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A LOGISTIC REGRESSION ANALYSIS OF MULTIDIMENSIONAL POVERTY: A CASE STUDY OF AIZAWL DISTRICT OF MIZORAM, INDIA

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ABSTRACT **DOI No: 10.36713/epra14440** **Article DOI: https://doi.org/10.36713/epra14440**

In this paper, we examine poverty in the state of Mizoram, India by taking the case of Aizawl district based on the method of Alkire-Foster counting approach. We also assess the determinants of such poverty using binary logistic regression model by considering household characteristics such as dependency ratio, age, education of the household head, household size and size of agricultural landholdings as explanatory variables. We found that 28.4 percent of the population is MPI poor (i.e. headcount ratio) with a 38.2 percent intensity of poverty (A). The overall MPI in the study area is 0.10. The findings of the study are very close to the findings of Alkire et.al (2015), who estimated the headcount ratio, intensity of poverty, and MPI to be 30.8 percent, 45.1 percent, and 0.139 respectively based on the National Family Health Survey-3 (NFHS-3).

The estimated logistic regression also showed that the household size, dependency ratio, age of the household head, and education level of the household head were significant determinants of poverty in the study area. The findings of this study agree with those of previous studies such as Datt (1998) Al-Saleh (2000), Ajakaiye and Adeyeye, (2002), Osowole, Asif (2007), Babu, & Sanyal (2009), etc. However, the size of agricultural landholdings is not a significant determinant of multidimensional poverty in the study area, which is contrary to the findings of Hashmi, et.al. (2008) and Babu, et.al. (2019).

KEYWORDS: ***Multidimensional Poverty, Alkire-Foster Method, Determinants of Poverty, Binary Logistic Regression.***

1. INTRODUCTION

Poverty, being a multifaceted phenomenon, is difficult to understand. There are different perspectives on the definition and measurement of poverty. Rowntree (1901) viewed poverty in an absolute sense and explained absolute poverty as the level of income that is inadequate to maintain the minimum necessities for the maintenance of human efficiency. Townsend (1971), on the other hand, explained poverty in relative terms as a lack of resources to obtain a standard of living that is customary, or at least widely encouraged and approved, in the societies to which they belong. Although both are different in their approach to giving definition, they are the same in that they use deprivation of economic resources as a basis of definition.

In the late 20th century, a completely new definition of poverty emerged when Amartya Sen emphasized a lack of capability and freedom as a basis for defining poverty. According to Sen, poverty is not just the lowness of income but the deprivation of a person's capability to live a life they have reason to value (Sen 1983 & 1985). Capability is the capacity to achieve 'functioning', and having this capability implies that people have the freedom to live well, and it is sufficient to not be poor (Sen, 1993 & 1999). Owing to the limitation of monetary measures of poverty and motivation from the work of Sen's capability approach (Sen, 1993) and Atkinson's discussion on multidimensional deprivation (Atkinson, 2003), Alkire and Foster defined poverty as a

multidimensional phenomenon and designed a new methodology called the Multidimensional Poverty Index (MPI) to capture multiple deprivations experienced by the poor (Alkire & Foster, 2011). The method of monetary measure and the MPI differ in that while the former refers to measurements based on income or expenditure, the MPI measures multiple deprivations by taking into account various indicators that are assumed to characterize an individual's well-being (Bader, et.al, 2016; Alkire, 2011).

In India, even though the monetary metric form is used as a measure of poverty, certain differences are found in the methodology of various poverty estimations resulting different pictures of poverty. For example, the extent of poverty in India in 2004-05 as per Lakdawala estimate was 27.5 % while it was 37.2 % as per the Tendulkar Committee during the same period. Discrepancies were also found between Tendulkar estimates and Rangarajan estimates with an average deviation of 8.3% from 2009-10 to 2011-12 (Expert Group, 2009). Likewise, the multidimensional poverty measure also demonstrated significant differences from the monetary measures in India. For instance, as per Tendulkar estimates, the percentage of the BPL population in India was just 29.5 % in 2011-12 (Expert Group, 2009). However, the 2011 global MPI report showed a different picture where the percentage of multidimensionally poor people in India during the same period was 55.4% (Global Multidimensional Poverty Index, 2011), which is almost double the Tendulkar estimate. All these differences clearly highlight the importance of the methodology in determining the extent of poverty.

2. RESEARCH GAP AND SCOPE OF STUDY

From an extensive review of the literature, it is observed that existing studies on poverty in India focus on monetary measures of poverty (Datt & Mahajan, 2011). Expert groups or committees constituted by the government, such as; Y.K Alagh (1979), Lakdawala (1993), Tendulkar (2005 & 2009), and Rangarajan (2012) also used consumption expenditure as a measure of poverty (Rangarajan & Dev, 2020; Pradhan & Saluja, 1998). However, to the best of our knowledge, very few studies have undertaken a multidimensional measure of poverty in India.

In this study, attempts have been made to bridge the research gaps by examining poverty from multidimensional perspectives in the rural areas of the Aizawl district of Mizoram, India. We attempted to identify the determinants of multidimensional poverty using binary logistic regression. The study is based on primary data collected through structured questionnaires which are explicitly designed for constructing MPI on the one hand and capturing other relevant information to identify determinants of multidimensional poverty on the other.

The state of Mizoram, being part of the territory of India, does not employ any standard measure of poverty. Various departments of the State Government have their own criteria for identification of poverty, leading to different lists of Below Poverty Line (BPL), such as the BPL list issued by the Supply Department, Rural Development Department, Directorate of Economics & Statistics, etc. However, in most cases, the level of poverty in the state was expressed using the official poverty data released by the Planning Commission of India, which was discontinued in 2011-12 owing to the abolition of the Planning Commission by the Narendra Modi led-government in 2014.

All these issues clearly reveal that study of poverty in terms of multidimensional aspects and assessment of the determinants of such poverty is the need of the hour to unearth the ground reality and formulate effective policy prescriptions to reduce it.

3. OBJECTIVES OF THE STUDY

1. To examine the incidence and intensity of multidimensional poverty in Aizawl district of Mizoram
2. To assess the distribution of poverty across the study area.
3. To identify the major determinant of multidimensional poverty in the study area.

4. METHODOLOGY

4.1 Sampling Design: This study employed both secondary and primary data. Secondary data were collected from various published reports. A multi-stage random sampling technique was adopted to collect primary data. In the first stage, the Aizawl district was selected so as to represent the state of Mizoram. In the second stage, three Rural Development Blocks were selected. The third stage involved the random selection of fifteen villages, five villages from each block. Requisite data were then collected randomly through a structured questionnaire which was designed based on the requirement for the construction of the Multidimensional Poverty Index. To determine the sample size, Slovin's formula with a 5.5 % margin of error was employed, which takes the following form;

$$\text{Sample Size (n)} = \frac{N}{1+Ne^2}$$

Where N is population and e is margin of error.

4.2 Tools of Analysis: To calculate incidence, intensity of poverty and MPI, the present study followed the method of Alkire-Foster counting approach. As regard to the choice of dimensions, indicators, thresholds, and weights associated with

indicators, the study followed the global MPI Brief Methodological Note 2017 (Alkire & Roble, 2017)

For estimating determinant of multidimensional poverty, the study employed the binary logistic regression which is usually expressed as

$$\text{Logit (p)} = \text{Log}\left(\frac{P}{1-P}\right) = [B_0 + B_1 X_i]$$

where 'p' is the probability of success and '1-p' is probability of failure. Equation-9 stated that the logit is the natural logarithm of the odds of success for the given explanatory variables x_1, x_2,x_3,…., $x_{i..}$ The model can also be written as

$$Pi = \frac{1}{1+\exp[-B_0+B_1 X_i]} \ldots\ldots\ldots\ldots\ldots \text{Eq-10}$$

We can apply the above model to define the determinants of poverty where the dependent variable Y can be regarded as the multidimensional poverty status of household i, which is 1 if the household is poor and 0 otherwise and can be written as

$$\left(\frac{P\,(y=1}{P\,(y=0)}\right) = \exp\,[B_0 + B_1 X_i] + \ldots\ldots\ldots\ldots\ldots \text{Eq-11}$$

Or

$$P(y=1) = \frac{\exp\,[B_0 + B_1 X_i]}{1 + \exp\,[B_0 + B_1 X_i]} \ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{Eq} - 12$$

where p(y=1) is the probability that the household is poor and p(y=0) implies the probability that the household is non-poor.

It is noteworthy that whether the dependent variable y, takes 1 or 0 is determined by the identification process of poor and non-poor using the Alkire-Foster counting method explained in the previous section as

$$y = 1 \text{ if } Di \geq Z \text{ or}$$
$$y = 0 \text{ if } Di > Z$$

where y is the categorical poverty indicator, Di is the deprivation score of the household and Z is the poverty cut-off.

In this study, household characteristics such as; dependency ratio, age, and education of the household head, household size, and size of agricultural landholdings were considered as explanatory variables to explain the poverty status of the household.

5. RESULTS AND DISCUSSION

5.1 Status of Multidimensional Poverty, Aizawl District, Mizoram

Aizawl district is the most advanced district of Mizoram based on various socio-economic indicators. Aizawl district has the lowest infant mortality rate with highest number of registered Micro Small and Medium Enterprise (MSME) units in the state. The district occupied the second highest position in literacy rate next to Serchhip district. As per BPL Baseline Survey conducted by Directorate of Economics & Statistics in 2016, Aizawl district also witnessed the third least percentage of BPL households next to Champhai district. On average, Aizawl district is relatively better than other districts in various development indicators. The overall state of multidimensional poverty in the Aizawl district is shown in Table 1 below.

Table 1: Status of Multidimensional Poverty, Aizawl District, Mizoram

Sl.No	Particulars	Aizawl District
1	Headcount Ratio (H)	0.284
2	Intensity of Poverty (A)	0.382
3	MPI (Adjusted Headcount Ratio/ M0)	0.10

Source: Own calculation from Survey Data (2019-20)

Table-1 shows the overall multidimensional scenario of the Aizawl district. The district has an incidence of poverty (headcount ratio) of 0.284 and 0.382 intensity of poverty with 0.10 MPI. The performance of Aizawl district is quite satisfactory and similar to the various existing official records of the Government of Mizoram. The larger number of health institutions in Aizawl city accompanied by easy means of transportation makes easy access to health services. All these facilities are likely to have direct and indirect impact in reducing child mortality, malnourishment and hence higher achievement in health dimension which is one component of Multidimensional Poverty.

Moreover, the number of schools and teachers are also comparatively higher than other districts in Mizoram. This indicates that education is more spread and easily accessible for the public, which in turn would improve the performance of Aizawl district in education dimension.

The satisfactory performance of rural Aizawl can also be attributed to the fact that Aizawl is the biggest commercial centre in Mizoram and caters to the needs of the state. It has the most diverse market structure in Mizoram where majority of business activities are done. It is, therefore, reasonable to conclude that easy market access directly and indirectly improves standard of living of the people in Aizawl district.

5.2 Distribution of Multidimensional Poverty in Aizawl District

To understand the level of multidimensional poverty in Aizawl district, it is necessary to examine the distribution of multidimensional poverty in the district. Table-2 and shows distribution of population and their categories based on deprivation scores. This classification clearly illustrates the status of multidimensional poverty in Aizawl district.

Table-2:Distribution of Multidimensional Poverty in Aizawl District

Population				
	MPI Poor (**28.4%**)		**Non-Poor (71.6%)**	
Category	Severe (%)	Non-severe (%)	Vulnerable (%)	Non-Vulnerable (%)
Percentage	2.2	26.2	20	51.6

Source: Field Survey (2019-20)

As shown in Table-2, Aizawl district has 28.4 percent of MPI poor, out of which only 2.2 percent are suffering severe deprivations while 26.2 percent are at moderate level. Majority of the population, which account for 71.6 percent of the total population, are identified as non-poor. However, out of 71.6 percent of the non-poor people, only 20 percent of the people are in vulnerable group, which means that the deprivations being faced by this group are close to be included in MPI poor and are high risk group to multidimensional poverty. Fortunately, the largest parts of the population, consisting of 51.6 percent of the population in the district are non-vulnerable to multidimensional poverty.

5.3 Determinants of Multidimensional Poverty in Rural Areas of Aizawl District.

Logistic regression modeling showed that household size, level of education of the head of family, dependency ratio, and age of the household head are the household-based determinants of multidimensional poverty which are significant at the 5% level of significance. The findings of the study conform to those of Datt, (1998) Al-Saleh (2000), Ajakaiye and Adeyeye, (2002), and Osowole, (2012). In regard to the size of agricultural landholding, the study found an insignificant result, which is the opposite of Hashmi, et.al., (2008) and Babu, et.al., (2019), which found a significant inverse relationship between the size of agriculture holding and poverty. However, the data revealed that agricultural productivity in Mizoram is still low, and people with larger agricultural land are unable to utilize such resources, which would normally have a negative link with the likelihood of a household being impoverished. Table 3 contains information about the significance of the coefficients, estimated odds ratios, and confidence intervals of the odds ratios generated by SPSS for the model.

Table 3: Determinants of Poverty

Variables in the Equation								
Household Characteristics	**B**	**S.E.**	**Wald**	**Df**	**Sig.**	**Exp(B)**	**95% C.I.for EXP(B)**	
							Lower	Upper
Household Size	.372	.150	6.127	1	.013	1.451	1.081	1.949
Size of Land Owned	.005	.033	.022	1	.883	1.005	.943	1.071
Education of Household Head	-.554	.150	13.640	1	.001	.574	.428	.771
Dependency Ratio	.053	.016	10.686	1	.001	1.054	1.021	1.088
Age of Household Head	-.068	.021	10.265	1	.001	.935	.897	.974
Constant	2.569	1.810	2.015	1	.156	13.058	-	-
Variable(s) entered: Household Size, Size of Land Owned, Education of Household Head, Dependency Ratio, Age of Household Head.								

Source: Author's Calculation from Field Survey, 2019-20

The estimated coefficient of 0.372 and the odds ratio of 1.45 for household size suggest a higher chance of being poor for larger households by 45 percent, which is consistent with the finding of Rani (2007), who concluded that the probability of a household being poor increases with the size of the household. The study also found a positive relationship between the dependency ratio and the probability of the household being poor, with a 0.053 coefficient and a 1.054 odds ratio, which is statistically significant as indicated in table 3. This finding is also consistent with previous findings by Rahman (2013), Asif (2007), and the World Bank Poverty Assessment for Latvia (2000), which found that households with higher dependency ratios had a higher probability of being poor and were at high risk of living in poverty. Sikander & Ahmed

(2008) also found that the dependency ratio has a positive relationship with the likelihood of a household becoming impoverished.

The study found significant negative coefficients for the age of the household head and his/her level of education, indicating that the likelihood of being poor was less if a household head was older and had a higher level of education. The result also reflects that the probability of a household being multidimensional poor is higher for younger household heads and for those with a low level of education. The results are in line with the findings of Asif (2007) and the claims of Babu & Sanyal (2009), who hypothesized a positive relationship between the age of the household head and the welfare achievement of such household, since older heads of households have more experience and respect in the community. The level of education was also hypothesized to have a positive impact on household welfare.

5.4 Goodness of Fit: The Classification Table

A commonly used test of the overall fit of a model in binary logistic regression is the Hosmer-Lemeshow test and classification table generated by SPSS. The Hosmer-Lemeshow test is computed by forming groups of cases and constructing a goodness-of-fit statistic by comparing the observed and predicted number of events in each group. The Hosmer-Lemeshow statistic indicates a poor fit if the significance value is less than 0.05. However, the Hosmer-Lemeshow test has been criticized as the p-value may change significantly when we allow for interactions in our data. As such, we excluded the interpretation of the Hosmer-Lemeshow test in this study despite the p-value being greater than 0.05. Another way of assessing how well the model fits can be explained by the classification table.

A classification table is a simple tool for evaluating the logit model in predicting the outcome variable (i.e. poor and non-poor). Table 4 presents the classification table.

Table 4: Classification Table

Classification Table				
Observed		Predicted		
		MPI Status		Percenage Correct
		Non-Poor	MPI Poor	
MPI Status	Non-Poor	76	9	89.4
	MPI Poor	17	27	61.4
Overall %age				79.8
The cut value is 0.50				

Source:Author's Calculation from Field Survey, 2019-20

As shown in table 4, the model has an impressively high level of correct predictions with an overall 79.8%. It predicted the MPI poor correctly by 89.4% and the non-poor by 61.44%. Thus, from the classification table, we can conclude that the model fits the observed data very well.

6. CONCLUSION

In India, poverty has been measured mostly in monetary metric forms, which fails to capture multiple deprivations that the poor are experiencing. Given the large geographical areas and different societies and cultures, the extent of poverty in India varies greatly across the country. Owing to such complex characteristics, the nature of deprivation and causes of such deprivation also vary regionally, which imposes the need for a regional based study on poverty in terms of multidimensional study. In this paper, we examine rural multidimensional poverty in Aizawl district of Mizoram, India based on the method of the global Multidimensional Poverty Index (MPI). We also assess the determinants of such poverty using binary logistic regression model by considering household characteristics such as dependency ratio, age, education of the household head, household size and size of agricultural landholdings as explanatory variables to explain the multidimensional poverty status of a household. The findings of the study provide a clear picture of poverty in the state and is expected to contribute in the formulation of poverty reduction policies.

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