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Research Article

Spatial Analysis Of Multidimensional Poverty In India: An Examination Of Regional Disparities.

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Abstract

This research investigates the spatial distribution and intensity of multidimensional poverty in India for the year 2021, using secondary data from the NITI Aayog report 2021, which is based on the NFHS-4 dataset. The 2021 Multidimensional Poverty Index (MPI), calculated using the Alkire and Foster methodology, includes three dimensions—health, education, and standard of living—comprising twelve indicators. The study identifies heightened levels of deprivation in economically challenged states such as Bihar, Madhya Pradesh, Uttar Pradesh, and Jharkhand. A detailed analysis was conducted to determine the primary causes of multidimensional poverty, revealing that health, particularly nutrition, is a significant factor affecting the MPI. The findings underscore the need for targeted policies aimed at eradicating poverty, with a particular focus on timely health and nutrition interventions. These insights offer a deeper understanding of the complex patterns of multidimensional poverty across Indian states, providing valuable perspectives for development planners and policymakers.

Keywords : poverty in India, multidimensional poverty, Multidimensional Poverty Index (MPI), spatial pattern of poverty, deprivation.

INTRODUCTION

In the field of development economics and social policy, the Multidimensional Poverty Index (MPI) serves as a crucial tool, shedding light on the intricate interplay of various poverty dimensions that affect individuals and communities globally (Alkire and Seth 2008; Alkire and Seth, 2015). Traditional poverty measures, which often rely solely on income-based metrics, fall short in capturing the multifaceted nature of deprivation affecting many societies (Alkire and Seth, 2015). In contrast, the MPI surpasses the limitations of these unidimensional approaches by incorporating a range of essential indicators, thereby providing a comprehensive understanding of poverty that goes beyond economic constraints alone (Tripathi and Yenneti, 2020). This introduction paves the way for an in-depth examination of the Multidimensional Poverty Index, exploring its conceptual foundations, methodological complexities, and practical applications (Dehury and Mohanty, 2015). As we delve into this discussion, we uncover the layers of disadvantage impacting diverse populations, emphasizing the critical need to address poverty in all its dimensions (Alkire and Seth, 2015). Tracing its conceptual origins to its current application in informing policy and promoting inclusive development, the MPI stands out as a vital instrument in the global effort to combat poverty (Tripathi and Yenneti, 2020). It guides interventions aimed at improving the well-being and dignity of the most vulnerable (Alkire and Seth 2008; Alkire and Seth, 2015). Through thorough analysis and critical reflection, this research paper seeks to contribute to the ongoing conversation on multidimensional poverty measurement, highlighting its importance in shaping a more equitable and sustainable future for all. India, a nation with a rich cultural heritage and vibrant diversity, paradoxically faces significant levels of poverty affecting millions of its citizens (Dehury and Mohanty, 2015). Despite the economic growth that has positioned India as an emerging global economic force, the harsh reality of multidimensional poverty remains, overshadowing the country's aspirations for progress and prosperity (Alkire and Seth, 2015; Kumar et al., 2015). In this context, the Multidimensional Poverty Index (MPI) is an essential tool for understanding and addressing the complex nature of deprivation experienced by diverse communities across India's vast landscape (Dehury and Mohanty, 2015).

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This discussion sets the stage for a focused examination of the Multidimensional Poverty Index within the Indian context, exploring the intricate web of factors that contribute to the persistence of poverty despite economic growth (Tripathi and Yenneti, 2020). From crowded urban slums to remote rural areas, the MPI provides a lens to investigate the intersecting dimensions of poverty, including income disparities as well as differences in health, education, and living standards (Dehury and Mohanty, 2015). As we delve into the intricacies of multidimensional poverty in India, it becomes clear that traditional measures fail to capture the full scope of deprivation faced by marginalized populations, necessitating a more comprehensive approach to poverty assessment (Tripathi and Yenneti, 2020). Against this backdrop, this research paper aims to explore the landscape of multidimensional poverty in India, highlighting the challenges and opportunities for policy intervention.

Through rigorous analysis of MPI data and contextual insights from empirical research, we seek to illuminate pathways towards inclusive development and social justice. By critically evaluating the effectiveness of existing poverty alleviation strategies and proposing innovative approaches informed by the MPI framework, this paper aspires to contribute to the discourse on poverty reduction in India, advocating for policies that prioritize the well-being and dignity of all its citizens.

LITERATURE REVIEW

Alkire and Foster (2011) provided a practical framework for identifying the poor and measuring aggregate poverty. They explored the strengths, limitations, and misunderstandings of multidimensional poverty measurement to clarify the debate and encourage further research. They established definitions for uni-dimensional and multidimensional poverty measurement methodologies and described their approach, which includes a 'dual cut off' identification step that views poverty as multiple deprivations, and an aggregation step based on the traditional Foster, Greer, and Thorbecke (FGT) measures. Alkire and Seth (2015) examined changes in multidimensional poverty in India between 1999 and 2006 using National Family Health Surveys. They found a significant reduction in national poverty, driven more by improvements in living standards indicators such as electricity, housing conditions, access to safe drinking water, and improved sanitation facilities than by other social indicators. Ataguba, Ichoku, and Fonta (2013) compared poverty and deprivation assessments using different conceptions, including money-metric measures and various multidimensional constructs, based on household surveys in Nsukka and Nigeria. They found a substantial mismatch between income poverty and multidimensional poverty. Suppa (2016) also observed a significant mismatch between Germany's official income-based poverty measure and the multidimensional poverty index based on the Alkire-Foster method. He suggested that additional individual income reduces multidimensional poverty, but at a decreasing rate. In China, Wang et al., (2016) found that 69% of multidimensionally poor households were not considered poor in terms of income poverty. Using panel household survey data from 2007, 2008, and 2010, Tran et al., (2014) showed that in Vietnam, monetary poverty (or non-poverty) does not always align with multidimensional poverty (or non-poverty). Monetary poverty is more sensitive to changes in a household's characteristics than multidimensional poverty. Moreover, improvements in multidimensional poverty are mainly due to a reduction in the incidence of poverty rather than the intensity of poverty. The study indicated that the effects of rapid economic growth are greater and more elastic on monetary poverty than on multidimensional poverty. Dehury and Mohanty (2015) estimated and decomposed the multidimensional poverty dynamics in 84 natural regions of India using the Indian Human Development Survey (IHDS) 2004-05. They included consumption expenditure to quantify the living standard dimension. Examining micro-level evidence from two slums in Delhi, Bisiaux (2013) explored the differences in poverty definitions—monetary poverty, primary good deprivation, and lack of capabilities—to measure poverty extent according to each approach. The results showed little evidence of a perfect match between the three definitions of poverty. The estimates of the multidimensional poverty index (MPI) have been published for over 100 developing countries in the UNDP's Human Development Reports since 2010. The MPI, developed by the Oxford Poverty and Human Development Initiative (OPHI) and based on the Alkire-Foster methodology, considers three dimensions: education, health, and standard of living (HDR 2010, 2015).

DATA BASE AND METHODOLOGY

This study relies on secondary data sources, specifically the Multidimensional Poverty Index (MPI) data for India for the year 2021, sourced from the Global MPI compiled by the National Institution for Transforming India (NITI) Aayog using the Alkire-Foster (A-F) Method. The MPI, developed by the Oxford Poverty and Human Development Initiative (OPHI) in collaboration with the United Nations Development Programme (UNDP), measures poverty through a set of indicators across three key dimensions: health, education, and living standards, each represented by specific indicators. India's national MPI largely aligns with the global methodology but has added two new indicators: Maternal Health (under the Health dimension) and Bank Account (under the Standard of Living dimension), as shown in the accompanying graphic

(which also indicates the weight attached to each dimension/indicator). These indicators correspond to various Sustainable Development Goals (SDGs).

Table 1 lists the dimensions, indicators, and cut-off points considered by NITI Aayog. Equal weights are assigned to each dimension, and within each dimension, equal weights are given to each indicator (Alkire and Santos, 2010; Alkire and Seth, 2015; UNDP, 2015, 2019). The deprivation score, which reflects the percentage of weighted deprivations experienced by the state's population, is calculated by summing the weights of each indicator of deprivation, summarizing the state's deprivation profile. Following Sen (1976), the next step is to identify who is poor using the poverty cut-off. Individuals experiencing one-third or more of the weighted deprivations are classified as MPI poor.

Thereafter, the proportion of multi-dimensionally poor individuals in the total population has been determined which is known as the Headcount Ratio (H) of multidimensional poverty and is the first of two partial indices used to determine the MPI.

Table 1. Dimensions, indicators, deprivation cut-off and weights of the multidimensional poverty.

Dimension	Indicators	Deprivation cut-off	Weight (W)
Health (1/3)	Nutrition	Any child between the ages of 0 to 59 months, or woman between the ages of 15 to 49 years, or man between the ages of 15 to 54 years -for whom nutritional information is available - is found to be undernourished.	1/6
	Child-Adolescent Mortality	A child/adolescent under 18 years of age has died in the family in the five-year period preceding the survey.	1/12
	Maternal Health	Any woman in the household who has given birth in the 5 years preceding the survey, has not received at least 4 antenatal care visits for the most recent birth or has not received assistance from trained skilled medical personnel during the most recent childbirth.	1/12
Education (1/3)	Years of Schooling	Not even one member of the household aged 10 years or older has completed six years of schooling.	1/6
	School Attendance	Any school-aged child is not attending school up to the age at which he/she would complete class 8.	1/6
Standard of living (1/3)	Cooking Fuel	A household cooks with dung, agricultural crops, shrubs, wood, charcoal or coal.	1/21
	Sanitation	The household has unimproved or no sanitation facility or it is improved but shared with other households.	1/21
	Drinking Water	The household does not have access to improved drinking water or safe drinking water is at least a 30-minute walk from home (as a round trip).	1/21
	Electricity	The household has no electricity.	1/21
	Housing	The household has inadequate housing: the floor is made of natural materials, or the roof or wall are made of rudimentary materials.	1/21
	Assets	The household does not own more than one of these assets: radio, TV, telephone, computer, animal cart, bicycle, motorbike, or refrigerator, and does not own a car or truck.	1/21
	Bank Account	No household member has a bank account or a post office account.	1/12

Source: National Multidimensional Poverty Index, 2021 Based on NFHS-4 (2015-16), NITI Aayog.

Percentage of multi-dimensionally poor is denoted by H and defined as $H = \frac{q}{n} * 100$

Where, q is the number of multidimensional poor households and n is the total population.

Thereafter intensity of poverty (A) which is the second partial index to formulate MPI has been calculated. The intensity of poverty (denoted by A) is the average proportion of deprivations which is experienced by multi-dimensionally poor individuals. In percentage form, it is expressed as

$$A = \frac{1}{q} \sum_{i=1}^{q} c_i(k)$$

Where, Ci(k) is the deprivation score of multi-dimensionally poor individuals up to the ith individual and q is the number of multi-dimensionally poor individuals.

The Multidimensional Poverty Index (MPI) is the product of the two partial indices, the (H) and (A). Hence, the index reflects both the incidence and the intensity of poverty.

Thus MPI is calculated as: MPI = H * A

Further we have decomposed the MPI by dimensions and indicators to assess the contribution of the various dimension/ indicators to overall poverty. The contribution of a particular indicator to overall multidimensional poverty is computed as:

Contribution of indicator i to $MPI = \frac{wiCHi}{MPIc} * 100$

Where wi is the weight of the ith indicator (Table 1)

Spatial Pattern of MPI, Headcount Ratio, and Intensity of Poverty in 2021

Table 2 presents state-wise regional disparities in multidimensional poverty, headcount ratio, and intensity of poverty in India based on the most recent NITI Aayog report from 2021. According to **Table 2**, Bihar has the highest MPI score in 2021 (0.265), while Kerala has the lowest (0.003). In addition to Bihar, Jharkhand also exhibits a very high level of multidimensional poverty with an MPI score greater than 0.198. High poverty levels, with MPI scores ranging from 0.133 to 0.198, are observed in seven states, from Chhattisgarh (0.134) to Uttar Pradesh (0.180).

Figure 1 illustrates that the central and eastern regions of India are significantly poorer compared to the rest of the country. As shown in **Table 2**, eight states, including Jammu and Kashmir, surpass the national MPI threshold of 0.118 in 2021, indicating the need for special attention. The spatial pattern of MPI reveals that severe poverty conditions persist in 28 percent of India. Six states—Nagaland, Arunachal Pradesh, West Bengal, Gujarat, Uttarakhand, and Tripura—fall into the moderate MPI score category (0.068–0.133) in 2021 (**Fig. 2**). The remaining 14 states have low MPI scores, less than 0.068. According to **Figure 2**, most states in the southern and northern parts of India exhibit low concentrations of multidimensional poverty. In terms of the headcount ratio, Bihar has the highest percentage at 51.9%, followed by Jharkhand. According to the NITI Aayog report, 25.0% of Indians are currently categorized as multi-dimensionally poor. A detailed analysis by state reveals that 10 out of India's 29 states have exceeded this threshold. Conversely, Kerala exhibits the lowest headcount ratio of multidimensional poverty, standing at just 0.7 %. From the perspective of poverty in India, it is encouraging to note that in 2021, states like Goa, Sikkim, and Tamil Nadu have achieved multidimensional poverty headcount ratios of less than 5%. Figure 3 also depicts that in 2021, the central, eastern, and northeastern regions of India experience moderate to high poverty headcount ratios, while the southern and northern regions have lower rates of multidimensional poverty headcount.

Figure 1. Spatial Pattern of MPI, Headcount Ratio and Intensity of poverty.

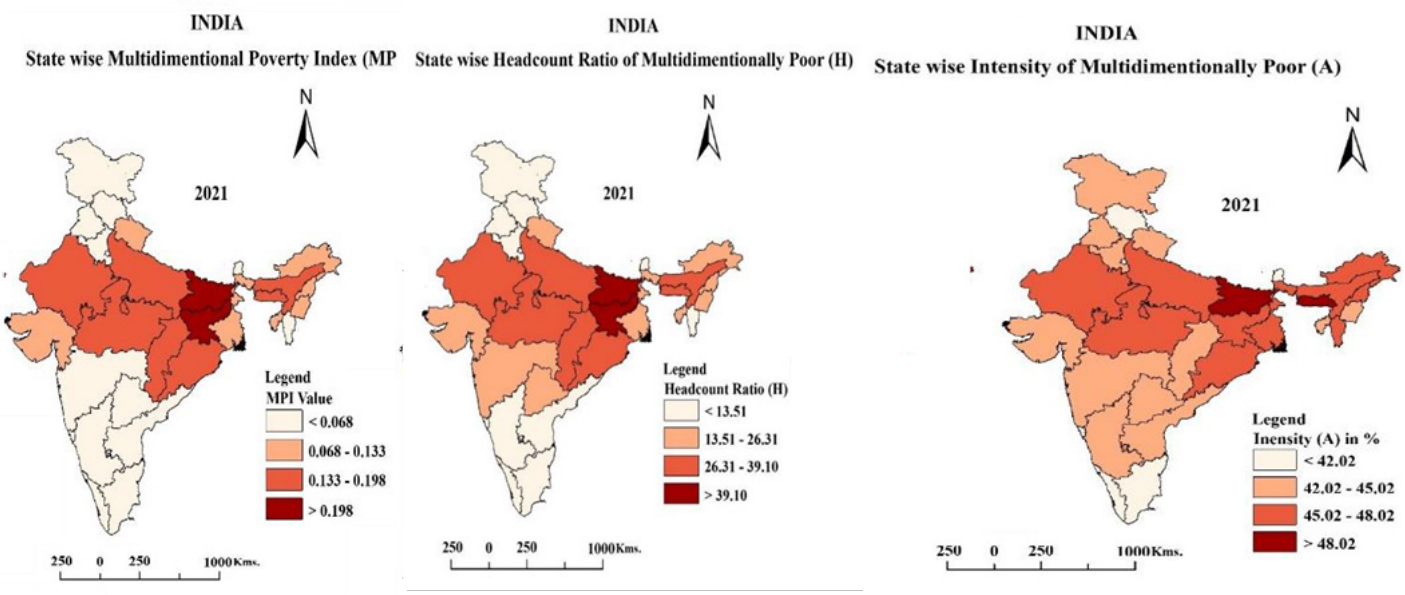
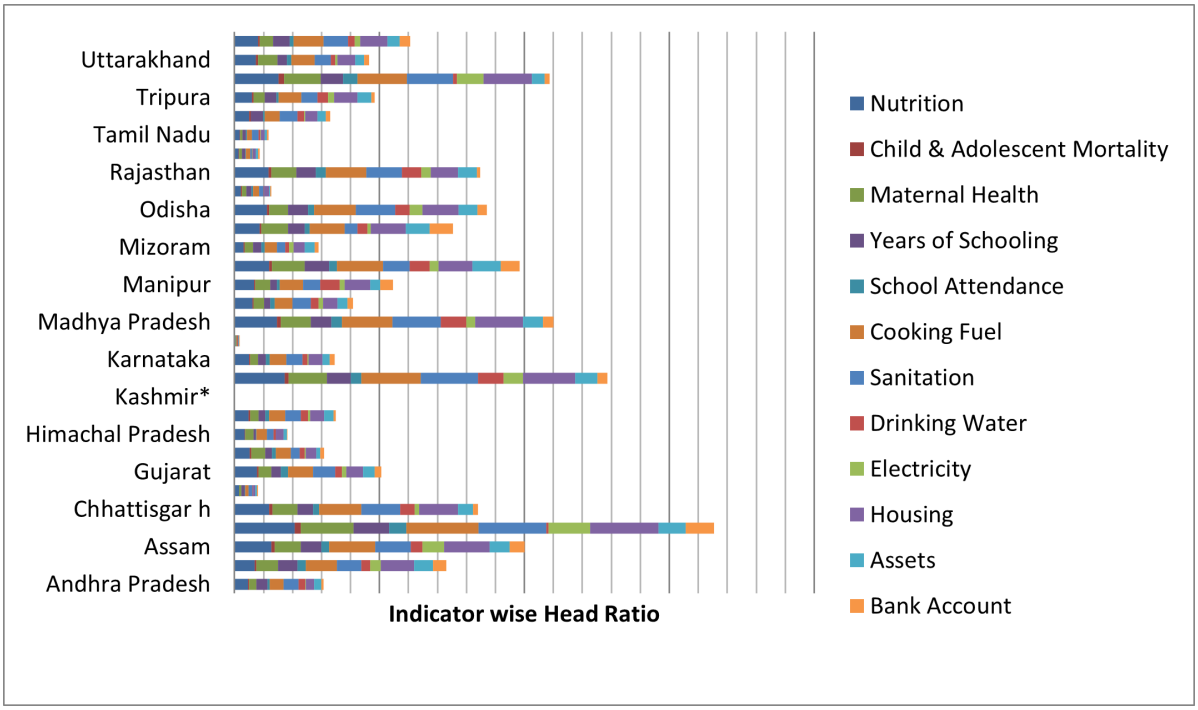


Figure 2. Indicator wise censored headcount ratio in states of India, 2021. Source: Prepared by author.



According to the latest data, Bihar exhibits the highest intensity of poverty, followed by Meghalaya (**Table 2**). In addition to these states, eleven others, ranging from Jharkhand (47.9%) to Tripura (45.0%), also experience high poverty intensity (**Fig. 3**). The NITI Aayog estimates for 2021 indicate that nine Indian states have poverty intensities exceeding the national average of 47.1%, while the remaining 19 states fall below this threshold. **Table 2** highlights that even in states with low multidimensional poverty rates (less than 15%), such as Mizoram, Punjab, Haryana, Jammu and Kashmir, and Karnataka, the intensity of poverty surpasses the national average (more than 42%). Spatial analysis reveals that poverty intensity often diverges from the patterns observed in MPI and headcount ratio assessments, influenced by various socioeconomic and cultural dynamics.

Figure 3. Headcount Ratio (% of population who are multidimensionally poor).

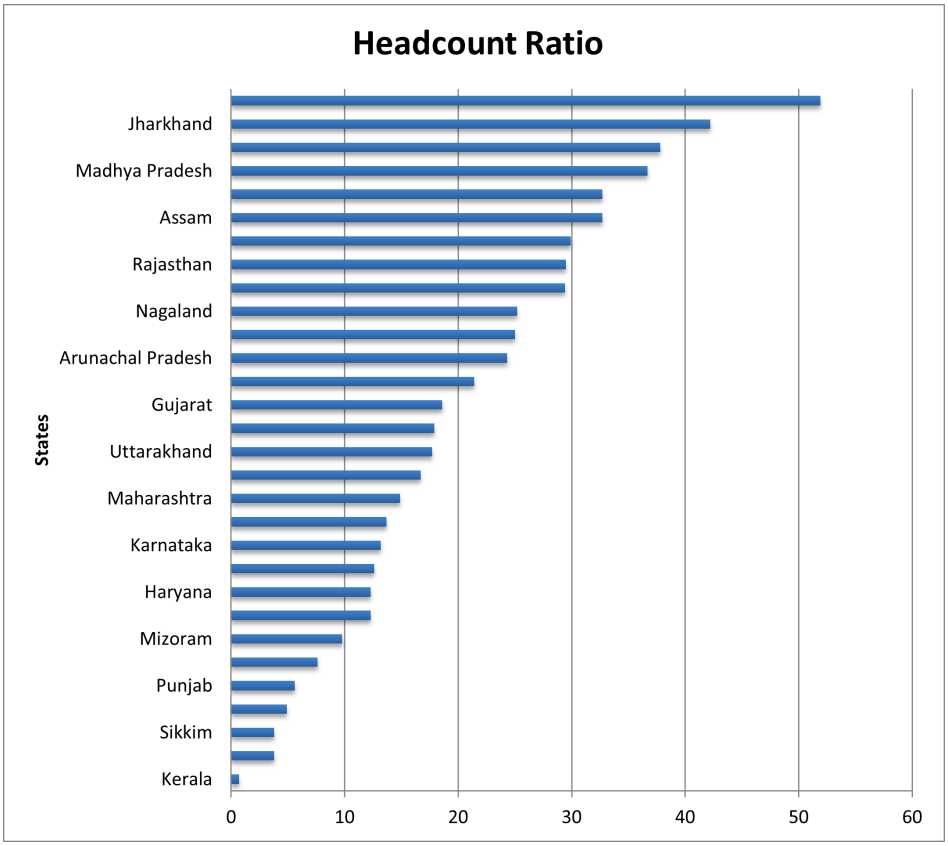


Table 2. State wise Multidimensional Poverty Index.

State	2021**		
	MPI	Head count (H)	Intensity (A)
INDIA	0.118	25.0	47.1
Andhra Pradesh	0.053	12.3	43.2
Arunachal Pradesh	0.115	24.3	47.3
Assam	0.156	32.7	47.9
Bihar	0.265	51.9	51.0
Chhattisgarh	0.134	29.9	44.6
Goa	0.015	3.8	40.2
Gujarat	0.084	18.6	45.0
Haryana	0.055	12.3	44.4
Himachal Pradesh	0.03	7.6	39.4
Jammu & Kashmir***	0.055	12.6	44.1
Jharkhand	0.202	42.2	47.9
Karnataka	0.056	13.2	42.7
Kerala	0.003	0.7	39.0
Madhya Pradesh	0.173	36.7	47.3
Maharashtra	0.065	14.9	43.8
Manipur	0.08	17.9	44.4
Meghalaya	0.157	32.7	48.1
Mizoram	0.046	9.8	47.4
Nagaland	0.117	25.2	46.3
Odisha	0.136	29.4	46.4
Punjab	0.024	5.6	43.8
Rajasthan	0.140	29.5	47.4
Sikkim	0.016	3.8	41.2
Tamil Nadu	0.02	4.9	40.0
Telangana	0.059	13.7	43.2
Tripura	0.075	16.7	45.0
Uttar Pradesh	0.180	37.8	47.6
Uttarakhand	0.079	17.7	44.4
West Bengal	0.097	21.4	45.5
INDIA	0.118	25.0	47.1

Source: * Global Multidimensional Poverty Index 2018, Oxford Poverty and Human Development Initiative (OPHI), University of Oxford, P. 31
** National Multidimensional Poverty Index, 2021 Based on NFHS-4 (2015-16), NITI Aayog *** Value of Jammu & Kashmir includes J & K and Ladakh UT.

Table 3 reveal that poorer states in India suffer acute deprivation in most indicators. Bihar is in the worst condition, with the highest deprivation in ten out of twelve indicators, including nutrition, child and adolescent mortality, maternal health, years of schooling, school attendance, cooking fuel, sanitation, electricity, housing, and bank accounts in 2021. Jharkhand's deprivation levels are similarly severe to Bihar's in most MPI indicators, except for electricity, assets, and bank accounts (**Table 3**). Uttar Pradesh, India's most populous state, also experiences intense deprivation in most indicators, excluding drinking water, assets, and bank accounts. **Table 3** shows that Madhya Pradesh has the highest deprivation in drinking water in 2021 and also faces severe deprivation in child mortality, cooking fuel, and sanitation. In the northeastern states, Meghalaya and Assam have the worst conditions (Fig. 2).

Table 3 shows that in 2021, Meghalaya in northeast India had the highest deprivation in assets. In contrast, the southern states like Kerala, Karnataka, Andhra Pradesh, Tamil Nadu, and Telangana exhibit much lower levels of deprivation across all indicators, falling well below the national average (Fig. 2). Among the western states, only Rajasthan has notably high censored headcount ratios (**Table 3**). Consequently, the poorer states of India—Bihar, Jharkhand, Uttar Pradesh, Madhya Pradesh, and Chhattisgarh—need special attention to address multidimensional poverty.

Table 3. State wise Censored Headcount Ratio of MPI Indicators in 2021.

Censored Headcount Ratio	Health			Education		Standard of Living						
	Nutrition	Child & Adolescent Mortality	Maternal Health	Years of Schooling	School Attendance	Cooking Fuel	Sanitation	Drinking Water	Electricity	Housing	Assets	Bank Account
INDIA	19.9	1.9	14.7	10.7	5.2	23.1	21.3	5.5	8.3	20.6	8.9	5.4
Andhra Pradesh	9.2	0.9	4.8	7.7	1.5	9.7	10.5	4.4	0.6	5.7	4.8	1.7
Arunachal Pradesh	13.8	1.2	14.9	13.5	5.9	21.3	16.7	6.2	7.2	23.3	12.9	9.2
Assam	25.5	2.2	17.8	14.3	5.6	31.6	24.4	8.3	14.7	31.4	13.9	10.5
Bihar	41.6	3.9	36.5	24.7	11.6	50.2	46.6	1.6	28.8	47.1	18.7	19.6
Chhattisgar h	24.0	2.3	17.0	10.9	4.3	29.1	26.6	10.2	2.8	26.8	10.4	3.4
Goa	3.0	0.2	1.4	2.2	0.6	2.1	2.8	0.3	0.0	1.8	0.9	0.8
Gujarat	15.4	1.1	8.7	6.7	4.8	17.3	15.5	4.7	2.9	11.4	8.2	4.4
Haryana	10.4	1.2	9.4	4.6	2.8	10.2	6.2	3.4	0.8	7.4	2.6	2.9
Himachal Pradesh	6.8	0.6	5.7	1.5	0.4	7.1	4.8	1.4	0.2	5.2	2.2	0.7
Jammu & Kashmir*	9.7	0.9	6.1	4.5	2.5	11.3	10.6	5.0	1.7	9.4	6.7	1.4
Jharkhand	34.4	2.7	26.5	16.5	7.2	41.3	39.4	17.5	13.6	35.9	15.5	6.6
Karnataka	10.1	0.7	5.4	5.5	2.4	11.6	11.0	3.5	1.0	9.4	5.0	3.4
Kerala	0.6	0.0	0.2	0.2	0.2	0.6	0.3	0.1	0.2	0.4	0.3	0.2
Madhya Pradesh	29.1	2.7	20.9	14.0	7.3	34.9	33.2	17.6	6.5	32.7	13.7	7.4
Maharashtra	12.4	0.8	7.1	4.3	3.0	12.5	12.5	5.3	3.1	10.1	6.7	3.8
Manipur	13.4	1.0	10.1	4.7	1.8	16.3	11.7	13.6	3.5	17.3	6.9	8.9
Meghalaya	23.8	2.1	22.5	16.7	5.3	31.8	18.6	13.7	6.4	23.3	19.4	12.9
Mizoram	6.2	0.6	6.0	5.5	2.3	8.7	5.7	2.8	3.0	7.6	6.7	2.7
Nagaland	17.2	1.4	18.3	11.3	3.7	24.0	8.7	6.9	2.5	24.0	16.7	15.8
Odisha	22.4	1.5	12.8	13.8	4.3	28.8	27.1	9.9	8.9	24.9	13.3	6.5
Punjab	4.4	0.5	3.1	3.4	1.4	4.2	3.0	0.3	0.2	3.3	0.6	1.0
Rajasthan	23.3	2.1	17.1	13.4	7.2	27.7	24.8	13.1	6.6	18.7	13.3	2.2
Sikkim	2.9	0.3	1.8	2.5	0.4	2.9	1.1	0.2	0.1	2.3	1.8	1.1
Tamil Nadu	3.6	0.3	1.7	2.3	0.5	3.6	4.5	1.2	0.4	2.6	1.4	1.5
Telangana	10.2	0.8	0.1	8.5	1.1	10.5	12.2	4.5	0.9	8.3	6.0	2.7
Tripura	12.0	0.9	7.8	8.1	1.7	15.5	11.1	7.3	4.3	16.2	9.4	2.2
Uttar Pradesh	30.5	3.8	25.3	15.1	10.0	34.3	31.8	2.4	18.4	33.4	8.9	3.3
Uttarakhand	14.7	1.6	13.1	6.7	3.2	15.8	11.2	3.2	1.4	12.4	6.2	3.2
West Bengal	16.2	1.0	9.4	11.3	2.8	20.8	16.9	4.4	3.7	18.8	8.7	7.1

Source: National Multidimensional Poverty Index, 2021 Based on NFHS-4 (2015-16), NITI Aayog * Value of Jammu & Kashmir includes J & K and Ladakh UT.

CONCLUSION

The analysis of India's Multidimensional Poverty Index (MPI) for 2021, based on NITI Aayog's report using the Alkire-Foster method, reveals significant regional disparities in poverty. Bihar emerges as the most impoverished state, with the highest MPI score (0.265) and headcount ratio (51.9%), while Kerala records the lowest MPI score (0.003) and minimal multidimensional poverty (0.7%). The findings highlight that central and eastern regions, including Jharkhand, Uttar Pradesh, and Madhya Pradesh, experience the highest levels of poverty, whereas southern states like Kerala, Tamil Nadu, and Karnataka demonstrate significantly lower deprivation levels.

The spatial distribution of multidimensional poverty indicates that 28% of India's population faces severe poverty, with states like Nagaland, Arunachal Pradesh, West Bengal, and Tripura falling into the moderate MPI category. Notably, Bihar and Meghalaya

register the highest poverty intensity, surpassing the national average of 47.1%.An in-depth indicator-wise assessment underscores that Bihar exhibits the highest deprivation across ten of the twelve indicators, particularly in nutrition, child mortality, maternal health, education, and basic amenities. Jharkhand and Uttar Pradesh follow a similar pattern, with severe deprivations in key areas. In contrast, southern and western states generally experience much lower levels of multidimensional poverty. The study emphasizes the need for targeted policy interventions in the most affected states, focusing on improving access to healthcare, education, and basic infrastructure. Addressing multidimensional poverty requires a region-specific approach to ensure inclusive development and progress toward Sustainable Development Goals (SDGs).

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