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Research Article

District-Level Disparities in Childhood Malnutrition: A Comprehensive Analysis of Nutritional Status and Determinants in Assam, India

Rupan Boro[1*], *Anup Karmakar*[2]

[1]*Assistant Professor, Department of Economics, Barnagar College, Sorbhog, Assam, India, 781317*

[2]*Assistant Professor, Department of Commerce, Barnagar College, Sorbhog, Assam, India, 781317*

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ABSTRACT

The research analyzes the various parameters of childhood malnutrition in the districts of Assam, India, by using secondary data to evaluate key nutritional indicators such as stunting, wasting, severe wasting, and underweight. The findings yielded major variations across districts and indicated that malnutrition rates were far above average in comparison to national and comparable Indian states. The analysis has also pointed out five districts that show high prevalence of malnutrition within a double or triple burden: *Karimganj, Dhubri, Bongaigaon, Biswanath, and Chirang,* thus indicating there is a severe and persistent nutritional challenge within these districts. Apart from this, geographical disparities indicate concentrated pockets of food insecurity and healthcare inadequacies within the state.

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1. Introduction

Childhood malnutrition is a significant public health challenge in many low and middle-income countries, severely affecting their survival and development (WHO, 2023). Undernourishment weakens their immune systems, making more susceptible to infections and illnesses like diarrheal diseases and respiratory infections, which can be fatal. Globally, malnutrition is linked to 45% of deaths (3.1 million) among children under five years old (Black et al., 2013). Furthermore, malnourished children experience frequent illness, which in turn exacerbates their poor nutritional status. This creates a vicious cycle of malnutrition, preventing their optimal physical and intellectual development (Stewart et al., 2013). Such retardant physical growth and cognitive development hinder their educational and economic potential, and can affect their future reproductive health as well (Stewart et al., 2013). Ending the hunger in all forms and ensuring food security by 2030 was, therefore, set as the second Sustainable Development Goal (SDGs) by the United Nations (UN) in 2015. India, committing to the SDGs, sets target to reduce prevalence of stunting and underweight up to 2.5% and 0.9% respectively by 2030. With an aim to achieving it, the Government of India launched the Prime Minister's Overarching Scheme for Holistic Nutrition (POSHAN) Abhiyan in 2018, besides the Integrated Child Development Services (ICDS) and Midday Meal schemes being implemented. The programme has a vision to ensure attaining malnutrition free India by 2022.

Malnutrition encompasses stunting, wasting, and underweight or overweight. According the WHO, stunting refers to low height-for-age, indicating chronic malnutrition. It is usually resulted by poverty, poor maternal health outcomes, frequent illness and/or inappropriate feeding. The wasting is defined as low weight-for-height, signaling acute malnutrition. It occurs when a person has inadequate quantity and quality of food and/or, suffers from frequent or prolonged illnesses. Underweight or overweight children may experience a combination of both acute and chronic malnutrition. The 2023 Joint Child Malnutrition Estimates by the UNICEF, the WHO, and the World Bank recorded that among the children under five years old 22.3% (148.1 million) were stunted, 6.8% (45 million) were wasted, and 5.6% (37 million) were overweight in 2022. Asia and Africa bore the highest burden of such children, with Asia alone accounting for 52% of global stunting, 70% of wasting, and 48% of overweight children. India lags behind not merely developed nations, many other countries in Asia with similar levels of economic development as well. For instance, the prevalence of stunting in India was 31.7% in 2022, compared to 26% in Bangladesh and Nepal each, 15% in Sri Lanka, and just 4.6% in China (WHO, 2023). The National Family Health Survey (NFHS-5) of 2022 also estimated that 35.6% of Indian children in the age of below five years were stunted, 19% were wasted, and 32% were underweight. Additionally, there have been rural-urban and socio-economic differences based on nutritional status (Kanjilal et al., 2010). Significant variation in child nutrition is seen across Indian States and Union Territories. For example, Meghalaya had the highest

*Corresponding Author:

bororupan71@gmail.com (R. Boro)

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stunting rate at 47%, while Puducherry had the lowest at 20%. The state of Assam, with 35.5% stunted children, is almost at per with the national average of 35.6%, but still has higher rates than many other states, including all north-eastern states (except Meghalaya). For instance, Sikkim reported at 22% and Manipur and Kerala at 23% each. Besides, child morbidity rate of Assam was 39 per 1000 live births, which was also much higher than other states like Kerala (6.2%) and Puducherry (3.9%). Thus, there has been prevalence of high childhood malnutrition, and infant and maternal mortality in Assam. This paper aims to assess the nutritional status of children below five years of age in Assam and explore the factors contributing to childhood malnutrition, based on secondary sources of information.

2. Review Of Literature

Studies have highlighted the statistically significant links between child malnutrition and various socioeconomic and demographic factors. Researchers such as Kanjilal et al., (2010) and Boma et al., (2014) have demonstrated how low socio-economic status; limited parental education, cultural norms, and poor dietary intake- particularly low protein consumption- contribute to childhood malnutrition. Children from low-income families are particularly vulnerable to malnutrition, as limited financial resources restrict both the quantity and quality of food available for consumption (Edris, 2007). Similarly, Kanjilal et al., (2010) and Kumar and Paswan (2021) have shown that children in the poorest socio-economic quintiles bear a disproportionate burden of malnutrition across Indian states. Other studies, such as those by Huda et al., (2018) in Bangladesh and Ekholuenetale et al., (2020) in Sub-Saharan Africa, reinforce the idea that socio-economically disadvantaged households face a higher prevalence of child malnutrition. Besides the economic factors, Hien et al., (2008) identified that the geographic isolation and poor maternal health outcomes as key determinants of children's nutritional status. Poor maternal health, such as underweight mothers, was shown as a key contributor to malnutrition of children, pointing to the generational effects of malnutrition. Parental education- especially the mother's educational levels is also identified as significant contributor to childhood malnutrition. Several studies by Edris, (2007); Hien et al., (2008); Ekholuenetale et al., (2020); Kumar and Paswan, (2021) highlighted that children of illiterate or uneducated mothers are more likely to be stunted, underweight, and wasted. This is because uneducated mothers are more often less capable of managing household resources effectively, accessing healthcare services, and implementing proper childcare practices, resulting in poorer nutritional conditions of their children. The number of children in a family is also exhibited as a key factor contributing undernutrition. Larger families tend to have higher rates of undernourished children, because children of such family are more likely to get insufficient quantity and quality of food (Hien et al., 2008).

A few studies on nutritional status of specific regions in Assam demonstrated similar findings. For example, Medhi et al., (2006) in their study on the nutritional status of the tea tribe population in Dibrugarh district of Assam exhibited how the poor socioeconomic conditions and unsanitary environment contributed to make the tea tribe population vulnerable to communicable diseases and under-nutrition. Dey and Nath (2017) also exhibited these factors along low levels of parental education as the significant contributors to malnutrition among school going children. Similarly, Bhattacharyya and Barua (2013) found a negative and significant relationship between nutritional status of adolescent girls and their mother's educational level in slum areas of Dibrugarh district of Assam. Researchers studied on nutritional status in different regions of Assam using household level cross sectional data. However, there is still the dearth of research based on extensive data across the districts of Assam. This paper studies nutritional status covering all the districts of Assam.

3. Significance of the study

This study of malnutrition in districts in Assam has enormous significance as it pinpoints certain high-risk areas, such as Karimganj (52.9% underweight) and Dhubri (48.5% stunted), which are literally in severe geographic contrasts. There arises an urgency for interventions targeted in the aforementioned areas. Differentiating between acute malnutrition (wasting in Karimganj at 48%) and chronic malnutrition (stunting in Biswanath at 42.7%) intensifies the argument for solutions of diverse timeframes-short-term food relief versus long-term improvement of health and sanitation. There are frightening gaps, as some districts are 20% above the state average, almost pointing to some failure of existing nutrition programs and a need to reset policy. As such, the study brings in the perspective of poverty, food insecurity, poor access to healthcare, among others, making the case for persuading action on these fronts for SDGs 2 and 3. The findings also highlight the economic and moral cases for a serious effort towards solving childhood malnutrition, as this will enhance productivity and break cycles of poverty. The findings would therefore bear significance for policymakers, NGOs, and researchers to clarify resource allocations and prioritize their strategies for intervention, with evidence of action, in those severely affected areas.

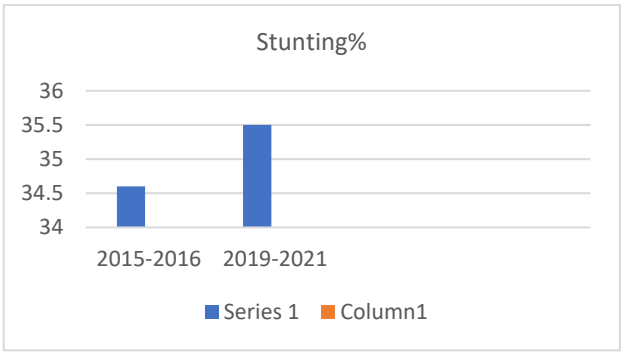
4. Methodology

This study bases secondary data obtained from the National Family Health Survey 2019-21 (NFHS-5). The NFHS offers information on population, health, and nutrition through survey of nationally representative sample households from 707 districts in all Indian states and Union Territories. The survey interviewed a total of 34,979 men and 4,973 women from 30,119 households in Assam to gather various information including household characteristics, and nutritional and health outcomes. We use data on nutrition and household characteristics to assess the nutritional status of children under the age of 0-59 months and identify the factors associated with it.

5. Results

According to the NFHS-5 estimates, the state of Assam had 35.5% of children under the age of five years affected by stunting in 2019-2021, showing a slight decrease from 36.4% in 2015-2016. Furthermore, 21.7% of children in the state were wasted, 9.1% were severely wasted, and 32.8% were underweight in 2019-2021. The rate of stunting in Assam was almost identical to the national average of 35.6%, while the rates of wasting, severe wasting, and underweight children were slightly higher than the national averages of 19.3%, 7.7%, and 32.1%, respectively. The estimates also reveal a disproportionate burden of malnutrition across regions and districts within Assam.

(A)



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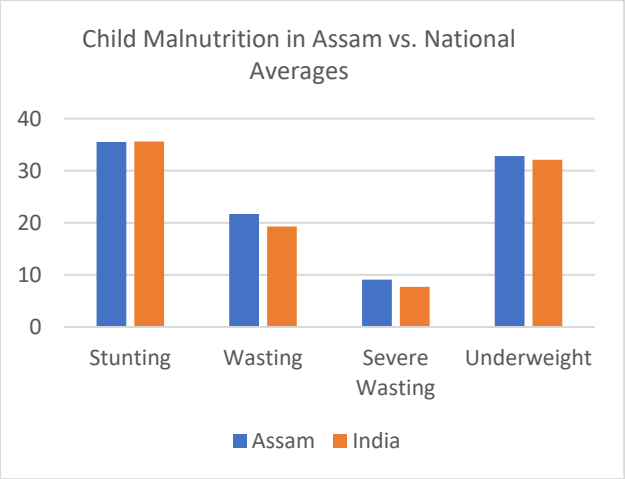

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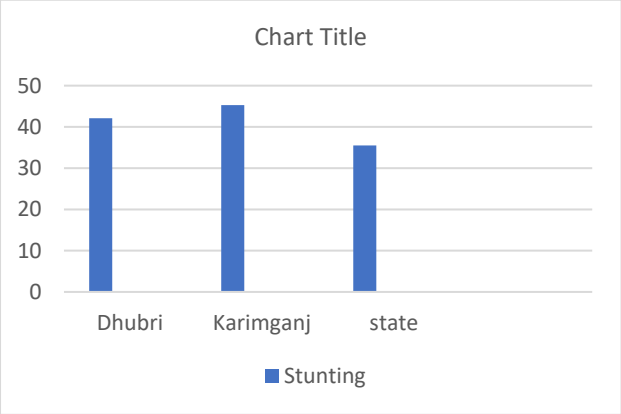

Figure 1: Rate of Stunted across districts of Assam in 2019-21

Among the districts of Assam, Dhubri had the highest rate of malnutrition, with nearly half of its children (48.5%) affected by stunting, followed by Bongaigaon (46.2%), Biswanath, and Chirang (42.7% each). Other districts such as Baksa, Hailakandi, and Morigaon also reported stunting rates above 40%. These figures were significantly higher than both the state average (35.5%) and the national average (35.6%). In contrast, Kamrup (22.6%) had the lowest rate of stunting followed by Kamrup Metro (25.4%).

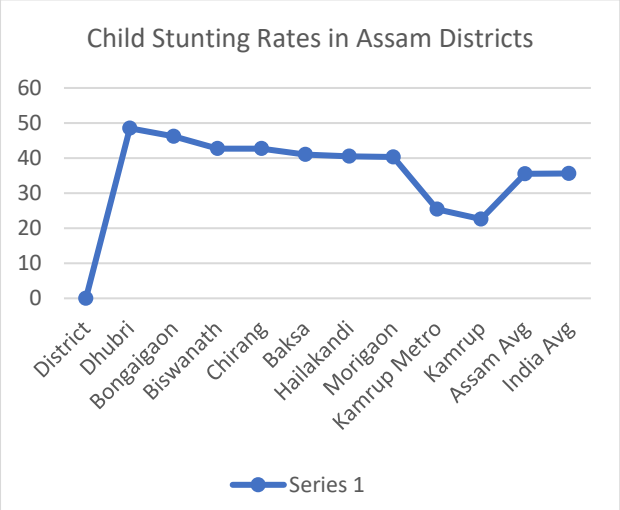

Figure 2: Rate of Wasted and Severely Wasted across districts of Assam in 2019-21

Karimganj district reported the highest rates of both wasted (48%) and severely wasted (30.5%) children. The proportion of children being wasted in this district was significantly higher than the state and national averages of 21.7% and 19.5%, respectively, and was notably higher than that in other districts like Hojai (12.7%) and Kamrup (14.8%). Similarly, severely wasted children in Karimganj were more than three times greater than the state average (9.1%) and the national average (7.7%). Other districts with higher rates of severely wasting included Goalpara (14.3%), Biswanath (13.7%), West Karbi-Anglong (12.7%), and Cachar (12.5%). Consequently, the burden of wasted and severely wasted children in these districts exceeded both the state and national averages. In contrast, districts such as Kamrup, Kamrup Metro, Hojai, Majuli, and Sonitpur had lower rates of both wasted and severely wasted children.

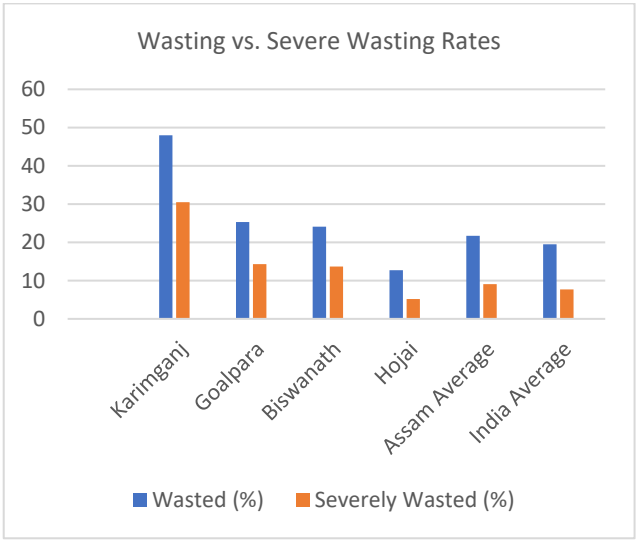

Figure 3: Rate of Underweight children across districts of Assam in 2019-21

Regarding underweight children, again Karimganj had the highest burden, with more than half of the children (52.9%) being underweight, followed by Hailakandi (42.4%). Both the districts had significantly higher proportions of underweight children compared to the state average (32.8%) and the national average (32.1%). These districts were also far behind other districts such as Kamrup (19.7%), Sonitpur (21.9%), and Kamrup Metro (25%) in terms of underweight children.

The data reveals that districts with high rates of stunting often struggle with other forms of malnutrition as well. The worst-performing districts for stunting, such as Dhubri, Hailakandi, Biswanath, and Chirang, also had higher proportions of underweight children. This suggests that children in these areas faced significant challenges of food insecurity and access to inadequate healthcare. Adequate access to these is the critical need during crucial growth phases of children. Besides, the higher rates of underweight reflect large number of children being suffered from both the acute and chronic malnutrition in these districts. Other districts like Karimganj, Goalpara, and Cachar exhibited high rates of both wasting and severely wasting, along with a higher proportion of underweight children. This indicates the children faced with short-term food scarcity or illness, which led them being suffered from both acute and chronic malnutrition in these areas. Furthermore, the combined high rates of stunting, wasting, and underweight in Biswanath highlight the triple burden of malnutrition faced by children in the district.

Table:1 *Triple Burden of Malnutrition in Assam Districts*

District	Under-weight (%)	Stunting (%)	Wasting (%)	Severe Wasting (%)
Karimganj	52.9	38.2*	48.0	0.5
Hailakandi	42.4	40.1*	22.3	0.8
Dhubri	39.8*	48.5	28.6	5.2
Biswanath	37.5*	42.7	24.1	3.7
Kamrup	19.7	22.6	14.8	.1
Assam Average	**32.8**	**35.5**	**21.7**	**.1**

6. DISCUSSION

Previous research has highlighted several household facilities and characteristics as key determinants of children's nutritional status. These factors include access to safe drinking water, improved sanitation, maternal education, exclusive breastfeeding, institutional births, age at first pregnancy, etc. Analysis of NFHS-5 data across districts of Assam reveals that areas with poor nutritional status are often lag in these crucial aspects. For instance, maternal education, as reflected in women's literacy rate, was significantly lower in underperforming districts like Bishwanath (69.2%), Dhubri (69.5%), and Chirang (71.5%) compared to the state average of 77.2% and better-performing districts such as Kamrup Metro (86%), Majuli (83.4%), and Kamrup (79.6%). The lower literacy levels among mothers in these areas might have limited their ability to effectively utilize resources and access child healthcare services, leading to high childhood malnutrition.

Additionally, access to safe and improved drinking water was notably lower in underperforming districts such as Hailakandi (41.2%), Cachar (43.8%), Karimganj (62.3%), and Biswanath (76.2%) compared to state and national averages of 86% and 95.9%, respectively. Similarly, the proportion of households with improved sanitation facilities in Cachar (57.6%), Hailakandi (60%), Karimganj (61.5%), and Dhubri (61.8%) was below both the national (70.2%) and state (68.8%) averages. Limited access to safe drinking water and inadequate sanitation affected nearly half of the households in specific areas, increasing children's vulnerability to infectious diseases and malnutrition.

The NFHS-5 estimates also highlight prevalence of higher early pregnancies (ages 15-19 years) in underperforming districts, with Dhubri (22.4%), Chirang (13.7%), and Goalpara (13.3%) compared to the state (11.2%) and the national (6.8%) averages. Institutional births were also comparatively less in these districts, reflecting limited access to healthcare services. Dhubri had the lowest institutional birth rate at 64.2%, followed by Karimganj (76.9%) and Cachar (79.2%).and national averages were 84.1% and 88.6% respectively. Greater proportions of pregnancies in an early age and non-institutional deliveries reveal the lack of awareness on benefit of and access to health care services. They also might be some of the key factors contributing higher proportion of undernourished children. Thus, deficiencies in household amenities and access to basic services in certain districts hindered efforts to combat malnutrition, exacerbating high prevalence of malnourished children in these districts.

7. CONCLUSION

The study finds that Assam faces significant challenges in tackling malnutrition. While the prevalence of malnourished children in Assam is slightly higher than the national average, it is notably higher compared to many other states. Malnutrition, disproportionately concentrates in specific districts, with Karimganj, Dhubri, Bongaigaon, Biswanath, and Chirang showing rates that significantly exceed both state and national averages. Karimganj, in particular, stands out with the highest rates of children being wasted, severely wasted and underweight. Despite the government's efforts to reduce the malnutrition through various programmes such as the Poshan Abhiyaan, ICDS, and Midday Meal scheme, high malnourishment continues to persist in many districts. Maternal education, limited access to safe drinking water, sanitation, and healthcare services are some of the key factors contributing the prevalence of high malnutrition. Districts with poorer nutritional status tend to have lower maternal literacy, limited access to safe drinking water, and higher rates of early pregnancies. Appropriate policies, specially a focused approach to high-burden areas need to be designed to make meaningful progress towards a malnutrition free state. Programmes like ICDS, Poshan Abhiyaan, and Midday Meal schemes must be scaled up in the areas with higher burden of malnutrition. In addition, proper attention must be paid to address the root causes of malnutrition-such as limited access to healthcare and education services, rather than focusing solely on under nutrition.

8. Recommendations

Scaling up therapeutic feeding centers across Assam's most burdened districts and strengthening the ICDS Anganwadi services in critically burdened areas like Karimganj and Dhubri are immediate steps to address the threat of malnutrition. To advance this further, implementation of targeted maternal and child health programs should take place with a focus on nutrition education, supplementation, and breastfeeding support. Meanwhile, food security will be addressed through kitchen gardens, crop diversification, and linking MGNREGA to nutrition-sensitive agriculture, improved WASH initiatives, aimed at stunting reduction, while at the same time, intensive therapeutic feeding centers would be scaling up strengthen boundaries. Such policy measures should include those districts as priority areas for monitoring by Poshan Abhiyaan in the state of Assam along with a multilateral convergence between health, education, and agriculture. Sub-district research and nutrition surveys every year will go a long way in keeping track of achievements made and patterning a catchment model similar to Kamrup along with involvement from the government, NGOs, and researchers to ensure effective last-mile delivery and responsible action regarding local drivers of malnutrition for sustainable impact on child development and future productivity.

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