

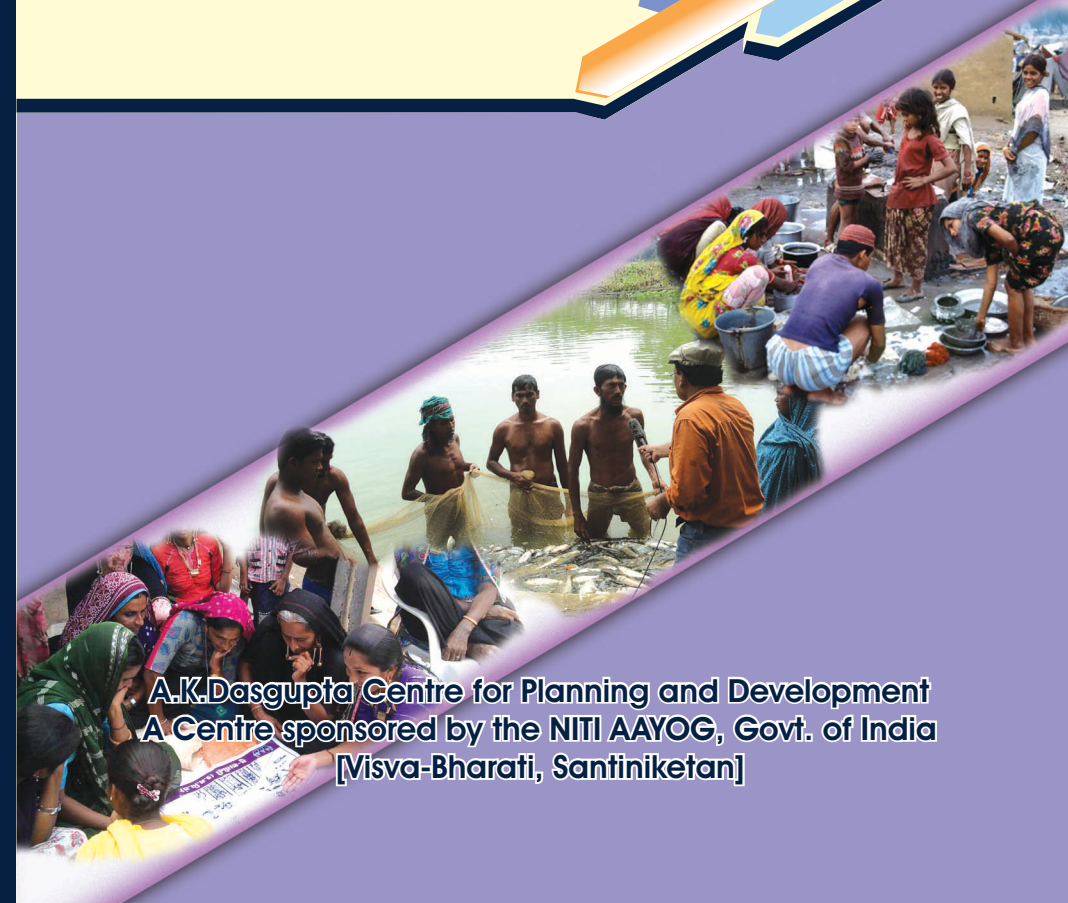


Inclusion and Empowerment Challenges & Opportunities  
Working Paper (Volume – IX)



# Inclusion and Empowerment Challenges & Opportunities

Working Paper (Volume – IX)



A.K.Dasgupta Centre for Planning and Development  
A Centre sponsored by the NITI AAYOG, Govt. of India  
[Visva-Bharati, Santiniketan]



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# **Inclusion and Empowerment**

## **Challenges & Opportunities**

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**Dr. Pranab Kumar Chattopadhyay**

Chair Professor

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# Multi-dimensional Deprivation of West Bengal and Bihar

A Cross District Study

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## Abstract

The primary objective of this paper is to explore the Multi-dimensional Deprivation level (MDL) for the districts of West Bengal and Bihar. This study covers three dimensions – Knowledge, Health and Living condition taking ten indicators. We have applied the data reduction technique-Principal Component Analysis (PCA) to derive the factors to determine the MDL of the districts. Finally, multidimensional deprivation index (MDI) of the districts has been computed taking weighted average of the important factors. This paper is based on the data published by Directorate of Population Census of India 2011. It is reported that value of MDI ranges from 0.060 to 0.889 across the districts in West Bengal, and that from 0.099 to 0.893 across the districts of Bihar. We have observed that Kolkata in West Bengal and Patna, Munger, Rohtas and Bhojpur in Bihar are least deprived districts while Maldah and Uttar Dinajpur in West Bengal and Madhura, Jamui, Araria, Purnia and Kishanganj in Bihar are the most deprived districts. In Bihar most of the districts have very high level of deprivation. MDI of all the districts of West Bengal and Bihar together, ranges from 0.000 to 0.944 across the all 57 districts. The districts of Kolkata, Darjeeling, North 24 parganas, Howrah, Hooghly, Bardhaman, Nadia and Purba Medinipur in West Bengal and only Patna in Bihar are least deprived districts, while the most deprived districts such as Kishanganj, Khagaria, Sitamarhi, Katihar, Saharsa, Purnia, Araria and Madhepura are from Bihar.

**Keywords:** *Bihar, Multi-dimensional Deprivation, Principal component, West Bengal,*

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## **Introduction**

Deprivation is commonly defined as the inadequate access to the basic needs in life like food, health services, education, electricity etc. No one indicator alone can capture the multiple aspects of deprivation and poverty. Income alone misses a lot because India is growing fast in economic perspective but health, education and living standard not improved yet. India has per capita income among one of the top countries in the world but if we see on the other dimensions of development like health status, education level and standard of living, then we find that some states of India are not so good in the other dimension rather than the income. So, we need a systematic methodological and economic framework which cover multidimensional aspects of deprivation. The structure of poverty analysis of Amartya Sen evoke the multidimensional view of poverty and deprivation. The multidimensional deprivation is measured from various dimensions which constitute poor people's experience of deprivation such as poor health, lack of education, inadequate living condition. Various indicators are used to measure each of the dimensions. Nowadays Multi-dimensional Deprivation Index (MDI) has been designed to measure acute poverty in several overlapping dimensions. Acute poverty refers to three main characteristics. First, it includes people living under conditions where they do not reach the basic education and basic functioning knowledge. Second, it refers to people living under condition where they do not reach the level of good health. And third, it includes the people who do not reach the level of modern or standard living condition in several aspects at the same time. This study contend identifying the poor using their multidimensional deprivation level and provides greater insight into dimensions of poverty across the various districts of the West Bengal and Bihar. The MDI evaluates poverty based on a household's deprivation in three basic dimensions - knowledge, health and living conditions. Various indicators are used to measure each of the dimensions and they represent a mix of commodities and actual functioning. The household's total deprivation score is compared to an established deprivation level. Since the MDI focuses on information from each household, it considers the multiple and interconnected deprivations for the household, enabling identification of not only the poverty head count ratio but also the intensity of poverty.

The HDI was the first such measure which considers these three dimensions of poverty. There are many differences between these

two measures which are as follows. The Human Development Index was developed by Mahbubul Haq and Amartya Sen in 1990 and has been reporting for the countries in human development report of the UNDP since 1990. The HDI is calculated by taking the geometric mean of the normalized indices of the three dimensions of human development, it takes into account different dimensions as health, education and standard of living. The UNDP is trying to improve on the HDI formula by introducing the IHDI (Inequality adjusted HDI). Although both Human Development Index and Multi-dimensional Deprivation Index uses the three broad dimensions as health, education and standard of living, HDI uses only single indicators for each dimension of poverty while MDD level uses more than one indicators for each dimension. Secondly, HDI is measured considering the conglomerative perspective of development, while MDI is measured considering deprivation perspective. The HDI is more universally applicable but the HDI has been criticized for ignoring other development parameters. HDI is concerned with all people of the country, whereas MDI is concerned with the disadvantaged section of people of the country.

***About the study States : West Bengal and Bihar***

According to the provisional results of the 2011 national census, West Bengal is now the fourth most populous state in India, with total population of 91,347,736 and with a population density of a little more than 1000 persons per square km. The state continues to attract a large number of migrants from neighbouring states as well as neighbouring countries. The topography of the state is dominated by the alluvial plains of the Ganga and its tributaries, except for the hilly territory of North Bengal, extending into the Himalayan foothills. In terms of income, the district of North 24-Parganas, Purba Bardhaman and Kolkata were the three best off out of a the total of 23 districts in the state, recording the highest Gross District Domestic Product at current prices in 2011. West Bengal has a total literacy rate of 77.08 percent, it is above the national average of 74.04 percent, however, it ranks 13th amongst the 36 states and union territories in India in terms of literacy rate. West Bengal schools are run by the state government and by several private organizations, including religious institutions. The capital and largest city of the state is Kolkata.

As of the 2011 census, Bihar was the third most populous state of India with total population of 104,099,452. Nearly 89 percent

of Bihar's population lived in rural areas. Almost 58 percent of Bihar's population was below 25 years age, which is the highest in India, giving Bihar the highest proportion of young people of any Indian state. The density was more than 1100 persons per square km, making Bihar India's most densely populated State. And Bihar has high agricultural production which making it one of the strongest sectors of the state. Near about 80 percent of the state's population is employed in agriculture, which is higher as compared to India's average. Even though, the good soil and favourable climatic conditions such as good rainfall that favour the agriculture, it often face flood fear. The capital and largest city of the state is Patna and all the branches of the government are located in this state Capital. Out of the total 38 districts in terms of income the three best districts are Patna, Munger and Begusarai. Bihar has a total literacy rate of 63.82 percent; it ranks lowest among all the states of India. The Government as well as private schools operates in the state of Bihar. Apart from this, here we can also detect Madrasas and Missionary schools operated by Christian Missionaries. However, Modern Bihar lacks educational infrastructure leading to a huge gap between the demand for education by the population and availability of quality education. Though a number of schools operate in this state, the lack of infrastructure and monitoring is a point of major concern.

The present study has tried to explore a situation of multi-dimensional deprivation of the districts in West Bengal and Bihar. Apart from the introductory section, the paper is organised as follows. Section-2 deals with the literature review. Section-3 presents the motivation and objectives. In section-4 we have specified research methodology and data sources. The empirical findings have been discussed in section-5. Section-6 concludes this paper.

## **Literature Review**

There is a broad and different range of work on the topic of multi-dimensional poverty in the literature. In this section we cite some selected studies in connection with the present study. Dejian Lai (2002) studied living condition of the people of the provinces in China. He has applied the weighted principal component analysis on the highly correlated indicators of the human development index that are as longevity (life expectancy), education (knowledge) and resource (standard of living). He has used different sources of data including 1990 population census. The study has found that in China

people in the cities enjoyed relatively higher level of standard of living, whereas, the agricultural population with about 80 percent of the total population are mostly living in rural areas with very primitive or no infrastructure for modern health care and education. The results from the weighted principal component analysis were compared to the HDI of each province in China using Spearman's rank correlation coefficient. The rankings from the human development index and from the main principal component are highly correlated, although there were some discrepancies between these two rankings. All autonomous regions (Xinjiang, Guangxi, Ningxia, Nei Mongol and Xizang (Tibet)) as well as provinces with high minority concentration and non-coastal inland provinces were ranked after 15 with Xizang at the last by both methods. The human development index increased for all provinces between 1990 and 1997. The ranges of both the measures were narrowed during the same period. However, the relative positions of the three industrious provinces (Heilongjiang, Liaoning and Jilin) in the northeast China worsened from 1990 to 1997.

Alkire and Santos, (2010) are the first who have computed Multi-dimensional Poverty Index (MPI) for 104 developing countries using household survey data. The MPI evaluates poverty based on a household's deprivation in three basic dimensions - education, health and living standards. Various indicators are used to measure each of the dimensions and they represent a mix of commodities and actual functioning. The three dimensions are equally weighted and a household's total deprivation score is compared to an established poverty cut off. The MPI captures a set of direct deprivations that batter a person at the same time. In their working paper they have explained the computational methodology and components in the MPI. They have examined the relation between three income headcounts (using the \$1.25/day, \$2/day and national poverty lines) and deprivations in each of the three dimensions of the MPI, as well as with the MPI itself. They have found that the head counts with the two international poverty lines are highly correlated with the MPI, but correlations are much lower with the head counts using the national poverty lines. However, they have documented many examples of mismatches between the two poverty criteria. Most of the world's multidimensional poor live in south Asia and Sub-Saharan Africa in the world. They have calculated that 55.4 percent of the population of India is multi-dimensionally poor. Intensity of multidimensional

poverty among the Indian states is highest in Bihar (MPI=0.5). The value of MPI for West Bengal is 0.32 in 2008-9.

Mehta (2011) presents a district level estimation of Multi-dimensional poverty in India with considering 379 districts from 15 large states of India and using district level data are from the Census (1991). This study computes three groups of indices which include variables that reflect persistent deprivation such as infant mortality, illiteracy, poor infrastructure and low levels of agricultural productivity. In this study all three set of indices was computed by the three different methods with a view to determining robustness of the results. It shows that near about 50 to 60 districts are most deprived in India. Among them 8 districts are from Bihar. The nine sets of multidimensional indices that computed the seven most deprived districts including Kishanganj in Bihar. These results clearly show the stability across all nine indices with respect to the identity of the poorest districts. Although the most income poor regions in the country is located in Bahraich and Budaun in Eastern and Western UP, Kalahandi in Southern Orissa, they are not multi-dimensionally deprived region in India. Therefore, the study shows that the regions identified as deprived in multi-dimensional terms are not always the same as the districts identified as poorest in income criteria.

Vijaya, *et al.* (2013) study individual level multidimensional poverty using data from the Karnataka Household Asset Survey (KHAS) 2010. Four dimensions - education, living standards, ownership of productive assets and empowerment under which many indicators have been chosen to construct index. This study develops a household poverty measure as well as an individual poverty measure for all adults (18 years and older) under the same dimensions and then a few indicators are varied to capture intra household differences. In order to ensure comparability, the individual and the household measures are calculated for the same of households. The individual level measure identifies substantial gender differences in poverty that are masked at the household level. They find a large potential for misclassification of poor individuals as non-poor when poverty was not assessed at the individual level. Within poor households, men and women experience different sets of deprivations. Women were typically deprived in the empowerment, asset ownership and education dimensions. Merely increasing the material wealth of the households where the women reside, therefore will not necessarily translate into fewer deprivations for them. As the household wealth

increases, the bargaining position of these women might even decline due to changes in relative wealth positions.

Singh, *et al.* (2013) introduce the dimensions of poverty in Bihar on the basis of primary data of 160 households collected from four villages of the districts of Patna and Darbhanga. The study covers 65 BPL households where near about two third of family members of BPL households are literate in both the districts of Bihar whereas 92 percent of family members of APL (Above Poverty Line) households in Patna district and 75 percent in Darbhanga district are literates, indicating lower level of education among poor households in Bihar. And average size of land holdings of sample BPL households is 0.28 hectare in Patna district and 0.24 hectare in Darbhanga district. Per BPL household assets is worked out at Rs 18.86 thousand in Patna district which is about two and half time more than average asset owned by BPL families of Darbhanga district. Thus, the land, education and asset poverty are common in villages of Bihar. And the landlessness and the low per capita land are also causing poverty in Bihar. The many of poor persons are getting employment in nonfarm sectors and the migration is main strategies for maintaining livelihood of the poor households in Bihar but majority of persons migrated outside to the state and were employed basically in the nonfarm sectors. Their access to sanitation, electricity and improved living condition are much low which may be one of the reason of their poor health.

Bagli (2017) compute a multidimensional poverty index (MPI) for the states and the districts in North East India covering ten indicators under the dimensions Knowledge, Health and Living condition. The study has taken the data from census 2011. The MPI has been computed measuring the normalized inverse weighted Euclidian distance of the actual vector of deprivation indicators from the worst situation of deprivation. This study observed that Meghalaya is the most deprived state in North East India while Mizoram, Tripura are in relatively better off position among the North Eastern states. This study has explored the district of KurungKumey belonging to Arunachal Pradesh as the poorest district among the districts. However, among the ten most deprived districts eight are not located in Meghalaya. None of the districts in Mizoram, Tripura and Sikkim come in the ten most multidimensional poor districts. On the other hand, Aizawl district of Mizoram is the least deprived among the districts in North East India. No one of the ten least multidimensional



poor districts belongs to the state of Meghalaya. However, there is no straight forward relation between MPI of the states and percentage of population live below poverty line income.

Dhongde and Haveman (2017) measures the multidimensional deprivation in the USA. using individual level data from the American Community Survey (ACS) from 2008 to 2013. Several wellbeing dimensions and indicators have been considered like health insurance as a measure of economic security, disability as a measure of health status, high school degree as a measure of education, English fluency as a measure of social connections, housing costs as a measure of standard of living and crowded housing as a measure of housing quality. This study applies traditional MDI methodology and also uses official poverty measure. It is found that 15 percent of the population are multidimensional deprived which is higher than the prevalence of official income poverty. There are some dimensions in which most of the Americans were deprived in such as lack of education, severe housing burden and lack of health insurance. As the deprivation increased during the recession, it trended towards a decline between 2010 and 2013. The supplemental and the official poverty measure which show slightly different results. These two measures did not show any decline, the MDI of deprivation better reflects the economic recovery from the recession. Therefore, the spreading of deprivation was higher in the southern and the western states and among the Asian and the Hispanic population. However, there was not much overlap between individuals who were income poor and those who were multidimensional deprived. Almost 30 percent of income poor individuals are experienced of multiple deprivations.

## **Motivation and Objectives**

Multi-dimensional poverty Index is a relatively new concept developed by Alkire and Foster (2007), based on household level data. Due to lack of household level data on the indicators of multidimensional poverty, we did not get any report regarding the multidimensional poverty of the different states of India in recent time. But it is urgent for implementing multifaceted deprivation of the population. To bridge this lack of information, we have planned to search the district level multidimensional deprivation of two states namely West Bengal and Bihar. It is well known that in terms of per capita income, education and standard of living of the people of Bihar is most backward among the states in India, whereas the

condition of the people of West Bengal is moderate in terms of the indicators. According to the Indian Human Development Report 2011, rank of west Bengal is 13<sup>th</sup> while rank of Bihar is 21<sup>st</sup> among the 23 measures states of India. In west Bengal the districts level Human Development Index were published last time in 2004. But in case of Bihar the district level Human Development Index is not yet published separately. With this end in view, we have tried to explore the district level Multi-dimensional poverty of deprivation of the two states separately and simultaneously. The specific objectives of this paper are as follows.

First, we study the relative position of the districts in West Bengal in respect of the selected deprivation indicators.

Second, the relative position of the districts in Bihar in respect of the selected deprivation indicators are to be determined.

Third, computing the MDI for each district in West Bengal and Bihar simultaneously we compare the districts of Bihar and West Bengal.

### **Research Methodology and Data Sources**

To compute Multi-dimensional Deprivation index (MDI) for each district in West Bengal and Bihar, we have covered three dimensions of deprivation such as Knowledge, Health and Living condition. We have taken percentage of illiterate population (illiteracy), percentage of school aged child not attending school (School Attendance) and percentage of people without using banking facility (Banking services) as deprivation indicators under knowledge dimension. Percentage of child mortality rate (Child Mortality), percentage of households without improved sanitation facility (Sanitation) and percentage of households without safe source of drinking water (Drinking water) are included under health dimension because lack of these, may cause some health problems. Percentage of households without electricity connection (Electricity), percentage of without improved flooring facility (Flooring), percentage of households using dirty fuel for cooking (Cooking Fuel) and percentage of households without owning censes assets (Assets) are included under Living condition The description of dimensions and deprivation indicators are presented in table1.

**Table 1:** Selected Dimensions and Indicators of the Multi-dimensional Deprivation

dimensions	indicators	Description
Knowledge	Illiteracy	Deprived if no household member attend school
	School Attendance	Deprived if any school aged child (5 to 13 years) are not attending school.
	Banking services	Deprived if any of households member not availing banking services.
Health	Infant Mortality	Deprived if any child or baby died in the family.
	Sanitation	Deprived if the household not having toilet facility or if their toilet is shared.
	Drinking water	Deprived if households uses unsafe source of drinking water such as Tap water from untreated source, Un-covered well, Spring, River/ Canal, Pond, Other sources
Living condition	Electricity	Deprived if the household have no electricity.
	Flooring	Deprived if the household has Mud, Wood/ Bamboo, Burnt Brick floor.
	Cooking Fuel	Deprived if the household cook with Fire-wood, Crop residue, Cow dung cake, Coal, Lignite, Charcoal and Kerosene.
	census Assets	Deprived if the household does not own more than one census asset like bicycle, TV, Computer/Laptop, telephone/mobile phone, motorcycle or refrigerator and does not own a car or tractor.

**Source:** Authors' own justification

We have applied principal component analysis for constructing composite index of multidimensional deprivation. The principal component analysis is a data reduction statistical technique which is designed to represent a wide range of attributes on a smaller number of dimensions and employed to show variability among the correlated indicators in terms of possibly lower number of uncorrelated, unobserved, unique indicators called factors. The observed indicators are modelled as linear combination of the possible unique factors.

Now, first of all before using the technique of factor analysis, here we use the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy test and Bartlett Test of Sphericity to know the applicability of the Factor analysis. The KMO measure of sampling adequacy is an index for comparing the magnitudes of the observed correlation coefficients to the magnitudes of the partial correlation coefficients. The large values (>.5) for the KMO measure ensures factor analysis for the indicators. Another indicator of the strength of the relationship among variables is Bartlett Test of Sphericity which is used to test whether the variables under study are correlated or not.

The Principal Component Analysis (PCA) method is a mathematical procedure that uses an orthogonal transformation to convert a set of correlated variables into a set of values of uncorrelated variables. The weights of the Factors are computed by extracting the maximum variances from the indicators, with successive charges continuing until all the meaningful variances from the indicators exhausted. According to the Kaiser criterion the factors having Eigen values greater than one are considered to be significant. If a factor having higher the Eigen value then this factor contributing greater strength to explain the variances in the indicators. Normally the first principal component has as high a variance as possible that is accounts for as much of the variability in the indicators as possible. For a given indicator the variance or the common proportion of that indicator is the sum of factor loading for all factors are called communality. The percentage of variance in a given indicator is measures by communality.

We have a set of 10 observed indicators  $X_1, X_2, \dots, X_{10}$  with mean as.  $\mu_1, \mu_2, \dots, \mu_{10}$  Suppose that for some unknown constant  $\beta_{ij}$  and k unobserved indicators  $F_j$ , where  $i \in 1, 2, \dots, 10$  and  $j \in 1, 2, \dots, k$ , where  $k < 10$ . Now we have

$$X_i - \mu_i + \beta_{i1}F_1 + \beta_{i2}F_2 + \dots + \beta_{ik}F_k + \epsilon$$

Here  $\beta_{ij}$ 's are define as factor loading which shows the power of relationship among the indicators and factors. The loading on factors can be positive or negative. A negative loading indicates that this factor has an inverse relationship with the indicator. The higher the loading the more important it is to that factor. There is a cut-off point which important for loading of an indicator in a factor which is

suggested by Camrey (1973). According to him if the value of  $\beta_{ij}$  is above 0.44 then this is considered solvent for that factor.

Using the Direct Oblimin method for rotation we have finally extracted the factors having Eigen value greater than one. It is a very common rotation method which shows a clear picture of which indicators load on which factor. In order to construct component indices for extracted components, we have used the general formula as

$$\text{Component Index} = \frac{\text{Actual value} - \text{Minimum value}}{\text{Maximum value} - \text{Minimum value}}$$

Finally, we compute weighted average of all component indexes taking Eigen values of the respective factors as weight. This weighted average is our Multi-dimensional Deprivation Index (MDI) for the district. We categories the districts of West Bengal and Bihar in respect of the level of multidimensional deprivation. If, MDI is less than equal to (Mean – SD) we consider the district having low level of deprivation. The MDI is greater than (Mean – SD) but less than equal to (Mean) the deprivation of the district is considered as moderate level of deprivation. If MDI ranges from mean to (Mean + SD) we consider the deprivation high degree of deprivation. The value of MDI greater than Mean + SD indicates the very high level of multidimensional poverty.

The data from the population census 2011 have been used for majority of the indicators of multidimensional deprivation. Only for child mortality data we use the data bank of UNICEF.

### ***Result and Discussion***

In this section the empirical findings are to be presented and discussed. Initially we present the description of the indicators. Table-2 shows the descriptive statistic of West Bengal. Under this we have observed that average illiteracy rate of the districts in West Bengal is 33.8 percent. It varies from 20.2 percent to 50.5 percent across the districts. Illiteracy rate is highest in the district of Uttar Dinajpur followed by Maldah, Purulia, Murshidabad and least in the district of Kolkata followed by Purb Medinipur, North 24 Parganas, and Howrah. It is saddening that 23.4 percent households of the districts in West Bengal have not attended school which ranges from 17.3 percent to 34.7 percent.

**Table-2:** Descriptive Statistic of the Indicators of Deprivations of the Districts in West Bengal

Indicators (%)	MEAN	MEDIAN	SD	CV	SKEW	MIN	MAX
Illiteracy	33.8	32.6	8.4	24.88	0.37	20.2	50.5
Children not attending school	23.4	22.1	4.6	19.69	1.09	17.3	34.7
Don't have access to banking services	52.9	57	13.6	25.63	-0.97	16.2	73.5
Infant mortality	12.3	11.8	9.5	77.56	2.97	2.3	47.5
Not availing improved sanitation facility	46.2	44.3	24.6	53.23	0.02	5.1	88.2
Don't have access to safe drinking water	14.5	8.2	15.7	108.34	2.03	2.6	60.1
No access to electricity	46.6	50.7	19.2	41.19	-0.83	2.2	71.6
Poor flooring	64.2	71.9	21.6	33.65	-1.28	5.5	86.1
Dirty fuel for cooking	79.5	85	14.5	18.23	-2.07	33.6	90.6
Don't have census assets	23.4	23.4	8.4	35.82	-0.44	3.6	36.3

**Source:** Authors' computation based on census data 2011

In West Bengal 52.9 percent households are not using the banking facilities. Median value of this indicator tells us that in half of the districts, 57 percent or more households are deprived of banking facilities. The variation across the districts are high were some districts such as Uttar Dinajpur, Maldah, Dakshin Dinajpur are highly deprived and Kolkata, Bardhaman, North 24 parganas and Hooghly are low deprived in terms of the access to banking services. Thus access to banking facility is a serious deprivation among all indicators of knowledge dimension for the districts in West Bengal.

The average infant mortality rate is 12.3 percent and it varies from 2.3 percent to 47.5 percent. The coefficient of variance is high which indicates high inequality among the districts of West Bengal.

Note that in Kolkata district the infant mortality rate is around 48 percent. Average percentage of households without improved sanitation facility is 46.2 percent and it varies from 5.1 percent to 88.2 percent. It is seen that the relative dispersion of the deprivation in improved sanitation facility is lower than that of infant mortality and that in unsafe source of drinking water across the districts. We observe that in average 14.5 percent households of the districts in West Bengal collect drinking water from unsafe source. There is a wide variation across the districts. The high deprived districts are Darjiling, Jalpaiguri, Puruliya and the low deprived districts are South twenty four parganas, Murshidabad, Purba Medinipur in terms of unsafe source of drinking water. So, among health dimension of deprivation sanitation problem is more serious compared to others.

In majority of the districts more than half of the households have no electricity or solar energy for lighting. The districts which are not having improved source of lighting varies from 2.2 percent to 71.6 percent. The most deprived district is Cooch Bihar and least deprived district is Kolkata in terms of the access to electricity. In average 64.2 percent households having not improved flooring facility. It varies from 5.5 percent to 86.1 percent across the districts. It is not surprising that 79.5 percent households of the districts in West Bengal have no access to improved fuel for cooking which asymmetrically ranges from 33.6 percent to 90.6 percent. The coefficient of variation is lowest among all the indicators of deprivation. However, only 23.4 percent households in average of the districts don't have census assets. Thus deprivation in terms of asset holding is not so serious in the districts of West Bengal.

**Table-3:** Description of the Indicators of Multi-dimensional Deprivations for the Districts of Bihar

Indicators (%)	MEAN	MEDIAN	SD	CV	SKEW	MIN	MAX
Illiteracy	49.6	48.9	5.97	12.03	0.02	39.2	59.2
Children not attending school	33.8	33.1	5.02	14.86	0.05	24	42
Not availing banking services	55.1	55.8	12.60	22.86	-0.09	26.1	79.7
Infant Mortality	52.1	52	6.31	12.13	0.27	37	68
Not having sanitation facility	77.3	78	8.57	11.09	-1.16	47	90.6

Don't have access to safe drinking water	7.8	4.4	8.59	110.02	2.54	1.4	43
No electricity	83.5	85.5	9.62	11.53	-2.39	42.4	94.5
Poor flooring	83.9	84.3	7.54	8.98	-1.29	57.8	94.5
Dirty fuel for cooking	90.8	92	5.42	5.97	-3.46	64.3	96.1
Don't have census assets	26.7	28.7	7.24	27.16	-0.55	9.4	38.1

**Source:** Authors' computation based on census data 2011

Table 3 shows the descriptive statistic of the indicators in the districts of Bihar. In an average half of the population of the districts are illiteracy. It varies from 39.2 percent to 59.2 percent across the districts in Bihar. The Percentage of households having illiteracy is highest in Purnia followed by Madhepura, Katihar, Sitamarhi and illiteracy is lowest in Rohtas followed by Patna, Munger and Bhojpur. It is observed that one third of the children of the districts in Bihar don't attend school. The fact is almost uniform among the districts of Bihar. More than half of the households in the districts in average don't have access to banking facilities. It varies from 26.1 percent to 79.7 percent across the districts. The problem of financial exclusion is highest in the district of Kishanganj preceded by Araria, Purnia, and Katihar and lowest in the district of Siwan followed by Gopalganj, Patna, and Bhojpur.

The average infant mortality rate of the districts in Bihar is 52.1 percent. It varies from 37 percent to 68 percent across the districts. The infant mortality rate is least in the state of Patna and highest in Madhepura. The variation of infant mortality rate across the districts is not so prominent. In majority of the districts more than half of the households don't have improved sanitation facility. In average 7.8 percent of the households of the districts in Bihar collect drinking water from unsafe source which varies from 1.4 percent to 43 percent. The problem of unsafe drinking water is serious in the districts such as Jamui, Banka and Munger. Among the indicators under health dimension sanitation problem is serious one.

It is not surprising that in Bihar 83.5 percent households across the districts don't have access to electricity or solar energy for lighting. In the district of Patna 42.4 percent households work and live without electricity while in Arwal almost all households live without electricity. Poor flooring of the residence of the households a common deprivation in the state of Bihar. In average 84 percent



households reside in a house without improved flooring facility. It is saddening that 91 percent households of the districts in Bihar use dirty fuel for cooking with 5 percent variation. However, only in average 26.7 percent of households are poor in respect of owning census assets which range from 9.4 percent to 38.1 percent. Therefore, under Knowledge dimension, financial exclusion, under health dimension, lack of sanitation facility and under living condition, dirty fuel for cooking are major indicators of multidimensional deprivation across the districts of West Bengal and Bihar. The depth of these problems are deeper in Bihar compared to West Bengal. If we compare West Bengal and Bihar in respect of all indicators, we show that except unsafe source of drinking water, the average value of all the indicators are high in Bihar. However, except the child education, the variance of all the indicators higher in West Bengal compared to Bihar. Therefore, only with respect to the access to safe drinking water the districts of Bihar are in better position than that of West Bengal.

The analysis of individual indicator is not sufficient to determine the relative position of the districts in respect of multidimensional deprivation. We need a comprehensive index which covers multiple dimensions of deprivation simultaneously. In this context we employ PCA for the selected indicators and consider the weighted average of the important components. Table 4 shows the results of diagnostic tests for the application of PCA. The KMO value are 0.685 and 0.814 for selected deprivation indicators for West Bengal and Bihar respectively, which are greater than 0.5. KMO test confirms the correlation among the deprivation indicators are significant and thus the PCA of the deprivation indicators are consistent. Further, the Bartlett's test of sphericity shows the significant result. Therefore, PCA technique is applicable to obtain uncorrelated factors from the analysis.

**Table-4:** KMO and Bartlett's Test for West Bengal and Bihar Separately

Test		West Bengal	Bihar
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.685	.814
Bartlett's Test of Sphericity	Approx. Chi-Square	200.823	385.618
	df	45	45
	Sig.	.000	.000

**Source:** Authors' computation

**Table -5:** Principal Component Analysis Using Kaiser Criterion (West Bengal)

Component	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	6.212	62.124	62.124	6.212	62.124	62.124	5.527
2	1.434	14.339	76.463	1.434	14.339	76.463	3.772
3	1.130	11.300	87.762	1.130	11.300	87.762	1.264
4	.565	5.653	93.415				
5	.338	3.381	96.796				
6	.133	1.331	98.127				
7	.089	.889	99.015				
8	.057	.571	99.586				
9	.027	.275	99.861				
10	.014	.139	100.000				

**Source:** Authors' computation

The results of PCA of the indicators for West Bengal and Bihar are presented in table- 5 and in table 6. It is observed that three factors for each state are found to be important which explain more than 87 percent of variance of the indicators across the districts in West Bengal and in Bihar respectively. The PCA method provides the relationship between the extracted factors and the deprivation indicators which are technically termed as the factor loadings. The PCA offers the facility of factor rotation to generate the orthogonal factors. Therefore, Oblimin technique of orthogonal rotation with Kaiser Normalization has been used. The results are presented in table-7 and table 8 for West Bengal and Bihar respectively.

**Table-6:** Principal Component Analysis Using Kaiser Criterion (Bihar)

Component	Initial Eigen values			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	5.702	57.019	57.019	5.702	57.019	57.019	4.747
2	1.956	19.564	76.583	1.956	19.564	76.583	4.405
3	1.001	10.014	86.596	1.001	10.014	86.596	1.545
4	.502	5.022	91.618				
5	.313	3.130	94.748				
6	.236	2.362	97.110				
7	.100	.998	98.108				
8	.089	.887	98.996				
9	.069	.692	99.688				
10	.031	.312	100.000				

Source: Authors' computation

**Table-7:** Rotated Pattern Matrix (West Bengal)

Indicators	Component		
	1	2	3
Illiterate Population	.336	.798	.149
School Attendance	.062	.849	-.126
Banking Services	.885	.112	-.079
Infant Mortality	-.771	.458	-.322
Sanitation	.245	.795	.291
Drinking Water	-.156	.132	.998
Electricity	.776	.343	-.054
Flooring	.884	.161	-.092
Cooking Fuel	.925	.076	-.074
Assets	.820	.206	-.131

a. Rotation converged in 17 iterations.

**Source:** Authors' computation

Table 7 shows that the factor loadings clearly identify the each indicator with only one factor. Indicators such as banking services, infant mortality, electricity, flooring, cooking fuel and assets are

identified with factor- 1. Illiteracy, School attendance and sanitation are loading in factor- 2 and the unsafe drinking water is loaded in factor- 3. Table-8 deals with the values of the factor loadings for the indicator in Bihar. Here, sanitation, electricity, flooring and cooking fuel are loading in factor- 1. Illiteracy, school attendance, banking services, infant mortality and assets holding are loading in factor- 2. Drinking water is loading in factor- 3.

**Table-8:** Rotated Pattern Matrix (Bihar)

Indicators	Component		
	1	2	3
Illiterate Population	.242	.800	-.140
School Attendance	-.160	.995	-.187
Banking Services	.171	.845	.084
Infant Mortality	.369	.504	-.112
Sanitation	.925	.068	.092
Drinking Water	-.018	.003	.966
Electricity	.964	-.095	-.072
Flooring	.761	.201	-.269
Cooking Fuel	.992	-.021	.089
Assets	-.051	.847	.375

a. Rotation converged in 7 iterations.

Source: Authors' computation

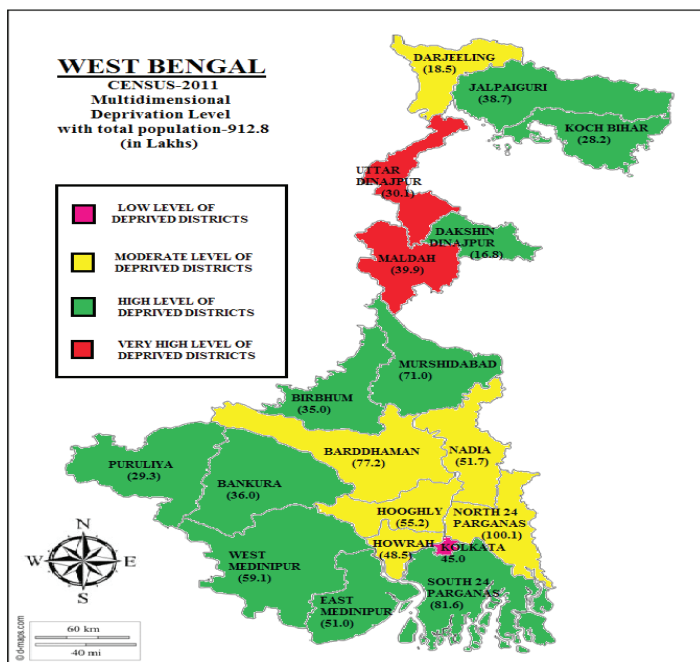
**Table-9:** Multi-dimensional Deprivation of the Districts in West Bengal

District Name	MDI	Level of MD
Kolkata	0.060	Low
Hooghly	0.504	Moderate
North Twenty Four Parganas	0.505	Moderate
Howrah	0.508	Moderate
Bardhaman	0.592	Moderate
Darjiling	0.597	Moderate
Nadia	0.665	Moderate
PurbaMedinipur	0.694	High
PaschimMedinipur	0.702	High
Bankura	0.728	High
South Twenty Four Parganas	0.743	High

Dakshin Dinajpur	0.785	High
Birbhum	0.788	High
Jalpaiguri	0.799	High
Koch Bihar	0.811	High
Murshidabad	0.829	High
Puruliya	0.854	High
Uttar Dinajpur	0.879	Very High
Maldah	0.889	Very High

**Source:** Authors' computation based on census data 2011

**Figure- I:** Multi-dimensional Deprivation of Districts in West Bengal (total population)



**Source:** drawn by authors

Finally, applying the specified methodology we compute the MDI for each district of West Bengal and Bihar. Table 9 and 10 present the level, from lowest to highest, that is, from the least deprived to the very highest deprived. The average value of MDI of the districts of West Bengal is 0.681 which ranges from 0.060 to 0.889. In

accordance with the value of MDI, we find Maldah and Uttar Dinajpur as the most deprived district in West Bengal. These districts have very high level deprivation with respect to our selected indicators of multidimensional deprivations. On the other hand, Kolkata is the least deprived among the districts in West Bengal. The districts suffer from moderate level of deprivation are Hooghly followed by North twenty four Parganas, Howrah, Barddhaman, Darjeeling, and Nadia. The remaining districts like as Purba Midnipur, Paschim Midnipur, Bankura are highly deprived districts in West Bengal.

In figure1 and in table 10 we categorize of the districts of West Bengal in respect of the multidimensional deprived population. The total population in West Bengal is 912.8 lakhs as reported in Census 2011. We have seen that only Kolkata district containing near about 44.97 lakhs population suffers from low level of deprivation of West Bengal. This population size is around 5 percent of total population in West Bengal. Six districts are suffering from moderate level of deprivation. These districts are the home of 351.11 lakh population which is 38 percent of total population in West Bengal. It is shown that more than half of the population residing in twelve districts are suffering from high or very high level of deprivation. Figure 1 shows the districts of West Bengal (except Bardhaman and Darjeeling) in the border of Bihar have high or very high level of multidimensional poverty.

**Table-10:** Multi-dimensional populations in West Bengal

MDD level	No. of districts	Percentage of districts	Total populations	Percentage of total populations
Low level of deprivation	1	5	4496694	5
Moderate level of deprivation	6	32	35110941	38
High level of deprivation	10	53	44672501	49
Very high level of deprivation	2	11	6995979	8

**Source:** Authors’ computation based on census data 2011

In table- 11 we have computed MDI for 38 districts of Bihar. This study reveals that average value of MDI of the districts of Bihar is 0.676 which ranges from 0.099 to 0.893. Therefore in both the states mean and dispersion of the degree of deprivation are almost same. In

accordance with the value of MDI the districts of Madhepura, Araria, Jamui, Purnia and Kishanganj are the most deprived districts in Bihar. On the other hand, Patna, Munger, Rohtas and Bhojpur are the least deprived among the districts in Bihar. The districts having moderate level of deprivation are Siwan followed by Bhagalpur, Gopalganj, Buxar, Begusarai, Saran and others. The remaining districts are suffering from high level of deprivation. In percentage distribution we find 10 (40) per cent of the districts have low (high) level deprivation. The deprivation of 37 percent districts are moderate level. In Bihar 13 percent districts are deprived of very high level of deprivation.

**Table -11:** Multi-dimensional Deprivation of the Districts in Bihar

District Name	Value of MDI	Level of MD
Patna	0.099	Low
Munger	0.440	Low
Rohtas	0.496	Low
Bhojpur	0.523	Low
Siwan	0.545	Moderate
Bhagalpur	0.562	Moderate
Gopalganj	0.567	Moderate
Buxar	0.574	Moderate
Begusarai	0.595	Moderate
Saran	0.603	Moderate
Lakhisarai	0.605	Moderate
Jehanabad	0.612	Moderate
Nalanda	0.613	Moderate
Vaishali	0.622	Moderate
Aurangabad	0.625	Moderate
Muzaffarpur	0.626	Moderate
Sheikhpura	0.654	Moderate
Gaya	0.658	Moderate
Darbhanga	0.677	High
Kaimur (Bhabua)	0.682	High
Arwal	0.701	High
Madhubani	0.721	High
Samastipur	0.722	High
Nawada	0.736	High

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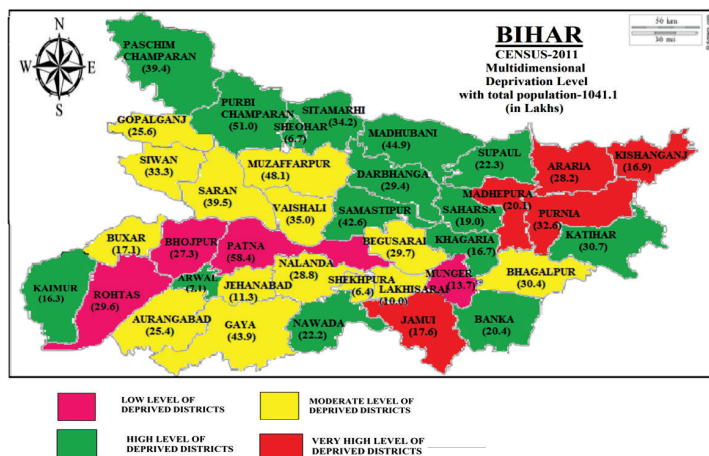
PurbaChampan	0.738	High
Sheohar	0.746	High
PashchimChampan	0.767	High
Khagaria	0.797	High
Banka	0.802	High
Sitamarhi	0.807	High
Saharsa	0.817	High
Katihar	0.818	High
Supaul	0.818	High
Kishanganj	0.827	Very High
Purnia	0.840	Very High
Jamui	0.863	Very High
Araria	0.878	Very High
Madhepura	0.893	Very High

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**Source:** Authors' computation based on census data 2011

We show the deprivation level of with respective to their population in figure 2. In table 12 the total population of Bihar, 1041.1 lakh, is divided in accordance with their level of multidimensional deprivation. There are 4 districts which are suffering from relatively low level of deprivation containing near about 128.95 lakh population. This population size is around 12 percent of population of Bihar. 37 percent population in Bihar are multi-dimensionally poor in moderate level. Around 40 percent population are suffering from high level of deprivation who live in 15 districts of Bihar. It is seen that 11 percent population of Bihar are living with very high level of deprivation. Thus, like West Bengal, in Bihar half of the population are suffering from high and very high level of deprivation.



**Figure 2:** Multi-dimensional Deprivation of the Population in Bihar**Table-12:** Multi-dimensional Deprivation of the Populations in Bihar

Level of Multi-dimensional Deprivation	No. of districts	Percentage of districts	Total populations	Percentage of populations
Low level of deprivation	4	11	12894555	12
Moderate level of deprivation	14	37	38426791	37
High level of deprivation	15	40	41249351	40
Very high level of deprivation	5	13	11528755	11

**Source:** Authors' computation based on census data 2011

Let us now extend the analysis computing the MDI for the districts of West Bengal and Bihar simultaneously using the same methodology. Then we determine the relative position of the districts of West Bengal and Bihar together

**Table- 13 A:** Level of deprivation of the Districts in West Bengal and Bihar Combined

Rank of the District	District Name	Value of MDI	MD Level
1	Kolkata	0.000	Low
2	Darjiling	0.223	Low
3	North Twenty Four Parganas	0.230	Low
4	Howrah	0.264	Low
5	Hooghly	0.269	Low
6	Barddhaman	0.393	Low
7	Nadia	0.444	Low
8	PurbaMedinipur	0.450	Low
9	Patna	0.455	Low
10	Jalpaiguri	0.471	Moderate
11	PaschimMedinipur	0.496	Moderate
12	South Twenty Four Parganas	0.515	Moderate
13	Bankura	0.552	Moderate
14	Munger	0.599	Moderate
15	DakshinDinajpur	0.599	Moderate
16	Koch Bihar	0.600	Moderate
17	Rohtas	0.609	Moderate
18	Siwan	0.614	Moderate
19	Puruliya	0.633	Moderate
20	Birbhum	0.635	Moderate
21	Gopalganj	0.648	Moderate
22	Bhojpur	0.650	Moderate
23	Murshidabad	0.658	Moderate
24	Buxar	0.672	High
25	Saran	0.675	High
26	Vaishali	0.697	High
27	Aurangabad	0.699	High
28	Bhagalpur	0.709	High
29	Maldah	0.712	High
30	Lakhisarai	0.721	High
31	Jehanabad	0.729	High
32	Nalanda	0.734	High

33	Uttar Dinajpur	0.735	High
34	Begusarai	0.736	High
35	Kaimur (Bhabua)	0.736	High
36	Muzaffarpur	0.737	High
37	Gaya	0.746	High
38	Arwal	0.751	High
39	Sheikhpura	0.753	High
40	Samastipur	0.787	High

**Source:** Authors' computation based on census data 2011

**Table 13B:** Level of deprivation of the Districts in West Bengal and Bihar Combined

Rank of the district	District Name	Value of MDI	MD Level
41	Jamui	0.802	High
42	Madhubani	0.807	High
43	Banka	0.814	High
44	PurbaChamparan	0.817	High
45	Darbhanga	0.825	High
46	Nawada	0.836	High
47	Sheohar	0.841	High
48	PashchimChamparan	0.842	High
49	Supaul	0.859	High
50	Kishanganj	0.891	Very High
51	Khagaria	0.896	Very High
52	Sitamarhi	0.905	Very High
53	Katihar	0.910	Very High
54	Saharsa	0.912	Very High
55	Purnia	0.930	Very High
56	Araria	0.935	Very High
57	Madhepura	0.944	Very High

**Source:** Authors' computation based on census data 2011

Table-13A and 13B, explore the relative position of the 57 districts of West Bengal and Bihar together based on ten indicators considered in this study. We have found that out of 57 districts, 9 districts are least deprived districts. Among them only one district, Patna, from Bihar.

Although relative to the districts of Bihar only there are four low deprived districts. Out of all 57 districts, 14 districts are moderate level deprived, among them 9 districts are from West Bengal and 5 from Bihar. Among the districts with high level of multidimensional deprivation 2 districts from West Bengal while 24 districts from Bihar. We find that 8 districts have very high level multidimensional deprivation which are all from Bihar.

**Table 14:** Multi-dimensional Deprivation of the Population of West Bengal and Bihar

Level of Multi-dimensional Deprivation	No. of districts	Percentage of districts	Total populations	Percentage of populations
Low level of deprivation	9	16	50541975	26
Moderate level of deprivation	14	25	52525192	27
High level of deprivation	26	46	72477900	37
Very high level of deprivation	8	14	19830500	10

**Source:** Authors' computation based on census data 2011

The study thus reveals that one fourth of the total population of the states of Bihar and West Bengal are least deprived in terms of the selected indicators. Ten percent of population of the two states are very high level deprived of.

The deprivation in term of most of the indicators is common throughout the districts of Bihar. Further most of the districts of West Bengal are deprived in many indicators of different dimensions of multidimensional deprivation. The study conclude that there is no significant difference between the states of Bihar and West Bengal in respect of the intensity of multidimensional deprivation. There are several deprivation alleviation programs, and these are not effective to reduce the deprivation up to desired level in the states like West Bengal and Bihar. So, there is an essential need to have holistic approach for improving multiple social and economic dimensions of states for rapidly reduction of deprivation in the states. So, for alleviating multidimensional deprivation we should formulate and implement regional programs based on the nature of deprivation of

the districts. The governments should provide them some simple way to having funds for utilizing with their own resources to improving their current situation in a positive way. We have to invest for improving the infrastructure of knowledge and health care units across the districts, this may create some demand of knowledge and good health and standard. These may alleviate multidimensional deprivation across the districts of West Bengal and Bihar. So far, often it is reported that the states fails to fulfill the target utilization of the fund for development. We thus need to utilize the flagship programs more effectively and more wisely for alleviating the intensity of multidimensional deprivation of the districts in the states.

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# Impact of Aquaculture Diversification on Efficiency in Indian Sundarban

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## Abstract

Recent research regarding diversification of carp culture has demonstrated that integration of some of the small indigenous fish species (SIFS) into carp polyculture system increases overall pond fish production. It has also been observed that these species command high nutritional value, often higher than that for Indian Major Carps, thus ensuring food and nutritional security to rural households. Farmers in Indian Sundarban have also initiated the process for expanding fresh water aquaculture by integrating SIFS into current carp production systems. It is, however, important to locate these efforts within specific socio-economic contexts and to formulate relevant strategies, as appropriate so that a sustainable and efficient aquaculture production model can be developed. In this paper data obtained from field survey for year of 2015-16 has been used to measure the levels of technical efficiency in carp-cum SIFS culture in comparison to traditional culture at the farm (pond) level in Indian Sundarban, using non parametric data envelopment analysis (DEA). This permits to separately identify how diversification of carp culture through SIFS can affect the overall pond fish production. The results showed significant technical efficiency difference among adopter and non-adopters of SIFS. Besides scope to increase technical efficiency of those farms, the results also indicated the absence of awareness among farmers about the advantages of incorporating SIFS with carp polyculture. However, the realization of these potentials will depend on continuous efforts by the government in ensuring an adequate supply of inputs, technology transfer, development and adequate provision of research, extension services in culture. There is need to strengthen management and conservation efforts through a participatory approach in order to popularize SIFS in Indian Sundarban.

**Keywords:** *Small indigenous fish species (SIFS), technical efficiency, carp culture, diversification, data envelopment analysis (DEA).* JEL Classification: Q22, C61

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## 1. Introduction

Small indigenous fresh water fish species (SIFS) are defined as fishes which grow to the size of 25-30 cm in mature or adult stage of their life cycle. They inhabit in rivers and tributaries, floodplains, ponds and tanks, lakes, beels, lowland areas, wetlands and paddy fields. Among SIFS, many species are cultivable with high demand and can be introduced as a candidate species in fresh water aquaculture system. These are *Amblypharyngdon mola*, *A. microlepis*, *Notopterus notopterus*, *Puntius sarana*, *Labeo bata*, *Puntius ticto*, *Cirrhinus reba*, and many others. It has also been observed that these SIFS command high prices, often higher than prices for Indian Major Carps, thus providing a source of supplementary income to rural households. Hence, along with the recommended six species of silver carp, grass carp, common carp, and three Indian Major Carps, farmers are also including some small indigenous Fish species (SIFS) in their carp polyculture practices. As a result, many fish growers are currently culturing more than 10 species in the composite fish culture (Jena *et al.*, 2005; Katiha *et al.*, 2006).

Side by side, it is also true that, carp culture through SIFS without any supplementary feed, quality seeds have always been discouraged by scientists (Mazid and Kohinoor, 2003). They have also discouraged introduction of predatory species without recommended adoption package of practices. But stark reality is that fish farmers, caring only for profit, have introduced mola, bata or some other SIFS in their polyculture practices without following scientific advice, resulting in frustrating outcome in term of fish production (Neiland and Bene, 2004). Considering the extent to which small indigenous species of fresh water fish play a role in providing nutrition to the rural poor and in maintaining biodiversity, it is important to consider promoting sustainable use of small indigenous species in culture fishery systems. Although rural population depend highly on indigenous species of fish for nutrition in many parts of West Bengal, very little attention has been paid on their role in aquaculture production enhancement, nutrition, captive breeding, livelihood security and conservation needs.

Indian Sundarban has a great potential for expanding fresh water aquaculture by integrating small indigenous species of fish into current production systems. In order to meet increasing demand of fish in the region, many small indigenous fish species (SIFS), along

with carps, has begun to be integrated in the polyculture system. Sundarban is blessed with 131 of such SIFS distributed in almost all the rivers, streams, lakes and canals of the region. These species are either caught from nearby water bodies or get naturally recruited to homestead/common village ponds which are then harvested by the pond owner or the local community. SIFS of fresh water origin are not only a source of vital protein to the rural poor but also of micro-nutrients such as calcium, zinc, iron and fatty acids (Roos et al, 2007). Indigenous knowledge about these species and about their health benefits is high among rural population. For example, such species are often considered an essential part of the diet of pregnant women and lactating mothers. Small fishes, which are eaten whole, constitute a rich source of vitamin A also. Research has proved that the bioavailability of calcium from these small indigenous fresh water fish species is at par with that derived from milk (Roos *et al.*, 2007). Again, from the point of view of overall family consumption of fishes, it has been found that producers of large carps usually deprive the women or children members of their households, because large carps are grown for cash crop, not for family consumption (Amilhat et al, 2006; Garaway, 2005). All these reasons have paved the way for production of SIFS in Sundarban.

Problem is that, these species tend to be sold and consumed locally. Perhaps this is one of the reasons why they remain invisible in national statistics (Roos, 2007). This invisibility in statistics could account for their poor recognition in fisheries and aquaculture development policies. It is, however, important to locate these efforts within specific cultural and socio-economic contexts, looking also at critical issues of ownership and access rights over water bodies, and to formulate relevant strategies, as appropriate. If such factors are taken into consideration, the objectives of nutritional security, promotion of employment and conservation of biodiversity can be better met especially in disadvantaged areas of Sundarban showing poor human development indicators. Present study is an attempt to move forward to this effort. A field study has been conducted with the aim of investigating the production potential of integrating SIFS in carp polyculture in small seasonal ponds in Sundarban.

## **2. Data and Methodology**

A cross-sectional interview-based survey was carried out at fresh water aquaculture dominated island blocks of Indian Sundarban,

selected through proper sampling design. This survey was conducted during the months of July to September 2015 and February to April 2016, using random sampling technique. Two out of 4 sub-divisions of South 24 Parganas, and Basirhat sub-division of North 24 Parganas have been purposively chosen for field survey. On the second stage, from each subdivision, two community development blocks of fresh water aquaculture region of Sundarban have been randomly selected. At the final stage, a comprehensive list of pond or tank owners from each GPs in the selected blocks has been prepared and then those villages in which farmers are growing SIFS with carp polyculture have been purposively chosen. In case of non-fulfilment of this condition in a particular village, a nucleus of villages with two or more contiguous villages was constituted. From each village, ten fish farmers have been randomly selected. In this way, the total number of 30 household pond owners from each block has been chosen. The number of sample pond owner from each sub-division is 60 and the total number of ultimate unit of analysis for the Sundarban area as a whole is, therefore, 180. It has been found that among those 180 fish farmers interviewed, only 78 have introduced SIFS along with carp polyculture, details of which have been presented in table-1.

**Table 1:** Sample Farmers practicing carp culture with or without SIFS

Sub-Division	Sample Size	Progressive Farmers	Traditional Farmers
Kakdwip	60	21 (35.0)	39 (65.0)
Canning	60	28 (46.7)	32 (53.3)
Basirhat	60	29 (48.3)	31 (51.7)
Total	180	78 (43.3)	102 (56.7)

Note: Figures in the parentheses indicate percentage to the respective totals.

Source: Field Survey, 2015-16

In this study, fish farmers practicing SIFS culture along with carp are termed as “progressive” farmers. Those, who are culturing only carps (not diversifying with SIFS) are termed as “traditional” farmers. The study has been performed on the basis of an open-ended and

exploratory research design. Observations are made according to the administered pre-designed structured questionnaires to all the fish farmers selected. The quasi-participant method was also used as and when necessary. Farmers were interviewed directly at his/her house/farm.

Here, fish output (or seed input) is expressed as the aggregated nominal value of total fish output (or total seed inputs) of all species taken together, instead of each species individually. Aggregation has been done because of the inability or unwillingness on the part of the fish farmers to provide detailed information about the use of different species of fish seed or fish output. Hence, Output (Y) represents the aggregate value of all fish species produced, measured in kilogram per acre. Similarly, the inputs involved in fish polyculture are also aggregated into few categories, which have been found to be used by farmers on regular basis.

Efficiency of the fish farms was assessed with the help of non-parametric Data Envelopment Analysis (DEA). DEA models operationalizes the concept of efficiency in the context of linear programming problems that calculates the frontier production function of a set of decision-making units (DMUs) and evaluate the relative technical efficiency of each unit, thereby allowing a distinction to be made between efficient and inefficient DMUs. Those identified as “best practice units” (i.e., those determining the frontier) are given a rating of one, whereas the degree of technical inefficiency of the rest is calculated on the basis of the Euclidian distance of their input –output ratio from the frontier (Coelli *et al.*, 1998). In the nonparametric DEA method, one makes a number of fairly general assumptions about the technology but leaves the functional form unspecified. Typically, it is assumed that the production possibility set is convex and both inputs and outputs are freely disposable. We consider an economy producing *m* outputs from *n* inputs. An input-output bundle (*x*, *y*) is considered feasible when the output bundle *y* can be produced from the input bundle *x*. The technology faced by the firms in the industry can be described by the production possibility set

$$T = \{(x, y): y \text{ can be produced from } x\} \dots\dots\dots (1)$$

In the single output case, one can conceptualize the production function

$$f(x) = \max y : (x, y) \in T \dots\dots\dots (2)$$

In the multiple output case, frontier of the production possibility set is the production correspondence

$$F(x, y) = 1 \dots\dots\dots (3)$$

The method of Data Envelopment Analysis introduced by Charnes, Cooper, and

Rhodes (CCR) (1978) and further extended to non-constant returns technologies by Banker, Charnes, and Cooper (BCC) (1984) provides a way to construct the production possibility set from an observed data set of input-output bundles.

Suppose that  $(X^j, Y^j)$  is the input-output bundle observed for firm  $j$  ( $j = 1, 2, \dots, N$ ). Now we make the following assumptions about the technology –

(I) All observed input-output bundle are feasible. Thus,

$$(X^j, Y^j) \in T \dots\dots\dots (4)$$

(II) The production possibility set is convex. Hence, if

$$(X^1, Y^1) \in T \text{ and } (X^2, Y^2) \in T, \text{ then}$$

$$\{\lambda X^1 + (1 - \lambda)X^2, \lambda Y^1 + (1 - \lambda)Y^2\} \in T, 0 \leq \lambda \leq 1 \dots\dots\dots (5)$$

In other words, weighted averages of feasible input-output combinations are also feasible.

(III) Inputs are freely disposable. Hence,

$$\text{if } (X^0, Y^0) \in T \text{ and } X^1 \geq X^0, \text{ then } (X^1, Y^0) \in T \dots\dots\dots (6)$$

This rules out the negative marginal productivities of inputs.

(IV) Output is freely disposable. Hence,

$$\text{if } (X^0, Y^0) \in T \text{ and } Y^1 \leq Y^0 \text{ then}$$

$$(X^0, Y^0) \in T \dots\dots\dots (7)$$

Then the smallest production possibility set satisfying the assumptions of convexity and free disposability that includes these observed bundles is

$$S = \{(x, y): x \geq \sum_1^N \lambda_j X_j, y \leq \sum_1^N \lambda_j Y_j, \sum_1^N \lambda_j = 1, \lambda_j \geq 0, j = 1, 2, \dots, N\} \dots\dots\dots (8)$$

The set  $S$  is also known as the free disposal convex hull of the observed input-output bundles. One can obtain various measures of efficiency of a firm using the set  $S$  as the reference technology.

Now, the output-bundle of the firm may be treated as an assigned task and the efficiency of the firm is judged by the maximum equi-proportionate reduction in all of its inputs without compromising the feasibility of the target output.

We consider the situation with 180 fish farms or decision making unit (DMUs), each producing output  $Y$  from a bundle of 4 inputs. The  $j^{\text{th}}$  DMU ( $j = 1, 2, \dots, 180$ ) uses  $X_k^j$  units of  $k^{\text{th}}$  input in the production of  $Y^j$  units. A separate linear programming (LP) problem is solved for each of the  $j$  DMUs ( $j = 1, 2, \dots, 180$ ) in the sample. The input based technical and scale efficiency for the  $j^{\text{th}}$  DMU can be obtained by solving the following LP problem –

$$\begin{aligned} & \text{Minimize } \theta^j \\ & \text{Subject to –} \\ & \sum_{j=1}^{180} \lambda^j Y^j \geq Y_0^j \text{ (output constraints)} \\ & \sum_{j=1}^{180} \lambda^j X_k^j \leq \theta^j X_k^0 \text{ (inputs constraints, } k = 1,2,3,4,5) \\ & \sum_{j=1}^{180} \lambda^j = 1 \\ & \lambda^j \geq 0, j = 1,2,\dots,180 \end{aligned}$$

Where,  $\theta^j$  is the dual of the variable indicating proportional increase in output possible by firm  $j$ ;

$\lambda^j$  = weight or intensity variable (or, shadow price) used to derive all possible linear combinations of the sample observations.

$Y_0^j$  = Actual output produced by firm  $j$ .

$X_k^0$  = Actual input use by firm  $j$

Where  $\theta$  is the proportional reduction in inputs possible and  $\lambda_j$  is the weight or intensity variable used to derive all possible combinations of the sample observations. Here,  $\theta$  determines the efficiency score of  $j^{\text{th}}$  DMU. The value of  $\theta = 1$  shows a technically efficient DMU;  $\theta$  less than one shows a technically inefficient DMU. In order to obtain efficiency score of each farm, equation (9) has to be solved  $N$  times, once for each farm.

The DEA problem mentioned above has an important intuitive interpretation. Essentially, the problem takes the  $j$ th firm and then seeks to radically contract the input vector,  $X_k^j$ , as much as possible, while still remaining within the feasible input requirement set. The inner boundary of this set is a piece-wise linear isoquant, determined by the observed data points, (i.e. all the firms in the sample). The radial contraction of the input vector,  $X_k$ , produces a projected point,  $(X_k^j \lambda^j, Y^j \lambda^j)$ , on the surface of this technology. This projected point is a linear combination of this observed data points. The constraints in the above LP problem ensure that this projected point cannot lie outside the feasible set.

One interesting point to note here is that a technically efficient DMU may still be over- or under-producing if it is found that altering the size of the farm towards optimal size increases (or decreases) the efficiency of that farm. It does mean that the DMU is not scale efficient. To analyze the performance of a farm, it is important to take care of this information since the magnitude of scale efficiency will tell us how much productivity gain would be feasible if that DMU can be moved to its optimal size. Scale efficiency of a particular DMU can be determined by running the CRS and the VRS models (the VRS model includes one more constraints that weighted value of the intensity variable,  $\lambda_j$ , must be equals to one) on the same data. A difference between these two scores indicates the scale efficiency of the DMU. Hence, scale efficiency (SE) is  $TE^{CRS}/TE^{VRS}$ .

Once  $\theta$  and  $\lambda_j$  can be determined it is easy to find out the optimal value of the input from the above LP equation. A comparison of the actual quantity of input used with the corresponding optimal quantity of that input reveals whether a particular DMU is using too much or too little of that input. Hence, for any particular input I, input use efficiency can be calculated by the ratio –

$$\alpha^i = \frac{L_0^i}{L_*^i}$$

A value of  $\alpha^i$  greater (less) than unity implies over (under) use of that input. In the present study, technical and scale efficiency score has been determined by solving those LP problems with the use of DEAP 2.1 (Coelli, 1996).

## Results and Discussion

### • *Input-Output Structure of Aquaculture Production:*

In this study, the sample focused on the different aspects of pond preparation like silt removal, weed removal of predatory fishes, initial liming. The pattern of seed stocking by the sample fish farmers has been captured in Table 2. Average stocking density per acre was 7583 fingerlings for carp species and 21145 SIFS. There was a significant difference ( $P < 0.05$ ) in such density between different category of ponds. Table 2 also indicates the position of the farmers regarding use of feed. It is quite clear that the proportion of traditional farmers using feed was higher than that of progressive farmers. As much as 96 per cent of the pond area held by progressive farmers was covered by the use of feed, while the corresponding proportion for the traditional farmers was close to cent percent. Surprising to note that there is wide variation in the use of feed among the traditional farmers (standard deviation figure is as high as 781). On an average sample farmers were using 1699 kg of fish feed per acre in a single production year.

Farmers used fertilizers mainly in the form of cow dung, urea and triple super phosphate (TSP) at varying rates. The use of organic manure like cow dung is widespread among the traditional farmers due to relatively cheap and wide availability of it in the study area. But uses of inorganic fertilization like urea or single super phosphate was relatively low (391 kg per acre) for progressive farmers. Only 35 per cent of traditional farmers used fertilizer. Lack of technical knowledge and poor economic returns were to major reasons behind such low rate of use. All medium and large farmers used inorganic fertilizers for fish farming. There was a significant difference ( $P < 0.05$ ) in fertilizer use between different size class of farming systems.

There are two types of labour inputs used in fish production – family labour and hired labour. Apart from the use of labour inputs in netting, fish catch and disbursement of fish, seed and manure; labour was also used by the farmers for supervision in order to prohibit unauthorized stealing and deliberate poisoning. Table 2 gives overall pattern of use of labour input by the sample fish farmers. There are not much differences in the use of labour, though traditional farmer's labour cost is higher than that of progressive farmers. It is interesting to note that traditional farmers, though using more labour than that of progressive farmers, usually employ family labour in higher



proportion. The use of average family labour was 193 days and average hired labour 71 days for traditional farms. The proportion of hired labour in total labour input has increased for progressive farms, though they had used only 168 labour days of labour in one production year.

**Table 2:** Input Output Structure of Aquaculture in Study Area

<b>Input Characteristics</b>	<b>Traditional</b>	<b>Progressive</b>	<b>Overall</b>
Stocking Density (quantity/acre/yr)			
Carp	9237 (893)	5929 (714)	7583 (791)
SIFS	--	13145 (3292)	13145 (3292)
Fish Feed (Kg/acre/yr)	1712 (781)	1686 (423)	1699 (598)
Organic Fertilizer (Kg/acre/yr)	889 (164)	734 (171)	811 (167)
Inorganic Fertilizer (Kg/acre/yr)	816 (167)	391 (49)	603
Duration of Rearing (month)	8	10	--
Labour used (number/acre/yr)	264 (32)	168 (28)	216 (30)
Fish yield (Kg/acre/yr)			
Carp	2017 (324)	1846 (167)	1931 (246)
SIFS	--	498 (91)	498 (91)

Source: Field Survey, 2015-16

Note: Figures in the parentheses indicate standard deviation values.

For measuring the overall production level of ponds, the output of all carp species is taken together and aggregate yield of SIFS has been estimated separately. Regardless of farming category, the average annual yields of carp were estimated at 1931 kg/acre (Table 2). There was a significant difference ( $P < 0.05$ ) in fish yields between different categories of ponds with a higher mean value in traditional farming system (2017 kg/acre) followed by progressive farming (1846 kg/acre). This was mainly due to a combination of larger ponds and higher inputs of fish seed, feed and fertilizer used in larger size of ponds. The variation in input use, discussed earlier, brought about

significant variation in the average yield rates per acre. However, a number of interdependent factors might also affect growth rate and productivity of fish, including environmental factors, water quality and other aspects of pond management.

• ***Variations in Technical Efficiency according to Diversification:***

The estimated values of technical efficiency (TE) for both traditional and progressive farms were shown in Table 3 and Table 4. The estimated technical efficiency score under CRS technology for the traditional farms varies from 0.27 to 1.0, with a sample average of 0.536. It implies, on the one hand, that on an average, the traditional farms can reduce 47.4 per cent of input use and can still produce the same output. A good number of farms are operating below potential and there are significant possibilities to increase the TE level of carp producers. Corresponding average for progressive farms are 0.659 and their efficiency scores varied from 0.41 to 1.0. Hence, use of existing inputs to produce fish was appeared to be more rational and efficient in case of progressive farms. The number of farms whose technical inefficiency is greater than 50 per cent (TE score is less than 0.5); that is, the number of farms which can contract more than half of their input use on an average, is 59 (57.8 per cent) for traditional farms in comparison to only 27 (34.6 per cent) in case of progressive farmers. The number of traditional farms who are carrying fish production optimally is only 3 in number in comparison to 5 in case of progressive farming. The difference between maximum and minimum TE score indicates that there is wide variation in the efficiency of the farms, especially in case of non-adopters of SIFS.

This difference has another important implication. The worst performing farm (having technical efficiency score of 0.32) can increase its efficacy regarding input use up to 68 per cent (and thereby can reach to the optimum TE score on one) just by sharing their own experience and implementing the input management strategy of best practice farms, without begging arms for institutional support. Thus the way to eliminate technical inefficiency in aquaculture in Sundarban would be to adopt the best practices strategies and input application management of efficient farms. Distribution of efficiency scores shows that TE concentration was more in the sixtieth percentiles for traditional farming (44 per cent). But progressive farms concentrate more on seventieth and eightieth percentiles in TE scores. Rests have, more or less, equal division between lower

and upper area of mean technical efficiency scores. Hence, overall, it is safe to conclude that integration of small fish species in carp polyculture system has improved the overall technical efficiency of production in Indian Sundarban.

**Table 3:** Distribution of Efficiency Score of Fish Farms

Technical Efficiency Score	Traditional (N1 = 102)		Progressive (N2 = 78)	
	Number	Percentages	Number	Percentages
0.00 to 0.26	00	00	00	00
0.27 to 0.49	39	38.2	12	15.4
0.50 to 0.69	45	44.1	27	34.6
0.70 to 0.89	11	10.8	29	37.2
0.90 to 1.00	07	06.9	10	12.8

Note: Figures are based on author's calculation on sample data of 2015-16

**Table 4:** Summary Efficiency Score of Sample Farms

Characteristics	TE <sub>Traditional</sub>	TE <sub>Progressive</sub>	TE <sub>Overall</sub>
Overall Sample Mean	0.536	0.659	0.597
Maximum efficiency	1.0	1.0	1.0
Minimum Efficiency	0.32	0.41	0.37
No and percentages of farms showing efficiency score less than average	59 (57.8)	27 (34.6)	86 (47.8)
No of "Best Practice" farms (TE = 1)	3 (02.9)	5 (06.4)	8 (04.4)

Note: Figures are based on author's calculation on sample data of 2015-16

• **Actual Versus Technically Efficient Input Applications:**

Table 5 presents information on actual (observed) and technically efficient (potential) quantities of input applications and output (fish) per acre according to the size of farms. Average actual usage of majority of inputs was lower than the theoretical TE levels. Actual use of carp fingerling should be increased by 18.3 per cent, on an average, in order to stay in best practice level. The progressive and traditional farmers should increase it by 30.7 and 13.6 per cent respectively, which clearly indicates that progressive farmers are more reluctant regarding optimal use of carp seeds. His might be due to two reasons. One, progressive farmers are suffering from 'fear psychosis' of

incurring loss by investing more on aquaculture business; and two, introduction of SIFS allowed them to think that use of more carp species in polyculture system might dampen the growth of SIFS. Those farmers might have faced financial constraints for its low use of most important input but, as regard to traditional farmers, they had shown lack of proper technical knowledge regarding fingerling use. Overall, fish seed had been undershoot by the sample farmers.

Similarly, input use efficiency has been calculated for all other principle inputs. It has been found that farmers in general have underutilized feed massively, whereas labour and fertilizers have been overused. Accordingly, feed use should be increased by more than 67 per cent in order to achieve full efficiency. This implies that fish feed is the most neglected input in the sample area which affects the fish production adversely. Undershooting of feed is more prominent for traditional farmers (70.4 per cent) compared to progressive farms (62.6 per cent). Side by side, fertilizer and labour had been overshooting by the farmers. Though slight increase in the use of fertilizer (only 1.5 per cent) is required to be best practice farm, farmers should reduce its labour use by almost 15 per cent. However, interesting to note that progressive farmers had used fertilizers less than what is required, whereas traditional farmers should reduce fertilizer use by almost 17 per cent. Traditional fish farmers were using fertilizer more than the potential level which may be due to the excessive usage of organic fertilizers like domestically available cow dung or oil cake. Another significant observation is that use of labour is more than the recommended (optimal) level irrespective of the categories of ponds. This might be due to the fact that, for the farmers involved in pond fish culture, extent of family cooperation is quite significant. Fish is grown for home consumption using family labor, supplemented with some hired labor for intensive harvesting. Usually, family labor is used for fish farming during the off-agricultural season, in which case there would be minimal costs for pond preparation. As labour cost become minimal due to the use of family and off-agricultural based labour, farmers were overshooting the input without concerning its adverse impact on production. It has also been found that farmers in Basanti block and especially progressive farmers were more profitable because they can take advantage of management with reduced cost of labour inputs.

Theoretically efficient quantity of carp fish production per acre appeared to be 3116 kg as against 1943 kg of actual production.

**Table 5:** Mean Actual versus Technically Efficient Input-output Applications

Inputs-Output	Size of Farm (Acre)		
	Progressive	Traditional	All
Actual Use of Carp Seeds (number/acre)	5929	9237	6315
Optimum Use of Inputs (number/acre)	7217	8128	7733
Change Required	1822 (30.7)	1109 (13.6)	1417 (18.3)
Actual Use of SIFS Seeds (number/acre)	13145	--	13145
Optimum Use of SIFS Seeds (number/acre)	16716	--	16716
Change Required	3571 (27.2)	--	3571 (27.2)
Actual Use of Feed (kg/acre)	1686	1712	1699
Potential Use of Feed (kg/acre)	2742	2918	2841
Change Required	1056 (62.6)	1206 (70.4)	1142 (67.2)
Actual Use of Fertilizers	1125	1705	1453
Potential Use of Fertilizers	1247	1573	1431
Change Required	122 (10.8)	(-) 132 (- 07.7)	(-) 22 (- 01.51)
Actual Use of Labour	168	264	216
Potential Use of Labour	141	219	185
Change Required	(-) 27 (- 16.1)	(-) 45 (- 17.1)	(-) 31 (- 14.4)
Actual Amount of Carp Produced	1846	2017	1943
Potential Amount of Carp Output	2852	3318	3116
Change Required	1006 (54.5)	1301 (64.5)	1173 (60.4)
Actual Amount of SIFS Produced	498	--	498
Potential Amount of SIFS Output	612	--	612
Change Required	114 (22.9)	--	114 (22.9)

Note: Figures are based on author's calculation on sample data of 2015-16

Clearly, actual production was significantly lower. The theoretical optimum suggests that production of fish could be increased by 1173 kg (60.4 per cent of the actual production) had the technically efficient input quantities been applied by the farmers. To investigate the percentage of required changes in outputs across different pond size groups, Table 5 shows that the operators of the progressive ponds could have increased fish production by 54.5 per cent with the TE inputs level. The traditional pond operators were able to match actual fish production with the optimum, requiring highest change of 64.5 per cent of the actual production. However, progressive farms could also increase their production of SIFS up to 22.9 per cent by following the theoretical level of input structure. Hence, overall, progressive farms could enhance productivity more than that of traditional farmers.

All these facts signify that, despite continuing growth in aquaculture in the study area, most of the present production techniques are quite rudimentary when compared with fully developed aquaculture practices. As a result, potential for growth in aquaculture, as well as the potential for aquaculture diversification through introduction of SIFS in carp polyculture system, in the Sundarban region is still far from exhausted. Reliance on unimproved breeds, seed collection from the wild, tardy nature of current practices, modification and manipulation of the proper adoption practices are manifestations of its unsophisticated nature. It is not that sample farmers have no knowledge about proper culture practices. Consultation with government officials has revealed that a good number of times extension services had been geared at the village level. The attendance rates of the adopters were also high. Still, production was far from expectation. Actually, technologies for utilizing such resources need not always be based on intensive commercial operations; rather they will be based on the application of basic aquaculture principles, their adaptation to local knowledge systems, and the different political and cultural contexts. The deviation from this rationality had compelled the farmers to manipulate their acquired scientific knowledge along with their own conventional wisdom to adopt only a part of the package of practice. As a result, ultimate production would adversely be affected. Production can therefore be significantly increased through more efficient use of farmers' resources and of existing inputs and technology.

#### **4. Conclusion and Policy Suggestions:**

In empirical application of the model, taking 180 fish farms from Sundarban area of West Bengal, it has been found that farmers, while integrating SIFS into their carp culture system, can improve their production through improving technical efficiencies. But, still there is high potential for improvement of efficiencies since there is ample variation in their efficiency scores. Farmers, just interacting among themselves and sharing information regarding input use, technologies followed and other production related activities, can improve their input use efficiency and thereby their levels of production.

The contribution of small indigenous fish species to the overall fish production, productivity and efficiency has been appeared adequate for suggesting management guidelines. Though the nutritive and livelihood importance of local fish species in carp polyculture is widely accepted, proper package of practice, with seed production technology and supply chains should be developed. Since, natural water bodies (and not government hatcheries) are still the source of SIFS; those resources should be protected and galvanized. For that, National Rural Employment Guarantee Scheme (NREGS) can be integrated to clear ponds of water hyacinth, to enhance fish production and as well as local livelihoods. Such packages could also be implemented under the National Nutrition Mission. Along with these, keeping in view of consumer preferences and market demand, some particular SIFS should be prioritized and government should strengthen their market linkages.

Another point deserves particular mention. The fish farmers practice their own indigenous technology as a common practice through natural resource management. The close and intimate observation of farmers through their age old practices has developed the expertise of acquiring knowledge and skills possessed by local people can substantially contribute to productive efforts and endeavors. For example, some small farmers, in the study area use to immerse banana logs in their pond by cutting into pieces. According to them, banana plant cell helps in increasing pH of the pond water through their alkaline secretion. Such activity helps to minimize protozoan disease and worm of fish. Some farmers could able to minimize mass mortality of *bata* species in this way. Unfortunately, scientific attitude to these indigenous technologies of the farmers are yet to be exposed. Conventional extension system is no longer able

to address effectively these changed grassroot level reality. These calls for different extension approaches like participatory extension approaches including success stories of technology adoption, indigenous innovation by farmers, community based management systems.

The financial assistance required for progressive farmers, is to be area or community specific, taking into account the different development potentials as well as constraints of each area or community. It is difficult to *tend a flock of sheep from the camel's back*. It is equally difficult to eliminate low productivity from the elevation of the central plan, however 'thorough and earnest'. From these points of view, it is expected that area-specific development plans would be very much effective.

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# **Women Empowerment in Sustainable Development in Panchayati Raj Institutions : With special reference to Lakhanpur Gram Panchayat of Gaya District**

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## **Abstract**

Empowerment is the ability, power, capability and eligibility of a person, with the help of that one take decision oneself without any help. Women empowerment refers to the women's capabilities which help them to think, to understand, to participate, to hold and represent in the Panchayati Raj Institutions (PRIs) and in any fields wherever they want to develop themselves. Sustainable development is development that meets the needs of the present without compromising the needs of future generations to meet their own needs. In sustainable development - environment, natural resources and government policies play a significant role to the upliftment of women. PRIs play a pivotal role in the empowering of women. In Bihar, the then NDA govt. under the leadership of Mr. Nitish Kumar made the provision of 50% reservation of seats for women in the PRIs. The Panchayati Raj Act, 2006 and many others have given so many opportunities to the rural women to formally involve themselves in the development process at grass root level. The purpose of this article is to highlight the government policies regarding women empowerment, the present condition of women in Panchayati Raj Institutions and their role and participation in sustainable development.

**Keywords :** *Women Empowerment, Panchayati Raj Institutions, Sustainable Development, Government Policies, Lakhanpur Gram Panchayat, Bihar.*

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## **Introduction**

### ***Women Empowerment***

Women Empowerment is the expansion of assets and capabilities of women to participate in, negotiate with, influence, control and hold accountable institution that affects their lives. Empowering women is a prerequisite for creating a good nation, when women are empowered, society with stability is assured. Empowerment of women is essential as their thoughts and their value systems lead to the development of a good family, good society and ultimately a good nation.<sup>1</sup> In other words we may say that - Empowerment of women involves many things - economic opportunities, property rights, political representation, social equality, personal rights and so on.

The concept of women empowerment emerged from debates generated by the United Nations in “Third World Women’s Conference” in Nairobi (Kenya) in 1985 where gender, equality, development and peace were the main subjects of contemplation, the decision to achieve the participation of women in the process of decision-making was considered necessary not mandatory. Women’s movement during the 1980s when feminists, particularly from third world countries, evinced dissatisfaction with the prevailing development discourse that was largely political and economist in its orientation. The mid 1980s therefore saw the emergence and spread of ‘women’s empowerment’ as a more political and transformative concept that challenged not only patriarchy but also the mediating structures of class, race and ethnicity and in the case of India, caste and religion.<sup>2</sup>

The term ‘women empowerment’ has come to occupy an important position globally over the years. Educational attainment and economic participation are the key constituents in ensuring empowerment of women. The economic empowerment of women is a vital element of strong economic growth in any country.

Women as an independent group constitute 49% of the country’s total population as per the 2011 Census. The importance of women as an important human resource was recognized by the Constitution of India which not only accorded equality to women but also empowered the State to adopt measures of positive discrimination in their favors. A number of Articles of the Constitution specially

reiterated the commitment of the constitution towards the socio economic development of women and upholding their political rights and participation in the decision making.<sup>3</sup>

The word ‘empowerment’ for the first time in India was used in the ninth five year plan (1997-2002). The government declared “The National Policy for Empowerment of Women 2001” which has its goal bringing about advancement, development and empowerment of women in all spheres of life through creation of a more responsive, judicial and legal system sensitive to women and mainstreaming a gender perspective in the development process. Over the years there have been efforts made to socially, economically and politically empowered women but as a result of the lack of synergy or coordination between these activities, the outcomes could never be completely satisfactory. Women’s lack of economic empowerment impedes not only growth and poverty reduction, but also has a host of other negative impacts.<sup>4</sup>

The article 14, 15, 16, 19, 21, 23, 24, 27, 39(a), 39(b), 39(c), 39(d), 39(e), 44 and 325 of the Indian constitution also provides equal rights to women like men.<sup>5</sup> There are also some special provisions for women in the constitution for their special case. Just after getting independence, many developmental programmes were initiated for the changes in the condition and direction of Indian women.

### **Panchayati Raj Institutions**

Panchayati Raj Institutions were present in India from the ancient period. The types and mode of PRIs were different in different period and stages. In Vedas, Ramayana, Mahabharata, Arthshashtra and in many others sections we find the presence of PRIs. In Buddha period Vaishali was known for decentralization and PRIs. After getting independence, so many committees were established for the development of it. In this regard Community Development Programme (1952), Balwant Roy Mehta Committee (1957), Ashok Mehta Committee (1977), G.V.K. Rao Committee (1985), L.M. Singhvi Committee (1986), 73rd amendment Bill (1993) played pivotal role in the development of PRIs and the empowerment of women.

Democratic decentralization is a highly concerned concept for development. Decentralization promotes local level representation, solves local issues and enhances decision making powers of the rural people. Effective decentralization provides greater choice to

the people to participate in decision making and this could acts as a mechanism in the development process.

Being the 50% of the whole population of India, their representation in the Centre and the State's Institutes is very less. In the past years, attempts have been made to pass the 33% reservation bill to increase their representation in the administrations. But in the initial stage of the presentation of the bill itself faced opposition. The 73rd and 74th Amendment Act of the Constitution provided 33 percent reservation for local bodies. In addition to that, in Bihar, the then NDA government under the leadership of Mr. Nitish Kumar passed a step further by passing the Bihar Panchayati Raj Act, 2006 and applying reservation for 50 percent for women at Panchayat level. There are 8471 PRIs in Bihar. In present scenario, there are so many government schemes, running in the PRIs for its development and empowerment of women. The Panchayati Raj Act, 2006 and many others schemes have given so many opportunities to the rural women to formally involve themselves in the development process at grass root level. This can be called the Bihar government's commendable and effective move.<sup>6</sup>

## **Sustainable Development**

Sustainable development is development that meets the needs of the present without compromising the needs of future generations to meet their own needs. In sustainable development - environment, natural resources and government policies play a significant role to the upliftment of women. For sustainable development it is necessary that women become empowered. Without empowering women it is very difficult to get sustainable development because they belong half of the population of India. PRIs play a pivotal role in the empowering of women.

The concept of sustainable development has been-and still is-subject to criticism, including the question of what is to be sustained in sustainable development. It has been argued that there is no such thing as a sustainable use of a non-renewable resource, since any positive rate of exploitation will eventually lead to the exhaustion of earth's finite stock.

Sustainability can be defined as the practice of maintaining process of productivity indefinitely-natural or human made-by replacing resources used with resources of equal or greater value without degrading or endangering natural biotic systems.<sup>7</sup>Sustainable

development ties together concern for the carrying capacity of natural systems with the social, political and economic challenges faced by humanity.

## **Review of Literature**

Before writing this paper I have gone through many research papers, books, journals, newspapers, articles, souvenir and used internet for getting information through wikipedia and other sources for related topic. In this regard, The Mannul Central Library of Magadh University, Bodhgaya have been visited. Research paper of Mr. Surendra Ram,<sup>8</sup> books of 'Panchayat Raj'<sup>9</sup> and 'Our Constitution' (Indian Constitution and Constitutional Law)<sup>10</sup>, journal of 'Shrinkhala'<sup>11</sup>, Articles of Azad Pratap Singh<sup>12</sup>, different souvenir, newspapers The Hindustan Times Daily, The Prabhat Khabar Daily & The Dainik Jagran Daily are the main supporting literature in the completion of this paper. This paper is related to my research work that is why I am very much interested to show the present condition of women in PRIs and their role and participation in the sustainable development.

## **Objective of Study**

- To study the government policies regarding women empowerment.
- To study the present condition of women in PRIs like Lakhanpur Gram Panchayat and
- To study the role and participation of women in sustainable development.

## **Research Methodology**

This research paper is related to historical, comparative and empirical method. In collection of data both primary and secondary sources have been used. Though it is not a large research, yet the conclusion of this research will be very significant. This paper is based on micro study and empirical method.

## **Bihar Government Policies/Schemes for Women Empowerment**

There are so many policies which are related to women empowerment and out of that many are initiated for only the empowerment of

women. Some important policies are being mentioned below which have significant role in empowering the women.

**Mukhyamantri Kanya Utthan (Graduation) Scheme:**

Keeping in view of empowerment of women, this scheme was launched on November, 2018. Through this scheme, government is trying to eradicate the child marriage and encourage the women for education. In this scheme a sum of ₹. 25,000/- is provided to those girls who are unmarried and passed the graduation. Before this, those unmarried girls, who passed intermediate, were getting a sum of ₹ 10,000/-.<sup>13</sup> Earlier bicycle scheme was started in the state which made a tremendous job in reaching the school of girls which is presently running. Now a day girls may be seen on the way in uniform with bicycle to reach the school for education.

**Reservation in Government Job:** There is a huge reservation in government job for women in Bihar. On 20th January, 2016 government has announced 35% reservation against every state government's job for women. Before this there was 50% reservation for women in appointing as a teacher upto middle school. Due to this, there is a huge number of women teachers in Bihar upto middle school. This type of reservation policy gives constructive support for the upliftment of women.

**Chief Minister's Seven Promise :** This scheme was initiated in the year 2016. Under this, seven types of different schemes are being operated such as (i) Aarthik Hal, Yuvaon ko Bal (ii) Aarakshit Rojgar, Mahilaon ka Adhikar, (iii) Har Ghar Bijli Lagatar, (iv) Har Ghar Nal ka Jal, (v) Ghar tak Pakki Nali-Galiyan, (vi) Shauchalay Nirman, Ghar ka Samman and (vii) Avsar Badhe, Aage Padhen. These seven schemes are made for only keeping in the view of empowering the women of Bihar at grass root level. They get so many facilities under these schemes which increase their respect in the family and society as well.

**Complete Liquor Ban :** There has been a demand from a woman from the then Chief Minister of Bihar Mr. Nitish Kumar during election congress in July, 2015. Keeping this demand in his mind, chief minister implemented complete liquor ban on 2nd October 2016. After implementation of this the women of this state became strong, powerful and capable. The condition is better than before the implementation of this act. Due to this, many families are saved from ruin while many families took places in new position.

**Bihar State Rural Livelihood Mission (Jeevika):** This scheme was initiated in April, 2013 with the aim of reducing poverty where state government provides an opportunity for livelihood to earn liveliness. Attempts are made to empower them financially and economically. At present it is working in whole Bihar. Under this scheme a few women make a group and get loan for their different work from the government. Government also brings different new facilities for the development of Jeevika. At present, women are participating in this Jeevika group and enhancing their capabilities.

**Chief Minister's Girls Uniform Scheme:** This scheme was initiated in the year 2008-09 for providing fund to girls students who are admitted in government schools. Under this scheme the different fund for different level is transferred through Direct Benefit Transfer (DBT) mode in the girl's account.

**Chief Minister's Girls Marriage Scheme:** This scheme was started by the Social and Welfare Department in 2007-08. Under this scheme government pay economical support to poor family for the marriage of their adult daughter. Getting the benefit of this scheme it is compulsion that either father or mother of the girl's should be native of Bihar. On the time of marriage ₹ 5000/- is paid to those family whose income is less than 60,000/- per annum. On the launch of this scheme the then President Pratibha Devi Singh Patil said that "The nation can achieve its full potential only when women realise their own potential."<sup>14</sup>

**Chief Minister's Girls Security Scheme:** This scheme was launched by Women Development Corporation in 2007-08 with the aim of stopping foeticide, registration of girls birth and improvement of sex-ratio. Under this scheme, poor family girls child who took birth after 22nd November, 2007, are getting certificate of fixed deposit of ₹ 2000/- which will be drawn on the completion of 18 years of the said girls child.

**Chief Minister's Women Shakti Scheme:** This scheme was initiated through Women Development Corporation in 2007 with the aim of social, economical and cultural empowerment of adolescent and women of the state. Under this scheme women resource centre has been established and running for the development of their skill, recruitment and other benefits.

For economical empowerment of the women, the training of computer, beautician, sales management, teacher-training etc. are



going on. For the encouragement of women industries self-help group has been transferred into Jeevika by which the information is passed regarding social matter, gender and women circulars of the state.

For social empowerment, Women Helpline has been started. Under this scheme there is an arrangement of support for lodging an F.I.R., temporary residential arrangement and vocational training as well as permanent residential arrangement for violence affected, offences and tortured women. Except this, there is an arrangement of women lodge, security home and temporary home also.

For the cultural empowerment, on the occasion of women/girls day there is an arrangement of cultural programme at districts and headquarter level.

**Inter-Caste Marriage Encouragement Scheme:** This scheme was launched for the encouragement of inter-caste marriage. Under this scheme a certificate of fixed deposit of ₹ 1,00,000/- has been given in the name of girl for her economical support. Due to this, there is a try to hurt on child-marriage, dowry, caste and untouchable system. For getting the benefit of this scheme there is a compulsion of marriage registration and adult bride & groom.

**Chief Minister's Incentive Scheme:** Under this scheme an amount of ₹ 10,000/- is provided to those girls child of general and BC-2 category who has passed the matriculation examination with 1<sup>st</sup> division. For SC/ST this amount is of ₹ 15,000/- while with the second division passed SC/ST girls find the amount of ₹ 10,000/-. Getting the benefit of this scheme there is a compulsion of taking admission in intermediate class. In this scheme, the fund is transferred to the beneficiary account through DBT mode.

Except the above there are also some schemes like Laxmibai Social Security Pension Scheme, State Social Security Pension Scheme, Special Residential School 'Dristi', Special Residential School 'Koshish', Aashiyana, Supplementary Nutrition Programme, Bihar Integrated Social Protection Strengthening, Chief Minister's Disables Marriage Incentive Scheme, Mahadalit Development Mission which are also supporting in the empowerment of women and finally in the sustainable development.

The Bihar government issued a notification banning plastic carry bags across the state after the intervention by the high court, which had, on September 24, sought to know from the state government when it intended to notify ban on plastic carry bags in Bihar. The

court later disposed off a Public Interest Litigation (PIL) petition, initiated suo motu, on the basis of a newspaper report regarding pollution from plastic in the historical Muchalinda Sarovar (lake) on the premises of Mahabodhi Mahavihara, a UNESCO world heritage site at Bodh Gaya. Expressing concern over devastating effect of polythene carry bags on the ecological system, the court had on July 9 called for “some bold and effective decisions” by the government to make Bihar a “plastic-free zone”. Now in Bihar, from 23 December, 2018 the plastic carry bag is completely banned and use of it is a punishable work. Definitely it is a one step forward in the development process.<sup>15</sup>

In addition to that, there are so many centre-oriented programmes and schemes which empower the women. Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) is a flagship scheme of the Government of India which aims to provide at least 100 days of guaranteed wage employment in a financial year to every rural household that demands work in which 1/3 reservation is provided to women. MGNREGS, the Centre’s flagship programme to address poverty by providing guaranteed jobs, covers all of India’s 691 districts and involves 116.5 million active workers across the states. In 2014-15, schemes that benefited individuals constituted 21.4% of the total MGNREGS work; now it has reached 66.7%, with the lion’s share of MGNREGS funds going towards labour payments for building houses for the homeless.<sup>16</sup> Except this there are also such types of schemes which run through centre-state co-operation and funding. Those are mentioned as follows :

(i) Prime Minister’s Residence Scheme, (ii) Purn Shakti Centre, (iii) One Stop Centre, (iv) Beti Bacho, Beti Padhao, (v) Rural Convergence and Facility Centre, (vi) Women Helpline 181, (vii) National Social Assistance Scheme (viii) Rajeev Gandhi Kishori Empowerment Scheme (Sabla).<sup>17</sup>

## **6. Condition of Women in Lakhanpur Gram Panchayat (LGP)**

During study, it is found that the education level of women in this Gram Panchayat is not satisfactory. On the basis of data collection, it is found that only 7.4% women of LGP are highly educated who have completed their master and higher degree while 44.78% are those women who have done upto graduation but the maximum percentage i.e. 47.80% is related to that women who have completed upto 10th

in which 31.03% are illiterate. Most of women are engaged in their household work only. They don't want to talk from outsider men.

As economical condition and their employment are concerned, it is found that only 6.59% women are doing job while only 3.84% are doing their business. Maximum women are of household workers i.e. 56.86% while 32.69% women are engaged in their field and labour work in agriculture. Due to this their income and economical condition is not so good, as it should be. Even earning women asked to their men for expenditure and so on.

As far as the health of women is concerned it is found that their health is also not fine. There is a huge number of women who live in below poverty line. Their economical condition is very poor. They only want to calm down their hunger. They aren't capable to fulfil their needs. They are spending their life only not enjoying.

During research work many related women, officials, politicians and eminent persons were visited. When I asked to women regarding PRIs and its contribution, it is found that only 41.75% are known to PRIs and its contribution while 55.49% are unknown. They don't have any basic knowledge of PRIs. In this regard, 02.74% were not able to reply regarding PRIs and its contribution in the development of panchayat.

## **7. The Role and Participation of women of LGP in Sustainable Development**

As far as women empowerment in sustainable development in PRIs is concerned, their participation in the PRIs is negligible. Due to lack of awareness and educationally backwardness their participation in decision making process at grass-root level in PRIs are not satisfactory. Women participation in the democratic institutions such as village panchayats and state assembly are inadequate. In spite of state government initiatives such as 50% reservation in PRIs their representation in village gram panchayats are negligible.

State government efforts for the upliftment of women and due representation in Panchayati Raj Scheme are not up to the marks. Due to the above mentioned facts women position in the Bihar state is not satisfactory and below expectations. If we talk about the reservation of women in State Assembly and Parliament, which is a demand of public for a long time, there is no party which is against this bill, but yet it is pending. It shows that only the politician talk about the

equality of women and reservation in State Assembly and Parliament as well, but they don't take proper decision.

For their active involvement in Panchayati Raj System, women will have to be aware and strong willingness, whose foundation has been laid, just needed to reach it on the floor. For this, women have to keep themselves active while facing the deteriorating policy of society like gender discrimination, male undue interference, dowry violence etc. For this, women should take lead for their developments. Women should be a member of organization like self-help organization and try to eradicate from social anomalies through organized way. Through this way they may empower themselves. The Panchayati Raj Act, 2006 and many others have given so many opportunities to the rural women to formally involve themselves in the development process at grass-root level.

## **8. Challenges**

In course of my research work, I find that still the condition of empowerment of women is not satisfactory. Most of women don't know their rights and responsibilities and unaware of schemes and programmes which are made for their upliftment. In addition to that there are so many obstacles such as poverty, illiteracy, population, caste, pardah etc. lagging behind. Patriarchy society, social environment, social evils and their ignorance towards their rights, powers, facilities, employment etc. are also the challenges in the empowerment of women and ultimately in sustainable development. Lack of interaction with information, officials and IT sectors are also the obstacles behind the sustainable development.

## **9. Suggestions & Conclusion**

No doubt, there are so many schemes for the empowerment of women and the work of government has to be appreciated. In this regard, Chief Minister, Bihar, Mr. Nitish Kumar has played a pivotal role in empowerment of women. Yet, the condition is not as such as it is shown in the different sources of media by the government of states as well as centre. It means not to say that women of India are not empowering. They are coming in a better condition with their own efforts. State government makes policies but there is no arrangement of surveillance of these programmes and schemes whether it is working properly or not.

So, on the basis of field work and above facts, I find and realize that women empowerment in PRIs is a need for sustainable development. In this regard, there is a need to fix the responsibility and the accountability of each and every person those who are related to the decision making process and implementation of developmental programmes for the upliftment of women empowerment and sustainable development. To make an impressive presence in political activities, women have to be aware about their rights and duties assigned to them. In this regard, support of family, society, officials, administrators, politicians, NGOs workers and all human being is needed. One should try to go ahead with the own efforts, not depends only on the support of government. After getting these facts, definitely, there will be empowered women in PRIs who will help in sustainable development. Without achieving these facts, it will be absolutely a blank fantasy. So, on the basis of research work and above facts, it may be said that there is a demand of more and more work and surveillance not only from government side but also from the women and society as well. For the empowerment of women, there should be a provision of special category for women in every stage of recruitment, admission and in any field of work, whether they belong to any caste or category. If the government pays attention towards it, definitely women will become empowered very soon and will play a pivotal role in the sustainable development.

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# Education through Open-Space Theatre: A particular case-study of 2010 with Audience-Feedback

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## Abstract

Education should not be meant for classroom teaching only. It should be taken in wider sense. Here, in this paper, we have chosen open-space theatre for the purpose of spreading value-based moral education which is very essential for our life. Theatre in an open space has been opted for its easy-going, economic friendly and well-communicating nature with the purpose of making voluntary decisions, starting a habit for doing introspection and an approach for teleological imperatives. With an aspect of public participation, a sphere has been made of, which proscenium theatre can never offer. We have drawn a view of Paulo Freire in support to our hypothesis. The paper is based upon a survey report done under the supervision of Howrah District Planning Committee with three troupes of theatre originating in Howrah for 28 rural areas; some of them were dominated by the minorities. Among those three troupes, we have chosen only one, Bauria P.R.T and their performance 'Manb Zami' for intense analysis. The details of the survey report have been used on behalf of the Director of Bauria P.R.T., the man, who relentlessly does the job over 25 years across the country. Along with it, we would like to focus on different approaches of teaching and learning processes which theatre can offer through 'experiential learning' process. It may pave the way to incorporate 'dramaturgy' as an alternative course in formal education. The paper tries to amplify the statement that theatre in an open-space proves to be a potential tool for education and communication.

**Keywords:** *open-space theatre, moral education, introspection, experiential learning, dramaturgy.*

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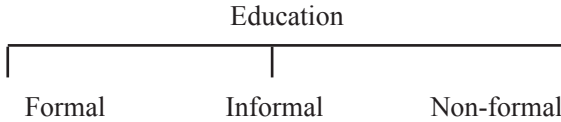


‘Theatre’ and ‘education’ are two basic elements to be discussed along with particular case study here. But before entering into the realm of discussion, we would like to draw a brief outline of what theatre is according to some standard definitions discerned by some world noted dictionaries. Oxford dictionary suggests :it is “a building or outdoor area in which plays and other dramatic performances are given” (<https://en.oxforddictionaries.com>). For Cambridge dictionary, theatre means “a building, room, or outside structure with rows of seats, each row usually higher than the one in front, from which people can watch a performance of plays, opera etc.”, a literary piece of work “written to be performed in public; or, most precisely, behaviour that is not sincere and is intended just to produce a particular effect or to attract attention” (<https://dictionary.cambridge.org>). According to Merriam-Webster Dictionary – “it is an outdoor structure for dramatic performances or spectacles in ancient Greece and Rome; it is a place or sphere of enactment of usually significant events or action; a piece of entertainment in the form of a dramatic or diverting situation or series of events” (<https://www.merriam-webster.com>). To Encyclopaedia Britannica, “theatre the word is derived from Greek ‘theaomai’ which means ‘to see’, the performance itself may appeal either to ear or to the eye, as is suggested by the inter-changeability of the terms spectator and audience. The appeal is mainly for the intellectuals for sometime, but intellectual element in itself is no assurance of good theatre. The full participation of the spectator is a vital element in theatre. The strongest impact on audience is made by acting, singing and dancing; background against which those activities take place” (<https://www.britannica.com>).

From the definitions cited above, we have a brief sketch about what theatre is. But we do not like to stigmatise on such theatre enacted within a hall; rather, we wish to focus on the open space where audiences are found closer than the proscenium and nature of the gathering in the form of audience is mixed. As theatre is a strong tool to motivate people easily with its bold and assertive action, the reaction comes from them is somewhat real and presumably, long-lasting because the technique is more appealing than any other form of approach to educate people.

Coming to the second part of the paper, the word ‘education’ is derived from the Latin word ‘educere’ which means ‘to lead out’ or ‘to train’ (Winch & Gingell, 1999:70). ‘Educare’ means ‘to train’

or ‘to nourish’ (ibid). Education is the combination of action and experience to gather ‘formative effects on the individual’ (Pritchard, 2012:7). Education is classified under three groups, roughly:



Generally, education received from schools, colleges, universities are called formal education. Cumulative grandeur of knowledge, skill and value-based education have been imparted through formal education from one generation to the generation next. The best example of formal education is to see in United Kingdom. Professional and trained teachers are needed to teach such mode of education.

Informal education is such a mode of education which continues throughout life. No particular planning, not any design for framing up curriculum, not any fixed evaluation pattern, not any division of time are there under such pattern of education. Informal education is better to be called an alternate way of self-motivation. People may learn from imitation, trial and error method and can implement them into their day-to-day life. In that very sense, informed education is rather more applicable than formal education as it is more near to our regular experience (Pritchard, 2012, Ch.:1:7-9).

And for the non-formal education, “Education is institutionalized, intentional and planned by an education provider. The defining characteristic of non-formal education is that it is an addition, alternative and/or a complement to formal education within the process of the lifelong learning of individuals. It is often provided to guarantee the right of access to education for all. It caters for people of all ages, but does not necessarily apply a continuous pathway-structure; it may be short in duration and/or low intensity, and it is typically provided in the form of short courses, workshops or seminars. Non-formal education mostly leads to qualifications by the relevant national educational authorities or to no qualifications at all. Non-formal education can cover programmes contributing to adult and youth literacy and education for out-of-school children, as well as programmes on life-skills, work skills, and social or cultural development” (<https://uis.unesco.org>).

From the above discussions, we may classify theatre as a mode of non-formal education which tries to impart informal education with

a particular intention for a close tally of what formal education offers us at the time of curriculum-based teaching. For example, theatre can focus on the following areas such as:

- a. Parental alcohol and drug-taking
- b. Neglect
- c. Parental mental health illness
- d. Bereavements
- e. Emotional abuse
- f. Physical abuse
- g. Sexual abuse
- h. Domestic violence
- i. Loss, separations, complex family relationships etc. (Delaney, 2009, Ch.:5:63).

These all are risk factors of the society. Theatre often deals with certain problems as their pivotal theme for on and off stage to make people aware about. There are many more issues like global warming and climate change, sustainable life, women empowerment, necessity for literacy etc. come to share the ground as a main issue (ibid:148-155). In this regard, we would like to talk about ‘dramaturgy’ which directs to planned and unplanned learning with a particular learning design and outcome for anticipated and unanticipated outcome (Beard, Wilson, 2010, Ch. 5:112). Martin, Franc and Zounkova drew a pioneering framework of experiential ‘dramaturgy’:

“Dramaturgy means ‘the art of theatrical production’, the main task of which is to examine the links between the world and the stage. The ‘dramatist’ chooses themes from society and a place that reflects these themes. Pieces of work and music are then chosen to reflect these themes” (ibid). They referred Holec in this regard:

“This term, known rather from the sphere of theatre, film and TV, became one of the most often used in recent years. Dramaturgy is a method of selection and time order of the activities with the aim to teach maximal pedagogical effect. It integrates, within itself, the questions (and also answers) concerning the participants on the course (their age, mental and physical maturity.....), time and space. The key thing for all dramaturgy considerations is to determine and realise the pedagogical, educational, recreational and other aims which the course wants to teach” (ibid).

Here from this perspective, we would like to bring out a survey report and case study of a particular theatre performed in an open space. A survey on audience's reaction for seeing theatrical performances was done for three months (03/01/2010-06/03/2010) in different villages of six Blocks. The report was submitted to the Howrah District Planning Committee in 2010. There were three groups of theatre namely, Natadha, IPTA (Howrah) and P.R.T. (Howrah) and there were 28 shows in number. We are not taking all in our discussion. Only 'Manab-Zami', a theatre performed in an open space by Bauria P.R.T. has been discussed with details of audience reaction. There were two-fold aims to be undertaken by the project:

1. To analyse the problems and prioritise the issues to be addressed
2. To set the indicators of women development and its initial evaluation.

The project also had a deep focus side by side with some several issues like the number of drop-out girl-students in the 2009 academic year, haemoglobin percentage of women from the age group of 12-50 years, average income of the members of self-help groups in the respective areas and etc. We take all the details from the director of P.R.T. (People's Reparatory Theatre), Bauria, Shri Utpal Fauzdar, along with document for the paper. He gave us his consent to use all the documents for the development of our research work.

Now, we are going to narrate the storyline of 'Manab-Zami'. It is a story of two parallel life and its perspectives, one is for war and the other is for fundamental qualities of like. The first is represented by a king of Abantipur who was a war-monger and the other part is represented by Sarama who championed life and its continual flow forever. The king was defeated in a war against Suratpuri and the General of his soldiers flew away. The king also had to fly away but always craved for another war secretly. He searched for a new person on whom he could invest the responsibilities of making new troupe of soldier. At last, he remembered Subal, the son of a farmer of a village under his kingdom; once he defeated a wrestler and won a medal. He called for him and told him about his wish. But Subal did have no specific idea about war especially about its rules and regulations. And moreover, his wife, Sarama was expecting a child. The situation got twisted when Subal and Sarama had a still baby. The queen also gave birth a healthy child on the same night. With the help of Baidya

raj, the children got exchanged and the king was informed that the queen had bred a dead child. The king broke down. Now Baidya raj had the opportunity to reign over the kingdom but not publicly. He started his work from those sections of people who were unfed, had no shelter, no education and even they didn't think of their treatment. But the work was not so easy. With direct communication with such chosen section of people, he gradually realised that they were not groomed to think upon what they should have; even they had almost lost their sense of distinction of good and bad. Sarama was assigned for the face of 'conscience' for everyone. Subal helped her in this task. They set up 'pathsalas' which were destructed by war. They arranged for child-education in morning shift and adult education in the evening session. Not only that, they preached for healthy and nutritious food for women and children, self-help projects for women so that they can afford for themselves and also they preached against liquor addiction the script allowed to demolish pubs in front of public so that it can send a direct message, taking alcohol is not only bad for health, but it can destroy something greater than that, mental peace and ability of thought and action. The theatre has a strong conviction that 'country' is not any abstract idea. Rather, people are integral part of a country. If people live peacefully and consciously, the sense of being their good is also make the goodness for the country. Thus, a parallel life against the concept of war bred through the well-knit plot with an approach to all to focus into the basic qualities of life.

The theatre makes a focus on several issues:

- a) Women empowerment
- b) Protest against alcoholism,
- c) Domestic violence
- d) Education for all
- e) Campaign for self-help group
- f) Focus on any social problems

There is a chart now shown on for the dates and places of this show in different villages with particular feedback of audiences. The chart also includes the number of presence of audiences here:

Table 1

Date	Block	Gram Panchayet/ Villages	Spectators
03/01/2010	Shyampur-I	1. Balichaturi 2. Ulughata (Khurigachhi)	140-150 250
24/01/2010	Uluberia-II	Joargori (Madhubati)	400
11/02/2010	Shyampur -II	1. Ajodhya (Belpukur) 2. Nakol (Naul)	180-200 400
12/02/2010	Uluberia-I	1. Barberia (Boalia) 2. Hatgachha (Kharia)	120-130 220-250
24/02/2010	Bagnan -II	Orphuli (Chak-Kamala)	250
03/03/2010	Bagnan -II	1. Bantul 2. Baidyanathpur	400
05/03/2010	Bagnan -I	1. Nabasan 2. Kalyanpur (Birampur)	140-150 400
06/03/2010	Uluberia II	Khalishani (Jagannathpur)	420-450

(Survey was done by Howrah District Planning Committee in 2010)

Now, we are going to put some random sample feedback from audiences present to see the theatre. From every Block, we have taken at least one feedback to show people's reaction after watching theatre. Feedback was taken on the same day mentioned above in the chart. With it, we are very much keen to prove about our very hypothesis how much well-sufficient a theatre is to education people, the mass, who have no formal degree of education. Rather, they are very good to understand how and why life skill should be enhanced and what should not be done for the purpose of well-being for themselves as well as the society. The responses are:

Table 2

Name of the Block	Responding people	Responses
Shyampur Block	A primary school teacher A student of Eng. Hons. (B.A. Part-I)	“Without knowing anyone, how easily people share their problems with you depending upon their faith and the theatre we have just seen”. “What the theatre has shown us is day to day reality. Now, we have a hope that theatre can speak for us”.
Uluberia -II	A group of local people	“No sign of women-empowerment. Every word of ethics doesn’t get materialised. Relationship between Sarama and Subal can be an example for inner chemistry between men and women relationship”.
Shyampur -II	An activist of Literacy Mission A mid-aged woman	“Wonderful story-telling technique to attract and motivate people through theatre”. “For the first time, I have realised that we are country and vice-versa”.
Uluberia -I	An age group of 17-18 years old girls	“When Sarama said about the division of food in a poor family between a son and a daughter of a poor family, we find out our real picture. It is true what she has said. Not even proper medication has been provided for the girls of our houses. Girls are almost neglected”.

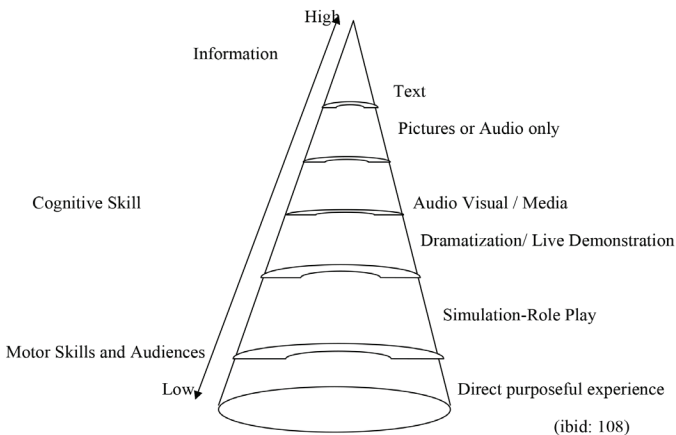
(Survey of feedback was done by Howrah District Planning Committee in 2010)

From above responses, we may satisfy our hypothesis how convincingly theatre educate people by igniting their conscience. To discern the responses cited above, we may feel that girls of the family make aware about their own rights and necessities. The elders of the family must have a realisation that daughters should be equally treated with boys of the family. Relationship between husband and wife should be strong enough to make a happy family and provide a better future for children as well as future society. In this regard, this is quite common that men of the families take alcohol almost every day. This show also has a scene that pub houses are being destroyed. In this regard, we must mention a feedback of an audience of Balichaturi Village of Shyampur Block –I: the man accused theatre group for not receiving any allotment what the government had

announced for the children of SC/ST. He claimed that he informed it from TV/Radio. Moreover, he demanded that what the troupe had shown was just a hoax, nothing was true. Suddenly an aged woman came forward with a prominent question that what he should say about taking liquor almost every day. The scene where pubs and ale-houses were destructed was applauded so much as that was a basic problem of every house in villages.

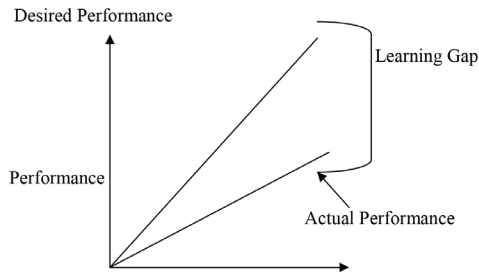
***What Boud, Cohen and Walker said about experiential Learning is that:***

“Experience is created in the transaction between the learner and the milieu in which he or she operates – it is relational. An event can influence the learner, but only if the learner is predisposed to being influenced. Similarly, the learner, can create a fruitful experience from a limited event, but only if there is something with which they can work” (Beard, Wilson, 2010, Ch:5:107). A geometric figure of a cone is presented here to make our hypothesis tally how theatre educates people:



Experiential learning becomes useful when it is activated in four-fold structure: social, physical, creative and psychological (ibid:113). The following diagram proves how experiential learning makes the gaps in learners:





(Alternating time and place to increase learning)

(ibid: 114)

For creative experiential learning programme, we have adapted basic typology offered by Beard in 1998 among which:

- i) To focus on target or to make objectives for fix up upon ‘state of Mind’
- ii) With physical movement, people, acting, information, exercises, create a ‘journey of destination’
- iii) Allow public participation for intelligentsia
- iv) Create the sequence of body, mind and spirit with the help of social, mental, physical and psychological activities.
- v) Adjust with ‘reality’
- vi) Stimulate ‘senses’
- vii) Use constructive or destructive activities sometimes by physical activities, sometimes with clue
- viii) Offer the atmosphere to take challenge or risk for the good
- ix) Allow to stretch personal boundaries of people
- x) Allow ‘story of experiences’ to be told in the form of feedback.

(ibid:115)

There are so many definitions on ‘education’. Richard Peters in his ‘Ethics and Education’ (1966) mentions some of the definitions among which the most appropriate one in this regard, is, “The processes of education involve at least some understanding of what is being learnt and what is required in the learning, so we could not be ‘brain-washed’ or ‘conditioned’ into education, and some minimal voluntary participation in such processes” (Routledge, 1999:70-71). Theatre makes such space. Theatre provides some

significant education of life such as to take voluntary decisions, for making introspection, the teleological imperatives etc. When we take a response against alcoholism, doesn't it throw enough light for introspection? Renaissance provides the platform of taking responsibility of a man for his own action and its consequences. This teleological imperative is such 'intentionality' of a man which serves a key-factor of his mind and action. Goal-oriented behaviour is such an offer which knowingly or unknowingly drags the audiences around to reach to their conclusion. Now voluntary decision is not stood apart (McFarland, 2016:81-86).

We have chosen open-space theatre for the purpose of education. This is not because Bauria P.R.T. has performed theatre in an open space, or, Manb Zami is a theatre enacted in an open space. Rather, open space theatre can well-apprehend the nature of its audience. All sorts of viewers ate there. They may be vocal or non-vocal, responsive, irresponsive, may be active, may be passive, may be literate, may be illiterate, may be financially balanced, may be poor; may be culturally sound, may be very blunt, but, everybody has direct scope to interact face to face with the performers. Now while acting with such issues regularly related to their lives and livelihood, their problems and struggle, they are very much keen to the performance, as if, it is their own story. This may happen also because, there is no artificiality of light, camera, sound and action, no loud make up is there to provide any other circumstances. Within such framework, open-space education is a connection of idea of education for democracy. According to Brazilian educator and philosopher Paulo Freire, "education involves action:the educated person is not a passive recipient of knowledge, but someone who actively seeks to change the world. Hence, education has a strong moral dimension" (Wood, 2011, Ch. 6:123). We do agree with Freire that theatre performed in an open space obviously serves the purpose.

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# Spatial Analysis and Assessment of Child Health Risk and Vulnerability in West Bengal: A Geo-Medical Study

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## Abstract

Children are the future and most important asset of a society as well as a nation, and good health status of children is the wealth of that nation. Therefore, to ensure the progress of a healthy nation child health must keep protected. In this context main focus of the study is to identify spatial inequalities and variations and spatial pattern of different health risks among children of different districts of West Bengal. Fourth round District Level Household Survey (DLHS-4) data has been used here to make this analysis. These filtered secondary data has been transformed into tertiary data set and then various statistical calculations, cartographic techniques have been made by using Microsoft Excel 2013, IBM SPSS 23 software and different mapping have been created by using Q-GIS 2.12. In this study, health vulnerability has been considered based on three main index parameters like malnutrition, morbidity and immunization. The districts, which are consider as most vulnerable or moderately vulnerable in child health, are not equally poor from each aspects of these three parameters. Government must take adequate measures to mitigate these risks or health problems and to resist the prevalence of these risks. Beside this general people or parents of the study area must aware regarding the causes and effects of malnutrition, morbidity and immunization.

**Keywords:** *Malnutrition Index, Morbidity Index, Immunization Gap Index, Child Health Vulnerability Index*

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## Introduction:

Children are the future and most important asset of a society as well as a nation, and good health status of children is the wealth of that nation. Therefore, to ensure the progress of a healthy nation child

health must keep protected. In this context, it is globally recognize that nutrition and health status, both are indispensable part of each other. Therefore, the investment in health and nutrition may counted as another mode of great human capital investments for low-income social group or developing countries (Grossman, 1972; Becker, 1975; Edward and Grossman, 1978; Behrman and Deolaliker, 1987; Behrman, 1988). This nutritional and health status of children is can be represented by infant mortality rate. During last decade, the rate of infant mortality is declining, but still it is estimated as 57 deaths per thousand live birth. (DLHS 3, 2007-08). This rate is much higher in rural area than urban in India. The position of West Bengal is becoming good year by year among other state. It is now 31 death per thousand live birth (Census of India, 2011). Therefore, the health status is becoming better in West Bengal during last decade. Nevertheless, not all districts of the state are developing from this aspect in it very equally. Variation in socio demographic, eco-cultural and political condition as well as difference in regional development over the study area have made the difference in health status of children. Some district has developed the health status of under-five children. But some district are lagging behind in different health issues of children. Therefore, to ensure secure good health condition of under-five children of entire state, backward districts must bring out from different health risk of their children.

## **Objectives**

Focus of the study is to identify spatial inequalities and variations among different districts in the study area from the aspects of different dimension of health risk and health vulnerability. There is also an attempt to assess different types of health risk among the children of different districts of West Bengal and classify those districts into different level of child health risk. Therefore, based on all these risk factor the districts of the study area have to classify into different category of health vulnerability and to identify most vulnerable districts from this angle.

## **Study area**

Although the study area comprises of twenty-three districts at present, but when the survey was done there were only nineteen districts. Therefore, the data has been collected on nineteen districts. Hence, this study has been done on nineteen districts.

Since the last decade, West Bengal is developing year by year from the aspect of child health in the whole country. Till now West Bengal have not reach at the satisfactory position in this matter. On the other hand, regional imbalance in socio economy, culture, demography as well as overall development has created different kind of health risk among under-five children of the study area. Although, some districts have come out from severe health vulnerability of child, some are not. This scenario lay behind to analyze health risk and vulnerability of children of these nineteen districts.

### **Database and Methodology**

The data on child nutrition, morbidity and immunization have been collected from fourth round District Level Household Survey (DLHS-4), conducted in 2012-13 by International Institute for Population Science (IIPS) in collaboration with Ministry of Health and Family Welfare, Government of India. The survey was made on a total sample of 6322 children for nutritional status, 1627 children for immunization status and 7358 children for morbidity status. In this context, the children only who were born and surviving since 01.01.2008, selected as sample child. The data regarding low birth weight baby has been collected from Ministry of Health and Family Welfare, Government of India.

These filtered secondary data has been transformed into tertiary data set and then various statistical calculations, cartographic techniques have been made by using Microsoft Excel 2013, IBM SPSS 23 software and different mapping have been created by using Q-GIS 2.12.

To show spatial inequality in different indicators of child malnutrition, morbidity and immunization gap of the study area Lorenz Curve and Gini Coefficient has been created.

Beside this, inter district variations of these selected indicators have been determined by coefficient of variation.

$$\text{Standardized Index} = \frac{\text{Actual Value (X)} - \text{Minimum Value (X}_{\min})}{\text{Maximum Value (X}_{\max}) - \text{Minimum Value (X}_{\min})}$$

Where,  $\sigma_j$  Standard deviation of the  $j^{\text{th}}$  variable and,  $X_j$  = Mean of the  $j^{\text{th}}$  variable.

In this study child health risk and vulnerability has been determined by different indices. To construct malnutrition index,

morbidity risk index and immunization gap index, values of each selected indicators of every dimension have been standardized by the given formula.

$$\text{Standardized Index} = \frac{\text{Actual Value (X)} - \text{Minimum Value (X}_{\min})}{\text{Maximum Value (X}_{\max}) - \text{Minimum Value (X}_{\min})}$$

These standardized values of every selected indicator of each dimension of different districts of the study area have been combined with certain weighted to construct some indices like, Child Malnutrition Index, Child Morbidity Index and Immunization Gap Index. Therefore, Child Health Vulnerability Index has been determined by certain formula.

$$\text{Child Health Vulnerability Index (CHVI)} = \left[ \left\{ (X)^{2/3} \right\} * \left\{ (Y)^{1/3} \right\} * \left\{ (Z)^{1/4} \right\} \right]$$

Where, X= Child Malnutrition Index; Y= Child Morbidity Index; Z= Immunization Gap Index

## Result

### *Child Health Risk*

#### **Malnutrition**

Under nutrition or Malnutrition is a serious health risk of children. It is strongly connected with child mortality rates (WHO, 1983). Malnourished children are trend to face simultaneously different risk of morbidity and mortality (Mosley & Cowley 1991; Griffiths *et al.* 2002).

In early stage, children who are surviving with malnutrition, most likely being affected with chronic illness and different physical or mental disabilities (Smith & Haddad 2000; Rajaram *et al.* 2007). Here Nutritional status of a child is determined through (NCHS and WHO, 1995) different anthropometric indices (Strauss *et al.*, 1995; Kakwani *et al.*, 1997; Ulijaszek, 1997; Pal, 1999; Svedberg, 2001; Cogill, B. 2003;) which are derived by specially height/length, weight in combination with age. These indices are further categorize into Z-score classification system (Onisde M. *et al.*, 1997; Cogill, B, 2003). Thus, the children whose height/length for age (HAZ), weight for age (WAZ), and weight for height/length (WHZ) are less than -2.0

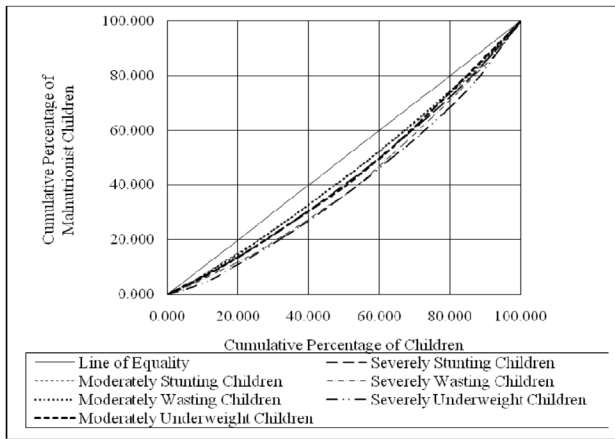
standard deviation from its mean, identified as mal nutrition affected children.

In this context less than 3.0 standard deviation Height for age (HAZ), Weight for age(WAZ) and weight for height (WHZ) of a child from the mean of total surveyed children of each district has been identified as severely malnutrition affected child. In addition, the children whose HAZ, WAZ and WHZ is laying between 3.0 standard deviation to 2.0 standard deviation are consider as moderately mal nutrition affected children. In this study these three measures of malnutrition has been represented by three malnutrition indices. Like, Stunting Child Index, Underweighted Child Index, and Wasting Child Index. These three index has been constructed by aggregating standardized value of severely malnutrition-affected child with two third weight and moderately malnutrition-affected child with one-third weight. Therefore, six indicator have been selected primarily to construct this mal nutrition index. These are, (i) percentage of children whose height for age are less than 3.0 standard deviation from its mean; (ii) percentage of children whose height for age are laying between 3.0 standard deviation to 2.0 standard deviation from its mean; (iii) percentage of children whose weight for age are less than 3.0 standard deviation from its mean; (iv) percentage of children whose weight for age are laying between 3.0 standard deviation to 2.0 standard deviation from its mean; (v) percentage of children whose weight for height are less than 3.0 standard deviation from its mean; (vi) percentage of children whose weight for height are laying between 3.0 standard deviation to 2.0 standard deviation from its mean.

### **Spatial inequality and variation in malnutrition**

Inequality and variation of the above-mentioned variables are noticeable in the study area (Figure 1). It has been observed that inequality in case of severely malnutrition-affected children is higher than moderately malnutrition affected children in the study area. Gini coefficient values of each indicators (Table1) are also representing that.





**Figure 1:** Spatial inequality in different indicators of mal nutrition in West Bengal, 2012-13

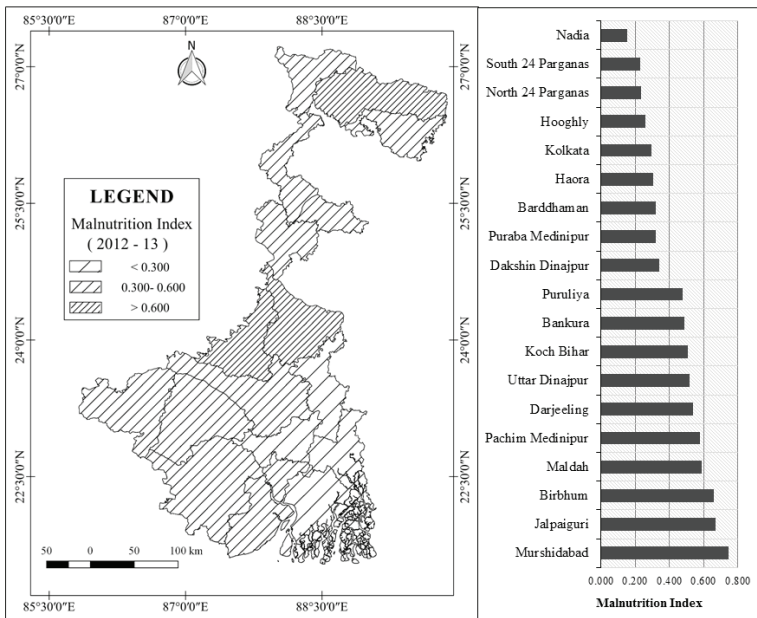
On the other hand, variation in each indicator is also noticeable (Table 1). Variation in severely malnutrition-affected children is higher than moderately malnutrition affected children over the study area.

**Table 1:** Spatial variation and inequality in different indicators of malnutrition in West Bengal, 2012-13

Indicator	Mean	Standard Deviation	Coefficient of Variation	Gini Coefficient
HFA_<3SD (Severely Stunting)	20.6895	5.6157	27.1430	0.1406
HFA_3SD_2SD (Moderately Stunting)	17.2632	3.5132	20.3508	0.1121
WFA_<3SD (Severely Underweighted)	15.1053	5.3906	35.6867	0.2011
WFA_<3SD_2SD (Moderately Underweighted)	22.0737	5.4342	24.6186	0.1353
WFH_<3SD (Severely Wasting)	14.4579	4.8706	33.6880	0.1804
WFH_<3SD_2SD (Moderately Wasting)	12.8053	2.6871	20.9844	0.1088

### Spatial pattern of malnutrition

Malnutrition index has been determined to represent level of malnutrition over different districts of West Bengal. Malnutrition index of child is just a simple geometric mean of Underweighted Child Index, Stunting Child Index and Wasting Child Index. It can be pointed out from the map (Figure 1) that the district situated on Ganga delta, like Nadia, North 24 Parganas, Hooghly, Kolkata and South 24 Parganas represent low vulnerable condition in comparison to other districts of the study area. In this context, the situation of Jalpaiguri, Birbhum and Murhidabad is very poor. Rest of the districts are representing relatively moderate condition in malnutrition.



**Figure 2:** Spatial pattern of Malnutrition among under five children in different districts of West Bengal, 2012-13

### Childhood Morbidity

Different types of short term and long term physical illness or disease determine morbidity of a child. Just after birth an infant, go through different kind of health risk. This is the crucial period to protect their health from any type of health problems, complications, disease and ailments. But in West Bengal, influenced by different

socio-demographic, eco-cultural and religious condition every parents cannot provide them adequate medical and healthcare service and facilities. Moreover, many times they ignore serious health complications of their child due to lack of knowledge. Therefore, an infant have to face different health risk, which affects their physical and mental health up to age of 5 years.

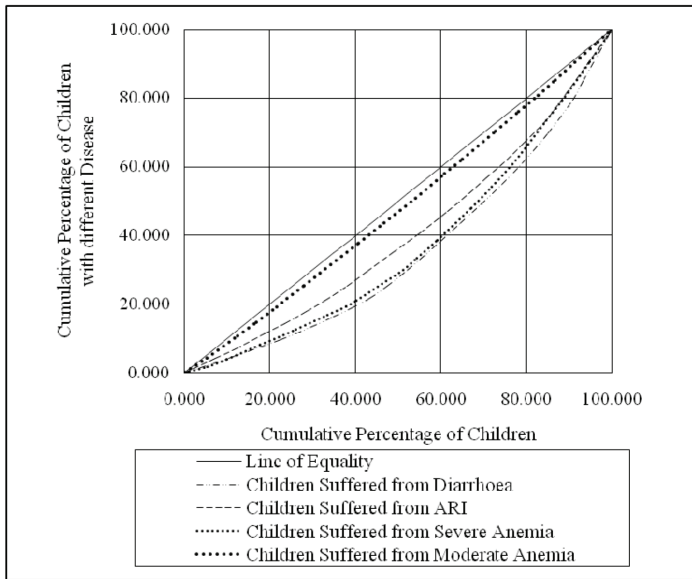
Anemia is most harmful long-term disease faced by children due to malnutrition and lack of adequate food intake in different socio-economically backward region of West Bengal. 86.4 percent of child in the state are surviving through any kind of anemia ( $<11.0\text{g/dl}$ ) and 6.3% are surviving with severe ( $< 7\text{g/dl}$ ) anemia (DLHS 4). Different research works have been shown that this anemia during childhood is associated with different harmful serious health risks including changes in immune response, deprivation in behavioral and cognitive development (Lozoff, B, *et al.*, 1991, Irwin, JJ *et al.*, 2001, McCann, JC, *et al.*, 2007) growth reduction and morbidity and mortality increase (Passi, S.J. *et al.*, 2001, Brabin, BJ. *et al.*, 2001)).

In addition, acute respiratory infection (ARI) and Diarrhea, which can cause infant death, are most common short-term disease affected by under five children in different parts of the study area. Diarrhoea is a leading cause of under-five child mortality and morbidity (Pahwa S. *et al.*, 2010; Kotloff, KL. *et al.*, 2013; Walker, CLF. *et al.*, 2013; Akanda AS. *et al.*, 2014).

These three types of disease here taken under consideration to analyze the morbidity index of children. To determine morbidity profile of a district four indicators have been selected. These are i) percentage of children suffered from severe anemia and ii) moderate anemia iii) percentage of child got affected by diarrhea and ii) acute respiratory infection (ARI).

### **Spatial inequality and variation in morbidity**

There are a remarkable inequality and variation among the indicators of morbidity over the study area (Figure no. 3). In case of child affected by diarrhoea and severe anemia, the inequality is more or less same in the study area and much higher than moderate anemia, ARI affected child. (Table No. 2). Therefore, a trend has been found among the children of West Bengal to be affected generally by moderate anemia. Comparatively prevalence of severe anemia and diarrhoea is low in the study area.



**Figure 3:** Spatial inequality in different indicators of Morbidity among under five children in West Bengal, 2012-13

Coefficient of variation values (Table No. 2) of these four indicators also tells that a huge variation is found in case of prevalence of severe anemia and diarrhoea than the other indicator among the children of different districts of West Bengal.

**Table 2:** Spatial variation and inequality in different indicators of child morbidity in West Bengal, 2012-13

Indicators	Mean	Standard Deviation	Coefficient of Variation	Gini Coefficient
Severe Anemia	6.752632	3.288763	48.70343	0.267504
Moderate Anemia	79.17895	6.351166	8.021281	0.043158
Diarrhoea	3.278947	1.814319	55.33237	0.297178
ARI	10.56316	3.804852	36.02003	0.19909

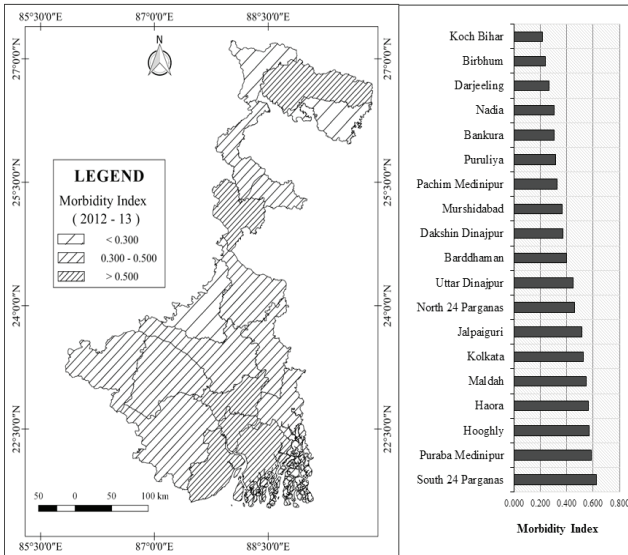
**Spatial pattern of morbidity**

The standardized value of selected indicators have been aggregated with a certain weighted to determine Child Morbidity Index (CMI). Therefore,

$$\text{Child Morbidity Index} = \left[ \left( \frac{2}{5} SA \right) + \left( \frac{1}{5} MA \right) + \left( \frac{1}{5} D \right) + \left( \frac{1}{5} ARI \right) \right]$$

Where, SA= Severe Anemia; MA= Moderate Anemia; D= Diarrhoea; ARI= Acute Respiratory Infection.

To construct this index more weightage has been given on percentage of anemia-affected children as it is most harmful, common long-term disease, among under five children in the study area and influences other short-term disease to grow easily in infant body. There are variation in level of morbidity among different district of West Bengal. According to this morbidity index, all districts of the study area have been classified into three category to represent their different level of morbidity among under five children (Figure 4). In this case South 24 Parganas, PurbaMedinipur, Hooghly, Haora, Maldah, Kolkata and Jalpaiguriare representing very poor and vulnerable situation comparatively whereas, Koch Bihar, Birbhum and Darjeeling relatively not in too vulnerable position in this matter. Other than these mentioned districts, whole area represents moderate morbidity risk.



**Figure 4:** Spatial pattern of Morbidity among under five children in different districts of West Bengal, 2012-13

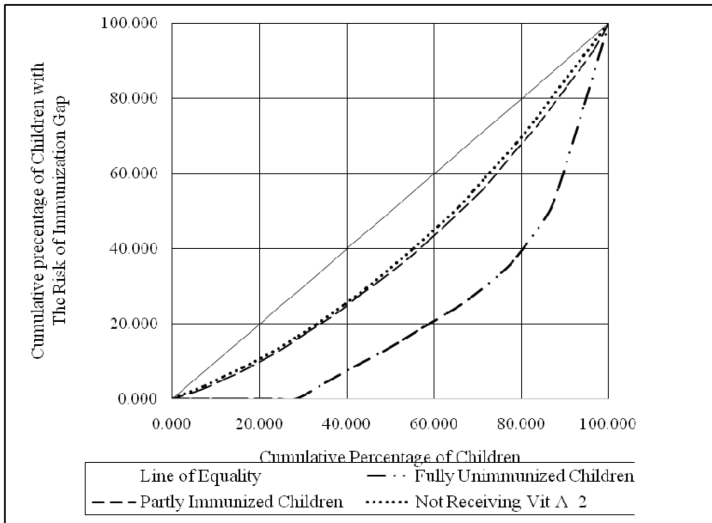
### **Immunization Gap**

Immunization protects child's health from different dangerous diseases, (UNICEF) impair illness, disabilities and saves many lives per year (Odusanya, O.O., *et al.*, 2008). This immunization process gets success, when a child be received full course of recommended vaccine. (Mustafi, M. A. *et al.*, 2013) To reduce infant morbidity and mortality, universal immunization of child has been considered to fight against six disease like tuberculosis, diphtheria, whooping cough, tetanus, polio and measles (NFHS-3, 2005-06). According to the guideline of World health organization a fully immunized child is consider when he or she has been received one dose of BCG, three dose of diphtheria, Whooping cough and tetanus (DPT), three dose of poliomyelitis and one dose of measles within the age of 12 months. Nevertheless, among many parents in different rural region of West Bengal, an unconsciousness and legacy has been noticed to immune their children fully. That is why many child of the study area have to survive with different risk of various diseases. Although, the percentage of fully immunize children has increased during last decade.

To determine immunization gap index three indicators have been selected in this study. These are i) percentage of child who had not given any vaccine ii) percentage of children who had not given full course of vaccine and iii) percentage of child who had not receive any dose of Vitamin-A<sup>2</sup>.

### **Spatial inequality and variation of immunization gap**

A huge inequality is found here in case of the selected indicators of immunization gap. In case of the children had been given none of any vaccine the inequality is highest in the study area. It reveals that major portion of the children of West been has been taken under immunization. Whereas these children of the study area, have not been fully immunized and brought under immunized by any dose of vitamin A<sup>2</sup>. The situation has been found to be too close in case of partly immunized children and the children receiving no dose of vitamin A<sup>2</sup> in the study area.



**Figure 5:** Spatial inequality in different indicators of immunization gap in West Bengal, 2012-13

Therefore, among the people of west Bengal a legacy is being found to immune their children fully and with any dose of vitamin A<sup>2</sup>. Beside this, inter district variation in case of fully unimmunized children and partly immunized children is higher than the children receiving any dose of vitamin A<sup>2</sup> in the study area (Table).

**Table 3:** Spatial variation and inequality in different indicators of immunization gap in Wet Bengal, 2012-13

Indicator	Mean	Standard Deviation	Coefficient of Variation	Gini Coefficient
No Vaccine had been given	1.5789	1.9147	121.2664	0.5603
Not Fully Immunized	21.3737	9.0511	42.3468	0.2259
Not receive any dose of Vitamin A <sup>2</sup>	37.8736	13.1482	34.7161	0.2012

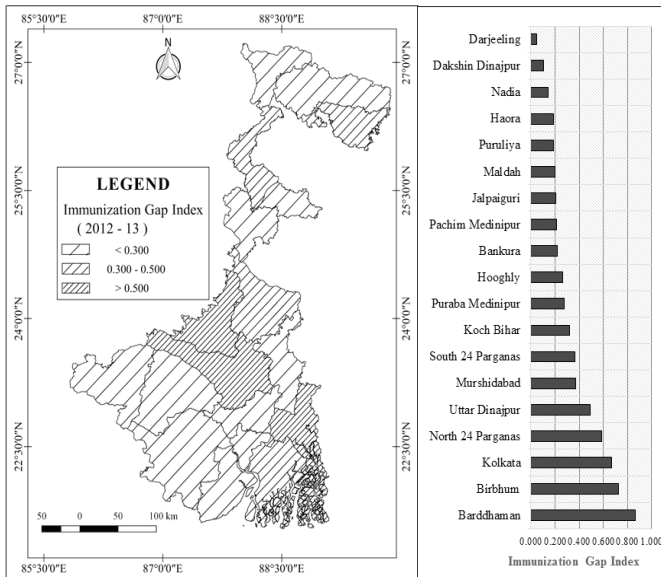
**Spatial pattern of immunization gap**

Immunization gap index has been determined by aggregating standardized values of these three indicators with certain weighted. Therefore,

$$\text{Immunization Gap Index} = \left[ \left( \frac{1}{2} \text{NoV} \right) + \left( \frac{2}{7} \text{NoFV} \right) + \left( \frac{1}{5} \text{NoVitA}^2 \right) \right]$$

NoV= None of any Vaccine; NoFV= No full Vaccine; NoVitA<sup>2</sup>= No dose of Vitamin-A<sup>2</sup>

Immunization gap index has been prepared to understand how many children are surviving in the study area with a risk of not receiving full course of essential vaccine. Bardhaman, Birbhum and Kolkata are such districts where immunization gap index is higher than other are. It reveals in these two districts, parents are not aware about vaccine or they cannot access or avail vaccination for their children. Therefore, these children are surviving through the high risk of being affected by different chronic disease. On the other hand, Koch Bihar, Uttar Dinajpur, Murshidabad and North & South 24 Parganas are representing as moderately risk porn districts for immunization gap. Rest of the districts are in better situation in this matter comparatively.

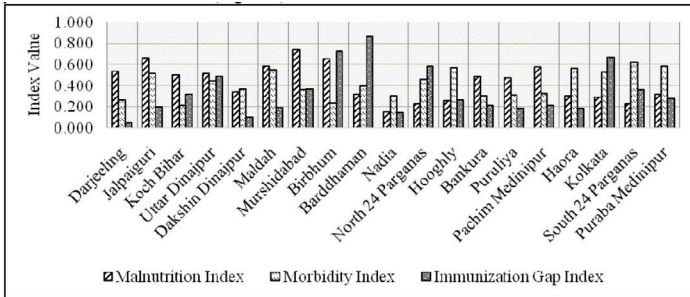


**Figure 6:** Spatial pattern of immunization gap among the children in different districts of West Bengal, 2012-13



### Child Health Vulnerability

Therefore, it is clear that not every index parameter are equally harmful for the child health vulnerability in every district of the study area. Mainly the prevalence of malnutrition among under five children is high in the districts of northern part of West Bengal comparatively. On the other hand, the prevalence of morbidity among children is relatively higher in most of the districts of southern part of the study area. Here districts wise risk level of these three indices parameter have been shown (Figure 7).



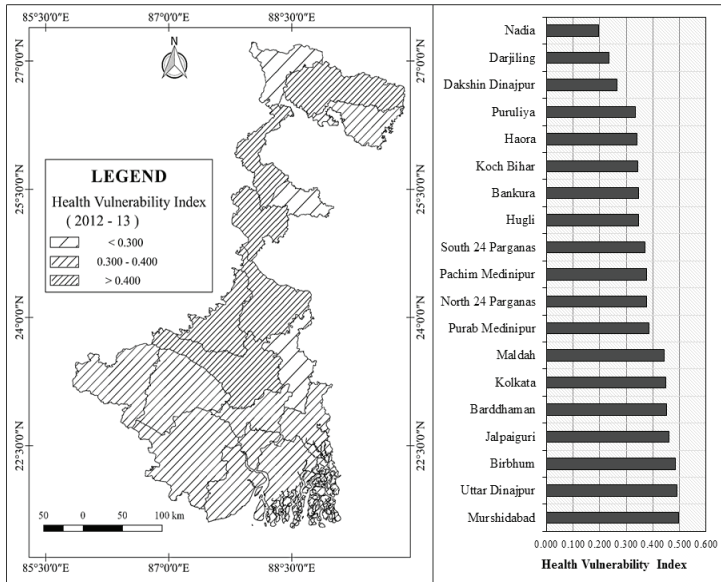
**Figure 7:** Level of different health risk in the districts of West Bengal, 2012-13

To analyze health vulnerability among under five children in West Bengal an index has been derived based on malnutrition, morbidity and immunization gap indices through certain formula.

$$\text{Child Health Vulnerability Index} = \left[ \left\{ (X)^{2/5} \right\} \cdot \left\{ (Y)^{1/3} \right\} \cdot \left\{ (Z)^{1/4} \right\} \right]$$

Where, X= Child Malnutrition Index; Y= Child Morbidity Index; Z= Immunization Gap Index.

Spatial distribution (Figure 8) of this index value shows level of health vulnerability among children in the study area.



**Figure 8:** Spatial pattern of health vulnerability among under five children in different districts of West Bengal, 2012-13

Through this index Murshidabad, Uttar Dinajpur, Birbhum, Jalpaiguri, Barddhaman, Kolkata and Maldah have come out as most vulnerable district from all these aspects of child health in comparison to other district of the study area. Whereas, Nadia, Darjeeling and Dakshin Dinajpur are not that much of vulnerable district, in case of under-five child health comparatively. A moderate health vulnerability has been noticeable in rest of the districts of the study area.

### Major Findings

- Spatial inequality is higher in case of moderately malnutrition-affected children than severe, from the aspect of stunting, underweight and wasting in the study area. Apart from some district of Ganga delta region, districts of entire northern and western portion have been considered as malnutrition affected district in the study. Among them Jalpaiguri, Birbhum and Murshidabad represents poorest situation in this case.

- Moderate anemia is identified as common problem among under five children in the study area.
- In case of immunization gap, the districts that situated in western and northern portion of the study area, are considered as backward districts since independence, shows better condition comparatively. Whereas Kolkata despite of being a metropolitan city represents very bad condition with Bardhaman and Birbhum from this aspect.
- It is quite alarming that Kolkata has come out as a vulnerable district from the aspect of under-five child health. Beside this Murshidabad, Uttar Dinajpur, Birbhum, Jalpaiguri, Barddhaman and Maldah have also been identified as vulnerable districts in this matter. In case of Jalpaiguri and Murshidabad Malnutrition is the most significant factor for health vulnerability whereas, in case of Kolkata and Barddhaman prevalence of morbidity and effect of immunization gap are accountable. Thus in the district of Uttar Dinajpur and Birbhum malnutrition and immunization gap among the children are most responsible for under-five child health vulnerability.

## 7. Conclusions

In this study, health vulnerability has been considered based on three main index parameters like malnutrition, morbidity and immunization. The districts, which are consider as most vulnerable or moderately vulnerable in child health, are not equally poor from each aspects of these three parameters. Government or different have to identify first which parameter is more influential for the vulnerable situation; therefore, they should have taken adequate stapes to resist or to stop each risk factor or indicator of the index parameter. As an example it can be say that in this study Jalpaiguri, Uttar Dinajpur, Birbhum, Murshidabad, Barddhaman and Kolkata have been identified as most vulnerable districts in case of under-five child health. Government have to take policy to bring out these districts from that situation. In this way, firstly government must identify which index parameter of child health is most harmful for a particular vulnerable district and have to take necessary stapes to mitigate this cause first. Thus it can be analyze that in case of Jalpaiguri, prevalence of malnutrition among the children is most significant. Therefore, government must

stapes forward to save the children from the outbreak of malnutrition in this district.

Some risk indicator of these three index parameter are affecting more to the under five children of the entire study area. Government have to take adequate measures to mitigate these risks or health problems and to resist the prevalence of these risks. Beside this general people or parents of the study area must aware regarding the causes and effects of malnutrition, morbidity and immunization. And they must also come forward to bring out their children from different kinds of health risk. In this way, through some balanced collaborative activities with different Governmental & non-governmental organization and child health conscious parents, children of the study area may bring out from vulnerable health situation.

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# **Disease Profile and Human Resources: A Study of Labpur C.D. Block, Birbhum District**

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## **Abstract**

Diseases and human resources are the important aspects of research in the field of social sciences and planning. Diseases adversely affect the body and mind of a person and in turn deteriorate both the actual and potential human resources. As diseases and human resources are the important aspects of human ecological system, the study of them becomes necessary for human well being. There is inadequacy of literature on the definition of disease. Webster defines disease as a condition of an organ, part, structure or system of the body in which there is incorrect function resulting from the effect of heredity, infection, diet or environment. It is also deranged or depraved condition in which the performance of vital functions of body or mind is interrupted. The oxford English dictionary defines disease as a condition of the body or some part or organ of the body in which the functions are disturbed or deranged. Both are the parts of human life where disease is solely a negative force and human resources are positive force. Disease stands for illness and is related to health of a person whereas human resources stand for working capability and is the result of mental and physical health. Types, nature and profile of disease depend to a great extent on age structure, social groups, gender, marital status, occupation, education, life style, migration, food and nutrition of a region's human resources. Health is an indicator of human resource development and important source of physical and mental development and human productivity (Gopal, 1996). Health and human resources sometimes connote the same meaning. Incidence of diseases such as parasites, malaria and tuberculosis are considered as important indicator of human resource development (Harbison, 1973). Human resource is the composite form of quantitative and qualitative attributes of individuals. Diseases do not act positively in the progress of human resources. This paper focuses on the profile of diseases across human resources of different age groups, social groups, economic sectors as well as on the matrix of multiple

diseases of surveyed individuals. This study is exclusively based on the primary data collected from sample households of Labpur C.D. Block.

**Keywords:** *health, disease profile, human resources, social well being.*

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## **Introduction**

Incidence of disease and levels of human resources and its development are not static but vary between places and over time. Diseases is the result of the maladjustment of the biological processes with the natural and cultural milieu and human resources is the outcome of education, training, health, food and nutrition and of other health ameliorating elements of social, cultural, economic and environmental groups. Disease is the outcome of the maladjustment of the biological processes with the natural and cultural environment in which these processes work (choubey, 1985).

The type of natural and cultural environment, food and nutrition has to do much with the type of disease.

Disease being a negative factor adversely affects the quantitative and qualitative elements of human resources by affecting body and mind. It snatches away the working or functional ability or capability of any individual by weakening or deteriorating the normal functioning of mind and body. It reduces the immunity and resistance of a person's body to fight against a particular disease. Disease represents death rate, morbidity and mortality rate, health or human resource situation, health care, health delivery and health resources, etc.

## **Definition and classification of diseases**

There is inadequacy of literature on the definition of disease. Webster defines disease as a condition of an organ, part, structure or system of the body in which there is incorrect function resulting from the effect of heredity, infection, diet or environment. It is also deranged or depraved condition in which the performance of vital functions of body or mind is interrupted. The oxford English dictionary defines disease as a condition of the body or some part or organ of the body in which the functions are disturbed or deranged. From an ecological point of view, disease is defined as maladjustment of the human organism to the environment. From a sociological point of view, disease is considered as a social phenomenon which disturbs the social structure (Park and Park, 1983). From geographical point of

view disease may be considered as a nature and human induced cause which disturbs the normal functioning of physiological organs or part and turn deteriorates the mental and physical capacity or capability of an area's human resources in time.

Diseases may be classified as communicable diseases and non-communicable diseases (Park and Park, 1983). The former includes respiratory, intestinal, anthropoid-borne, surface infection etc. and the later includes cancer, cardiovascular, diabetes, blindness, etc. Respiratory disease includes influenza, whooping cough, small pox, chicken pox, measles, rubella, mumps, and diphtheria; intestinal includes poliomyelitis, vital hepatitis, cholera, typhoid fever, food poisoning, amoebiasis and ancylostomiasis; anthropoid includes yellow fever, dengue, reckettsial, plague, malaria, sleeping sickness, kala-azar, filaniasis; surface infections compromise rabbis, trachoma, tetanus, leprosy, Sexually Transmitted Diseases (STD), etc.

On the basis of length of suffering period diseases may be prolonged (chronic) and less prolonged, and depending upon its severity and acuteness diseases may be more acute or less acute, more severe or less severe. Diseases may be equatorial, tropical, temperate, sub-tropical, etc. depending upon regional or latitudinal location.

## **Objectives**

The objectives of the study are:

- (i) Profile of diseases across human resources of different age groups
- (ii) Profile of diseases across human resources of different social groups
- (iii) Profile of multiple diseases, their relative dominance in order of importance and to extend appropriate suggestions for preventing diseases for better health of the area's people.

## **Methodology**

To fulfil the objective methods like random sampling, percentage calculation, multiple disease matrix have been applied.

To accomplish the work a Community Development Block (C.D. Block) i.e Labpur of Birbhum District has been selected. This C.D. Block comprises of 161 inhabited villages (District Statistical Handbook, Birbhum, 2008) in which the share of cultivators

dominated and agricultural labourers dominated villages remains almost equal. out of the total villages seven cultivators dominated and another seven agricultural labourer dominated villages altogether amounting to around 11% were separately selected for household survey following the simple random sampling without replacement technique. Similarly, 30 households from each village were selected following the same technique. Thus, the total number of villages and households become 14 and 420 respectively to as the ultimate sample units of the study. Finally, the primary data relating to the types and number of diseases by which individuals were suffering were collected from 420 households comprising of 210 from cultivators dominated and another 210 from agricultural labourers dominated villages for synthesis and analysis of the data.

Human resources are defined as the sum total of knowledge, skill, energies, talents, attitudes, aptitudes, interest and other mental and physical capabilities actually or potentially available in all people of an area. There is variation in the concept of human resource formation. Some scholars consider only those people as human resources who are economically active and employed in gainful jobs and belonging to the working age group of 15 to 59 years. But some scholars certainly consider the total population of the region as human resources because all people possess or can possess particular quality as mentioned in definition. Therefore, concept of human resources must include all people from working age, over working age as well as under the working age except the unemployable persons who may not work and may harm the production processes. Thus, on the basis of age groups and potentially utilizable qualities human resources are classified as: infants of 0-4 years with future potentialities, school going age groups of 5-14 years children with near future potentialities, younger working age group of 15-34 years persons with more potentialities, older working age group of 35-59 years persons with relatively low potentialities and over working age group of 60+ years persons with less utilizable potentialities. Human resources also classified on the basis of social profile as religions Hindus, Muslims, Sikhs, Jains, and Higher Caste, Other Backward Caste, Schedules Caste, Scheduled Tribes. Thus, human resources being unalienable from the quantitative and qualitative characteristics of population is the outcome of physical and mental health. In other words, human resource is the composite form of quantitative and qualitative attributes of individuals.

### Location of the study area

Labpur Block is community development block of Birbhum District of west Bengal. The study area is located in between 23°46' north to 23°50' north latitudes and 87°44' east to 87°50' east longitudes. Labpur is a part of the Rarh Bengal. The average elevation of the place is 35 metres. Administratively the block falls under the Bolpur sub-division. There are eleven Gram Panchayets (GPs) namely, Hatia, Indus, Bipratikuri, Chauhatta-I, Chauhatta-II, Labpur-I, Labpur-II, Jamna, Kurnahar, Thiba, Dwarka in Labpur block. The total population of the block is 176,803 (census, 2001). On its north-eastern side lies Murshidabad District and south-eastern side lies Burdwan District

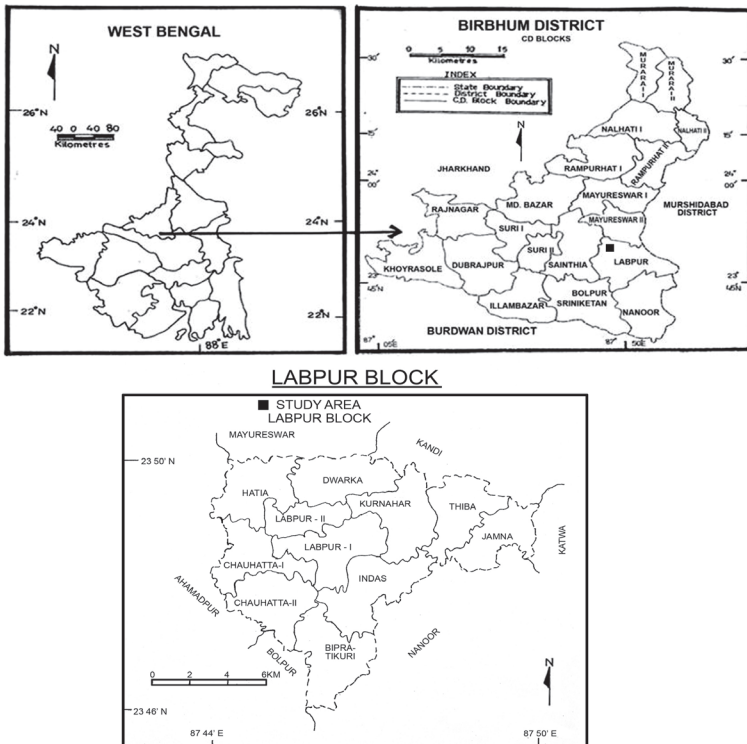


Fig.1

## **Analysis**

### ***Profile of disease and human resources***

Types, nature and profile of disease depend to a great extent on age structure, social groups, gender, marital status, occupation, education, life style, migration, food and nutrition of a region's human resources. For example, measles and whooping cough are more frequent among children, cancer and atherosclerosis among old age people, diabetes, hypertension, cardiovascular disease among the people of advancing age; ecological disease, syphilis, rheumatoid arthritis are found among women and prostatic hypertrophy, coronary artery diseases are normally found among men; cancer is more frequent among married women; pneumoconiosis, dermatitis, etc. are generally caused due to expose to a person's occupation; rheumatic heart disease, chronic bronchitis, tuberculosis, leprosy, gastric ulcer and cervical cancer are more frequent among the persons of socio-economically lower classes. The upper social groups have generally lower mortality and morbidity than lower social classes. Diseases depend on pattern of eating. Drinking, consumption of alcohol, smoking, sexual habits, etc. particularly, epidemiological disease depends on morbidity of persons (Park and Park, 1983).

### **Profile of diseases of surveyed individuals by age and sex**

Table-1 explains the variation in the profile of diseases of surveyed persons of different age groups. Here, children (future potential human resources) of below 15 years generally suffer from liver problem, skin diseases, malaria, anemia, amoebiasis, gastric, heart diseases, gallbladder stone, arthritis, gynecological diseases, asthma, etc. Most of such diseases may be due to dietary deficiency and unrestricted food habits. Less active human resources of 35-59 years of age group are found suffering from amoebiasis, gynecological diseases (females only), gastric disorders, diabetes, arthritis, skin diseases, heart diseases, cancer, tuberculosis, malaria, asthma, paralysis, etc. such diseases develop with advancing age (particularly above 40 years) of persons. Less utilizable or sensible human resources are more susceptible to gastric, skin diseases, amoebiasis, diabetes, arthritis, liver problems, heart diseases, cancer, and asthma, etc. such diseases afflict easily the old persons due to less resistance capacity to fight against diseases caused by senility. When we compare the relative dominance of diseases in order of its importance among the persons

of different age groups, we find that infants and school going children are normally less affected by the diseases which cause more damage to the persons of other age groups. This indicates better health of the children.

The percentage of liver problem and gallbladder stone is found highest among the persons of younger working age group probably because of unrestricted food and drink habits and uncared life style. Similarly, the percentage of amoebiasis, malaria, paralysis is highest among the persons of older working age group owing to weakening trend of appetite and digestive efficiency.

The percentage of heart disease, cancer, tuberculosis, gastric, anaemia, gynaecological diseases, arthritis, diabetes, skin diseases, paralysis and asthma is highest among the over working age group persons of 60 and above.

As a whole it can be said that generally the dominance in terms of percentage of each disease is found increasing towards higher age groups persons which indicates better health of lower age group persons than that of higher age group persons.



**Table 1:** Profile of diseases among surveyed rural people of different age groups in Labpur C.D. Block, 2017

Name of the Diseases	Age Groups (in years)												Total	
	0-4		5-14		15-34		35-59		60+		Male	Female	Male	Female
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Female	Male	Female	Female
Heart disease	2	3	3	3	5	7	11	9	16	14	37	36	37	36
	5.4	8.33	8.1	8.33	13.51	19.41	29.72	25.00	43.24	38.88	(4.33)	(3.1)	(4.33)	(3.1)
Cancer	-	1	-	2	3	4	7	12	15	20	25	35	25	35
		2.8		5.71	12.00	11.43	28.00	34.28	60.00	57.14	(20.92)	(3.01)	(20.92)	(3.01)
Tuberculosis	-	-	2	1	6	7	9	4	17	9	34	21	34	21
			5.88	4.76	17.64	33.33	26.47	19.04	50.00	42.85	(3.98)	(1.81)	(3.98)	(1.81)
Gastric and allied problems	10	17	25	27	38	50	42	63	60	72	175	231	175	231
	5.71	7.35	14.28	11.68	21.71	21.64	24.00	27.27	34.28	32.03	(20.47)	(19.9)	(20.47)	(19.9)
Amoebiasis	7	12	20	17	42	47	47	60	41	42	157	178	157	178
	4.45	6.74	12.73	9.55	26.75	26.40	29.93	33.70	26.11	23.59	(18.36)	(15.33)	(18.36)	(15.33)
Liver problem	3	7	12	13	27	30	12	10	17	20	71	80	71	80
	4.22	8.75	16.9	16.26	38.02	37.5	16.9	12.5	23.94	25.00	(8.3)	(6.89)	(8.3)	(6.89)
Anaemia	1	5	2	7	8	15	8	24	12	35	31	86	31	86
	3.22	5.81	6.45	8.13	25.8	17.44	25.8	27.9	38.7	40.69	(3.62)	(7.41)	(3.62)	(7.41)
Gynaecological diseases	-	-	-	2	-	34	-	58	-	61	-	155	-	155
				1.29		21.93		37.41		39.35		(13.35)		(13.35)
Arthritis	1	2	2	5	7	20	17	37	29	15	56	109	56	109
	1.78	1.83	3.57	4.58	12.5	18.34	30.35	33.94	51.78	41.28	(6.55)	(9.39)	(6.55)	(9.39)

Diabetes	-	-	-	2	3	32	12	34	19	68	34
				2.94	8.82	47.05	35.29	50.00	55.88	(7.59)	(2.93)
Gallbladder stone	-	-	2	3	4	2	5	3	3	10	14
				30.00	28.57	20.00	35.71	30.00	21.42	(1.17)	(1.21)
Skin diseases	13	25	18	40	30	33	41	41	43	145	154
	8.96	16.23	12.41	27.58	19.48	22.75	26.66	28.27	27.92	(16.9)	(13.26)
Malaria	2	3	4	4	5	10	8	7	4	27	20
	7.40	15.00	14.81	14.81	25.00	37.03	40.00	25.92	20.00	(3.16)	(1.72)
C.V.A. Paralysis	-	-	-	1	-	2	1	2	1	5	2
				20.00	-	40.00	50.00	40.00	50.00	(0.58)	(0.17)
Asthma	-	-	1	1	1	3	1	10	3	14	6
				16.66	16.66	21.42	16.66	71.42	50.00	(1.64)	(0.52)
Total	39	75	90	186	247	225	345	304	393	855	1161
	(4.65)	(6.46)	(10.53)	(8.18)	(21.75)	(26.31)	(29.72)	(35.56)	(33.85)	(100.00)	(100.00)

**Source:** field survey, 2017

Unbracketed lower decimal figures are the percentages to total males or females of respective disease categories

Bracketed lower figures are the percentages to grand total of males and females

### **Profile of diseases of surveyed individuals by social groups**

Table-2 shows the profile of diseases across the persons of different social groups. It has been found that both male and female human resources of higher caste suffer more from gastric disease, skin disease, diabetes, amoebiasis, etc. Among other backward caste persons amoebiasis and gastric are the major problems. In Muslim category both males and females suffer more from gastric, amoebiasis, arthritis diseases. Scheduled caste persons suffer more from skin diseases and amoebiasis and liver problems whereas, scheduled tribes suffer more from amoebiasis, gastric, skin and anaemia. In brief, it can be said that there is not much difference in the relative dominance of diseases in order of its importance among the persons of different social groups as in all social groups gastric, amoebiasis, skin diseases, liver problems etc. are generally found as pre-dominant health affecting diseases.

When we analyse the existence of disease in order of its dominance among the persons of different social groups we find that the percentage of persons suffering from heart disease is highest in higher caste, higher in other backward caste, high in Muslim and low in scheduled caste and scheduled tribe category people. But a remarkable fact is that the percentage of males (as against females) suffering from heart diseases is higher in all social groups.

In case of cancer the percentage is higher among Muslim and scheduled caste persons and lower among the persons of higher caste, other backward caste and tribes. However, the percentage of females as against males is higher in all social groups.

Tuberculosis is a chronic bacterial disease and continues to be a serious health hazards particularly in the developing countries. The percentage of persons suffering from this is gradually higher among scheduled caste and scheduled tribe and lower among other backward and higher castes and Muslims. Gastric effects are found more or less equal among the persons of all social groups. The percentage of persons suffering from liver problem is found in scheduled caste, Muslims, scheduled tribe, other backward caste and higher caste in descending order. Similarly, the percentage of persons suffering from amoebiasis is found highest among other backward caste persons, higher in scheduled caste, high in Muslims and low in scheduled tribe and higher caste. However, males in all social groups are found more prone to be affected by diseases. Liver

problems are found dominant in scheduled caste, scheduled tribe and Muslim categories. Percentage of persons suffering from anaemia is found in descending order in scheduled tribe, scheduled caste, and higher caste, other backward castes and Muslims. In this disease the percentage of females as against males is generally higher in all social groups. In gynaecological disease the percentage of women in descending order is found in other backward castes, scheduled tribe, higher caste, scheduled caste and Muslims. Arthritis is an important disease in the study area and the cases are found comparatively more among women. The percentage of persons suffering from this disease is found higher in Muslims, other backward castes and higher caste categories and lower in scheduled caste and scheduled tribes.

Diabetes is one of the non-communicable diseases and the percentage of persons suffering from it is highest in higher caste and other backward castes and high in Muslims, low in scheduled caste and lowest among scheduled tribes. It is to be noted that the percentage of men is generally higher in all social groups. Percentage of both males and females remains almost equal in gallbladder stone type disease. Skin diseases are very prevalent in the study area as the percentage of persons suffering from this disease is fairly higher. Relatively dominance in order of importance is found in scheduled caste, higher caste, Muslims, scheduled tribes and other backward castes.

Malaria is one of the communicable diseases and caused by certain species of infected female anopheles mosquitoes. Percentage of persons suffering from these diseases is found in descending order in scheduled tribes, Muslims, scheduled caste higher and other backward castes. C.V.A. paralysis is not dominant as other diseases in the study area. However, the variation among men and women of different social groups is seen from few cases in relation to this disease. Asthama is found more among the males than females and the relative dominance of this in terms of percentage is found in other backward castes, Muslims, higher caste, scheduled caste and tribes.

Briefly it can be said that in the entire study area gastric, amoebiasis and skin diseases, arthritis and gynaecological diseases are widely prevalent. Secondly, the percentage of males of all social groups is more in heart disease, amoebiasis, diabetes, skin diseases, C.V.A. paralysis, asthama and in arthritis, cancer, anaemia and gynaecological diseases percentage of females are more in cancer, anaemia, arthritis and in gynaecological diseases.

**Table 2:** Profile of diseases among surveyed rural people of different social groups in Labpur C.D. Block, 2017

Name of the Diseases	Social Groups												Total	
	Higher caste		OBC		Muslims		Scheduled caste		Scheduled tribes		Male	Female	Male	Female
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Hearth disease	17	19	8	5	7	6	3	4	2	2	37	36	37	36
	7.79	6.17	5.29	2.35	3.53	2.24	2.05	2.20	1.41	1.32	(4.33)	(3.1)	(4.33)	(3.1)
Cancer	5	9	4	7	8	9	5	6	3	4	25	35	25	35
	2.29	2.92	2.64	3.3	4.04	3.37	3.42	3.31	2.12	2.64	(20.92)	(3.01)	(20.92)	(3.01)
Tuberculosis	2	3	4	3	7	5	9	4	12	6	34	21	34	21
	11.91	0.97	2.64	1.41	3.53	1.87	6.16	2.2	8.51	3.97	(3.98)	(1.81)	(3.98)	(1.81)
Gastric and allied problems	47	64	30	45	48	55	25	35	25	32	175	231	175	231
	21.55	20.77	19.86	21.22	24.24	20.59	17.12	19.33	17.73	21.19	(20.47)	(19.9)	(20.47)	(19.9)
Amoebiasis	30	35	40	46	35	38	25	37	27	22	157	178	157	178
	13.76	11.36	26.49	21.69	17.67	14.23	17.12	20.44	19.15	14.56	(18.36)	(15.33)	(18.36)	(15.33)
Liver problem	7	12	10	8	17	25	22	25	15	10	71	80	71	80
	3.21	3.89	6.62	3.77	8.58	9.36	15.06	13.81	10.63	6.62	(8.3)	(6.89)	(8.3)	(6.89)
Anaemia	3	25	2	10	1	3	10	23	15	25	31	86	31	86
	1.37	8.11	1.32	4.71	1.5	1.12	6.84	12.7	10.63	16.55	(3.62)	(7.41)	(3.62)	(7.41)
Gynaecological diseases	-	42	-	37	-	30	-	24	-	22	-	155	-	155
		13.63		17.45		11.23		13.25		14.56		(13.35)		(13.35)
Arthritis	15	27	13	25	17	35	5	15	5	7	56	109	56	109
	6.88	8.76	8.6	11.79	8.58	13.10	3.42	8.28	4.24	4.63	(6.55)	(9.39)	(6.55)	(9.39)

Diabetes	37	16	17	10	9	5	3	1	2	2	68	34
	16.97	5.19	11.25	4.71	4.54	1.87	2.05	0.55	1.41	1.32	(7.59)	(2.93)
Gallbladder stone	3	2	1	2	3	6	2	3	1	1	10	14
	1.37	0.64	0.66	0.94	1.51	2.24	1.36	0.65	0.70	0.66	(1.17)	(1.21)
Skin diseases	42	50	17	12	32	42	32	40	22	10	145	154
	19.26	16.23	11.25	5.66	16.16	15.73	21.91	22.09	15.6	6.62	(16.9)	(13.26)
Malaria	4	3	2	11	7	5	4	3	10	7	27	20
	1.83	0.97	1.37	0.94	3.53	1.87	2.73	1.65	7.09	4.63	(3.16)	(1.72)
C.V.A.	2	-	-	-	3	1	-	1	-	-	5	2
	0.91				1.51	0.37		0.55			(0.58)	(0.17)
Paralysis	4	1	3	2	4	2	1	-	2	1	14	6
	1.83	0.32	1.98	0.94	2.02	0.74	0.68		1.41	0.66	(1.64)	(0.52)
Asthma	218	308	151	212	198	267	146	181	141	151	855	1161
Total	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)	(100.00)

Source: Field survey, 2017

Unbracketed lower decimal figures are the percentages to total males or females of respective social group Bracketed lower figures are the percentages to grand total of males and females

**Profile of multiple diseases of surveyed rural people**

Table-3 explains the matrix of multiple diseases of surveyed persons in Labpur C.D. Block. There are fifteen major and minor diseases of communicable and non-communicable group in the study area. From the matrix of multiple diseases it is clear that the actual number and percentage of persons suffering from heart disease only were 57(3.68%) in which two persons were suffering from heart and cancer, four from heart and liver problem and ten from gastric problems by making gross number of diseases 73. Forty-three (2.77%) persons were found suffering solely from cancer in which five persons had heart disease, four liver problem and eight diabetes also. 29 (1.87%) persons were found suffering exclusively from tuberculosis. Among these persons, one person was also suffering from heart disease, another one from asthma, ten were with gastric problems and fourteen with skin diseases. Among all the diseases..35 persons suffering from gastric problems constitute the largest percentage (21.65%). Out of them five persons were also having cancer, ten persons having tuberculosis, eleven liver problem, nine persons having anemia, twelve persons having arthritis, fourteen persons having diabetes and ten persons having gallbladder stone. 239 (15.44%) persons were reported suffering from amoebiasis. From among them two were also suffering from heart disease, seven from tuberculosis, forty two from liver problem, seven from anaemia, nineteen from gynaecological diseases. Ninety (5.81%) persons had liver problems and two from them had heart problem, another two cancer, ten gastric problem, thirty seven amoebiasis and ten had malaria also. Similarly, 91 (5.88%) persons were suffering from anaemia. Out of them twenty six were also suffering from anaemia as well as five from other types of diseases. 131 (8.46%) females only were having gynaecological problems in which one woman had heart problem, another one cancer, twelve amoebiasis and ten had anaemia also. 148 (9.56%) persons were with arthritis problem. Out of them one person was suffering from heart disease and cancer, eleven were reported to have gastric problem and two persons were suffer from asthma. 70 (4.52%) persons reported suffering from diabetes and out of them three were having heart problem, ten gastric, seven amoebiasis, five gynaecological diseases and seven were having skin diseases. 14 (0.9%) were suffering from gall blabber stone in which ten were found suffering from different types of multiple diseases. There were 225 (16.48%) persons in skin diseases and out of them five

were with tuberculosis, thirty were with amoebiasis. 25 (1.61%) were with malaria in which ten were with amoebiasis, three with diabetes, seven with skin diseases and two were with asthma also. Only 7 (0.45%) persons were found suffering only from C.V.A. paralysis in the study area. 13 (0.84%) from among surveyed persons were found suffering from asthma and cancer, other two were suffering from asthma and tuberculosis and three were suffering from asthma and gastric problem in the study area.

The above 15 prevalent diseases vary in its relative strength measured in terms of percentage to total (1547) surveyed persons suffering from different diseases. Vertical arrangement of these prevalent diseases in order of its percentage provides us the relative dominance in afflicting the size of population in the study area.

When it is looked into the distribution pattern of gross total of different diseases as mentioned in table-3, it is found that in each disease category there are extra persons as against the actual surveyed persons.





Gynaecological diseases	1	-	-	12	-	10	131	-	-	-	-	-	-	-	-	-	-	155	(7.69)													
Arthritis	1	-	13	-	-	-	8.24	-	148	-	-	-	-	-	-	2	-	165	(8.18)													
Diabetes	3	-	10	7	-	-	5	70	-	7	-	-	-	-	-	-	-	102	(5.06)													
Gallbladder stone	-	2	2	1	-	-	-	-	-	5	14	-	-	-	-	-	-	24	(1.19)													
Skin diseases	-	5	-	30	-	-	-	-	-	-	255	-	-	-	-	-	-	299	(14.83)													
Malaria	-	-	-	10	-	-	-	3	-	7	25	-	2	25	-	2	-	47	(2.33)													
C.V.A.	-	-	-	-	-	-	-	-	-	-	-	-	-	1.61	-	-	-	7	(0.35)													
Paralysis	-	2	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	20	(0.99)													
Asthma	-	2	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	13	(0.84)													
Gross total	73	60	55	406	335	515	117	155	165	102	24	299	47	7	20	2016	-	-	-													
Extra persons	16	17	26	71	96	61	26	24	17	32	10	35	22	-	7	460	(3.62)	(2.98)	(2.73)	(20.14)	(16.26)	(7.49)	(5.8)	(7.69)	(8.18)	(5.06)	(1.19)	(14.83)	(2.33)	(0.35)	(0.99)	(100.00)

Source: Field survey, 2017

Unbracketed lower decimal figures are the percentages to total surveyed persons (i.e. 1556)

Bracketed lower figures are the percentages to gross total of diseased persons (i.e. 2016)

An extra number of persons is the difference between the actual number and gross total of each disease. The difference shows that some persons from among the actual surveyed persons suffer from other types of diseases also. For example, there are 96 extra persons in amoebiasis category in which two suffer from heart disease, 7 from tuberculosis, 12 from malaria, 19 from gynaecological problems, 42 from liver problems, 5 from arthritis, other 2 from asthma and another 7 from anaemia. This category has the largest number of persons (96) suffering from 8 other types of diseases in addition to amoebiasis. Next extra largest persons (71) are found in case of gastric problems where they suffer from other 7 types of diseases also along with gastric problems. The similar feature of overlapping of persons suffering from multiple diseases is found associated with the respective disease category.

Finally, it can be said that in the area as a whole there is concentration or intensity or dominance of single disease as indicated by the number and percentage of actual surveyed persons in respective disease category. It also reveals that 29.56% of the surveyed persons were found suffering from multiple diseases.

### Profile of diseases across working human resources

Table-4 shows the relative dominance of disease in order of its importance which is measured in terms of percentage among human resources of agricultural and non-agricultural sectors. The table shows variation in the distribution and dominance of prevalent diseases between agricultural and non-agricultural economic functions in the area.

**Table 4:** Profile of diseases of working human resources of Labpur C.D. Block, 2017

Name of the Diseases	Human resources in:			
	Agricultural sector		Non- Agricultural sector	
	Male	Female	Male	Female
Heart disease	3 0.78	2 0.94	14 8.19	4 13.79
Cancer	4 1.04	5 2.37	6 3.5	2 6.9
Tuberculosis	14 3.66	8 3.79	3 1.75	-

Gastric and allied problems	40 10.42	31 15.16	37 21.67	4 13.79
Amoebiasis	153 39.84	39 18.48	22 14.57	4 13.79
Liver problem	72 18.75	28 13.27	31 18.13	-
Anaemia	22 5.73	22 10.43	2 1.32	-
Gynaecological diseases	-	33 15.64	-	9 28.15
Arthritis	20 5.21	12 5.60	12 7.01	1 3.45
Diabetes	11 2.86	6 2.84	15 9.93	2 6.9
Gallbladder stone	2 0.52	4 1.89	2 11.32	3 9.37
Skin diseases	35 9.11	20 9.04	17 9.94	2 6.9
Malaria	-	-	2 1.32	-
C.V.A. Paralysis	-	-	3 1.75	1 3.45
Asthma	8 2.08	-	14 0.66	-
Total	384 (100.00)	211 (100.00)	179 (100.00)	32 (100.00)

Source: Field survey, 2017

Unbracketed lower decimal figures are the percentages to total surveyed persons (i.e. 1556)

Bracketed lower figures are the percentages to gross total of diseased persons (i.e. 2016)

It is apparent that both males and females of non-agricultural sector suffer more from heart disease, C.V.A. paralysis, diabetes, gallbladder stone, gastric and asthma as the incidence of relative dominance of such diseases in terms of percentage to total males or females of respective human resource category is higher than that of the agricultural human resources.

Similarly, the percentage of both males and females in agricultural sector is found higher among tuberculosis, liver problems, amoebiasis, anaemia, asthma and skin diseases. It means agricultural human resources are more susceptible to such diseases. Variation in the relative dominance of the above mentioned diseases among males and females between agricultural and non-agricultural sectors of rural economy may be because of difference in the life style, food and drink habits, physical works, physical exercise, purity of food, air and water.

## Conclusion

From the above analysis it has been found that there is variation in the profile of the diseases across age groups and sex, social groups, dominance of multiple diseases as well as across agricultural and non-agricultural economic sectors. Therefore, under the concept of social justice of contemporary issues for better health of all, it may be suggested that provision of fair distribution and allocation of essential medical infrastructure or resources must be made available to the entire rural people in the study area. Apart from health education, training, incentives of various types and at various levels should be provided to the rural people for enhancing their awareness for better health as well as taking precautions from diseases. Special emphasis may also be given on children, aged persons, and vulnerable sections of the society. It can also be suggested to give proper emphasis on the persons engaged in agricultural and non-agricultural economic functions in the study area.

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# Forgotten Facet of Public Health Care System in Rural India: A Study on Snake-bite in West Bengal

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## Abstract

The history of public health is still a story of the search for effective means of securing health and preventing disease in the population. In the early 19<sup>th</sup> century outbreak of epidemic and endemic infectious diseases stimulated thought and innovation in prevention of diseases on a pragmatic basis, often before the causation was established scientifically. This approach is popularly known as 'Germ Theory'. In spite of the tremendous advancement in the treatment of infectious diseases through germ theory, some diseases are still uncared for and the huge death from snake-bite is one such area. Conceived in this way, in 2009 World Health Organization (WHO) considered snake bite as one of the 'neglected tropical diseases'. Broadly speaking there are four major myths surrounding snake-bite. First, the mortality rate due to snake-bite is difficult to ascertain due to paucity of dependable data. Secondly, snake-bite are accidental which precludes any systematic analysis. Thirdly, the incidence of snake-bite occurred mostly outside dwelling places. Lastly, majority of the snake-bite patients expires before reaching the hospital. All these myths are examined with respect to two snake-bite prone districts of West Bengal namely Burdwan and South 24 Parganas. For Burdwan the information given in various orders of the Disaster Management Section (DMS) are processed. In the case of South 24 Parganas the results of an attempted census on snake bite cases done by an NGO, Canning Juktibadi Sanskritik Sanstha (CJSS) are used. It is expected that the study will help the health workers to have an understanding of 'epidemiological triad' in the nature, which in turn helps them to ameliorate the knowledge about the distressing condition surrounding snake-bite in rural areas of India.

**Keywords:** *Germ Theory, mortality rate, epidemiological triad.*

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**Introduction:** The primary objective of this paper is to estimate the number of deaths due to snake-bite and incidence of snake-bite in the rural areas of West Bengal. The related objectives are to ascertain the age, livelihood patterns of the victims and seasonal variation in the incidence of snake bite. The spatial distribution of species of venomous snake will also be probed. This type of analysis is known as epidemiological study and it is essential in adopting a policy towards prevention of death from snake-bite.

Here two districts of West Bengal namely Burdwan and South 24 Parganas are selected for the study. According to the Department of Health and Family Welfare (HFW), Govt. of West Bengal in 2011, the related snake-bite deaths in Burdwan and South 24 Parganas were 48 and 38 respectively. Both the figures seem to be underreported as the real figures seems staggeringly high. This prompted us to search for alternative sources.

The detailed and dependable information about snake bite are not properly available. The Health on the March, 2010-11, an annual health bulletin of Govt. of West Bengal, does not provide any information about snake-bite at the district level. Recently Disaster Management Section, Burdwan (DMS) made payments to the families of indigent victims due to death caused by snake-bite. From these records one may have some idea about the incidence of snake bite in the district. We have used this recording by DMS on snake bite victims for Burdwan. As against this, we depend on the findings of survey on South 24 Parganas by an NGO, Canning Juktibadi Sanskritik Sanstha (CJSS) for our study on incidence of snake bite in the district.<sup>1</sup>

The addresses, the date of occurrence of death of snake bite victims are available from DMS data. In some cases, the age of the victims can be ascertained. But DMS data do not provide any information on the species of various venomous snake and place of bite of the venomous snake. Considering this the analysis with respect to Burdwan will be of limited coverage, while the analysis with respect to South 24 Parganas will be done with a wider coverage. Initially, the incidence of snake bite will be considered at the district level. Thereafter the regional variation and other aspects of snake bite will be considered.

**The districts:** The information about snake bite with respect to Burdwan was collected for the period 2007 – 12. Analyzing the

information, it is observed that in 2007 the number of deaths due to snake bite was 28 there after the number gradually increases to 203 in 2011 (Table 1).

**Table 1:** Recorded Snake-bite victims: Burdwan and South 24 parganas 2006-2012

Year	Burdwan	South 24 Parganas
2006	N.A	21
2007	28	92
2008	53	146
2009	66	149
2010	176	77
2011	203	50
2012	82	N.A.

Note: Excludes the victims in Municipal / Corporation area.

Source: Office of the District Magistrate, Burdwan, Disaster Management Section and Field Survey by C.J.S.S. 2008-2012.

The phenomenal rise in the number of deaths can be explained in terms of canvassing of a centrally sponsored scheme towards payment to the families of indigent victims due to death caused by snake bite. It may be argued that the canvassing of the scheme enables the DMS to record maximum number of deaths due to snake bite during 2010 and 2011. DMS data however do not provide any information towards the number of snake-bite cases in Burdwan. As such it is not possible to estimate the mortality rate of snake-bite in Burdwan. However, an indirect measure in the form of snake bite victims per 1,00,000 rural population can be estimated. According to Census 2011, the rural population in Burdwan district was 4644079, thus rate of snake bite victims per 1,00,000 rural population was 4.3. The corresponding figure at the all India level was 4.1 per 1,00,000 annually.

It is already stated that in South 24 Parganas the data was collected through 'household' survey. During the survey the enumerators were asked to visit each household of the 'gram sansad' and collect information relating to snake-bite, if any, occurred in the family during the past two years through a structured questionnaire. Started in January 2008, the survey was completed in March 2012. Due to financial constraint and administrative reasons on the part of National Rural Health Mission (NRHM), the period of survey was prolonged.



The survey was conducted in four phase and the number of blocks in each phase of survey was not uniform. In other words, the survey suffers from comprehensiveness<sup>2</sup>. In spite of these limitations it is observed that the total number of snake bite cases was 12206 and total number of deaths due to snake bite was 535. Considering this it may be argued that in South 24 Parganas the mortality rate due to snake-bite was 43.83 per thousand snake-bite. The number of deaths due to snake-bite was not uniform between the period 2006 and 2011. It is observed that number of deaths in 2006 was only 21, thereafter the figure rose to 146 in 2008. The reported death in 2009 was 149 and with a rural population of 6065179 in 2011, the approximate rate of snake bite victims per 1,00,000 rural population was 2.5 annually. The number of death decreases thereafter (Table 1). The apparent reason for this decline was that in the fourth phase of survey only seven blocks were considered. The above figures and rates thus help one to realize the district position with respect to snake bite. The regional variation in the snake-bite case in the district will now be considered.

**Intra district variation:** The district Burdwan comprises of six sub-divisions and thirty-one blocks. The district may be divided into three spatial zone: Paschim, Sadar and Rarh<sup>3</sup>. Paschim zone includes nine blocks, Sadar zone includes twelve blocks and Rarh zone includes ten blocks. A careful analysis of the record of DMS reveals that the number of victims due to snake-bite was high in Sadar Zone and remarkably low in Paschim Zone. Geographically, the soils of Paschim zone consists of Red and Yellow Ultisol and inhabitable for snakes. The reported low snake-bite victims in this Paschim zone may be explained in terms of the hard character of the soil. As against this, the soils of Sadar Zone are composed of Alfisolorder Alluvium and are the natural habitat of various species of poisonous and non-poisonous snake. As a result, deaths due to snake bite are the additional hazard of common people living in the area. This observation can be easily understood by analyzing the DMS data for the period 2007 and 2012. It is observed that for any year between 2007 and 2012 about 50 per cent of snake-bite victims were inhabitants of this region (Table 2 and 3).

**Table 2:** Zone wise variation of snake bite victims in Burdwan

Zone / Year	2007	2008	2009	2010	2011	2012	Total
Paschim	4	9	10	10	27	10	70
Sadar	15	32	33	104	100	46	330
Rarh	9	12	23	62	76	26	208
Total	28	53	66	176	203	82	608

Source: Office of the District Magistrate, Burdwan, Disaster Management Section.

**Table 3:** Zone wise variation of snake bite victims in South 24 Parganas

Zone / Year	2006	2007	2008	2009	2010	2011	Total
Non-Sundarban	NA	22	63	76	56	36	253
Sundarban	21	70	83	73	21	14	282
Non-island	2	27	52	43	21	14	159
Island	19	43	31	30	NA	NA	123
Total	21	92	146	149	77	50	535

Source: Field Survey by C.J.S.S. 2008-2012.

It should also be mentioned that in Sadar Zone 60 per cent of the total workers are agriculturists (District Human Development Report-Burdwan 2011). The above fact reveals that agriculturists are the major victims of snake-bite in the Sadar Zone of the district.

There are twelve blocks in Sadar Zone. Out of 12 blocks, the incidence of snake-bite is very high in five blocks namely Burdwan-1, Burdwan-2, Bhatar, Jamalpur and Raina. The highest number of victims was found to be at Bhatar. Between 2007 and 2012, the recorded number of snake-bite victims in Bhatar block was 57. In other words, the average figure of victims in Bhatar block was 9 per year. In Raina-1, Burdwan-1, this average rate per year is comparatively low, the average being 5 victims per year. A preliminary investigation reveals that villages along the banks of river Kunur are the most snake-bite prone area.

Like Burdwan, the district of South 24 Parganas may be divided into three spatial zone :Non-Sundarban, Sundarban and island Sundarban<sup>4</sup>. The southern part of Dampier-Hendeges line is commonly known as Sundarban. It has 13 blocks. The 13 blocks of Sundarban can again be categorized into two zones :island blocks

and non-island blocks. Non-island blocks are now parts of mainland which is connected by road. The island blocks are almost entirely detached from the mainland and people in these five blocks live under much difficult conditions unmatched in the rest of India. The regional variation of snake-bite in South 24 Parganas will be done with respect to these three regions namely Non-Sundarban, Sundarban and island Sundarban. The survey reveals that in 14 blocks of Non-Sundarban area, the number of snake-bite cases between 2007 and 2012 were 5012 and consequent recorded death was 253 (Table-2). In other words, the mortality rate due to snake-bite in non- Sundarban area is 50.47 per thousand snake bite. As against these the reported snake bite cases in 13 blocks of Sundarban was 7194 and reported snake bite victims was 282. Thus, the mortality rate due to snake bite in Sundarban area was 39.11 per thousand snake-bites. In other words, mortality rate due to snake bite was lower in Sundarban area compared to Non-Sundarban area. This implies that although the number of deaths in Sundarban is higher than number of deaths in Non-Sundarban area, the majority of the bites was from non-poisonous snake.

**Seasonal and age group specific variation:** The bite pattern of snake with respect to various months will now be discussed. It is observed that July to September is the most active period of snake and consequent death of snake-bite patients. It is observed that in Burdwan, out of 608 snake-bite victims 48 per cent death occurred between July-August-September. As against this only 10 per cent death is recorded during the winter season. This particular feature of snake-bite victims is also observed in South 24 Parganas. In this district out of 535 recorded snake-bite victims in 65 per cent cases death occurred between June and September. In both the district, the number of victims is low between January and March. Thereafter gradually increases, attains its peak during August and September. With the onset of winter, it decreases. In other words, the general pattern of snake-bite victims over the month is 'like a normal distribution'. (Table 4).

**Table 4:** Snake bite victims: Seasonal variation: Burdwan and South 24 Parganas

Month	Burdwan		South 24 Pargana	
	Number	In per cent	Number	In per cent
January	9	1.48	3	0.56
February	5	0.82	11	2.05

March	21	3.45	18	3.36
April	41	6.74	33	6.16
May	42	6.9	36	6.72
June	75	12.33	52	9.71
July	76	12.5	58	10.84
August	114	18.75	123	22.96
September	101	16.61	118	22.01
October	66	10.85	53	9.9
November	41	6.74	24	4.48
December	17	2.79	6	1.12
Total	608	100	535	100

Source: Office of the District Magistrate, Burdwan, Disaster Management Section and Field Survey by C.J.S.S. 2008-2012.

The analysis on age specific distribution of snake-bite victims will now be discussed. It is already stated that the age of snake-bite victims in Burdwan is available for only 38 persons. In spite of this fragmented information it is very crucial towards the identification of species of snake. A careful analysis of the age of snake-bite victims in Burdwan reveals that out of 38 snake-bite victims only 8 per cent were below the 10 years of age. Contrary to this, in South 24 Parganas, out of 184 snake-bite victims, 16.64 per cent belong to the age group 0 – 10 (Table-5). The significant difference in the percentage of death in the same age group in these two districts will now be examined.

**Table 5:** Snake Bite Victims by age group: Burdwan and South 24 Parganas

Age in years	Burdwan		South 24 Parganas	
	Number	In per cent	Number	In per cent
01-04	-	-	34	6.36
05-09	3	7.89	55	10.28
10-14	4	10.52	76	14.21
15-19	5	13.15	76	14.21
20-24	4	10.52	43	8.04
25-29	7	18.42	32	5.98
30-34	2	5.26	23	4.30
35-39	3	7.89	33	6.17
40-44	3	7.89	32	5.98

45-49	5	13.15	31	5.79
50-54	1	2.63	31	5.79
55-59	1	2.63	26	4.86
60 +	-	-	43	8.04
Total	38	100.00	535	100.00

Source: Office of the District Magistrate, Burdwan, Disaster Management Section and Field Survey by C.J.S.S. 2008-2012.

The DMS data do not provide any information about the species of poisonous snake prevailing in Burdwan. A primary investigation about the species of snake in Sadar area of Burdwan district reveals the presence of three venomous snakes namely, Monocled Cobra, Spectacled Cobra and Russell's viper. Common Krait is rarely seen in this area. Among these four types of snakes, Common Krait is a night faring one. It is a predator of Gharchitti – a non-poisonous snake generally found in the dwelling room of the poor people. Thus, while Russell's viper and Monocled Cobra are visible generally in the day time out side the dwelling place of the people, Common Krait due to its night faring nature remains invisible. Due to its night-faring nature and normal tendency to move to sleeping men, the number of deaths among children is very high. It may be said that the comparatively high percentage of deaths of persons below the age of ten years in South 24 Parganas can be explained by the presence of Common Krait. Conversely, in Burdwan a low percentage of death of children may be ascribed to the absence of this night-fairing snake. Considering this it is necessary to discuss the variation in the species of snake across the regions of the district.

**Variation with respect to species:** It is already stated that DMS data do not provide any information about the species of snake in Burdwan. CJSS however collected information about species of poisonous snake in South 24 Parganas. Between 2006 and 2011, the survey recorded 535 snake-bite victims. The baseline study indicates that out of 535 deaths, Common Krait, Monocled Cobra and Russell's viper accounts for 290, 181 and 63 deaths respectively. Another intriguing observation of the survey is the variation in the presence of these snakes between Sundarban and non-Sundarban region. Thus, while in Sundarban area the reported death by Common Krait was 186, in non-Sundarbans area it was 104. Similarly, Russell's viper is mainly visible in non-sundarban area. In non-Sunderbans area, there had been 62 deaths due to bite from Russell's viper, while in

Sunderbans area, the recorded death from Russell’s viper is only one. The apparent reason behind the significant number of deaths by Common Krait are four i) night faring nature of this species; ii) unpredictability of bite at the early stage iii) gradual extinction of Branded Krait a natural predator of Common Krait and iv) bad condition of dwelling houses of people. Similarly, the excessive salinity of the soil in Sundarban area perhaps prevents the growth of Russell’s viper. (Table 6)

**Table 6:** Number of deaths by species of venomous snake:South 24 Parganas 2006-11

Area	Species of venomous snake				Total
	Common Krait	Manocled Cobra	Russell’s Viper	Others	
Non-Sundarban	104	87	62	-	253
Sundarban					
Non-island	104	53	1	1	159
Island	82	41	-	--	123
Total	290	181	63	1	535

Source: *ibid*

The night faring nature of Common Krait and their tendency to move to sleeping man can be easily understood from the place of bite of poisonous snake. Similarly, it is observed that Russell’s viper rarely enters into the dwelling house of the poor people. As against this, Monocled Cobra is visible both within the room and out side the room. During the survey, CJSS collected information about the place of bite of poisonous snake for 535 snake-bite victims. It is observed that out of 535 snake-bite victims, Common Krait, Monocled Cobra and Russell’s viper accounts for 290, 181 and 63 deaths respectively. It is also observed that out of 290 deaths by Common Krait, in 257 cases it was occurred at the bed and in 24 cases it was occurred within the room. As against this, all reported bite by Russell’s viper occurred outside the room. In case of Monocled Cobra, out of 181 victims, 33 cases, happened within the home and 85 cases had occurred outside the home (Table-7).

**Table 7:** Places of bite of 535 Snake Bite Victims:2006 – 2011 South 24 Parganas

Category	Place	Species of Snake				Total
		Common Krait	Monocled Cobra	Russell's Viper	Others	
A.	Home / attached to home					
	1 At the court yard	8	2	-	-	10
	2 At the straw stack etc	-	6	-	-	6
	3 At the bed	257	17	-	-	274
	4 Within the room	24	8	-	-	32
B.	Outside the home	-	-	-	-	
	1 At the pond	-	32	2	-	34
	2 At the attached courtyard	-	14	30	-	44
	3 At the road	-	12	22	-	20
	4 At the paddy field	-	76	24	-	98
C.	Others	1	14	1	1	17
	TOTAL	290	181	63	1	535

Source: C.J.S.S. Field survey 2008 – 2012

**Pattern of Treatment adopted:** The course of treatment adopted by patients after a poisonous snake-bite will now be discussed. In rural areas of Bengal, a snake-bite patient initially moves to traditional healers (Ojha). Some times the prayer of the traditional healers is an integral part of the treatment. Considering the after-effects of bite, the patients proceed to nearest block hospital for proper treatment. Now, treatment of snake- bite patients requires a little specialization. Thus, in spite of World Health Organization (WHO) guideline the attending doctors at the block hospitals hesitate to treat the snake bite patient at their responsibility. As a result, patients are usually referred to distant sub-divisional hospital or higher level hospitals. A glance at the Table 8 reveals all this aspect of treatment.

**Table 8:** Pattern of treatment adopted by poisonous snake bite patients in South 24 Parganas:2011

To From	Without Treatment	Traditional healers	Quack	Sarberia Mission Hospital	Way to Block Hospital	Nursing Home	Block Hospital	Way to NRS / etc	NRS / Bangur etc	Total
Without Treatment	28									28
Traditional healers		120		2			209		2	333
Quack			6	2		1	18			27
Sarberia Mission Hospital				5			10	1	1	17
Way to Block Hospital					32		2			34
Nursing Home						5				5
Block Hospital							61		28	89
Way to NRS / etc								2		2
NRS / Bangur etc									-	
Total	28	120	6	5	36	6	300	3	31	535

Source: Field Survey 2008 – 2012



Table 8 shows that there were at least 28 persons who died without any treatment. However, considering the treatment by Quack, traditional healers and Sarberia Mission as improper treatment, the number of persons died without any treatment jumps to 195. In other words, the survey reveals that out of 535 victims 36.44 per cent victims meet with death due to ignorance. Table 2.9 also shows that there were 209 persons reached the block hospital after visiting local Ojha, there by wasted 2 – 3 hours of crucial time after bite and meet with death.

In India there is a norm to register the vital events i.e., birth of a new born babies and death of individuals. The necessary instructions on this aspect are displayed at every Gram Panchayet Offices, Hospitals and important locations of area. The Govt. officials expect that people would respond positively to the advertisement. But the reality with respect to registration of snake-bite victims is pathetic in South 24 Parganas. In South 24 Parganas there is 300 Gram Panchayet offices and 1166 Health Units of various categories. The survey recorded 535 snake-bite victims between 2006 and 2011 in the district. The survey also recorded that out of 535 snake-bite victims only 120 deaths were registered at GP offices. Thus, in spite of arrangement for registration of vital events i.e., death only 34.18 per cent of 535 snake-bite victims is registered at the respective GP offices. The apparent reason seems to be lackadaisical attitude towards snake-bite victims. During the survey it was observed that in many cases family members of the victims heisted to report about the victims due to some prevailing superstitions.

The poor registration of the snake-bite victims is also reflected in the reported payment to the families of indigent due to death caused by snake-bite. Although the relevant scheme i.e. ex-gratia grant to the bereaved families of snake-bite victims, was launched by Govt. of India in 2005, between 2006 and 2011 only 13 victims out of 535 victims in South 24 Parganas were given ex-gratia grant. Moreover, under-payments to the tune of ₹10, 000/- only paid to 6 victims. It should be mentioned that between 2007 and 2012 in Burdwan, Disaster Management Section assisted 608 families of snake-bite victims by giving ex-gratia grant. The poor registration of snake-bite victims along with meager compensation payment to families of snake-bite victims reflects misery of poor people in South 24 Parganas.

**Socio economic implications of snake bite:** At the individual level the physical body is the poor man's assets. Any injury due to

snake bite triggers a series of consequences such as loss of work, deprivation of earnings and expenditure for medical treatment often made worse by borrowings. This along with reduced financial capacity to restore earlier health status, lower productivity and earnings and the burden of debt repayments inevitably pushes low income families into poverty trap. A preliminary study over the patients of Russell's viper bite demonstrates the above consequences on poor families. In South 24 Parganas district the average expenditure 'per episode of hospitalization' with respect to Russell's viper bite is ₹ 16,000.00 which is too high for a poor family to manage.

At the aggregate level health is an important determinant of productivity. Any loss of persons in middle life either through death or disability cripple's development. In this sense snake-bite should be viewed as a public health problem, deserving special attention from the state. This status is reinforced by two combined features: snake-bite fatalities increased to high levels and became as damaging as traditional illness such as Asthma, Kalahari, and Malaria causing large social and economic losses to society. According to Director of Health Services in West Bengal the percentage of deaths due to Asthma was 1.55 and corresponding deaths due to snake bite was 1.52. Similarly, for South 24 Parganas districts Kalazhar, Malaria and Pneumonia together accounts for equal number of deaths due to snake bite. During the last phase of survey, it is observed that out of total deaths due to various communicable and non-communicable diseases death from snake-bite account for 8 per cent.

Let us now summarise the analysis and on the basis of this summarization we shall concentrate on the measures to be adopted for the prevention of death from snake-bite. First, between 2007 and 2012 the recorded total number of snake-bite victims in Burdwan was 608 and in South 24 Parganas between 2006 and 2011, the recorded number of victims due to snake-bite was 535. In 2011 the number of deaths due to snake-bite in Barddhaman was 203, while the number of deaths due to snake-bite in South 24 Parganas was 149. Thus, both the districts are suffering from a high level of mortality due to snake-bite. Second, among the three zones of the district Burdwan, Sadar is more snake-bite prone than Paschim and Rarh zone. It is observed that for any year between 2007 and 2012, about 50 per cent of the snake-bite victims are inhabitants of this region. The inhabitants are agriculturists in general. In cases of South 24 Parganas, the Sundarban region is marginally more snake-bite prone than non-Sundarban region. It is

observed that the total number of recorded snake bite victims between 2006 and 2011 in Sundarban area was 282 while in non-Sundarban area it was 253. Third, the bite pattern of poisonous snake with respect to various months for both the district remains same. In both the district, the number of victims is low between January and March, thereafter gradually increases and attains its peak during the month of August and September. With the onset of winter, the reports about snake-bite victim's decreases. Fourth, the age specific distribution of snake bite victims for both the districts however varies. In case of Burdwan, out of 38 snake bite victims only 8 per cent were below the age of 10 years of age. In case of South 24 Parganas out of 535 snake bite victims 17.13 per cent were below the age of 10 years of age. The significant difference in the percentage of death in the same age group can be explained by the roaming of Common Krait in South 24 Pargans. Fifth, there exists a wide variation in the preferred place of bite of poisonous snakes. It was observed that out of 290 deaths by Common Krait, in 257 cases it had occurred at the bed. It was also observed that all 63 reported victims by Russell's viper had occurred outside the room. In case of Monocled Cobra, out of 181 victims, 33 cases had occurred within the room and the rest, 148 cases had happened outside the room. Lastly, in spite of poisonous bite about 36.44 per cent patients initially went to traditional healers for treatment<sup>5</sup>. These estimations lead us to key issue for the districts how many people will die or get injured by snake bite before preventive and curative measures improve?

## **Conclusion**

Man is mortal. In spite of this, the basic objective of medical science is to delay this inevitability. Medical science tries to attain this objective by adopting disease specific preventive and curative measures. The preventive measures necessitate social awareness which in turn generates demand for medical services. In a backward economy, a systematic social awareness campaign about 'agent' and 'environment' of the disease slowly transform the mindset of the people towards realization of the primary cause of the diseases. This transformation in the mindset of the poor people for proper treatment of the patient is very important and it generates demand for medical services.

The curative measures on the other hand, stress on the development of infrastructure both physical and personnel. In other words, proper supply of medical personnel, medicine and instruments in the health-

care units is the prime task of curative measures. Hence equilibrium in health service's market requires a balance between demand for health services and supply of health services. A distortion on any parts may jeopardize the balance.

With financial assistance from NRHM, CJSS attempts to generate a demand for proper and immediate health-care services of the snake-bite patients at the block level and sub-divisional level hospitals. However, it is observed that in many cases the patients are referred to hospital located at Calcutta. It is our observation that lower level health-care service points are to be revamped so that balance between demand for and supply of health care service is maintained.

### Footnotes

1. Between 2009 and 2012, Canning Juktibadi Sanskritik Sanstha (CJSS) had received some grants-in-aid from National Rural Health Mission (NRHM) for conducting awareness campaigning programme on Snakes, Snake-bite and its medical care in 27 blocks of district South 24 Parganas, West Bengal. The survey was organized by CJSS along with this 'Awareness Programme'.
2. Phases of Survey in South 24 Parganas

Phase	Sundarban Block		Non Sundarban Blocks	Total
	Island Block	Non-Island Block		
1 <sup>st</sup> (Jan.2008 – March 2008)	Gosaba, Basanti			2
2 <sup>nd</sup> (Aug.2009 – Jan.2010)	Kultali, Sagar, Patharpratima	Joynagar-II, Mathurapur-II, Namkhana		6
3 <sup>rd</sup> (Aug.2010 – Jan.2011)	-	Joynagar-I, Mathurapur-I, Kakdwip	Mograhat-I, Mograhat-II, Bhangar-I, Bhangar-II, Budge Budge-II, Bishnupur-I, Bishnupur-II, Falta, Namkhana	12
4 <sup>th</sup> (Jan. 2012 – March 2012)	-	Canning-I, Canning-II	Sonarpur, Diamond Harbour-I, Diamond Harbour-II, Kulpi, Baruipur	7
Total	5	8	14	27

3. Name of the blocks in different Zones of Burdwan

Paschim Zone	Sadar Zone	Rarh Zone	Total
	Burdwan-I Burdwan-II Bhatar*, Jamalpur, Raina-I	Mangalkot, Monteswar	7
Galsi-1	Auagram –II, Galsi-II, Memari-I, Memari-II	Ketugram-II*, Katwa-I	7
Durgapur- Faridpur	Ausgram –I, Khandaghosh, Raina-II*	Ketugram- I, Kalna-II, Katwa-II	7
Kaksa, Jamuria*, Raniganj, Barabanbi		Kalna-I, Purbasthali-I, Purbasthali-II	7
Salanpur, Andal*, Pandabeswar			3
9	12	10	31

4. See note 2

5. In contemporary period Priest's prayer are found to be adopted by local inhabitants in Surat a district of Gujrat for treatment of Malaria patients (E.P.W. July 28, 2012, page 33)

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# Women's Rights are Human Rights: An Approach towards Sustainable Development

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## Prologue

“To call a women the weaker sex is a libel;... it is man's injustice to women. If by strength is meant moral power, then the women is immeasurably man's superior. Has she no greater intuition, is she not more self sacrificing, has she not greater powers of endurance, has she not greater courage?... If non violence is the law of our being, the future is with a women...” This speech by M.K. Gandhi undoubtedly points out both the value and position that the Indian women have been holding till the ages. This very prejudice of ‘weaker sex’ gives birth to the inevitable and international concern for women empowerment, as evident in the speech delivered by Hillary Rodham Clinton on September 5, 1995 at the United Nations Fourth World Conference on Women in Beijing .She opined that human rights are women's rights and women's rights are human rights, once and for all and stated that there is no longer acceptable to discuss women's right as separate from human rights. These rights include basic civil freedoms, the right to live free from violence, slavery and discrimination, to own and dispose of property, and to a fair and equal wages, marriage, divorce and parenthood rights. The Sustainable Development Goals include a specific goal for gender equality. It lays emphasis on ending gender based violence, eliminating child marriage, female genital mutilation and ensuring access to sexual and reproductive health, including

equal access to education, expanding women's economic opportunity and reducing the burdens of unpaid care-work on women and girls. According to SDG Agenda, countries are expected to establish their own Sustainable Development strategies, supported by Integrated National Financing Framework policies. The strong focus should be on implementation through mobilizing financial resources, capacity building and technology. Not only in India, but also in respect of the whole world, education is the only powerful weapon to beat the issue of violation of women's rights and can act as an amplifier in bringing the consciousness of women empowerment. The word 'empowerment' involves power to, power with and power within'. It is a concept limited not only to the entitlement of power to women, making rivals all the men folk, but also to the all encompassing idea of making them self-dependent, self sufficient and capable of raising voice against all sorts of injustice, ignoring social stigma and prejudices. 'Women's Rights are Human Rights' is an approach relevant for ever, but unfortunately fails to reach a saturation point. Constitutional provisions in India play valuable role in making the right position of women, but they are not implemented properly due to ignorance, lack of consciousness on the part of the women and obviously for the hidden pressure of the male-chauvinistic society. The 5<sup>th</sup> goal of SDG has its heart in the fulfillment of the Constitutional provisions, swiping out the hindrances through some remedial measures.

### **Women's Rights in the Context of Sustainable Development:**

"I raise up my voice-not so I can shout, but so that those without a voice can be heard...We cannot succeed when half of us are held back." These words uttered by Malala Yousafzai moves us to think further about Women Empowerment.

The Charter of the United Nations (1945) declared one of its goals "to reaffirm faith in fundamental human rights, in the dignity and worth of the human person, (and) in the equal rights of men and women."

The World Conference on Human Rights, raised the cry, "Women's Rights are Human Rights". It stated that "the human rights of women and of the girl-child are an inalienable integral and indivisible part of universal human rights."

The United Nations Conference on Sustainable Development (Rio+ 20) took their commitment towards Sustainable Development, and reaffirms the commitment of states to “Women’s equal rights, access and opportunities for participation and leadership in the economy, society and political decision-making and includes explicit references to accelerate the implementation of commitments in the Convention on the Elimination of All Forms of Discrimination against women.

SDG 5 (Achieve gender equality and empower all women and girls) include the following targets:

1. End all forms of discrimination against all women and girls everywhere;
2. Eliminate all forms of violence against all women and girls in the public and private spheres, including trafficking and sexual and other types of exploitation;
3. Eliminate all harmful practices, such as child, early and forced marriage and female genital mutilation;
4. Recognize and value unpaid care and domestic work through provision of public services, infrastructure and social protection policies and the promotion of shared responsibility within the household and the family as nationally appropriate;
5. Ensure women’s full and effective participation and equal opportunities for leadership at all levels of decision-making in political, economic and public life;
6. Ensure universal access to sexual and reproductive health and reproductive rights as agreed in accordance with the Program for Action and the outcome documents of their reviewed conferences;
7. Undertake reforms to give women equal rights to economic resources, in accordance with national laws;
8. Enhance the use of enabling technology, in particular information and communication technology, to promote the empowerment of women;
9. Adopt and strengthen sound policies and enforceable legislation for the promotion of gender equality and the empowerment of all women and girls at all levels.



## **Constitutional Provisions for Women:**

Once Justice Bhagwati declared, “These fundamental rights represent the basic values cherished by the people of this country since the Vedic times and they are calculated to protect the dignity of the individual and create conditions in which every human being can develop his personality to the fullest extent.”

The Preamble of the Indian Constitution contains the goal of equality of status and opportunity to all citizens and this has been included in the Constitution to ensure equal rights to women and men in terms of status and opportunity. By the Constitutional provisions, political, economic and social equity of women may have been ensured; but many a time, it remains theoretical due to their non-implementation, gender insensitivity and lack of legal literacy.

- **Article 14:** Equality before law
- **Article 15:** Prohibition of discrimination on grounds of religion, race, cast, sex or place of birth
- **Article 16:** Provision for equality of opportunity in matter of public employment
- **Article 21:** Protection of life and personal liberty

### ***Directive Principles of State Policy:***

- **Article 39:** Certain principles of policy to be followed by the state including the equal opportunity of women
- **Article 42:** Provision for just and human conditions of work and maternity relief

## **Fundamental Duties:**

Article 51-A (e) states that

“It shall be the duty of every citizen of India to promote harmony and the spirit of common brotherhood against all the people of India transcending religion, linguistic, regional and sectional diversities, to renounce practices derogatory to the dignity of women.”

### ***Contributions of some pioneering women in the field of women empowerment***

Contribution of women in the development of Indian culture and society is commendable and praiseworthy. Both in the pre-independence and post-independence era, women with astounding

persona and will power achieved success in their personal and professional fields as well as in the area of social work across all odds and overcoming all obstacles in every walk of their lives. We are proud of these Indian women who have excellence all the fields like engineering, politics, social work, medicine, banking, sports etc. Contributions of some of these women are mentioned below:

**Abala Bose (1865-1951):** She was a feminist and emphasized women education. She set up the Nari Shiksha Samiti, a non-profit whose mission was to educate girls and women. She also opened a home for widows and a rehabilitation centre for women.

**Aruna Asaf Ali (1909-1996):** She was a leader of the Quit India Movement and a Bharat Ratna recipient.

**Asima Chatterjee (1917-2006):** She acquired the position of first female scientist in India and conducted research in organic Chemistry. She devoted her exclusively to develop anti-epileptic and anti-material drugs.

**Chandramukhi Basu (1860-1944) and Kadambini Ganguly (1862-1923):** They are the first two female graduates of the British Empire in 1882. Kadambini Ganguly was the first South Asian female physician, trained in Western Medicine. It may be appeared to be insignificant, but they achieved this in the British Reign when the Bengali society was so conservative to accept such initiative.

**Mahasweta Devi (1926-2016):** She was known as a famous writer of short stories, poetry, novels and vocal advocate for the rights of tribal people. Her major works include 'Hazar Churashir Maa' and 'Aranyer Adhikar'.

**Kalpana Chawla (1962-2003):** She was an astronaut who was the first Indian women in space.

**LataMangeskar (1929-):** She was the most awarded Indian singer, Bharat Ratna recipient, Legion of Honor recipient. She is famous for her heavenly melodious voice with a gift of thousands songs.

**Laxmibai: Rani of Jhansi (1828-1858):** She was the notable personality in India's freedom movement. She sacrifices her life for the sake of the country.

**Matangini Hazra (1870-1942):** She was the revolutionary leader in Indian Freedom Movement, known as 'Gandhiburi'.

**Mother Teresa (1910-1997):** She was the founder of Missionaries of Charity, known for her incredible work for the poor, Bharat Ratna recipient and the first woman to win the Nobel Prize in 1979. She was a 'woman who changed the world'.

**Mary Kom (1983-):** Chungneijang Mary Kom Hmangte, familiar to us as Mary Kom, is a renowned Indian Olympic boxer. She is the only woman to become World Amateur Boxing Champion for six times and also received a medal in each one of the seven World Championships.

**Sania Mirza (1986-):** She is a famous Indian tennis player who won six Grand Slam titles in her career. Until her retirement from singles in 2013, she was ranked No.1 by the WTA.

### **Constraints of Making Women are Right as Human Right:**

Different committees and commissions are constituted for the welfare of women in the Post Independent period. National Committee on Women's Education (1958) and it emphasized on the expansion of girls' education that should be aimed at universal enrollment of in the age group by 6-11 by 1979 and the age group 11-14 by 1981. Durgabai Deshmukh Committee (1959) recommended for the prioritization of the girls' education by the Central and the State Government. Bhaktavatsalam Committee (1963) recommended for the establishment of schools in all areas and also opined that state should create public opinion in favour of women's education.

The recent Millennium Development Goals Report displays that though there was remarkable progress in respect of gender equality, there remains much to be done by all the country of the world to achieve equality and empowerment. (Parvin)

A number of constraints are there to reach the goal of desired women empowerment:

- a. **Gender Discrimination:** Gender discrimination between boys and girls in India is an age old practice that is still in dominant position in modern era. From the very beginning of childhood, boys and girls are treated differently in the household so far as the availability of various opportunities are concerned. Boys can avail more healthy food than girls and this is also true in case of educational opportunity also. Girls are being married underage, affecting adversely their natural health.

- b. Lack of educational opportunity:** According to the Literacy Rate 2011, literacy rate among women is 65.46%, where the literacy rate among men is above 80%. This is a proof of how women are logging behind in terms of equality of educational opportunity. This is mainly caused by gender discrimination. Women are believed to be born only for home-making with no need of proper education, which is also considered an wastage of time and money. Boys are free from such prejudice and can avail educational opportunity, as this would be beneficial for the parents in their old age.
- c. Female Infanticide:** The cruelest practice that can be done for the degradation of status of women-folk, is female infanticide. Due to preference for a boy child, the parents of the unborn child make the gender identification and illegally 'murder' them in their mother's womb. Women's have no opinion in this regard as they are bound to obey the opinions of their husbands or other in laws.
- d. Lack of Achievement Motivation:** The deprivation of the basic needs, give birth to the lack of Achievement Motivation among most of the women. They have to choose the life as it is, often raise their voice of protest, but unfortunately dip in the futility. They are habituated to see themselves to be repressed under the pressure of male dominated society.
- e. Lack of Decision-making power:** As the society is male dominated, women has the least chance to take part in making any important decision. Women are sometimes believed to be 'less intelligent' than men folk, so are unable to draw any significant decision.

All these hindrances can be eradicated only by the proper expansion of education and its implementation in the practical field. The barriers actually, are not separate causes, but results in a single problem i.e. violation of women's rights.

### **Role of Education in empowering Women folk**

"If you educate a man you educate an individual, however, if you educate a women, you educate a whole family.

—Pandit Jawharlal Nehru

Education is considered to be an effective and most important means to empower women with knowledge, skills and self-confidence

necessary to participate fully in development process. Education provides opportunities for people to enjoy an enhanced life and subsequently offers social and radical benefits to society.

The issue of women empowerment is an international concern and the revolution can take place only through the empowerment tool like education. The process of empowerment is multi-dimensional; as per United National Development Fund for Women (UNIFEM), the term 'women empowerment indicates-

- Acquiring knowledge and understanding of gender relations and the ways in which these relations may be changed.
- Developing a sense of self-worth, a belief in one's ability to secure desired changes and the right to control one's life.
- Gaining the ability to generate choices exercise bargaining power.
- Developing the ability to organize and influence the direction of social change, to create a more just social and economic order, nationally and internationally.

So, it could be easily understood that the concept of women empowerment include personal, social, political upliftment to reach a more improved state.

Since the Pre-Independence Era, the literacy rate of women of India is remarkably secondary position so far as their overall wellbeing is concerned.

Education can act as a panacea to upheld the position of women-

- Education can help women to identify themselves as a separate human being and to be aware of their own rights.
- The higher literacy rate among women signifies higher sense of self-reliability and consciousness about the circumstances.
- Education helps to raise the employability of the women; this can help in not only in their role in supporting family economy, but also lessen their dependability on men.
- An educated woman is an asset for her household as she can transmit her educational background through the generations; thus acts as an agent of social change.
- It is only through the education among women that can remove all kinds of social evils.

- Education makes women more conscientious about degradation of other women and stand as a spokesman to secure them.
- Above all, Cooperation from the educated women is necessary for the progress of the country.

## **Epilogue**

Women have been expected to be blessed with equal rights since ages, but the degradation of values over ages have made their status as a 'weaker sex' and this raises the present issue of 'empowerment. The status of women in India can be best understood from the following statistics:

- Maternal mortality ratio in India is 130per 100,000 live births in the year 2014-16 (Sample Registration Survey issued by the Registrar General and Census Commissioner, India)
- Only 62.98% of adult women are literate in India.(Survey on Literacy Rate in India,2015)
- Lower caste and tribal women experience the highest levels of physical violence.
- According to the survey, conducted by NSSO, the percentage of female worker population in the year 2011-12 are only 23.7%.

'Women' became a key factor in Sustainable Development so far as their empowerment in all sphere of life is concerned. The new Gender Action Plan (2016-2020) emphasized "the need for the full realization of women's and girls' full and equal enjoyment of all human rights and fundamental freedoms and the achievement of gender equality and the empowerment of women and girls." It provides a new gender framework for supporting partner countries, 'to achieve tangible results towards gender equality.

The achievement of this Sustainable Development Goal alone will not create gender equality in this world. The issue of women empowerment in India depends not only on fulfillment of Constitutional provisions or modification of behavior on the part of the men but on the attitude of the women on themselves. The removal of gender discrimination and expansion of equal opportunity of education must be used as a method of implementation to ensure this objective. The following measures can be taken as remedies:

- Equality of educational opportunity
- Enhancement of decision-making power
- Self-dependence
- Strict implementation of the Constitutional Provisions
- Awareness programmes

There is no dearth of provisions for the success of women empowerment, be it Constitutional provisions, initiatives at the international level or by different NGOs working for it. But the seeds of age old practices of violence and injustice against women is hidden not only in the mindset of men, but in the mindset of women also. The legendary women and their achievements are mentioned here, no doubt they are a source of light and hope for us, but the so called successful and empowered women, now-a-days are not so empowered in their domestic life. Time and again every other morning we come across newspaper columns on injustice against women in some form or other. It is more unfortunate when such injustices go unnoticed and hence has no effect on the statistics. The solution is in the development of conscience of all the people around us. Formal education may help improve the statistics, but lessons on moral values should be imparted from the very beginning of childhood in an individuals' home so that no issue about 'Women's Rights' can bother us, and we could move ahead towards universal 'Human Rights' and as such move a step towards fulfillment of Sustainable Development Goals.

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