

Status of Child Nutrition in India: A Comparative Study of Assam and West Bengal

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ABSTRACT- Undernutrition represents a distressing health issue among children in developing countries. It has been recognized as a significant factor contributing to child mortality worldwide, with approximately half of child deaths attributed to it. Despite India initiating the largest number of anti-malnutrition programs and boasting one of the fastest-growing economies globally, the situation regarding child malnutrition remains dire compared to other developing nations. Thus, utilizing data from the National Family Health Survey (NFHS) fifth and fourth rounds, this study aims to evaluate the nutritional status of children under 5 in Assam and West Bengal. The findings of the study reveal that West Bengal slightly outperforms Assam across all nutritional indicators. The prevalence rates of stunting (height-for-age), wasting (weight-for-height), and underweight (weight-for-age) are higher in both states, with noticeable increases over time as evidenced by various NFHS rounds. Furthermore, significant regional disparities exist within both states. While Assam exhibits significant results for wasting and underweight, West Bengal only displays significance for underweight. Despite robust economic growth in both states, they lag behind the Indian average concerning child nutrition.

KEYWORDS- Undernutrition, Stunted, Wasted, Underweight, Health, Assam, West Bengal.

I. INTRODUCTION

The 2030 Agenda for the Sustainable Development Goals (SDGs) speaks a common framework of worldwide cooperation to enhance sustainable development. Nutrition is one of the key points for the SDG-2 'End hunger, achieve food security and improved nutrition and promote sustainable agriculture' and is a necessary element for achieving other targets: the nutritional aspects is the overall SDGs aim to establish people healthy globally ensure food security. Nutrition is an input to people healthy and physical growth; nutrition improves right away of children health and cognitive abilities among them and helps to better learning capacities. Better nutrition also a main entrance points to minimize the pressure of poverty and to obtaining healthy life (WHO, 1988). As per view of the UNICEF nutrition as a basic human right, articulated in numerous human rights instruments from the convention on

the Rights of the Child to the Universal Declaration of Human Rights. The associations of nutritional issue related with the infection, fertility, maternal, immunity and child health and family health as well have more attention, in recent times. Children are considered as one of the greatest nutritional riskier groups and in now a day the numbers of under-nutritional children are increasing with the time. Generally, it has been observed that the under-nutrition influences the rate of mortality and morbidity among the children group and also significant impact has to their mental and physical development. The children are lesser able to capture physiologically for the deficiency of nutrition than the adults, Senauer & Gracia [1]. Nutrition is the thing which can drive the economic growth of the nation, because well-nourished children have much higher the earning potential as adults. If children suffer with under-nutrition, they are more chances to catch the disease which can affect their body function, brain, eye sight and other organs (UNICEF, 2007). Mostly in the developing countries like India the most health relating problem is under-nutrition and more children die from poor nutrition than for infectious disease, hence when larger portion of children suffer with under-nutrition the nation's entire population suffer. This is why worldwide nations have come up with the issues related to under-nutrition. Though we are relating nutrition with the SDG 2 but actual it is related with all the SDGs and the short description is how nutrition is link with goals which is consider as Grosso et al. [2]: 1. No poverty: Poverty limits access to adequate food and to makes it difficult to reach nutritional recommendations, 2. Zero hunger: Unsustainable food production consequences undernourishment, 3. Good health and wellbeing: Healthy and sustainable nutrition able to reduce child death, 4. Quality education: Undernutrition has impact on learning abilities, while higher awareness may affect healthy and sustainable food choices among the people, 5. Gender equality: Empowering women to claim their rights leads to improved quality of life and nutrition; proper nutrition improves learning performance, which can be translated into better job opportunities, and hence all other goals are related with the issue of nutrition in this way. Under-nutrition levels in India are higher than those of some poorer and lower-growth countries. According to the third National Family Health Survey (NFHS-3) Report, 48 per cent of Indian children below five years of age are stunted,

43 per cent underweight and 20 percent wasted. 24, 16 and 6 per cent of children below five years of age respectively suffer from severe forms of stunting, underweight and wasting. In the round five of National Family Health Survey (NFHS-5) it has recorded the indicators' value of stunted, wasted and underweight is 35.5, 19.3 and 32.1 percent respectively. Assam has a child population share of nearly 15 percent as per Census 2011 data and the West Bengal is more or less 12 percent. The various rounds of NFHS data indicate a low level of nutrition among the children of Assam and West Bengal from the others developed states of India. The nutritional indicators like stunted, wasted and underweight children percentage are 35.3, 21.7 and 32.8 respectively in Assam and 33.8, 20.3 and 32.2 percentage respectively in West Bengal as per the report of NFHS round 5.

There are several studies have been done with the issue of nutrition. Rajaram et al., [3] assessed the nutritional scenario of under-5 year's children considering the variables like weight-for-age (WAZ), height-for-age (HAZ) and weight-for-height (WHZ) of two states Kerala and Goa, Radhakrishna and Ravi [4] investigated the trends over the past two decades of malnutrition in India, Das [5] explored the child under nutrition level among different caste group class mainly in the mid-Indian tribal belt inhabited where the proportion of SC and ST are substantial. Bharati et al. [6] explored district level under nutrition children and the socio-economic factors of underweight children in West Bengal whose aged 0 to 71 months. Das and Sahoo [7] access the factors associated with child under-nutrition in the state Madhya Pradesh. The study suggested for improvement of nutritional status holistic programmes should need to be undertaken keeping mind their food habit with good health behaviour. Gaiha et al., [8] analyzed the composite indicator of anthropometric failure (CIAF) and it is disaggregation into subcategories considering under-5 years undernourished children. Khan and Raza [9] investigated the impact of socio-economic factors on malnutrition of under-5 children in Bangladesh. Rahman [10] analysed the various socioeconomic, demographic, health related factors of malnutrition among under-5 years children in Asian developing economy. Kumar et al. [11] examined the child malnutrition status and among tribal in India. The results found that the prevalence of stunting, wasting and underweight children among tribal whose age under 3 years was 41%, 30% and 43% respectively. Some others important related studies have been done by the researchers like Behrman & Wolfe [12] Gragnolati et al., [13] Pal, [14] Arnold et al., [15] Behrman & Skoufias, [16] Alderman et al., [17] Svedberg, [18] Bawdekar & Ladusingh, [19] Bharati & Bharati, [20] Ganapati, [21] Deaton & Dreze, [22] Ajieroh, [23] Kanjilal et al., [24] Mendelson, [25] Bharati et al. [26] Pathak & Singh, [27] Sahu et al. [28]. Other related issues have been addressed by the researchers like Bhattacharya and Jana [29], Paul et al., [30] and Bhattacharya and Jana [31]. The present study has made an assessment of the overall nutritional status of under-five year's children in the states Assam and West Bengal of India based on the secondary data from National Family Health Survey (NFHS) and other government publications. There are several factors which affect the child health and their nutritional status especially during their infancy periods. Apart from nutritional

deficiencies, child morbidity, educational level of the mother, living standards, and social practices have significant influences on child health. This study has only analyzed the nutritional status of under-5 year's children by looking into key indicators viz. Stunted, Wasted and Underweight.

II. OBJECTIVE OF THE STUDY

The objectives of the present study are:

- To see the status of nutritional indicators of under-5 children in Assam and West Bengal.
- To analyze the regional disparity of nutritional indicators in both the states Assam and West Bengal.

III. DATA AND METHODOLOGY

The present study is based on secondary data, and data is collected from the National Family Health Survey (NFHS), which is published in the different rounds. We only consider the 4th and 5th rounds that is published in the year 2015-16 and 2019-20, respectively. We make a comparative analysis of the nutritional status of children in the states of Assam and West Bengal. Further, we also analyze the divisional disparity of each state from the available data. To know the statistically significant disparity of the nutritional indicators among the divisions of both the states, we used one-way ANOVA.

IV. RESULTS AND DISCUSSION

As per the definition of World Health Organization (WHO), under-nutrition can classify into two parts, one is Protein Energy Malnutrition and other is Micro Nutrients Deficiency. Protein Energy Malnutrition manifests before the age of 2 years, due to inappropriate breastfeeding or other low level of protein in the food and different types of infections children are suffer from some unfit physical growth which is measured in indicators like stunting, wasting and being underweight. Here, children whose height-for-age (HAZ) Z-score is below minus two standard deviations (-2 SD) from the median of the reference population are considered short for their age or stunted; children whose weight-for-height (WAZ) is below minus two standard deviations (-2 SD) from the median of the reference population those are called wasted and Children whose weight-for-age is below minus two standard deviations from the median of the reference population are classified as underweight. The measurement of the related z scores is calculated based on the reference population and its median. Normally, it is measured by specific software like ANTHRO provided by the World Health Organization. Here, we also consider mainly these three indicators, namely stunted, wasted and underweight, for the analysis of the nutritional status of the states of Assam and West Bengal.

Table 1 represents the under-5 year's children nutritional condition considering the indicators like stunted, wasted underweight and overweight in the states Assam and West Bengal and it's compared with the India average as per the report of national family health survey 2019-20. It is observed that in case of all the nutritional indicators the state West Bengal is little bit better position as compared with the Assam. The value of all indicators like stunted,

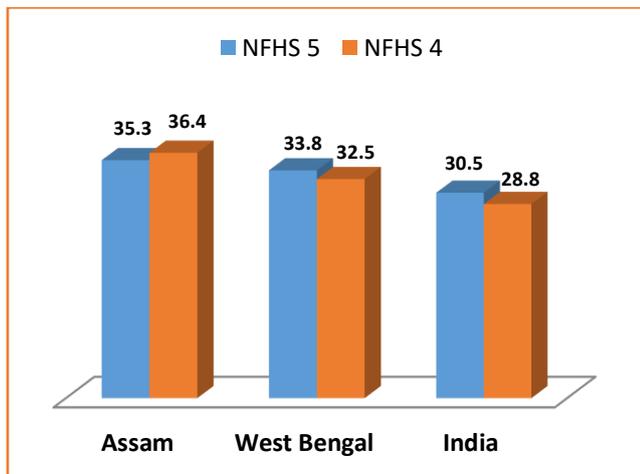
wasted, severely wasted, and underweight higher in the state Assam than India average as well as West Bengal except overweight (weight-for-height).

Table 1: Nutritional Status of Under-5 years Children in 2019-20 (%)

Indicators	Assam	West Bengal	India Average
Stunted (height-for-age)	35.3	33.8	30.5
Wasted (weight-for-height)	21.7	20.3	19.5
Severely wasted (weight-for-height)	9.1	7.1	8.8
Underweight (weight-for-age)	32.8	32.2	24.6
Overweight (weight-for-height)	4.9	4.3	8.3

Source: NFHS- 5 (2019-20)

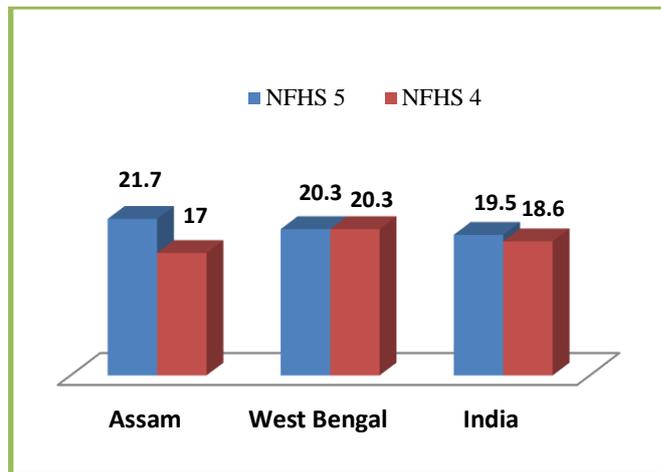
Figure 1 exhibits the percentage improvement of stunted children with the time in the states Assam, West Bengal and all India average as well. It has been seen in Assam the percentage under-5 years stunted children was 36.4 % in the year 2015-16 (NFHS-4) which has little decreased in 2019-20 (NFHS-5) that is 35.3 %. In the state West Bengal and all India average the results is slide different that here the stunted children percentage has increased over the time as per the NFHS report. So, it's a good sign for the state Assam though the number has not been significantly decreased.



Source: NFHS- 5 (2019-20) and NFHS- 4 (2015-16)

Figure 1: Children under-5 years who are stunted (%)

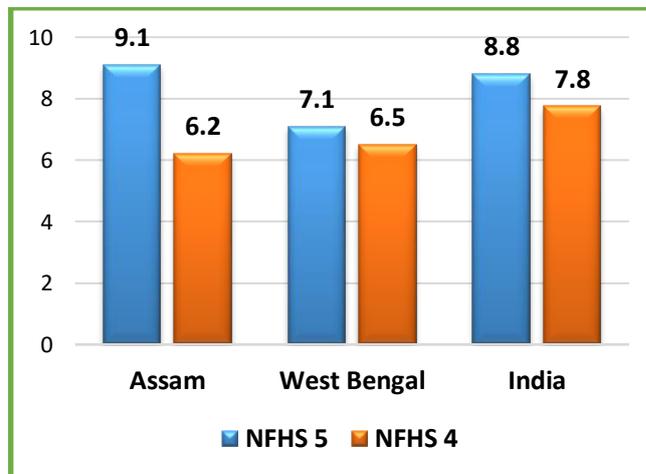
It is observed from the figure 2 that the percentage children under-5 years who are wasted have increased up to 21.7 percent in 2019-20 in Assam, where it was 17 percent in the year 2015-16. In the West Bengal the percentage of wasted children are same in both the national family health survey round that is 20.3 percent, there is no improvement recorded. The scenario of wasted children in all over India the trend is reverse that is day by day the percentage of under-5 years children has increasing and this situation has been seen only for some developing states, in the maximum states we found the reduction of the wasted children percentage, so government have to more interfere to the state which have higher wasted rate.



Source: NFHS- 5 (2019-20) and NFHS- 4 (2015-16)

Figure 2: Children under-5 years who are wasted (%)

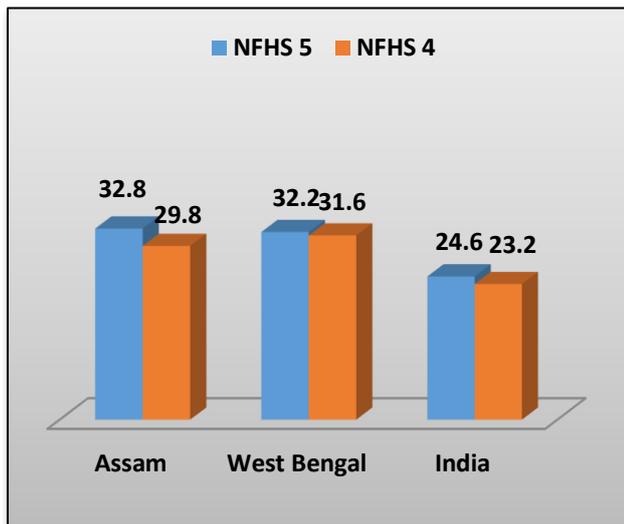
Figure 3 shows the percentage of under-5 years children who are severely wasted in Assam, West Bengal and compared with all over India. Although we have seen in both the states the percentage of severely wasted children are below 10 % but over the time this percentage is increasing which will intervene the healthy physical growth of the child. In Assam we observed the more increasing trend than West Bengal and all India average.



Source: NFHS- 5 (2019-20) and NFHS- 4 (2015-16)

Figure 3: Children under-5 years who are severely wasted (%)

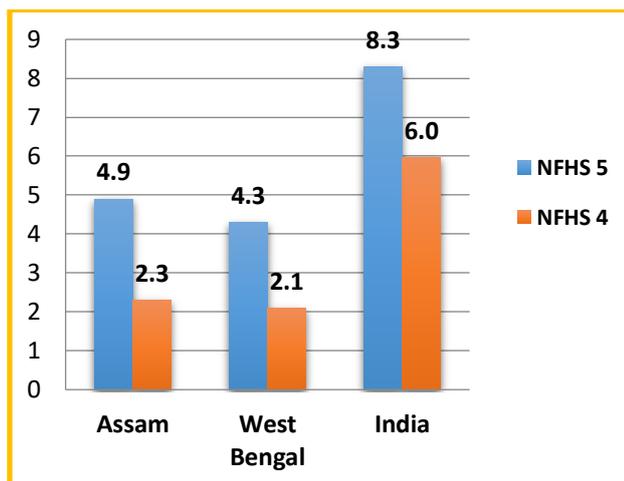
The focus of the figure 4 is to give the overview of under-5 years of children percentage who are underweight in Assam, West Bengal and all India average as well. In Assam this percentage has increased to 32.8 % in the year 2019-20 where it was 29.8 % in 2015-16. In case of West Bengal more or less the same scenario has been captured and if we go for comparison with all India average than it is 24.6 % (2019-20) that is both the states Assam and West Bengal are not in the desirable position as compared with all India average. So, more focused should be on the states which have the higher percentage of underweight children than all India average.



Source: NFHS- 5 (2019-20) and NFHS- 4 (2015-16)

Figure 4: Children under-5 years who are underweight (%)

Malnutrition has a strong negative impact on children’s health, overweight also another part of it and the figure 5 represents the outline of the percentage of overweight children in Assam and West Bengal.



Source: NFHS- 5 (2019-20) and NFHS- 4 (2015-16)

Figure 5: Children under-5 years who are overweight (%)

Here also considers the improvement of the indicator over the time and compared with all India average. With the time it has been seen in each of the states of India the percentage of overweight children increasing and the states Assam and West Bengal also not lag behind from that. In India under-5 years overweight children are increased to more than 10 percent, in the year were it was 6 percent. In Assam and West Bengal though the percentage has increased but both the states are lagging behind the India average.

Overall scenario of the considered nutritional variables maximum have found increasing trend over the time in the states Assam and West Bengal and India as well. Here the table 2 shows the indicators whether change or not in the NFHS-5 round from NFHS-4 round, the upward arrow sign represents the percentage has increased and downward arrow represents the decreased value. In the state Assam it has been seen only the stunted has decreased but wasted and

underweight percentage has increased, in West Bengal except wasted others has increased with the time. If we see the overall picture of India than the data shows that all three nutritional indicators that is percentage of stunted, wasted and underweight children has increased.

Table 2: Improvements Summary of the Nutritional Indicators

NFHS-5 as Compared to NFHS-4	Percentage of Nutritional Indicators (Under-5 Years Children)								
	Assam			West Bengal			India		
	Stunted	Wasted	Underweight	Stunted	Wasted	Underweight	Stunted	Wasted	Underweight
	↓	↑	↑	↑	⇒	↑	↑	↑	↑

A. Administrative Division of Assam and West Bengal

To better understand of the scenario of child nutritional status in different region of the states Assam and West Bengal we have categorized both the states into five parts as per the current administration division (Government of Assam General Administration & State of West Bengal).

Table 3 shows the current administrative division of Assam and it categorized into five parts as per the Government of Assam General Administration namely Barak Valley, Hills and Central Assam, Lower Assam, North Assam and Upper Assam. Lower Assam has large number of districts and Barak Valley has only three districts. Now, we have discussed all the indicators status in different region wise. Table 3 also represents the Indian state of West Bengal is divided into five administrative divisions namely Presidency division, Medinipur division, Burdwan division, Malda division and Jalpaiguri division. A group of districts form a division, which is administered by a ‘Divisional Commissioner’. West Bengal is now divided in 23 districts, grouped under five divisions.

Table 3: Current Administrative division of Assam and West Bengal

State	Division Name	Districts
Assam	Barak Valley	Cachar, Hailakandi, and Karimganj
	Hills and Central Assam	Dima Hasao, Hojai, East Karbi Anglong, West Karbi Anglong, Morigaon, and Nagaon
	Lower Assam	Baksa, Barpeta, Bajali, Bongaigaon, Chirang, Dhubri, Goalpara, Nalbari, Kamrup Metropolitan, Kamrup Rural, Kokrajhar, and South Salmara-Mankachar
	North Assam	Biswanath, Darrang, Sonitpur, and Udalguri
	Upper Assam	Charaideo, Dhemaji, Dibrugarh, Golaghat, Jorhat, Lakhimpur, Majuli, Sivasagar, and Tinsukia
West Bengal	Presidency division	Howrah, Kolkata, Nadia, North 24 Parganas, South 24 Parganas
	Medinipur division	Bankura, Jhargram, Paschim Medinipur, Purba Medinipur, Purulia
	Burdwan division	Birbhum, Paschim Bardhaman, Purba Bardhaman, Hooghly
	Malda	Dakshin Dinajpur, Malda, Murshidabad,

	division	Uttar Dinajpur
	Jalpaiguri division	Alipurduar, Cooch Behar, Darjeeling, Jalpaiguri, Kalimpong

Source: Government of Assam General Administration and State of West Bengal

B. Divisional Disparity of Child Nutrition in Assam

Table 4 shows the scenario of under-5 years stunted, wasted and underweight children percentage of different region of the state Assam as per the national family health survey. From the above mention region the percentage of stunted children are more in north Assam that is 38.8 % as per the NFHS-5 and in upper Assam stunted percentage of children are 33.5 % which is lower from the others region of Assam. In case of stunted children we have seen only in Barak Valley the percentage has decreased with the time but in others region there has recorded slide increasing trend in Assam. The scenario of wasted children we found increasing trend in the entire region, in Barak Valley more percentage has been seen in NFHS-5 round. Larger percentage also found in case of underweight children in Barak Valley that is 44.5 % and hence it has been seen that Hills & Central Assam and upper Assam are comparatively in better position though there also observed increasing turn.

Table 4: Divisional Status of Nutritional Indicators in Assam

Division	Stunted		Wasted		Underweight	
	NFHS 5	NFHS 4	NFHS 5	NFHS 4	NFHS 5	NFHS 4
Barak Valley	33.6	38.9	33.6	22.4	44.5	34.8
Hills & Central Assam	37.4	34.9	18.7	12.2	28.7	24.8
Lower Assam	36.0	35.9	19.0	16.9	31.2	29.2
North Assam	38.8	37.1	22.1	19.7	32.1	32.2
Upper Assam	33.5	32.5	19.1	13.1	29.5	23.7

Source: Authors Estimation

Table 5 shows the ANOVA results of divisional variation of Assam in case of Nutritional indicators these are stunted, wasted and underweight. Here we have checked whether there exists any divisional significant variation or not. From the results it is observed that for the nutritional variables wasted and underweight have the significant differences among the five divisions of Assam but the variable like stunted have no statistical significant differences among division though there have normal differences.

Table 5: ANOVA Results of Nutritional Indicators in Assam on the basis of NFHS 5

Indicators	Division	Mean	S.D.	F	Sig.
Stunted	Barak Valley	33.57	8.09	0.614	0.656
	Hills & Central Assam	37.42	5.13		
	Lower Assam	36.03	8.68		
	North Assam	38.80	4.28		
	Upper Assam	33.48	5.54		
Wasted	Barak Valley	33.63	13.15	5.787	0.002
	Hills & Central	18.70	4.24		

	Assam				
	Lower Assam	19.01	2.73		
	North Assam	22.13	6.60		
	Upper Assam	19.11	2.97		
Underweight	Barak Valley	44.50	7.57	4.358	0.01
	Hills & Central Assam	28.72	3.80		
	Lower Assam	31.17	6.33		
	North Assam	32.13	7.84		
	Upper Assam	29.54	4.69		

Source: Authors Estimation

C. Divisional Disparity of Child Nutrition in West Bengal

Table 6 represents the overview of the nutritional indicators (Stunted, Wasted and Underweight) in different division of West Bengal. As per the NFHS-5 it is observed that except Burdwan division in all others division stunted children percentage is more than 30 %, out of these Malda division is more worst position where it is nearly 40 %. As compared to NFHS-4 we have seen only in Burdwan division stunted percentage is reduced significantly, on the other side it is recorded from remaining divisions stunted children has increased in Presidency and Malda division but in Medinipur and Jalpaiguri division though it has decreased that is not significant. Percentage of wasted children also has increased with the time in different division of West Bengal, only in Medinipur division wasted percentage has slide decreased in NFHS-5 (2019-20) as compared to the NFHS-4 (2015-16). Underweight also another important indicators to understand the scenario of nutritional status and from the analysis it has been seen that in Medinipur division this percentage is higher that is 38.9 %, in Jalpaiguri this percentage is lower than others division. In case of underweight we also have seen that in maximum division the percentage has been increased over the time.

Table 6: Divisional Status of Nutritional Indicators in West Bengal

Division	Stunted		Wasted		Underweight	
	NFHS 5	NFHS 4	NFHS 5	NFHS 4	NFHS 5	NFHS 4
Presidency division	30.5	26.6	20.5	15.3	28.2	22.7
Medinipur division	31.0	34.7	25.3	28.5	38.9	42.8
Burdwan division	19.8	34.4	29.5	24.6	35.6	35.2
Malda division	39.3	38.3	18.8	17.9	32.5	33.7
Jalpaiguri division	30.6	31.1	18.6	16.4	26.5	26.5

Source: Authors Estimation

Table 7 focused on the divisional disparity of the nutritional indicators in West Bengal, here from the one way ANOVA results shows that only in case of percentage of underweight children found statistically significant differences among the above mention divisions of West Bengal. For the variables stunted and wasted though it has been seen the differences among five divisions but that is not statistically significant as per the NFHS-5 unit level data.

Table 7: ANOVA Results of Nutritional Indicators in West Bengal on the basis of NFHS 5

Indicators	Division	Mean	S.D.	F	Sig.
Stunted	Presidency division	30.46	4.22	2.958	0.055
	Medinipur division	31.03	4.56		
	Burdwan division	19.83	15.5		
	Malda division	39.25	5.38		
	Jalpaiguri division	30.63	3.18		
Wasted	Presidency division	20.54	5.89	2.345	0.102
	Medinipur division	25.30	6.79		
	Burdwan division	29.53	9.00		
	Malda division	18.78	3.24		
	Jalpaiguri division	18.57	1.91		
Underweight	Presidency division	28.22	4.17	4.885	0.01
	Medinipur division	38.93	6.45		
	Burdwan division	35.58	4.39		
	Malda division	32.48	2.11		
	Jalpaiguri division	26.50	4.65		

Source: Authors Estimation

V. CONCLUSION

Undernutrition impact demonstrated in the present and future of a nation's child, which affects problem to the economy too. From a perspective of human development, good health and nutrition are vital to contributing to the child physical and cognitive development. Child under-nutrition is more likely to chances to affect children by several infections and also delayed in recovering from diseases, which will cause the burden of diseases, especially in developing countries like India. Though to analyze the scenario of a child's nutritional status, we have to consider the different variables, but for this analysis here, we focused mainly on three variables, namely Stunted (height-for-age), Wasted (weight-for-height) and Underweight (weight-for-age). It has been seen that health expenditure is higher in both the states Assam and West Bengal as compared with other states, but in child nutritional indicators they are not perform well, the percentage of the child nutritional indicators like stunted, wasted and Underweight are higher in the recent and another things we observed that in both the states these percentage has been increased over the time which is clearly found from the different round of NFHS data. It is observed that in the case of all the nutritional indicators, the state of West Bengal is a little bit better positioned than Assam. The analysis shows all the above-discussed indicators like stunted, wasted, severely wasted, and underweight higher in the state Assam than India average as well as West Bengal, but in the case of overweight (weight-for-height) just, we have only seen the better situation in Assam. All the considered variables for the nutritional status maximum have been found to be increasing trend over time in the states Assam and West Bengal and India as well. In Assam we seen only the stunted has decreased but wasted and underweight percentage has increased over time, in West Bengal except the wasted others has increased.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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