environment management. The study is based on secondary data collected from relevant sources and explained with meaningful analysis. The study provides some proposals where land resources can be utilized in a planned way so that vacant or fallow land can be fruitfully used in a sustainable way. Thus proper landuse planning leading to resource based enrichment for environmental upgradation is the prerequisite for any developmental process.

Key words: Forest degradation, landuse, migration, population dynamics, sustainable

INTRODUCTION

Population, which acts both as a producer and consumer of resources, plays a very important role in any develpmental process. The socio-economic progress of any area greatly depends on the quality of it's population. The developmental plan towards achieving sustainability in the growth process require a clear scenario of population dynamics. In the present era of technological civilization any planning, progammes and policiesof the society towards better livelihood are converging with population dynamics. The dynamic aspect provide information pertainig to the changing trend of population chatacteristics.

Forests are the most important natural resources which constitute a vital segment of biospheric environment and plays an important role in maintaining global ecosystems at various levels. The growing pressure of human population is generally assumed to be the prime

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factor of environmental change in general and change in landuse in particular. Consequently forest cover decreasing due to increasing demand of food, fuel woods and timber woods as well shortage of arable land also been noticified. Globally it is estimated that more than 1.6 billion people depend on forest derived goods and services. Apart from this population growth causing huge structural changes in the landuse pattern of the state as forested areas being cleared for construction, new quarries appeared in due course of time, transport network got multiplied, roads getting widened all resulting a gradual decline of the forested land in the state.

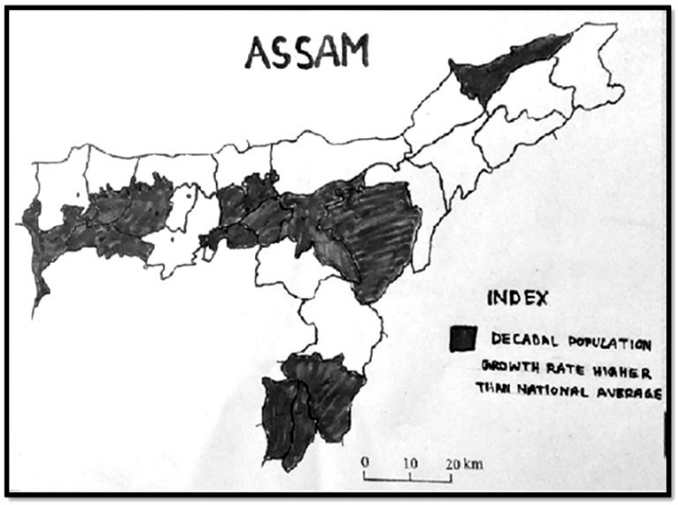
During 1901-1951 and 2.1% during 1951-2001. As a result the state's population to the country's total has increased from 1.38% in 1901 to 2.6% in 2001.

Table 1. District-wise population of Assam with Decadal Increase and Population Density

SL No	District	Population	Decadal Increase	Population Density (person/km^2)			
				1971	1991	2001	2011
1	Nagaon	28,23,768	22.00%	302	494	604	711
2	Dhubri	19,49,258	24.44%	310	473	584	896
3	Sonitpur	19,24,110	15.55%	171	208	315	370
4	Cachar	17,36,617	20.19%	221	321	381	459
5	Barpeta	16,93,622	21.43%	294	427	506	742
6	Kamrup	15,17,542	15.69%	256	460	579	489
7	Tinsukia	13,27,929	15.47%	-	254	303	350
8	Dibrugarh	13,26,335	11.92%	201	308	347	392
9	Kamrup Metropolitan	12,53,938	18.34%	-	-	-	1313
10	Karimganj	12,28,686	21.90%	316	457	555	679
11	Sivasagar	11,51,050	9.44%	251	340	395	431
12	Jorhat	10,92,256	9.31%	185	306	354	383
13	Golaghat	10,66,888	12.75%	-	236	270	305
14	Lakhimpur	10,42,137	17.22%	126	330	391	458
15	Goalpara	10,08,183	22.64%	233	266	451	553
16	Morigaon	9,57,423	23.34%	-	375	455	617
17	Karbi Anglong	9,56,313	17.58%	37	64	78	92
18	Baksa	9,50,075	10.74%	-	-	-	387
19	Darrang	9,28,500	22.19%	241	373	432	586
20	Kokrajhar	8,87,142	5.21%	150	255	294	269
21	Udalguri	8,31,668	9.61%	-	-	-	413
22	Nalbari	7,71,639	11.99%	351	450	504	733
23	Bongaigaon	7,38,804	20.59%	-	322	361	676
24	Dhemaji	6,86,133	19.97%	-	148	176	212
25	Hailakandi	6,59,296	21.45%	-	338	409	497
26	Chirang	4,82,162	11.34%	-	-	-	251
27	Dima Hasao	2,14,102	13.84%	16	31	38	44

source: Provisonal population total census 2001 and 2011 and Statistical Handbook of Assam

∗Census in 1981 not held in Assam.



MAP-1: Districts of Assam with population growth rate higher than national average.

India has a decadal population growth rate of 17.64% for the year 2001-2011. Assam has this decadal growth rate comparatively lower than the national average ie 16.93% for the same year. There are 13 districts of Assam having population growth rate higher than national average comprising almost 50% of the total geographical area.It is observed that Assam registered a higher decadal growth rate of 35% during the decade of 1951-61 than the natural average growth rate of 21.6% which is second highest in North East after Tripura 78.7%. This was partially a result of sudden population influx into the region. During devastated civil war period to independence of Bangladesh in 1971 about 10 million people left from East Pakistan for the adjoining areas of India. Infact Assam and Nagaland have experienced large scale influx of immigrants initially settled in char areas and gradually encroached forested land for cultivation and settlement. Following tables give a clear view of population dynamics of the state from 1951 to 1991 and 2001

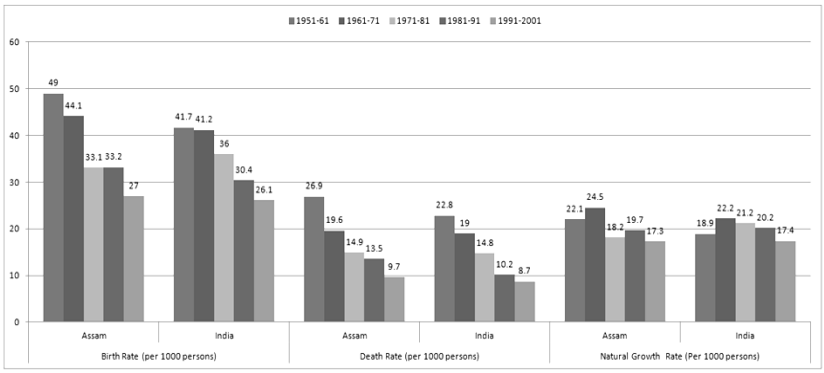


Fig 2. Decade-wise Birth and Death Rates for Assam and India per thousand population 1951-2001

Note : * Based on Expert Committee Population Projection,RGI
source: Census of India 1961,1971 and Compodium of India's Fertility and Mortality Indicators, SRS, Registrar General of India

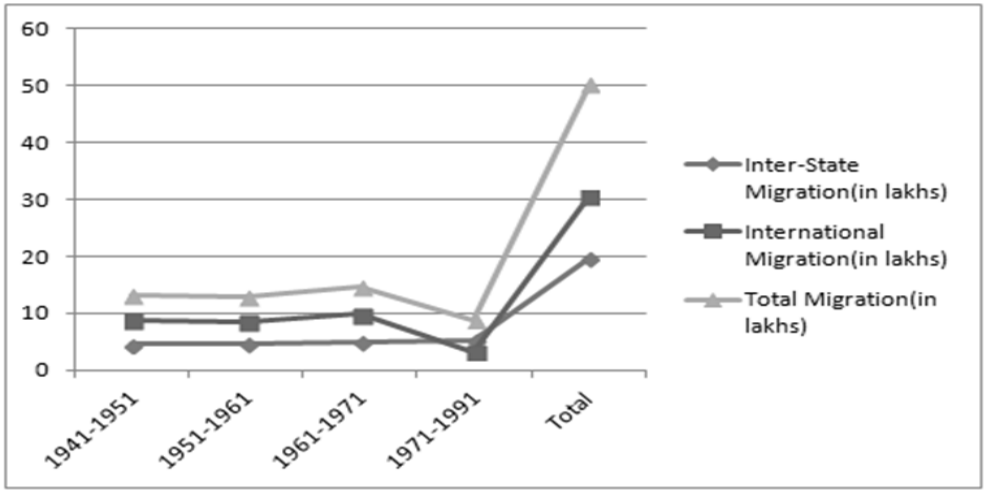


Fig 3. Migration to Assam 1951-1991 (Based on Place of Birth Data)

(Source: census of India 1951,1971 and 1991)

Rural population also lay a great impact on forest coverage of any area as about 20 persons in a rural setting consumed an estimated 3060 kgs of fuel wood to meet about two third of their annual energy requirements. In the state the rural population in 1991 was 19,926,527 and in 2011 it has increased to 26,807,034. About 85% of the total population lives in villages and thus their dependencies on forest resources causing cosequent decrease in the forest coverage of that particular areas.

Population density is an useful indicator for the form and intensity of interactions with their ecosystems, as increasing have long been considered both a cause and a consequence of ecosystem modification. It is observed that population density in Assam was 102 in 1951 to 397 in 2011. It indicates that there was about four times increase in the density of population during six decades in the state.

Depleting Forest Resourses in the State

The state of Assam is inriched with extensive forest resources. It has valuable forest products and also endowed with different species of flora and fauna. On the basis of soil and climate the natural vegetation of Assam can be broadly classified into -i) Tropical Wet and Semi Evergreen forest, ii) Tropical Moist Decideous, iii) Sub Tropical Broad leaved and iv) Swamp Forest. There are about 51 different types and subtypes of forests occuring in the region.

In predominent rural society like Assam the economy is based on forest products like timber, fuel wood, food, fibre, fodder etc. Assam is one of the least urbanised state in India. According to 1971 census Assam has 21,995 villages that increased to 26,247 in 2011, along with the no population of the villages also goes on inclining. The fuel wood demand along with other forest products

accelerates as population pressure increases. It is an established fact that the clearing of forest areas in frequent intervals for survival of the nearby areas of forest land results into a loss of primary forest cover. It is also notable that a large portion of rural population depends on livestock farming and in dearth of available grazing fields these people start to encroach the forested land.

SL No	District	Geographical Area	2011 Assessment			Total Forested area	% of Geographical area
			Very Dense Forest	Moderate Dense Forest	Open Forest		
1	Barpeta	3245	35	179	183	397	12.23
2	Bongaigaon	2510	33	267	221	521	20.76
3	Cachar	3786	81	975	1180	2236	59.06
4	Darrang	3481	12	91	367	470	13.5
5	Dhemaji	3237	7	124	160	291	8.99
6	Dhubri	2798	21	201	196	418	14.94
7	Dibrugarh	3381	29	165	564	758	22.42
8	Goalpara	1824	1	71	265	337	18.48
9	Golaghat	3502	6	122	397	525	14.99
10	Hailakandi	1327	13	373	400	786	59.23
11	Jorhat	2851	2	113	498	613	21.5
12	Kamrup	4345	68	612	753	1433	32.98
13	Karbi anglong	10434	566	3819	3554	7939	76.09
14	Karimganj	1809	3	318	539	860	47.54
15	Kokrajhar	3169	208	716	220	1144	36.1
16	Lakhimpur	2277	4	118	171	293	12.87
17	Morigaon	1704	6	41	86	133	7.81
18	NC Hills	4888	135	1553	2562	4250	86.95
19	Nagaon	3831	40	353	403	796	20.78
20	Nalbari	2257	4	70	208	282	12.49
21	Sibsagar	2668	8	144	543	695	26.05
22	Sonitpur	5324	56	280	624	960	18.03
23	Tinsukia	3790	106	699	731	1536	40.53
	TOTAL	78438	1444	11404	14825	27673	35.28

Source: Indian State Forest report 2011.

Overexploitation of forest resources for the sake of economic development has swallowed much of Assam's rich forest during 1980's and 1990's. Assam Remote Sensing Application Centre(ARSAC), based on satellite data of late 1980's revealed that the state of Assam as a whole has an existing forest cover of 21.98% which was 25.2% during 1980-82. So in about half of the decade there was a loss of 3.3% of forest coverage.

Encroachment is one of the main cause of depletion of valuable forest resorces in Assam. Most of the forest areas of the state are under extreme stress due to large scale encroachment. Assam's forest area gradually declined in 2001-2015 it lost 91km^2 of forest and the state is most affected state of the region in terms of degradation of dense forest during this period. Moreover, Assam has the second highest encroachment of forest land in India after Madhya Pradesh. The encroachment position in various forest divisions of Assam has been summarized in the following tables.

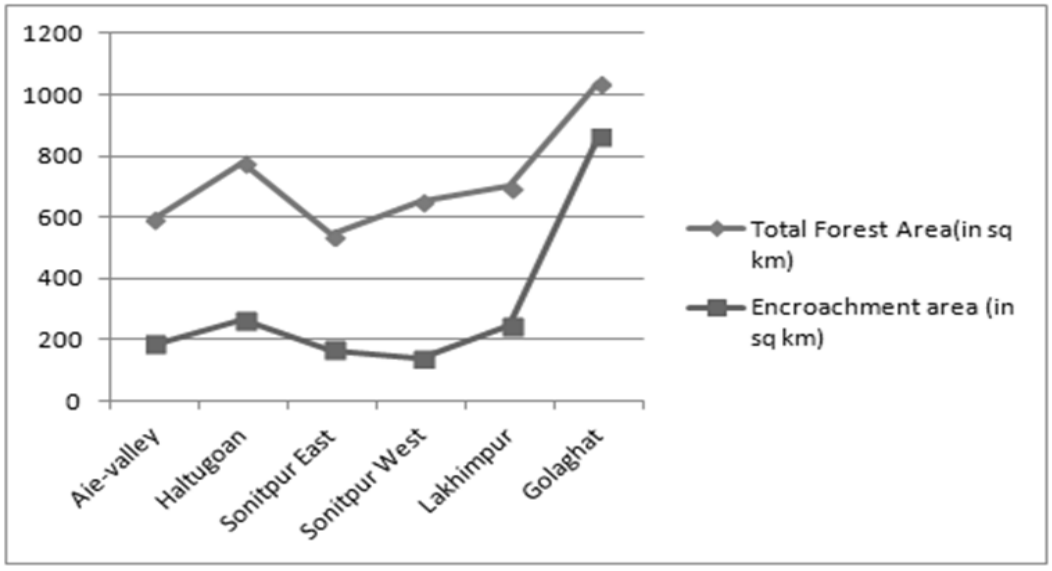


Fig 4. More than 100 sq km of encroachment area in different forest ranges of Assam 1996

Source: Department of forest, Assam, 1996

A glimps of worse scenario is provided by the fact that Gohpur Reserve Forest has no trace of forast left, The Nambor(south) Reserve Forest has merely left with 3.6%, Doyang Reserve Forest only 2.5% and Diphu Reserve Forest 8.2% of forest area left respectively. Total estimated area under encroachment as per Department of Forest Assam, upto 31-03-2003 was 3555 Sq.Km. In geospatial study of Assam Forest It has been seen that Sibsagar and Sonitpur District have lost more than 50% of its forest coverage.

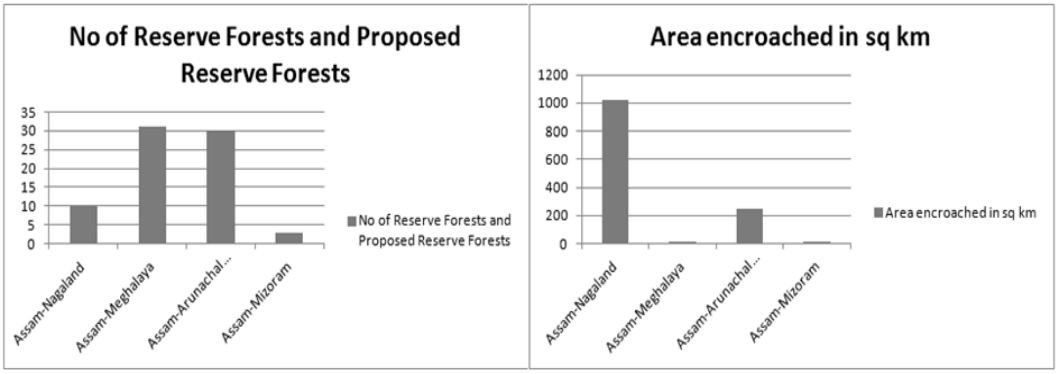


Fig 5. Forest area encroached in inter-state border of Assam

(Source: Department of forest, Assam, 1996)

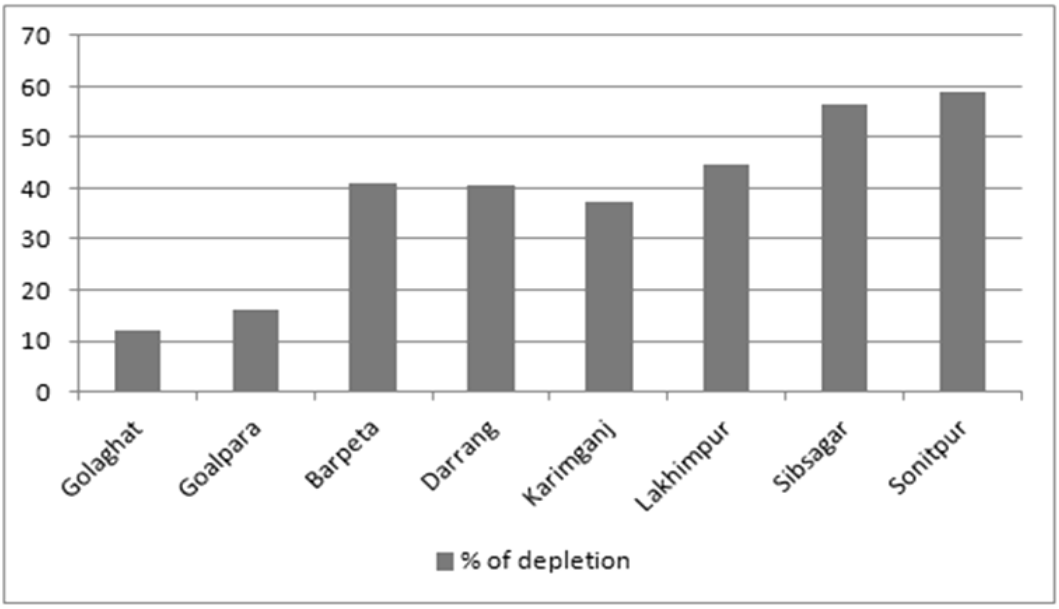
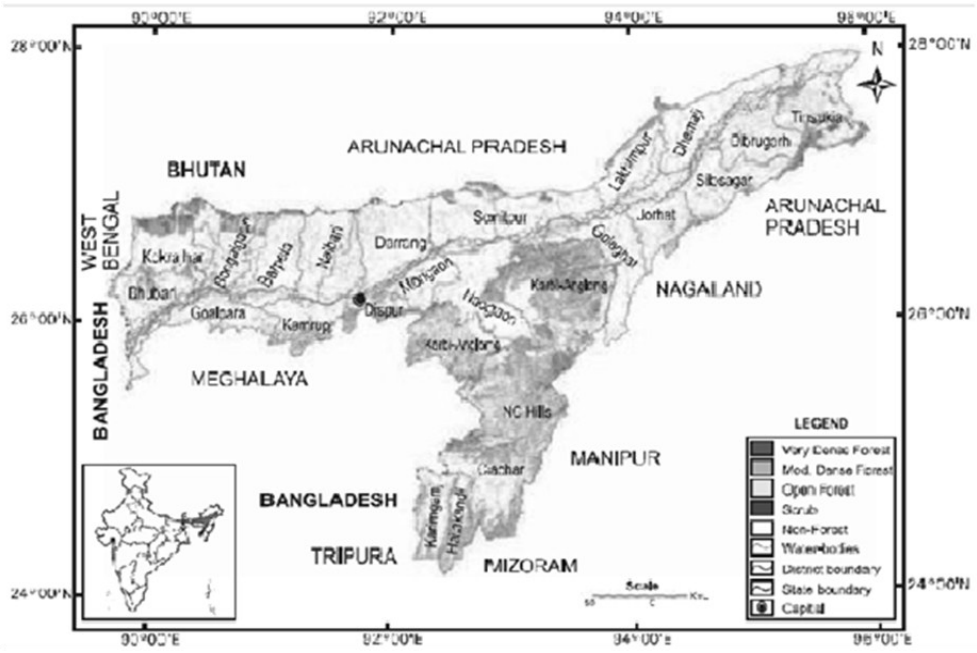


Fig 6. Districts with highly depleted forest cover from 1990-2001

(Source: www.fao.orgnet)



MAP 2 Forest cover of Assam (State Forest Report 2001)

As shown in map-1 there are 13 districts which have decadal population growth rate higher than national average i.e 17.64% for the year 2001-2011. Out of the 13 districts, 9 districts have less than 21% of forest area whereas the situation is very critical in Barpeta, Darrang, Dhemaji, Dhubri, Morigaon and Nalbari. These 6 districts have less thab 15% of thier geographical area under forest coverage, that clearly dipicts an inverse relationships between population growth rate and forest coverage of any particular area.

It is seen that there are 16 districts out of 23 districts of the state in 2001, the forest cover is less than state's average forest cover and less thaan proposed forest coverage of 33%. There are 7 districts of the state with less than 15% of the forest coverage area they are Morigoan(7.81%), Dhemaji(8.99%), Barpeta (12.23%), Lakhimpur (12.87%), Darrang(13.5%), Dhubri (14.94) and Golaghat (14.99%) respectively. Among them Dhubri and Barpeta has population density more than 500 persons/ km^2 whereas Morigoan and Darrang has population density more than 400 persons/km^2. Sonitpur and Golaghat although have comparatively less population density but the loss in forest coverage of these two districts is a matter of grave concern. While population growth and density are unquestionablely related to forest cover trends. Only about one-tenth that of size of deforested area to forest cover trends. Only about one-tenth that of size of deforested area able to regain due to reforestation efforts and natural growth. Apart from this deforestation effects in overall global environment viz. reduction in carbon fixation, climatic havoc, occurance of floods, serious threat to bio-diversity and so on.

RECOMMENDATIONS

- Development of sufficient fodder, fuel and

pasture resources in areas adjoining to forested lands.

- Afforestation of medicinal and aromatic plants provide sustanance to the tribal or indeginious people residing in and arond forest areas.
- Raising awareness among communities about the benifits of more sedentary land use system.
- Environmental awareness camps, celebration of Van Mahotsav and Sacred Plant Day by Local Government Bodies or Panchayats.
- Introduction of Social Forestry Programmes and Establishments of Eco-Camps in Selected regions of the state can create employment oppurtunities with a sustainable natural environment.

CONCLUSION

Demographic factors have always adversly affected natural resources. Massive population increase and organized group encroachment in the Reserve Forest areas causing a huge loss of forest resources in the state. It is clearly evident that some districts with higher population density are in the verge of total extinction of forest coverage if the pace of reckless population increase goes on unchecked. To find ways and mechanisms that conserve our threatened forest cover, inspite of stringent Forest Laws, community awareness and co-operation can be prove more effective for a sustainable forest resource of the state.

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Northeast Journal of Contemporary Research, December 2017. Vol. 4 No. 1, pp 44-54
ISSN 2349-3089

Epidemiological Transition and the Implications for Healthcare: A Study in Kerala, India

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ABSTRACT

The early stages of an epidemiological transition represent a shift from infectious diseases to chronic/degenerative diseases as a major cause of death cause. Such transition features relatively more deaths among adult ages than among younger ages. Evidence from many developed countries indicates that a further mortality reduction is possible from adult ages to oldest ages by controlling chronic/degenerative diseases, called the advanced stage of an epidemiological transition. However, such studies examining advanced stage of an epidemiological transition in the context of developing countries are scanty. By attaining a commendable mortality reduction and a high life expectancy through with a low per capita income and nutritional intake, Kerala (a state of India) stands as a pioneer in the epidemiological transition among the developing countries. But in view of a drastic increase in chronic/ degenerative diseases, a soaring *healthcare burden and insufficient public healthcare interventions, the overall healthcare system in Kerala is said to be in a crisis. In this context, this study reviews the literature as part of tracing the epidemiological transition in Kerala and its healthcare implications. The study has found that the heathcare in crisis in the state is the result of mismatches in addressing the requirements of an epidemiological situation in an effective way. Nevertheless, several preventive, promotive and curative healthcare measures have been undertaken by Kerala state after 2000s which are expected to help attain the advanced stage of an epidemiological transition in the near future.*

INTRODUCTION

During the last century, Kerala witnessed a drastic decline in mortality rates and an impressive expansion in life expectancy. This attainment comparable to that of many developed countries (Parayil, 2000; Panikar, Soman, 1984; CDS/UN, 1975) could be attributed to the effective state healthcare interventions within a short period of the state formation. Such changes could be attributed to a decline in death caused by famines and infectious diseases which have since been replaced by chronic/degenerative diseases and the concentration of deaths among old adult ages, referred to as an epidemiological transition (Omran, 1971; McKeown, Brown, 1955; UN, 1962). The recent experience of the developed countries shows a further decline in deaths among old adult ages relative to oldest ages where chronic/degenerative diseases re-

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main a major cause of death, as an advanced stage of an epidemiological transition (age of delayed degenerative diseases). However, the possibility of Kerala attaining such an advanced stage needs to be examined.

A change in the healthcare strategy was necessary to take on additional challenges from chronic/degenerative diseases for the developed countries in the West and North Europe, Japan and USA which paved the way for attaining an advanced stage in the epidemiological transition among them (Olshansky, Ault, 1986; Mesle, Vallin, 2002; Vallin, Mesle, 2004). These changes consisted of a shift in focus from primary healthcare towards chronic/ degenerative diseases. However, in the context of Kerala, although the state has already crossed the early stages of epidemiological transition, there is no comprehensive inquiry into such factors which have a crucial role to play in attaining such an advanced stage. This becomes more relevant in the context of studies pointing out that the healthcare system in Kerala is in a crisis (Ekbal, 2007). A dramatic increase in the lifestyle related diseases, an increase in the number of old aged people, a soaring healthcare burden and insufficient public healthcare interventions are said to be the major causes of this crisis. These changes can be partly related to or may be due to the mismatches between the epidemiological transition taking place and the corresponding healthcare mechanisms available in the state. Keeping these apsects in view, this paper reviews various studies as part of examining the inter linkages between the epidemiological transition and healthcare needs in the context Kerala.

Epidemiological Transition – A Theoretical Review

'Epidemiological transition' refers to changes in the pattern of diseases, generally from infectious diseases to chronic/degenerative diseases (Caldwell, 1990; Namera, 1982). Omran (1971) argues that there are three ages of an epidemiological transition, namely, pestilence and famine, receding pandemics and the age of man-made degenerative diseases. The age of 'pestilence and famine' is characterized by a high and fluctuating mortality, mostly due to infectious diseases with an average life expectancy of 20 to 40 years. Infectious and parasitic diseases like influenza, pneumonia, diarrhea and tuberculosis happen to be the main killers in this stage. The 'age of receding pandemics' is marked by a shift from infectious to chronic diseases with a general increase in life expectancy. It can be due to improvements in sanitation and standard of living with contributions from medicine and public care measures. The third age, the age of degenerative diseases, is characterized by the predominance of chronic diseases or lifestyle diseases and the stabilization of mortality at a low level with a life expectancy of over 70 years.

Apart from these stages, Roger and Hackenberg (2001) defined violent deaths and deaths due to social pathologies (accidents, suicides and homicides), along with chronic/ degenerative diseases, the hybristic stage of an epidemiological transition. During the hybristic stage, morbidity and mortality are affected by man-made diseases, individual behaviors and potentiality, destructive lifestyles. Individual behaviour ssuch as physical inactivity, unhealthy diet, excessive drinking, and smoking increase the risk of adverse health outcomes, including heart disease, diabetes, liver cirrhosis, and lung cancer. They further observe that, while most environmentally-based infectious diseases are eradicated during the hybristic stage, some infectious diseases are increase in importance due to individual lifestyles and man-made causes – a well-known example is HIV/AIDS.

The 'cardiovascular revolution' in the Western European countries through their advanced medical care and better lifestyles resulted in more survivals among adult and older ages their by leading to a life expectancy expansion, even as chronic/degenerative diseases remained as major causes of death. This advanced stage of epidemiological transition was later coined as

'stage of delayed degenerative diseases' (Olshansky and Ault, 1986). In the later years, Omran (1998) again added one and possibly two additional stages to his initial theory of three stages. The fourth stage proposed by him is characterized by steady rise in life expectancy until the age of 80 to 85 years followed by stability and a decrease in cardiovascular diseases as a cause of death and the emergence of new diseases (HIV, Hepatitis B & C, Ebola etc.) as also the revival of Cholera, Malaria, Dengue, Diphtheria, Plague, Tuberculosis etc (Omran, 1998).

In contrast, because of high death rates due to cardiovascular diseases, neoplasm and violence caused by an excessive use of alcohol, smoking, and excessive diet pattern achieving of an advanced stage was delayed in Eastern European countries. Within thirty years, males could gain less than one year and females three years of life expectancy in these countries (Mesle et al, 2002; Vallin and Mesle, 2004). The experience of these countries indicates the role of socio-economic and cultural factors and the lack of state interventions in delaying the epidemiological transition (Caselli et al, 2003).The delay in achieving an advanced stage of the epidemiological transition in Eastern European countries points to a concern in the context of Kerala also. It is mainly because, Kerala has had a similar experience in reducing deaths due to communicable diseases through public healthcare initiatives but possibly without appropriate changes effected to public medical care, as in the Eastern European countries.

Most of the epidemiological transition related theories are based in the context of the developed countries, where the epidemiological transition took place gradually. But, in the developing countries, this transition has been faster because of a sudden decline in mortality and fertility rates. These countries are now experiencing a high prevalence of chronic/ degenerative diseases, although they are focusing considerably on primary healthcare. Notably, such a fast transition leaves a much shorter time interval for them to adjust the their health systems in order to respond adequately to the health needs of adults and the elderly and, at the same time, to maintain the efforts towards reducing the burden of infectious diseases among children and reproductive health problems (Bobadilla and Possas, 1992). In this respect, exploring the experience of Kerala assumes a greater significance not only in terms of identifying the possibility of 'advanced stage', but also in assessing the capability of the healthcare system in addressing the new challenges in the context of an ongoing epidemiological transition from a developing countries perspective.

Epidemiological transition in Kerala

Various studies have mentioned that the epidemiological transition has been highly significant in Kerala (Panikar, 1999; Shenoy, 2000; Navaneetham et al, 2009). Way back in the early 20th century, Kerala was grappling with the shocking death rates due to famine and epidemics such as plague, cholera, small pox and other contagious diseases, taking a heavy toll on human lives (Kooiman, 1991). On an average, the infant mortality rate was 242 per 1000 births with an expected life span at birth of just 25 years (Namboodiri, 1968). The prevalence of unsanitary conditions, inadequate nutritional intake, especially of infants and children, lack of maternal healthcare and insufficient medical and preventive health programmes/ facilities were largely responsible for such a health scenario (Singh, 1944; Panikar, 1999). This could be that Kerala was in the earl phases of an epidemiological transition -' th age of pestilence and famine', during those decades.

A decade before the formation of Kerala state in1956, the epidemiological transition in Kerala had advanced into a situation where the state could effectively control an outbreak of communicable diseases such as small pox, cholera and malaria etc.. At the same time, new challenges of non-communicable diseases, especially cancer and cardio-vascular diseases began to emerge in the state. Notably, the crude death

rate (CDR) in Kerala was 16.9 and Life Expectancy (LE) 46.2 years for males and 50 years for females in 1951-60, whereas CDR was 22.8 and LE 41.9 years and 40.6 years for both males and females respectively for all India for the same period (GOK, 1974, CDS/UN, 1975). However, significant geographical disparities were prevailing in Kerala. Travancore - Cochin area was far better off than Malabar region in respect of LE and CDR. Notably, CDR in Travancore was only 12, while it was 23 in Malabar for the same period (CDS/UN, 1975). Similarly, there was a significant persistence of health disparities between lowland, midland and highland regions especially highland was saddled with a poor health infrastructure (Krishnan, 1976). For those decades, Kerala appeared to have reached a stage of 'age of receding pandemics' in the epidemiological transition with an improved life expectancy through reining death rates mainly caused by the infectious diseases and maternal and child related causes.

In the early 1970s, significant changes in the epidemiological transition were evident in Kerala, highlighting that the state had entered a stage – 'age of degenerative diseases'. Such a shift was reflected in the changing pattern of causes of death hitherto dominated by communicable diseases to non-communicable diseases for those years. Smallpox was eradicated, Malaria was wiped out and the number of deaths due to cholera became negligible and the deaths due to fever declined significantly (Franke and Chasin, 1992, Thomas and James, 2014). However, the state experienced a threat from non-communicable diseases, mainly Cancer and cardiovascular diseases (RGI-CDSR and RGI-MCCD, Various Years). According to Panikar: "The proportion of patients treated for Cancer and Cardiovascular diseases at the Maternal and Child Health (MCH) during 1962-63 came to 12.1 per cent and 8.8 per cent respectively; these proportions increased to 16.3 and 9.8 percent in 1971-72. Apparently, the number of cancer patients seeking treatment at MCH has increased more steadily and steeply than of patients suffering from cardiovascular diseases (Panikar, 1999, Page 13)".

Even though Kerala attained a better health status through its low mortality rates and a high LE as compared to national averages, various studies have highlighted that the state began to experience "Low Mortality High Morbidity Syndrome" in the 1980s (Ekbal, 2007; Panikar and Soman, 1984). Besides, the state was experiencing a surge in chronic/degenerative diseases (WHO, 1984). As Panikar and Soman observe "On the one hand, the mortality rate is low, and even comparable to the levels obtained in high-income countries. On the other hand, morbidity rate is high. As for the pattern of morbidity, the picture is again a mixed one. The dominant disease group resembles that of typically underdeveloped countries. At the same time, the emergence of atherosclerotic heart disease and of degenerative and metabolic diseases as major causes of morbidity resembles the situation in developed countries (Panikar and Soman, 1984, Page 90)". Therefore, this juncture had called for a new strategy from the Government of Kerala (GOK) through healthcare interventions to address the emerging challenges.

In contrast, it is evident that healthcare in Kerala was moving towards a crisis in the early years of the 2000s (Ekbal, 2007). Deaths due to communicable diseases had become negligible. However, hepatitis, typhoid, dengue, chikungunya, leptospirosis, scrub typhus etc continued to haunt Kerala during South-West Monsoon (GOK, 2003). The environmental degradation also peaked, causing pollution and unhygienic conditions that further worsened the health status (KHP, 2013). At the same time, non-communicable diseases such as cardiovascular diseases (mainly Coronary Artery Diseases (CAD)), cancer, type-2 diabetes etc. increased accounting for 53 per cent of the overall mortality rates and 44 percent of disability rates (GOK, 2011). There were a significant number of deaths and trauma due to accidents, homicides, suicides and HIV/AIDS in Kerala. That apart, 8.6 lakh people were identified as disa-

bled in the state. In all, there was a sporadic increase in the morbidity rates in the presence of various diseases. The PAP which was around 95 per thousand people in 1994-95 increased to 240 by 2004 (NSSO, 2004).

Most importantly, life expectancy in Kerala did converge mainly among males in the recent decades. The state could achieve only a 1.6 and 1.3 years of life expectancy gain for males and females respectively between 1991 and 2011 (69.9 years to 71.5 years for males and 75.6 years to 76.9 years for females). A relatively high prevalence of chronic/degenerative diseases leading to increased mortality and morbidity rates and the convergence of life expectancy point to the fact that Kerala is also experiencing a delay in achieving a desired epidemiological transition as in Eastern European countries. In other words, the existing healthcare mechanism that focus on primary healthcare system for addressing infectious diseases and maternal and child health in the state has apparently failed to address the chronic/degenerative diseases resulting from an ongoing epidemiological transition. In the coming section, this paper, therefore, discusses the importance of healthcare system in addressing the epidemiological challenges and the burden emanating from their mismatches.

Epidemiological Transition and Healthcare Burden

Changes in the healthcare burden in the context of an epidemiological transition in the stage of 'age of degenerative diseases', are majorly related to the severity of chronic/ degenerative diseases and the longevity of the population. Remarkably, the increasing burden of chronic/degenerative diseases is mainly due to the changing age structure and lifestyles, persisting poverty and environmental degradation (Prasad, 2006).The epidemiological transition increases the healthcare burden of individuals, especially in the stage of chronic/degenerative diseases, as they usually require lifelong treatment. Therefore, the cost of healthcare depends on the nature of diseases and the age of the patient. An individual who contracts chronic diseases in the early stage of his/her life is likely to suffer more than an individual who contracts them at later ages. Besides, their chances of contracting other diseases and developing complications during treatments are very high towards older ages.

There are two strategies which individuals use to avoid the healthcare burden: (i) making 'healthy choices' with respect to their lifestyles/behaviors and (ii) their use of medical care and treatment (Mackian, 2003). Notably, individuals' health care behavior is a function of various factors like perception or awareness of the diseases, and accessibility of health facility. Empirical evidence shows that awareness programs, anti-alcoholic smoking campaigns, and policies resulted in a large reduction in the related diseases (Royal college, 1962; Casselli et al 2002; Mesle and Vallin, 2002; Vallin and Mesle, 2004). Similarly, advancements in medical technology and accessibility to better healthcare facilities can lead to a considerable reduction in chronic/degenerative diseases related mortality (ibid). However, an unequal distribution of wealth and coverage of healthcare often prevent individuals from accessing necessary healthcare which in turn creates a polarization in the epidemiological transition (Bobadilla and Possas, 1992). A accessibility of the poor to health facilities in the rural areas and reduced capacity for their medical needs, dependency on self-medication or non-usage of existing healthcare services, adversely affecting the epidemiological scenario mainly in the rural areas in India (Garg and Karan 2006) are relevant in this context.

States with strategies to tackle the impacts of the epidemiological transition through appropriate interventions are the other notable facts. Prominent among them are raising public awareness regarding chronic/degenerative diseases and various medical interventions which are evident in most of the developed countries (Prasad, 2006). However, the empirics from de-

veloping countries show that their intervention mechanisms are often constrained by insufficient funds to meet the challenges. Most of the developing countries lack the required health infrastructure to deal with the most pressing health needs, and going by their gross national products and the proportion of funds spent on health, this is not likely to improve in the next decade or so. And most of these countries are forced to adopt a therapeutic medical model to deal with the burden of non-communicable diseases (Bobadilla and Possas, 1992). The insufficiency of states, mainly in the developing countries, invites an alternative private care system to fill up the increasing healthcare needs (Baru, 1998). Nevertheless, a higher cost of treatment in the private sector adversely affects the poor people. The problem is more acute for an aging population suffering from deteriorating physical and mental health problems, morbid diseases which often demand an expensive technology, hospitalization and long-term nursing care as compared to the youngsters) which gets further aggravated with an increased life expectancy (longevity) (WBPRR, 1994).

Policy mismatches with respect to ground realities about the prevailing epidemiological transition can also lead to a high burden, especially in the 'age of degenerative diseases'. For instance, drugs used for the treatment of chronic/degenerative diseases such as ischemic heart disease and cancer etc. have been brought out of the protective orbit of price control and a prohibitive rise in treatment costs have resulted in a concomitant rise in the number of patients abandoning the treatment halfway, or, not seeking treatment because of economic exigencies in India (Prasad 2006). Besides, mismatches also exist between the priorities and policy direction of the central government for the country as a whole, and the requirements of individual states (Kumar 2005). Such a situation is a major concern in the context of Kerala where the state faces high levels of mortality and morbidity due to chronic/degenerative diseases. In short, the present epidemiological transition calls for effective changes in the healthcare system. Any mismatches in the same can result in a high healthcare burden. In this respect, the following section analyses the healthcare system mainly in terms of the state government role and healthcare burden, especially in the 'age of degenerative diseases'.

State Healthcare in Kerala and Epidemiological Transition

Kerala has a long history of state healthcare in the context of an epidemiological transition from the early decades of the 19th century (Before 1956, the present boundaries of Kerala were the Princely states of Travancore and Cochin as well as Malabar region occupied by the British). Notably, the Travancore government accounted for 1.09 per cent of total government expenditure between 1863 and 68 on medical and public health (Panikar and Soman, 1984). Moreover, the Travancore state proclaimed a compulsory vaccination programme against smallpox for all public servants, established a special department for sanitary arrangements in 1894 besides being vigilant against cholera, plague etc, mainly by improving sanitation at the sites of fairs and festivals (ibid). This government, in collaboration with Rockefeller Foundation implemented programmes against hookworms, spread awareness regarding public health in addition to establishing of modern healthcare facilities for maternal and child health during the 1930s in Travancore. Later, the government also intensified anti-malaria programmes and various nutrition programmes, especially school feeding programme in the 1940s (Kabeer, 2003; Panikar and Soman, 1984). Similarly, the British government brought in Madras Public Health Act in the year 1939 (MPHA-1939) for controlling contagious/ epidemic diseases that had broken out mainly due to unhygienic surroundings. Perhaps, the early stages of an epidemiological transition in the state, mainly due to infectious and pandemics, can be attributed to these factors.

After the state formation, the Govern-

ment of Kerala (hereafter GOK), initiated significant actions to ensure better health, education, water and sanitary facilities, food, nutrition and housing etc. Notably, the government started giving importance to the provision of healthcare in the neglected areas including Malabar region. As part of expanding the medical infrastructure, GOK increased the number of PHCs and CHCs and specialized hospitals where the services of junior doctors were utilised for providing healthcare at the local levels (GOK, 1963). A high priority was given to MCH services for infants, children and young mothers. Further, the GOK strengthened the coverage of immunisation and launched a massive campaign against communicable diseases which in turn, resulted in the prevention of various epidemics. Remarkably, the GOK could extend medical facilities to every Panchayat as of 1975-76 either in the form of allopathic, ayurveda or homeopathy treatment (GOK, 1975; GOK, 1979). Recall, Kerala had begun to experience a surge in chronic/degenerative diseases, mainly Cancer in the early 1970s, but commendable actions against these diseases were absent in Kerala indicating at a policy deviation.

The insufficiency of state intervention with respect to the epidemiological transition became severe since the end of the 1980s in Kerala. A surge in chronic/degenerative diseases demanded a better curative care or preventive/promotive measures. Although, the GOK sponsored specialty care programme identified various schemes for cardiology, cardiothoracic surgery, neuro surgery, nephrology and transplant units, endocrinology and metabolism, it was not sufficient enough. Rather, the state continued its focus on healthcare in relation to infectious diseases, maternal and child care. Because of a mounting financial crisis at the end of the 1980s, the percentage share of health in the total spending declined that already impacted the public healthcare system into outpaced infrastructure with poor medical facilities (Sadanandan, 2001). An inversed demand for therapeutic health services mainly in the presence of chronic diseases, fall in the quality of services at government hospitals led to the mushrooming of private hospitals (Ekbal 2007). In reality, the private hospitals are better equipped in terms of technical resources and are reported to be encashing the long term illnesses (Dilip 2009). Notably, such a financial burden added an additional four per cent to the population below poverty line (Ashish, 2005). To recall our earlier discussion, the convergence of life expectancy, may be due to the impact of these mismatches between the epidemiological transition and healthcare system.

There are radical changes observed in healthcare in Kerala in the recent years (since the 2000s). This includes curative, care mainly with respect to non-communicable diseases by adding to or upgrading the existing infrastructure at General Hospitals, District Hospitals and Taluk Hospitals (GOK, 2002; GOK, 2012). Besides, the GOK has implemented NPCDCS focused on curbing the prevalence of such diseases at the sub-centre level, titled 'Amrutham Arogyam' (GOK, 2013) The GOK has established early cancer detection and chemotherapy centers in all the district hospitals apart from Medical Colleges (MCs). Similarly, Kerala Heart Foundation (KHF) and Indian Institute of Diabetes (IID) for controlling diabetes were established in 2001 with IID focusing on clinical care, sub-specialty services, epidemiological studies of non-communicable diseases and health awareness. It has expanded as a nodal agency for a national programme for the prevention and control of diabetes, Cardiovascular Diseases (CVDs) and stroke. Introducing Health Insurance Scheme, Rashtriya Swastha BimaYojana (RSBY) and Comprehensive Health Insurance Scheme (CHIS) are the other initiatives aimed at reducing the healthcare burden of the poor due to non-communicable diseases. The GOK initiated the National Health Mission (NHM) programme and upgraded/strengthened the public healthcare system. Moreover, it has vitalized Society for Medical Assistance to the Poor programme, as part of providing financial

support for life-threatening diseases such as brain surgery, open heart surgery, pacemaker implantation, angioplasty, cancer, dialysis, and liver transplantation surgery etc (GOK, 2008).

Apart from addressing chronic degenerative diseases, the GOK also has started addressing accidents, suicides and homicides etc. For instance, Kerala Integrated Scheme for Intervention in Suicide Prevention (KRISIS), launched in 2002 against the backdrop of alarming suicide rates. Reformation of the transport sector is a major change affecting deaths and disability and hence the health status, as Kerala stands third with respect to road accident index in India. For the same, the GOK passed 'The Kerala Road Safety Authority Act, 2007', apart from strengthening Intensive Care units. The GOK also has enforced stringent measures against hazardous lifestyles like smoking and drinking through various legislations. Above all, the GOK formulated a policy framework with regard to all such health care initiatives by drafting Kerala Health Policy (KHP, 2013) in 2013 apart from subsidiary policies like Pain and Palliative Care Policy, Old age Policy etc. By and large, it can be said that a number of commendable initiatives have been undertaken by the government in Kerala in order to address the epidemiological transition related challenges in the recent years. However, fruits of such initiatives may take some time getting before getting reflected in a reduction in mortality rates and an improvement in life expectancy given the nature of chronic/degenerative diseases.

CONCLUSION

All the way through, this study tried to explore the inter linkages between the epidemiological transition and healthcare system in the context of Kerala. It specifically examined the possibility of Kerala having entered an advanced stage of the epidemiological transition – stage of delayed degenerative diseases in the state. It is important to note here that Kerala had already entered the 'age of degenerative diseases' in the early 1970s, through a shift in the causes of deaths and morbidity from infectious and MCH related diseases to chronic/ degenerative diseases, accidents and injuries. However, there was no commendable healthcare intervention in terms of addressing these new challenges until the 2000s. Such mismatches resulted in a delay in attaining the 'stage of delayed degenerative diseases' in the context of a huge healthcare burden in Kerala unlike the developed countries. Nevertheless, there is a strong evidence to show that the state has under taken comprehensive initiatives in terms of preventive, curative and promotive care in the recent years. Perhaps, the impacts of such initiatives could be robust enough to take the state into an advanced stage of the epidemiological transition.

An increasing healthcare burden as a result of mismatches characterizing the healthcare system and the emerging epidemiological challenges are a concern as they tend to nullify Kerala's earlier achievement of a 'model of good health at low cost'. To provide a reasonably good healthcare at an affordable cost in the context of chronic/degenerative diseases as well as trauma from accidents and injuries, the state needs to effectively implement preventive/promotive measures. In this respect, Local Self Governments (LSGs) can play an important role using their available resources. At the same time, the rising healthcare burden has to be tackled by way of ensuring advanced public healthcare facilities and insurance coverage. There should be a healthcare mechanism of early detection of chronic/degenerative diseases at the grass-root level with centers connected to referral units through the use of Information and Communication Technologies. Since Kerala already has a well-connected public healthcare network for primary care, such an attempt for care against chronic/ degenerative diseases may not be a difficult one. Besides, a cost-effective treatment through traditional systems like Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homoeopathy (AYUSH) can be included in healthcare against new challenges instead of ex-

clusively depending on the allopathic system of healthcare.

The delay in attaining an advanced stage of an epidemiological transition in Kerala sheds light on many questions in the similar context of developing regions which are trying to achieve better a health status. First, it cautions these countries that though they are capable enough of addressing the infectious and MCH issues, there is an altogether different approach required for addressing the challenges thrown up by chronic/degenerated diseases that characterize by the epidemiological transition. Secondly, the soaring healthcare burden indicates that an over emphasis on curative care may not be a viable solution to chronic/degenerative diseases. Rather, these countries need to focus on preventive and promotive measures for addressing these new epidemiological challenges which are financially viable and can be easily implemented through primary healthcare initiatives. In other words, socioeconomic factors play an important role in achieving an advanced stage of the epidemiological transition rather than mere medical interventions in the developing countries. Finally, there is a need for a mechanism to promote research on the emerging epidemiological transition issues which may facilitate these countries in devising adaptive strategies at affordable cost.

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Northeast Journal of Contemporary Research, December 2017. Vol. 4 No. 1, pp 55-58
ISSN 2349-3089

Women and Human Rights: Women's Human Rights violation with special reference to the state of Assam, India

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ABSTRACT

Human Rights, in general, refer to those rights which belong to any individual for being human. Women's have the human rights as because she is a human being. But women rights are violated in every phase of human history. Women rights are violating day by day around the world by various ways. Assam women's conditions are also not good in terms of their rights. Rape, dowry death, witch Hunting etc. are very often violence against women in Assam. According to the reports of National Human Rights Commission (NHRC), Assam ranks second in the acts of violence against women. In this paper an attempt has been made to draw attention of some human rights violation with special reference to the state of Assam, India.
Key Words:- Women, Human Rights, Violation, witch hunting, dowry, Assam.

INTRODUCTION

Human Rights are inherent and inalienable rights possessed by every human being irrespective nationality, race, religion, language, culture, sex etc. simply because a human being. These birth rights and fundamental freedoms allow us to fully develop and use our human qualities, intelligence, talents, conscience and to satisfy our physical, spiritual and other needs. Human rights are sometime called natural rights. As natural rights they are seen as belonging to men and women.

Women are part and parcel of our society. Indian ancient history is a rich heritage having no match in the other part of the world. In ancient Indian women enjoyed a significant role not only at home but in the society also. But slowly and gradually the status of women in the society degraded. The rights of a woman in society, to a great extent, are determined by the rights she enjoys. Violence against women are perhaps the most shameful human rights violation. The status of a woman in modern society in a sort of a paradox. In theory men and women are equal. But in reality, women continue to experience a sense of deprivation, because of the inbuilt notions of patriarchy. At present women rights violation is a continuous system. The proposed paper seeks to the condition of women in terms of their "Human Rights". The aim of the study is to make the common people aware of women empowerment which is vital gender-based issue in the present.

METHODOLOGY

The study is based on secondary data collected from books dealing with topics related to violence against women. Information are also gathered from the Internet.

The concept of women's Human Rights –

The term 'Women's human rights' is

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the product of an international movement to uplift the condition of women. During 1976-1985, women from different geographical, racial, religious cultural and class backgrounds took up organizing to improve the status of women. The United Nation sponsored women's conference, which took place in Mexico city in 1975, Copenhagen in 1980 and Nairobi in 1985 were convened to examine the status of women and to formulate strategies for women's advancement. The concept of women's human rights have given opportunity to the women of the world to know the widespread inequality and violence that women facing every day.

The preamble of the Human Rights charter of the United Nations expressed the determination of member states "to reaffirm faith in fundamental human rights, in the dignity and worth of every human person, in the equal rights of men and women …….. the recognition of the inherent dignity and of the equal and inalienable rights of all members of the human family is the foundation of freedom, justice and place the world". Our Indian constitution also provides basic human rights in spite of sex differences. Preamble, Fundamental Rights (Article 12-35 part- III), Directive principles of state policy (Article 36-51 part -IV) are all provide the basic human rights for the people of Indian. Though violation of human rights against women is a universal phenomenon even in the so called progressive societies.

Violation of Women's Human Rights –

The Convention on the Elimination of All Forms of Discrimination against women defines the right of women to be free from discrimination and sets the core principles to protect this right. In the Fourth world conference on women in Beijing in September 1995, it was declared that "violence against women constitutes a violation of basic human rights and is an obstacle to the achievement of the objectives of equality, development and peace". Even though, women rights are not well protected. Her rights are violating in every day. Various kinds of women's human rights violation have prevailing till today. For instance –

Domestic Violence – women are more likely to be victimized by someone that they are intimate and close partner. The impact of Domestic Violence in the sphere of total violence against women can be understood through the example that 40-70 % of murders of women are committed by their husband or boyfriend. Domestic violence is the leading cause of injury among women in most of the different parts of the world. Between 22 to 35 % of women who visit emergency rooms are in United States for that reason. Indian women are also suffering very same.

Rape – Rape can occur anywhere, even in the family, where it can take the form of material rape or incest. Rape is now become the common phenomena of our society.

Sexual Harassment – Sexual Harassment in the work place is a growing concern for women employers abuse their authority to seek sexual favours from their female co-workers. Sometimes promising promotions or other forms of career advancement or simply creating an untenable and hostile work environment. Women who refuse to give in to such unwanted sexual advances often run the risk of anything from demotion to dismissal.

Sexual assault with marriage – In many countries sexual assault by a husband on his wife is not considered to be a crime, a wife is expected to submit. It is thus very difficult in practice for a women to prove that sexual assault has occured unless she can demonstrate serious injury.

Prostitution and trafficking – Many women are forced into prostitution either by their parents, husbands or boyfriends or as a result of the difficult economic and social conditions in which they find themselves. Since prostitution is illegal in many countries, it is difficult for prostitutes to come forward and ask for protection if they be-

come victims of rape or want to escape from brothels most women and girl children initially victimized by sexual sexual traffickers have little inkling of what awaits them.

Son Preference – Son Preference affects women in many countries, particularly in Asia. It is consequences can be anything from foetal or female infanticide to neglect of the girl child over her brother in terms of such essential needs as nutrition, basic health care and education. In China and India, some women choose to terminate their pregnancies when expecting daughters but carry their pregnancies to term when expecting sons.

Dowry – related and early marriage – In India, an average of five women a day are burned in dowry – related disputes. Early marriage, especially without the consent of the girld is another form of human rights violation.

Mob violence – In 2010 Amnesty International reported that mob attacks against single women were taking place in Hassi Messaoud, Algeria. According to Amnesty International, "Some women have been sexually abused and were targeted not just because they are women, but because they are living alone and are economically independent".

Witch Hunting – Witch hunting is a social menace which causes death of many innocent people. In such case an innocent person specially women is suspected to be the cause of all evils of a society such women are killed mercilessly in public.

Violence against women in situation of armed conflict – women in situation of armed conflict – Rape has been widely used as a weapon of war whenever armed conflict arise between different parties. It has been used all over the world as in Chirapas, Mexico, Rwanda, Kuwait, Haiti. Women and grild children are frequently victims of gang rape committed by soldiers from all sides of a conflict.

Violations of Women's Rights in India – It is very sad that even often various efforts at the national and international level, still the position of women termed as a second class citizens. The scenario of rural women of India and Assam are more worse than the urban women. The rural women silently accepted the violation of their rights due to the conservative family norms. In India a women is raped in every twenty two minutes and a bride burnt for dowry every fifty eight minutes. The Police registered cases of molestation of women, a figure that is about 85% higher than the number of rapes.

Women's human rights violation in North east India are increasing day by day. For instance – in most tribes, including the kukis if a woman does not have a son, inheritance is impossible. It leads to son preference. Among the Meetei Community in Manipur, polygamy is still practiced. Unmarried single woman is always considered as a additional burden of the family. The another ongoing severe violence is rape in Northeast India. The Indian security forces have been accused of perpetrating the vast majority of rapes in the region, throughout the course of the insurgency of Northeast India. The Armed Forces (special power) Act, 1958 has been imposed for several decades in North East India and the security forces are violating women's right in the form of rape.On 2 November 2012, Ms Irom Sharmila Chanu,a Manipuri woman will completed 12 years of hunger strike demanding the repeal of the Armed Forces(secial power)Act,1958 (AFSPA).

Violation of Women's Rights in Assam - In Assam the secenario of violation of women rights are highest. The state of Assam which was previously famous for insurgency, political instability and lack of infrastructure has off late, come to the fore-front for the various crimes against women. Like all other states, in the country, incidents of violence against women in the state of Assam have

been on a constant rise. According to the reports of National Human Rights Commission (NHRC), Assam ranks second in the acts of violence against women.

In February 2000, eleven years old Rupa Nath of Gogamukh Sonapur in Dhemaji District employed as domestic help in the house of Rudra Gogoi of Dhopalial gaon in Lakhimpur district was accused of stealing gold ornaments. she and her sister Oirabati Nath were taken to Ghilamara police station for interrogation. There they were severly beaten and manhandled. Again Rupa was handed over to Rudra Gogoi's elder brother who beat her " to get her to confess " unable to extract a confession by the police and Rudra Gogoi's family Rupa and her sister were again taken to Gogamukh police station for the second time where the girls were repeatedly raped. In the incident Rupa lost her consciousness and was left to die near a culvert while her sister was dragged of near her house.

A twelve year old girl in 2005 was allegedly raped by an Assam Rifles soldier in Karbi Anglong district of Assam.

In November 2007 at Guwahati 17 years old Adivasi girl was stripped and paraded during a protest March.In july,2012 a minor girl was beaten up and molested by a mob on a busy G.S. Road,Guwahati. Very recently in January 2016, a girl was beaten up and molested by a mob on the busy Zoo Road Tiniali, Guwahati. In Assam in every minutes and in every seconds the basic woman rights are violated in somehow by her male counterpart. The rising crime graph of Assam, which is well above the national average, ought to be a matter of serious concern both for government and civil society. Murder, rape, extortion, kidnapping, robbery, theft etc. have registered a phenomental increase and it raises a question before social scientists, why a once peaceful state, and one in which women used to hold a reserved position, should now be gripped by a situation of all pervasive crime, including those against the fairer sex. The ineffective low enforcing machinery apart, lowering of moral values, alcoholism, cross materialism and lure of easy money etc are some of the factors behind it.

Summing up with suggestions

From the above discussions, it has been found that, there is a need to make all round attempt to educate people about the concept of women dignity and rights, to treat human being and individual and a person demanding respects and dignity. Thus there is a need for better protection through strong legislation and policy with proper implementation and reform in criminal justice system. Education and legal awareness widens women perspective, lays confidence to stand up to the oppressor and if need to be take recourse to the courts for redresses. Educational and economic independence of woman can play very important role in the realization and protection of her own rights. The whole society and women's intimates should take a further step to indentify the contribution of women in the family as well as in the society. So, that woman may also enjoy her rights and a society based on equality, justice and human rights may be build. At last it may be said that women are also a part of the society and human being. Without women, society cannot be existed. Let a woman to live as a human being with ensuring the human rights.

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Northeast Journal of Contemporary Research, December 2017. Vol. 4 No. 1, pp 59-64
ISSN 2349-3089

Gender Difference in the overt expression of aggression among adolescents

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ABSTRACT

Anger is an emotion, which every human being experiences irrespective of the different conditions they live in. Anger is perceived as a negative emotion because of its hazardous effects on human life. Researches have distinctively shown how it affects our physical as well as mental health. The underlying cause of violent acts can be traced down to the feeling of anger, although there may be other perpetuating factors. Aggressive behavior refers to an act that is intended to injure or irritate another person. Aggression is generally defined as a behavioral act that results in harming or hurting others. It is one of the most prevalent and destructive behavior that we face today. Children are particularly at risk, of being either the victim or the perpetrator of an act of violence (Maguire and Pastore, 1998). The present study tries to empirically study the gender difference in overt expression of aggression in children. The tool that has been used is the Overt Aggression Test (OAT) by Dr. Preeti Vohra and Prof. Raj Kumari Gupta.
Key words: Adolescence, Aggression, Anger, Children, Emotion, Violence.

INTRODUCTION

Aggressive behavior refers to an act that is intended to injure or irritate another person. Aggression is generally defined as a behavioral act that results in harming or hurting others. Social psychologists define aggression as behavior that is intended to harm another individual who does not wish to be harmed (Baron & Richardson, 1994). Because it involves the perception of intent, what looks like aggression from one point of view may not look that way from another, and the same harmful behavior may or may not be considered aggressive depending on its intent. Intentional harm is, however, perceived as worse than unintentional harm, even when the harms are identical (Ames & Fiske, 2013).

Social psychologists use the term violence to refer to aggression that has extreme physical harm, such as injury or death, as its goal. Thus violence is a subset of aggression. All violent acts are aggressive, but only acts that are intended to cause extreme physical damage, such as murder, assault, rape, and robbery, are violent. Slapping someone really hard across the face might be violent, but calling people names would only be aggressive. Aggression can be verbal as well as physical. Physical aggression is aggression that involves harming others physically—for instance hitting, kicking, stabbing, or shooting

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them. Nonphysical aggression is aggression that does not involve physical harm. Nonphysical aggression includes verbal aggression (yelling, screaming, swearing, and name calling) and relational or social aggression, which is defined as intentionally harming another person's social relationships, for instance, by gossiping about another person, excluding others from our friendship, or giving others the "silent treatment" (Crick & Grotpeter, 1995).

Hostile aggression on the other hand is intended to harm another person, such as hitting, kicking, or threatening to beat up someone. Relational aggression is a form of hostile aggression that does damage to another's peer relationships, as in social exclusion or rumor spreading. Examples: "Go away, I'm not going to be your friend anymore!" and "Don't play with Margie, she's a nerd."(Berk, L. (1999). Infants, children, and adolescents (3rd ed.). Girls in early adolescence tend to be more verbally aggressive than girls in later adolescence. The gender differences in overt expression of anger will vary across cultures. Peer rejection is related to relational aggression. The age of onset of violent behavior is later for girls than for boys. Girls usually develop antisocial behavior mainly during adolescence rather than earlier.

Objectives of the study:

i. To assess the gender difference in the overt expression of aggression
ii. To assess the level of aggression in adolescents.

Hypothesis of the study:

i. There will be no significant gender difference in the overt expression of aggression.
ii. (No hypothesis is formulated for the second objective as it is exploratory in nature)

METHOD

Sample

The sample for this study consisted of 110 students from different schools of Dibrugarh District, Assam. These students belong to the age group of 9-11 yrs. The sample consisted of 55 male and 55 female students. Simple random sampling method was adopted for data collection in considering the characteristics of population under study.

Procedure

The procedure for the research included approaching schools and getting the consent of school authorities. It was specified that the data will be kept confidential and will be used only for the purpose of research. The students were then administered the Overt Aggression Test. The class teachers of the respective students were than briefed about the Behavioural Checklist, and the instructions to fill them were given. After the collection of data, the statistical analysis has been carried out to test the hypothesis that has been stated.

Tool used

Overt Aggression Test: This test was developed by Dr. Preeti Vohra and Prof. Raj Kumari Gupta. The *Overt Aggression Test* consists of two tests: *Self Assessment Booklet* and the *Behavioral Checklist*.

In the *Self Assessment Booklet,* there are 12 statements with multiple choice opinions. The opinions for each statement varied from 3-5. The items in the Self Assessment Test pertain to the vast spectrum of child's behavior (his actions and reactions) with his friends/siblings, adults and animals, his self perception and what others think of him, his likes and dislikes about games, TV programmes, film stars etc and also some related to wishful thinking.

The *Behavioral Checklist* consists of the opinion of the teacher and parents in relation to the child's behavior. It consisted of overt behaviors pertaining to aggression in ten areas with 4-9 sub items in each area. The checklist was prepared on a 4 point scale of always, often, sometimes, never.

RESULTS

The obtained data was analyzed by using appropriate statistical measures viz. Descriptive Statistics-Mean, Standard Deviation, Frequencies; Inferential Statistics- Chi square.

Table 1(a): Mean and Standard Deviation of the Behavioural Checklist.

Descriptive Statistics

Gender		N	Mean	Std. Deviation
Female	BCLCATEGORIES	55	4.76	.719
		55		
Male	BCLCATEGORIES	55	4.20	.803
		55		

Table 1(b): Mean and Standard Deviation of the Self Assessment Booklet

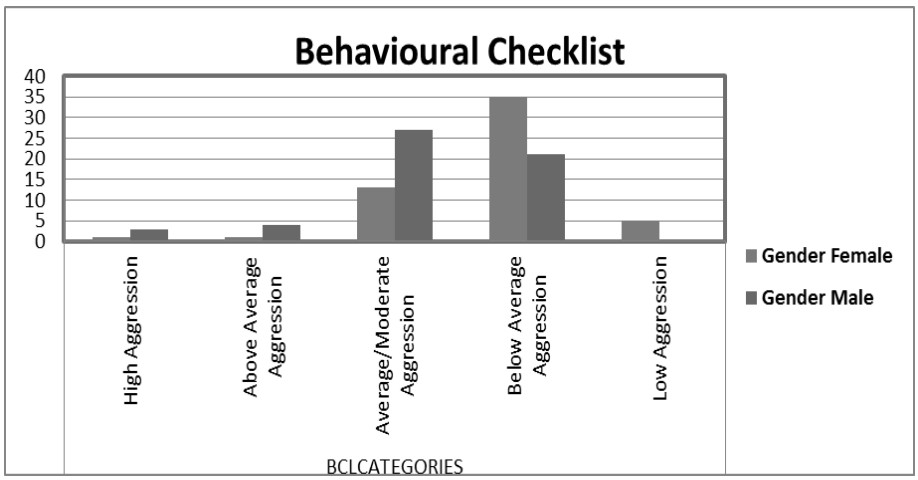
Descriptive Statistics

Gender		N	Mean	Std. Deviation
Female	SABSUBBCATEGORIES	55	5.07	.716
		55		
Male	SABSUBBCATEGORIES	55	4.27	.732
		55		

In the above table, Table 1(a) & Table 1(b), shows the means and standard deviations for the independent and dependent variables used in the study.

Table 2(a): Frequency of male and female students in the Behavioral Checklist

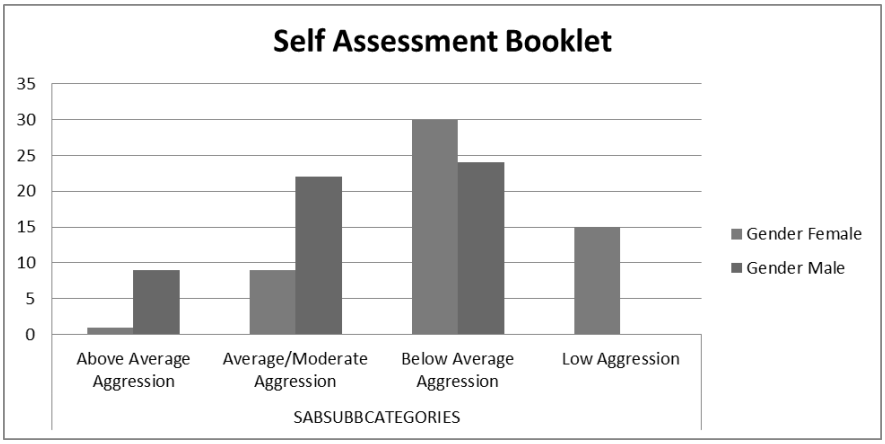
BCL CATEGORIES	**Gender**		**Total**
	Female	**Male**	
Extremely Aggressive	0	0	0
High Aggression	1	3	4
Above Average Aggression	1	4	5
Average/Moderate Aggression	13	27	40
Below Average Aggression	35	21	56
Low Aggression	5	0	5
Total	55	55	110



The data in table 1 shows the level of aggression in both males and females as measured by the tool, Behavioral Checklist. From the above frequency table, it is evident that in this sample, no individual was recorded in the extremely aggressive categories. In the high aggression, the numbers of males were higher than females. Similarly in the average/moderate aggression, the numbers of males were higher than the females. In the next category, i.e., below average aggression, the numbers of females were higher than males. In the low aggression category, females were higher than males.

Table 2(b): Frequency of male and female students in the Self Assessment Booklet

BCL CATEGORIES	Gender		Total
	Female	Male	
Above Average Aggression	1	9	10
Average/Moderate Aggression	9	22	31
Below Average Aggression	30	24	54
Low Aggression	15	0	15
Total	55	55	110



The data in table 2 shows the level of aggression in both males and females as measured by the tool, *Self Assessment Booklet*. From the above frequency table, it was found that in the above aggression category, the number of males was higher than females. In the average and moderate category, the number of males was higher than females. Whereas in the below average category, the number of females was higher than males. In the low aggression category, the number of female was higher and there was no male in this category.

Table 3: Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	16.200[a]	4	0.003
Likelihood Ratio	18.448	4	0.001
Linear-by-Linear Association	13.325	1	0.000
N of Valid Cases	110		

a. 6 cells (60.0%) have expected count less than 5. The minimum expected count is 2.00.

Table 3, shows that the p value is 0.003, which is less than .05, and therefore the null hypothesis stating that there will be no significant gender difference in the overt expression of aggression will be rejected.

DISCUSSION

The aim of the present study was to study the level of aggression in adolescents. Further the study also intended to find out, whether there exists any gender difference in the overt expression of aggression. To find the level of aggression in adolescents, frequencies were found out. From the results obtained from the Behavioural Checklist, which consisted of five levels of aggression viz, Extremely aggressive, high aggression, above average aggression , average/ moderate aggression, below average aggression, low aggression, it was observed that none of the participants were in the extremely aggressive category. Boys were higher in the high aggression category as compared to girls, and in the above average aggression also, boys scored higher. In the next category i.e., average/ moderate aggression, boys were higher. In the below average aggression, girls have scored higher. In the low aggression category, girls were higher. From the above results it is evident that, boys tend to be on the more aggressive side as compared to girls. Girls tend to be low on aggression. Similarly when we observe the data of the Self Assessment Booklet, which consists of four levels of aggression viz; above average aggression, average/moderate aggression, below average and low aggression. The response in this booklet too shows that boys tend to have higher level of aggression as compared to girls. The Behavioral Checklist consists of the responses that the teacher has provided, after observing the behavior of the students. The Self Assessment Booklet on the other hand, has been the scores that the participants have given themselves about their behavior, which was tabulated to find the level of aggression.

On analysis of the gender difference, using chi-square analysis, the obtained p value was .003, (<.05), and therefore the null hypothesis stating that there will be no significant gender difference in the overt expression of aggression can be rejected. The results obtained are supported by the findings of different research-

es; males are much more likely to be violent aggressors at any age (Anderson & Huesmann, 2012). Various other research findings also states that, girls are more likely to engage in verbal aggression rather than physical aggression. Girls show more indirect aggression throughout childhood, in particular in adolescence (Anderson & Huesmann, 2012).

CONCLUSION

On the basis of the findings it can be concluded that there exists gender differences in overt expression of aggression. Males tend to be on the higher in overt expression of aggression as compared to females. This significant difference can be due to cultural influences and gender role expectations from both the gender.

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Northeast Journal of Contemporary Research (NeJCR)
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Vol. 4 No. 1
December 2017

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Published by Darrang College, Tezpur, Assam (India) and Printed at TICOL STYLE TRACK, Kumargaon, Tezpur, Assam