

Prevalence Of Malnutrition Among Under-5 Children And Its Association With Infant And Young Child Feeding Knowledge And Practices Among Mothers In Nadia District, West Bengal: A Cross-Sectional Study

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ABSTRACT

Background: Adequate knowledge and practices of Infant and Young Child Feeding (IYCF) among mothers is the key area to combat childhood malnutrition. The term malnutrition covers two broad groups of conditions. One is ‘under-nutrition’—which mainly includes stunting (low height for age), wasting (low weight for height), and under-weight (low weight for age) the other is overweight and obesity. The current study was conducted in the Nadia district to assess the nutritional status of under-five children and to find out its association, if any, with IYCF knowledge and practices among mothers.

Methods: A community-based cross-sectional study was conducted among 351 under-5 child-mother dyads recruited from 32 sub-centers of the Chakdaha block following a multi-stage random sampling method. The socio-demographic profile of the dyad, mothers’ IYCF knowledge, and practices were recorded using a predesigned, pretested questionnaire. The nutritional status of the children was assessed using WHO Anthro (version 3.2.2) software after measuring weight and height.

Results: A significant 40.1%, 54%, and 51.4% of the children fell below 2 standard deviations from the international cut-off for weight-for-height, height-for-age, and weight-for-age, emphasizing the prevalence of undernutrition. Overall, only 9.4% of the study participants belonged to the normal category regarding nutrition status if all 4 criteria (weight for age, weight for height, height for age, BMI for age) had been considered. Inferential statistics revealed that those mothers having good IYCF knowledge and practice scores had higher odds of having children with normal nutritional status.

Conclusion: Malnutrition, specifically under-nutrition, is still a significant public health problem that should be dealt with high priority and concerned authorities should implement a much-needed approach of targeted health educational interventions to improve maternal understanding and adherence to optimal IYCF practices & thereby improving the nutritional status of the children in future.

Keywords: Eastern India, Mother’s Perception, Nutrition, Pre-school children, Relationship, Survey.

1. INTRODUCTION

WHO defines malnutrition as deficiencies, excesses or imbalances in a person’s intake of energy and/or nutrients. The term malnutrition covers 2 broad groups of conditions. One is ‘under-nutrition’—which mainly includes stunting (low height for age), wasting (low weight for height) and under-weight (low weight for age) the other is overweight and obesity, which means a person is too heavy for his or her height due to abnormal or excessive fat accumulation which also can impair health

(1). Undernutrition is much more prevalent in third-world developing countries because poverty has a great influence on nutrition(2). Childhood obesity and overweight were initially considered a disease of developed countries with higher per capita income(3). However, in developing countries, the prevalence of overweight and obesity among children is also increasing which poses a significant challenge to the healthcare system(4).

Undernutrition during the first few years of life hampers children's growth and development and puts children at greater risk of dying from common infections, by increasing the frequency and severity of such infections. Globally nearly half of all deaths in children under 5 years are attributable to under-nutrition (2). Childhood overweight/obesity is a precursor to metabolic syndrome, poor physical health, mental disorders, respiratory problems, and glucose intolerance, which can continue into adulthood (5).

Childhood undernutrition is mainly caused by the faulty practice of breastfeeding and complementary feeding, unavailability or lack of awareness about nutritional diet, and lack of hygiene whereas, being overweight and obesity are determined mainly by consumption of high-calorie diets and physical inactivity. The latest UNICEF-WHO-World Bank joint malnutrition estimates show that globally among under-5 children 22.3% (148.1 million) are stunted, 6.8% (45 million) are suffering from wasting and 5.6% (37 million) are overweight in 2022(6).

In the last four decades India has witnessed a substantial reduction in under-nutrition rates across all age groups however, stunting, underweight, and wasting rates in Indian children are still among the highest in the world(7,8). Additionally, a dual burden has been observed recently in India, whereby children suffer from being underweight on the one hand and obese or overweight on the other hand(9).

NFHS-5(National Family Health Survey) (2019-2021) data reported the under-5-mortality rate for India and West Bengal as 41.9 & 25.4 per 1,000 live births and studies revealed nearly 35% of child mortality is attributable to undernutrition (10-12). Whereas, globally, childhood overweight and obesity are said to be associated with more deaths than childhood underweight conditions, representing a global epidemic(13). To achieve the SDG targets, India has to undertake programs focusing on the prevention, detection, and management of both under- and over-nutrition in children. There is ample data on the prevalence of under-nutrition in children, but there is a paucity of data on the prevalence of over-nutrition in children(14).

Optimizing nutrition early in life, particularly before 5 years of age ensures the best possible start in life, with long-term benefits(15). Infant and Young Child Feeding (IYCF) is a set of nutritional practices recommended by WHO and UNICEF in order to meet the optimum nutritional requirements of the early days of life. (16). Govt. of India launched Home-Based Newborn Care (HBNC-2011) and Home-Based Care of Young Child (HBYC-2018) programs, to ensure optimal health for newborns and children beyond 6 months of age by addressing the knowledge and practice among mothers (17,18).

Nadia district of West Bengal, is the home of a diverse population from rural backgrounds, at the same time with recent pressure of urbanization, lack of physical activity, increased intake of fast food, etc. are also on the rise. NFHS-5 data shows that, in this district, 26.1%, 18%, and 25.1% of under 5 children are stunted, wasted, and underweight respectively while 3.0% are overweight (weight-for-height)(19). There is a dearth of scientific reports assessing IYCF practices among mothers under-five children and its association with nutritional status from West Bengal particularly after the implementation of the HBYC program. With this backdrop, current study aims to assess the nutritional status of the under 5 children of Nadia district and its association with IYCF knowledge and practices of the mothers in Nadia District.

2. MATERIALS AND METHODS:

A community-based cross-sectional study was conducted among the under-5 children and their mothers in Nadia district West Bengal between February to July 2023. All the mothers who were present during the survey had given informed written consent and were permanent residents (residing for more than 1 year) of Nadia district were included in the study. Informed written consent had been taken from every participant before the interview and ethical clearance was obtained from the Institutional Ethics Committee, Institute of Health & Family Welfare, Government of West Bengal.

The sample size was calculated using Cochran's formula. The prevalence of underweight in Nadia as per NFHS-5 was 25% (17). Considering C.I. 95% and absolute precision of 5%, the sample size was 289. Adding a non-response rate of 10%, the final sample size was calculated to be 318. Multistage random sampling was used. At first, one subdivision (Kalyani Sub-division) out of a total of 4 sub-divisions of Nadia district had been selected randomly. In the second stage, one block (Chakdaha block) of that subdivision had been chosen randomly out of three blocks. Thereafter 50% of sub-centers of the selected block had been selected randomly. So, a total of 32 sub-centers were visited. After obtaining a line list of under 5 children of the selected sub-centers from the local Accredited Social Health Activist (ASHA), 10-11 mother-child dyads were selected randomly from each sub-center following inclusion and exclusion criteria for the interview.

The study tool consisted of a pre-designed pre-tested semi-structured questionnaire. It had two parts. The first part was for the socio-demographic characteristics of both the mother and the children. The second part was adapted from the sets of standardized questionnaires [Knowledge Attitude and Practice (KAP) questionnaire by the Food and Agriculture

Organization (FAO)(20); Example Questionnaires published by the WHO and UNICEF in 'Indicators for assessing infant and young child feeding practices-definitions and measurement methods' and Home Based Care for Young Child (HBYC) Operational Guidelines published by Ministry of Health and Family Welfare & Ministry of Women and Child Development, Government of India, in April 2008, as a part of 'POSHAN Abhiyaan' (18,20,21).

The questionnaire was first prepared in English. Then it was translated into Bengali by a linguistic expert, ensuring semantic equivalence. To verify the translation, it was retranslated into English by two independent researchers who were unaware of the initial English version. The face validity of each item was checked by previous researchers in the presence of public health experts. They also determined the content validity of each domain. Reliability was checked using the test-retest method. Pretesting and pilot testing were conducted. Necessary corrections and modifications were made to the questionnaire accordingly.

The set of knowledge questions was targeted to assess the respondent's knowledge related to early initiation of breastfeeding, pre-lacteal feeding, exclusive breastfeeding, continuation of breastfeeding, proper age of initiation of complementary feeding, importance of complementary feeding, and ideal amount and frequency of feeding for different age groups of children. A total of 16 multiple choice and short answer type questions (7 related to breastfeeding knowledge and 9 related to age-appropriate feeding knowledge) were there and each correct response carried a '1' mark. The total of all individual marks was recorded as a knowledge score (maximum 16 to minimum 0). The set of practice questions was targeted to assess the respondent's stated IYCF practices. This included breastfeeding practice and current age-appropriate feeding practice in terms of amount and frequency. The first 5 questions were related to breastfeeding and complementary feeding practices. One question was related to hand washing and hygiene. Each appropriate response carried a '1' mark. The next 4 questions were related to age-appropriate feeding practices in terms of food amount, meal frequency, and quality of food. Consumption of foods from any 2 of the 3 recommended food groups was considered adequate. For children aged 2-5 years, if all 4 responses were per recommendation, then a score of '1' was recorded for following age-appropriate feeding practices. For children aged 6 months to less than 2 years, if all 4 responses were per the recommendation and are currently breastfeeding, then a score of '1' was recorded for following age-appropriate feeding practices. Children aged less than 6 months who were currently breastfeeding exclusively, got a '1' mark for age-appropriate feeding practice. The Sum of scores for breastfeeding practice, hand washing and age-appropriate feeding practice was recorded as Practice score. [Maximum score 7- Minimum score 0]. An Overall knowledge and practice score was calculated by adding up these two scores, [minimum 0 to maximum 23].

An infantometer was used to measure length of children below 2 years. Measuring Tape was used for others. A weighing machine was used to measure the weight of the children. WHO Anthro v 3.2.2 software [WHO Anthro for personal computers, version 3.2.2, 2011: Software for assessing growth and development of the world's children. Geneva: WHO, 2010 <http://www.who.int/childgrowth/software/en/>] was used to analyze anthropometric data of under-five children for 4 indicators i.e. weight-for-age, length/height-for-age, weight-for-length/height, body mass index-for-age.

The collected data were entered into MS Excel and analyzed using SPSS 21.0 software (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to assess the socio-demographic characteristics of mothers and children. For analytical purposes, the median scores for knowledge & practice were calculated and respondents were categorized into binary outcomes i.e. good (>median) and poor ($\leq$ median). Nutritional status was assumed to be normal if weight-for-height, height-for-age, weight-for-age, and BMI, all four parameters were within the normal range (for analytical purpose). Bivariate analyses were conducted in SPSS to find out the association, if any, between the nutritional status of children and IYCF-related knowledge and practice of their mothers. All statistical tests were two-tailed, and a p-value < 0.05 was considered statistically significant.

3. RESULTS:

A total of 351 mother-child dyads were included in the analyses. The majority of mothers (46.1%) were between 21-26 years old, with a mean age of 25.70 years (standard deviation (SD) = 5.285), and most (84.7%) were Hindu. A significant proportion (66.2%) lived in joint families, and 52.3% belonged to Scheduled Castes (SC). Education levels were predominantly secondary or higher secondary (69.0%), and most mothers (91.2%) were housewives. The highest socioeconomic status group was the middle class (32.2%). Regarding their children, most (47.58%) were between 25 months and up to 5 years old, with a mean age of 26.22 months (SD = 15.822), and gender distribution was nearly equal (49.0% male, 51.0% female). The majority of children (60.5%) were first-born, with most (98.6%) born in a hospital or nursing home, and 66.5% of deliveries were Caesarean sections. Only 20.51% of mothers were visited at home by an ASHA within one month postpartum. (Table 1)

Table 1: Socio-demographic Characteristics of the Study Population [n=351]

Variables			Frequency (n)	Percentage (%)
Mother's age (in completed years)		≤ 20 yrs.	59	16.8
		21- 26 yrs.	162	46.1
		27- 32yrs	88	25
		33- 38yrs	36	10
		>38 yrs.	6	2.1
		Mean age	25.70	
		Std. Deviation	5.285	
Religion		Hindu	298	84.7
		Muslim	53	15.1
Family Type		Nuclear	118	33.5
		Joint	233	66.2
Caste		SC	184	52.3
		General	115	32.7
		OBC	21	6.0
		ST	31	8.8
Education of Mothers		No Formal education	10	2.8
		Primary	49	13.9
		Secondary/ Higher Secondary	243	69.0
		Graduation and above	49	13.9
Occupation of Mothers		Housewife	321	91.2
		Tailor/Farmer	30	8.5
SES*	I	Upper	5	1.4
	II	Upper-middle	41	11.7
	III	Middle	113	32.2
	IV	Lower-middle	109	31.1
	V	Lower	83	23.6
Child's age in completed months		0-6 months	44	12.53
		7 months-2 years	140	39.89
		25 months -5 years	167	47.58
		Mean age	26.22	
		Std. Deviation	15.822	
Child's gender		Male	172	49.0

	Female	179	51.0
Birth order of the indexed child	1	213	60.5
	2	121	34.4
	3	15	4.3
	4	2	.6
Place of birth	Hospital/ Nursing home	346	98.6
	Home/In transit delivery	5	1.4
Type of delivery	Caesarean Section	234	66.5
	4. **NVD	117	33.2
ASHA home visit within one month	yes	72	20.51
	No	279	79.49

*SES is Socio-Economic status According to BG Prasad's Socioeconomic Status Scale (modified in 2022)

** NVD is Normal Vaginal Delivery

The following results revealed a concerning pattern of malnutrition across multiple indicators. (Table 2)

Table 2: Showing different parameters of the nutritional status of the children (n= 351)

Weight-for-Height/Length	Severely wasted (Z score < -3SD)	13.30%
	Wasted (Z score < -2SD)	26.80%
	Normal (Z score within +2 to -2 SD)	49.60%
	Overweight (Z score > +2SD)	7.50%
	Obese (Z score > +3SD)	3%
Height/Length-for-Age	Severely Stunted (Z score < -3SD)	18.20%
	Stunted (Z score < -2SD)	35.80%
	Normal (Z score within +2 to -2 SD)	46%
Weight-for-Age	Severely Underweight (Z score < -3SD)	17.10%
	Underweight (Z score < -2SD)	34.30%
	Normal (Z score within +2 to -2 SD)	48.60%
BMI	Severely wasted (< -3SD)	12.10%
	Wasted (< -2SD)	24.20%
	Normal (Z score within +2 to -2 SD)	50.10%
	Overweight (Z score > +2SD)	9.10%
	Obese (Z score > +3SD)	4.20%

Weight-for-height/Length: In this study significant proportion of the children (13.3%) were classified as 'severely wasted' and 26.8% were categorized as 'wasted' indicating a higher prevalence of malnutrition.

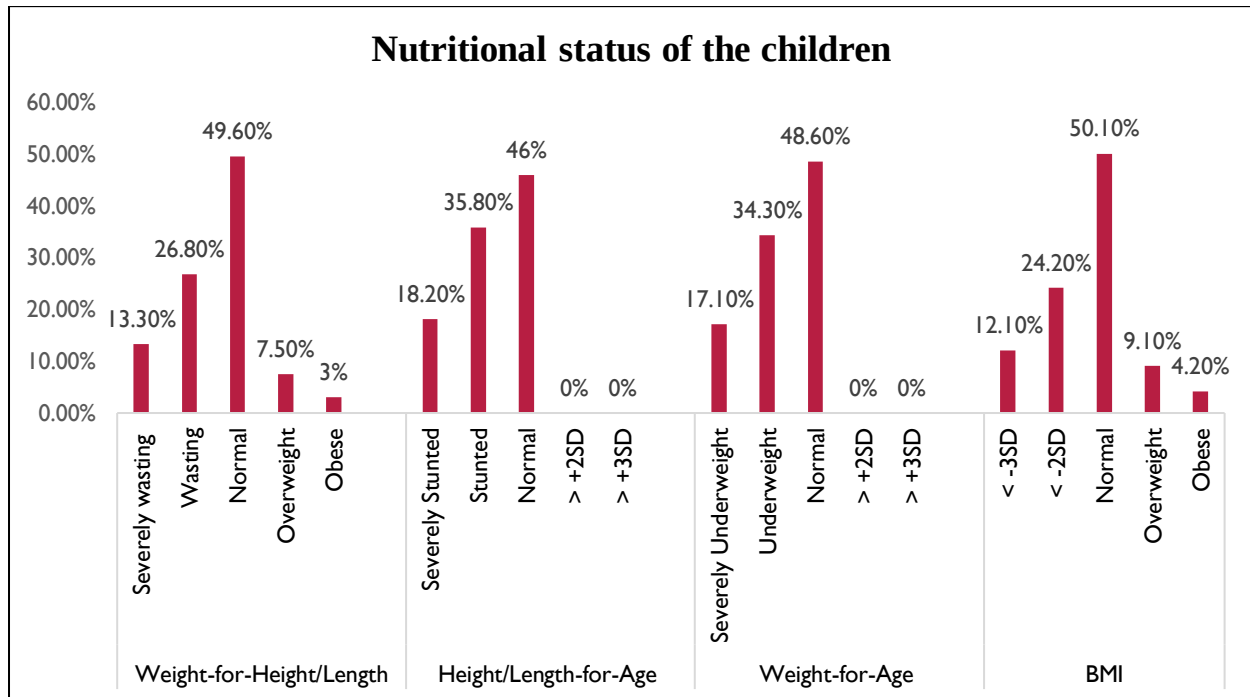
Height-for-age: A considerable percentage (18.2%) were severely stunted, indicating chronic malnutrition affecting linear growth. Another 35.8% were classified as stunted, implying some degree of impaired growth.

Weight-for-age: A notable proportion (17.1%) of individuals were severely underweight, indicating a significant level of

undernutrition. Additionally, 34.3% fell within the underweight category, reflecting a high prevalence of undernutrition within the population.

BMI: The present study's BMI data showed that 12.1% of individuals fell below -3SD, indicating 'severe wasting'. Furthermore, 24.2% fell below -2SD, signifying 'wasting' as well. The majority (50.1% or 165 individuals) fell within the normal range for BMI suggesting a relatively healthier proportion. There were also some individuals classified as overweight and obese, although the percentages were relatively small. (Showing in Figure 1)

Figure 1: Nutritional status of the children under study (n=351)



Knowledge & Practice score- The Knowledge & Practice score, which included both knowledge about IYCF and age-appropriate IYCF feeding practices, was considered good for only 45.58% (160 out of 351 mothers) of the study population. This indicated that less than half of the participants in the study were meeting the desired standards for optimal feeding knowledge and practices for their infants and young children.

For analytical purposes, children who were within +2 SD to -2 SD of international standard for all 4 measured parameters were considered as with 'adequate/normal' nutritional status.

This study depicted that overall only 9.4% of the study population belonged to the normal category regarding nutrition status if all 4 criteria (weight for age, weight for height, height for age, BMI for age) had been considered.

Bivariate analyses revealed that the mothers who had a good IYCF knowledge and practice score had higher odds of having children with normal nutritional status. (Table 3)

Table 3: Association of Normal Nutritional Status with Knowledge and Practice Score: Bivariate Analysis (n=351)

Variable		Normal Nutritional Status		Test of significance	OR (95% CI)
		Yes n (%)	No n (%)		
Knowledge and practice score	Good (>10)	21 (13.1%)	139 (86.9%)	$\chi^2=4.78$ df=1 p=.029	2.25 (1.07 - 4.73)
	Poor (0-10)	12 (6.3%)	179 (93.7%)		

5. DISCUSSION:

The current study surprisingly revealed that a significant proportion (40.1%, 54%, and 51.4% respectively) of the children fell below 2 standard deviations from the international cut-off for weight-for-height, height-for-age, and weight-for-age, emphasizing the prevalence of undernutrition. In terms of overweight (weight for height), the present study reported a higher prevalence of 7.5%. This indicates a potential increase in the prevalence of overweight children in the study population. Obesity may be more common in low-income households because of the lower cost and higher availability of processed foods that have high calorific content but low nutritional value. A study by Maiti S. et al, among under-3 children of West Bengal in 2012, revealed that the prevalence of stunting (50.9%) was much higher than underweight (28.6%). Approximately 14.4% of the pre-school children were overweight(20). Another study by Bose K. et al, in Nadia district, West Bengal revealed that the children had lower height-for-age, weight-for-age, and weight-for-height z-scores compared to the NCHS reference standards. The overall rates of stunting, underweight, and wasting were 23.9%, 31.0%, and 9.4%, respectively(21). Almost similar had also been reported in a study by Giri SP. et al, in 2017 among Bengalee preschool children(3-5 years) of Sundarban, South 24 Parganas, West Bengal, India(22).

In terms of overweight (weight for height), the present study reported a higher prevalence of 7.5% compared to the NFHS-5 data of 3.0% (19). This indicates a potential increase in the prevalence of overweight children in the study population. These differences in prevalence rates between the present study and NFHS-5 data may be attributed to various factors such as changes in socioeconomic conditions, dietary patterns, access to healthcare, or differences in sample sizes and data collection methodologies (Table 4).

Table 4: Comparison between the present study and NFHS-5, Nadia district, West Bengal

	NFHS-5, Nadia, West Bengal (2019-20)	Present study findings (2023)
Stunted (Height for age)	26.1%	35.8%
Wasted (Weight for Height)	17.6%	26.8%
Severely wasted (Weight for Height)	7.5%	13.3%
Under-weight (Weight for age)	25.1%	34.3%
Over-weight (Weight for height)	3.0%	7.5%

Overall, the results highlighted a significant burden of malnutrition within the population, encompassing acute and chronic malnutrition. It emphasized the urgent need for interventions and strategies to address these nutritional challenges and improve the overall well-being of the children.

Surprisingly, only 9.4% of children could have been categorized as ‘green child’ where the child had scored in the green zone following all 4 WHO criteria i.e. weight for age, weight for height, height for age, BMI for age. NFHS-5 also did not provide this scenario. This zone should be stressed to find out any kind of undernutrition in the child which will overall help to improve the child's health in the future. This finding was actually a devastating one, showing the reluctant nature of the mothers as well as flaws in the health system which ignored regular growth monitoring and excessive reliance on a single parameter to assess nutritional status. Mothers were found to have a lack of awareness about their children's current status of nutrition since their children did not have any morbidity. Lack of awareness related to IYCF along with its inadequate practice was found to be associated with deranged nutritional status in the study. A similar result was found in other research too (23-25). In our earlier study, we have similarly shown that suboptimal feeding practices driven by limited caregiver awareness may contribute to both undernutrition and rising overweight trends through unbalanced feeding habits, as a substantial proportion of caregivers had only average knowledge and practice scores related to infant and young child feeding, highlighting how inadequate awareness of proper nutrition can exacerbate malnutrition in both its undernourished and overweight forms (26). The current study revealed only the stated practices of the mother and that too assessed by the recall method. Hence the practice revealed might not reflect the actual practice of the mothers.

6. CONCLUSION

The study reveals a high prevalence of malnutrition among the children, with notable percentages falling below standard measurements for weight-for-height, height-for-age, and weight-for-age. Additionally, there is an emerging concern of overweight children, possibly linked to the consumption of low-cost, high-calorie processed foods. Lack of knowledge and adequate practice related to IYCF is found to be a significant contributor of malnutrition.

The findings underscore the urgent need for comprehensive interventions to improve both knowledge and practices related to IYCF. Enhanced educational programs targeting mothers, along with regular growth monitoring and community support, are essential to bridge these gaps and ensure better nutritional outcomes for children. Sustainable strategies, including promoting diverse and adequate dietary practices and emphasizing the importance of complementary feeding at the right age, are crucial to addressing the dual burden of undernutrition and emerging overnutrition in this population.

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