

## Undernutrition and Morbidity Profile of Exclusively Breastfeeding Children: A Cross-sectional Study

### Abstract

**Background:** Undernutrition is common and has been recognized as a public health problem in Bangladesh. It has devastating effects on any population as it increases morbidity children and reduces the quality of life of all affected. The study was done with the objective to assess the undernutrition and morbidity profile in children who have completed exclusive breastfeeding. **Methods:** This was a descriptive cross-sectional study, which was carried out among children aged 6–12 completed months attending a tertiary level hospital in Bangladesh. A total of 251 children were selected through convenient sampling from January to December 2015. Nutritional assessment was done in terms of underweight, stunting, and wasting. **Results:** One hundred and forty-three (57.0%) were boys while 108 (43.0%) were girls. The prevalence of undernutrition (Z-score  $\leq -2$ ) was observed in 11.2%, 16.3%, and 12.0% based on stunting, underweight, and wasting. Among 251 children, 16.7% were not suffering any diseases, whereas majorities (69.7%) were suffering from single disease and 13.5% were suffering from multiple diseases. Cough and fever (55.0%), pneumonia (18.3%), measles (9.9%), and diarrhea (8.3%) were the most common cause of infectious morbidity observed in children. **Conclusions:** The prevalence of undernutrition was high in the study population, and it continues to be a public health burden because of its major effect on morbidity and impairment of intellectual and physical development in long-term. Increasing the practice of exclusive breastfeeding, the introduction of timely complementary feeding, and standard case management of morbidities would be beneficial to combat the problem of undernutrition.

**Keywords:** Breastfeeding, malnutrition, morbidity, underweight

### Introduction

Undernutrition has long been major public health problems in Bangladesh leading to high morbidity and mortality among under-five children.<sup>[1]</sup> Undernutrition in children is multidimensional; governed by biological, behavioral, and environmental factors.<sup>[2]</sup> It reduces children's resistance to infection and increases the burden of disease in the communities.<sup>[3]</sup> Studies have reported that despite the economic development, childhood malnutrition still remains a significant public health problem in developing countries.<sup>[4–6]</sup> Undernutrition has been reported to be associated with diarrhea, respiratory infections, measles, tuberculosis, etc.<sup>[2–4,6]</sup> Multiple attacks of these morbidities further aggravate the malnutrition.<sup>[7]</sup> The nutritional status may be assessed using anthropometric measurements which are needed to know the presence of stunting, wasting, and underweight.<sup>[8]</sup> Globally, the prevalence

of stunting, underweight, and wasting in children under 5 years are 26, 16, and 8%, respectively. These figures in Asia are 26.8, 19.3, and 10.1%, respectively.<sup>[9]</sup> However, Bangladesh Health and Demographic Survey 2014 revealed that the prevalence of stunting, underweight, and wasting were 36.0, 33.0, and 14.0% in 2014, respectively.<sup>[10]</sup>

Therefore, realizing the importance of undernutrition among children, this study was undertaken with an aim to estimate the prevalence of undernutrition and morbidity profile among exclusively breastfeeding children.

### Methods

#### Study design and study place

The present cross-sectional study was carried out in the Breastfeeding Department of the Rangpur Medical College Hospital (RMCH), which is located at the center of Rangpur town, Bangladesh.

**How to cite this article:** Debnath SC, Haque ME, Hasan DM, Samin S, Rouf MA, Rabby MF. Undernutrition and morbidity profile of exclusively breastfeeding children: A cross-sectional study. *Int J Prev Med* 2018;9:55.

Sumon Chandra Debnath,  
Md. Ekramul Haque<sup>1</sup>,  
Dewan Md. Mehedi Hasan<sup>2</sup>,  
Sharraf Samin<sup>3</sup>,  
Md. Abdur Rouf<sup>4</sup>,  
Md. Fazlay Rabby<sup>5</sup>

Bangladesh Breastfeeding Foundation, Mohakhali, Dhaka, Bangladesh, <sup>1</sup>Communicable Disease Control (CDC), DGHS, Mohakhali, Dhaka, Bangladesh, <sup>2</sup>Hospital Service Management, DGHS, Mohakhali, Dhaka, Bangladesh, <sup>3</sup>TB/HIV Control Program, BRAC, BRAC Centre, Mohakhali, Dhaka, Bangladesh, <sup>4</sup>Aichi Medical College and Hospital, Dhaka, Bangladesh, <sup>5</sup>Associates for Community and Population Research, Dhaka, Bangladesh

#### Address for correspondence:

Sumon Chandra Debnath,  
Bangladesh Breastfeeding Foundation, Mohakhali, Dhaka-1212, Bangladesh.  
E-mail: [sumonphysio@gmail.com](mailto:sumonphysio@gmail.com)

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**Website:**  
[www.ijpvmjournal.net/www.ijpvm.ir](http://www.ijpvmjournal.net/www.ijpvm.ir)

**DOI:**  
10.4103/ijpvm.IJPVM\_201\_17

#### Quick Response Code:



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RMCH is a government tertiary level referral hospital. The outpatient department of this hospital provides curative and referral services to about 150–200 patients from different parts of the urban and rural areas and of different sociodemographic characteristics, per week. Patients from different parts of the urban and rural area of different sociodemographic characteristics attended this hospital. The study was conducted between January and December 2016.

### Study subjects

The study individuals consisted of children aged between 6 and 12 months who have completed exclusive breastfeeding. Mothers of eligible participants (or another responsible caregiver) were interviewed and information was collected regarding age and gender of the child, socioeconomic status (SES) of the family, household demographics, and child-feeding practices including exclusive breastfeeding

### Sampling and sample size

The sample was selected through convenient sampling. A sample size of 354 was calculated using the prevalence of stunting 36%,<sup>[10]</sup> absolute precision of 5% with 95% confidence interval. A total sample of 251 children was recruited for this study whose anthropometric measurements were provided.

### Data collection

Data were collected by face-to-face interview and two types of instruments were used: a structured questionnaire and anthropometric measurements including weight and length. The questionnaire used in the present study was pretested and then modified based on difficulties in understanding or interpretation that were encountered. The questionnaire, which was written in English, was translated to local language (Bangla) and again translated back to English to ensure its accuracy. Mothers of eligible participants (or another responsible caregiver) were informed about the study goals, and verbal consent was obtained to take their child's anthropometric measurements. The interview was taken at the hospital of the participants ensuring the privacy and confidentiality as far as possible.

### Anthropometry

Anthropometric measurements taken were weight, length, as per following technique.

#### Weight

Portable (Seca Model 881) scales were used for measuring the weight of children dressed in light clothing. The scales were checked for accuracy and calibrated every morning using standard known weights. Weights were recorded to the nearest 0.1 kg. Children who could not stand on the scale were weighed with the respondent, then the respondent has weighed alone, and the difference was used for obtaining a weight of the child.

#### Length

United Nations Children's Funds provided length/height portable wooden constructed scale calibrated for length measurement. The length was measured by making child lay on the flat surface, head positioned firmly against the fixed hardboard, with the eyes looking vertically. The knees extended, by applying firm pressure and feet are flexed at right angles to the lower legs on the board. Readings of length were taken to the nearest 0.1 cm.

#### Assessment

Anthropometric indices weight for age (underweight), height for age (stunting), and weight for height (wasting) of the children were calculated using reference medians recommended by the World Health Organization (WHO) and classified according to standard deviation (SD) units (z-scores), based on the WHO criteria.<sup>[11,12]</sup>

To assess the morbidity, we analyzed corresponding data (prescription diagnosis) collected during each interview. A medical (on duty) doctor clinically examined of all the children to detect any disease or morbid condition present at the time of the data collection.

#### Ethical approval

The protocol and consent forms were reviewed and approved by the Institutional Review Board of National Institute of Preventive and Social Medicine, Dhaka, Bangladesh. Written consent and approval was given by the hospital authorities where this study was carried out while verbal consent was obtained from the mothers of the children.

#### Statistical analysis

The Anthro software of WHO was used for analyzing the nutritional status of children and all other analyses were done using the Statistical Package for Social Sciences version 20 (Chicago, IL, USA). The numerical data were presented as mean  $\pm$  SD and categorical variables were presented as percentage. Chi-square test was used to test for significant association of the proportion.  $P < 0.05$  was considered statistically significant.

### Results

#### Sociodemographic status of children

A total of 251 children under 1 year of age participated in the study, of them, 143 boys and 108 girls were used in the final analyses. Children age was in a range of 6–12 months with a mean of 8.6 months [Table 1]. About 84.1% of the mothers received education below secondary and only 15.9% received education higher secondary and above [Table 1]. Monthly incomes for 31.5% households were taka  $\leq$ 9999 and 27.1% households were taka 15,001–20,000 whereas 25.5% households earned above taka 10,000–15,000 and 15.9%

households earned taka  $\geq 20001$  per month. The mean income was taka 144402.4 [Table 1].

### Anthropometric measurements and indices

Overall mean ( $\pm$ SD) weight and length were  $7.7 \pm 1.4$  kg and  $70.2 \pm 4.7$  cm. For male children, these values were  $7.7 \pm 1.4$  kg and  $69.5 \pm 5.5$  cm, respectively, and for female children  $8.5 \pm 0.9$  kg,  $91.81(\pm 8.33)$  cm and  $71.1 \pm 3.2$  cm, respectively. Mean weight and height increased with the increase in age and tended to be greater for girls than for boys [Table 2].

### Height for age

For 88.8% of children's height for age Z-score was  $\geq -2$  of the WHO median indicating that they were normal [Table 3]. The prevalence of moderate stunting ( $\geq -3$  and  $< -2$  z-scores) 11.2%. No severe stunting was found in this category [Table 3].

### Weight for age

The study revealed that 83.7% of the children were normal and 16.3% moderately underweight ( $\geq -3$  and  $< -2$  z-scores) [Table 3].

### Weight for height

Moderate acute malnutrition (MAM) was defined as a weight for height of  $\geq -3$  and  $< -2$  z-score and severe acute malnutrition was defined as weight for height z-score of  $< -3$ . Among all the children, 88.0% were normal and 3.92% moderately wasted/MAM. No severe wasting was found in this category [Table 3].

### The prevalence of malnutrition

Among all the children, higher proportion of children 11.2% was found in malnourished (stunting) using H/A as the indicator and the prevalence of underweight and wasting was 16.3% and 12.0%, respectively [Table 4]. The age group of  $\geq 6-7$  months showed the highest prevalence of underweight (7.9%) and age of  $\geq 10$  months showed the highest prevalence of stunting (4.8%) and wasting (5.2%), accordingly [Table 4].

### Morbidity status of children

Among 251 children, 16.7% were not suffering any diseases, whereas majorities (69.7%) were suffering single disease and 13.5% was suffering from multiple diseases [Table 5].

### Morbidity patterns of children

The most prevalent (55.0%) disease was a cough with fever and the percentage was higher in girls compared with boys (56.4% vs. 53.9%) [Table 5]. Second prevalent (18.3%) disease was pneumonia and the percentage was greater in boys compared with girls (21.0% vs. 14.8%) [Table 5]. The third prevalent disease was the measles (9.9%) and there were more boys sufferers

**Table 1: Sociodemographic status of children (n=251)**

Characteristics	n (%)
Child's gender	
Boys	143 (57.0)
Girls	108 (43.0)
Child's age	
$\geq 6-7$ months	106 (42.2)
8-9 months	46 (18.3)
$\geq 10$ months	99 (39.4)
Mean $\pm$ SD	8.6 $\pm$ 2.3
Mother's education	
Secondary and below	211 (84.1)
Higher secondary and above	40 (15.9)
Mother's occupation	
Homemaker	217 (86.5)
Not homemaker	34 (13.5)
Family income (taka)	
$\leq 9999$	79 (31.5)
10,000-15,000	64 (25.5)
15,001-20,000	68 (27.1)
$\geq 20,001$	40 (15.9)
Mean $\pm$ SD	144,402.4 $\pm$ 7439.9

SD=Standard deviation

**Table 2: Mean $\pm$ standard deviation anthropometric measurements of study subjects (n=251)**

Gender	Age group (months)	Weight (kg)		Length (cm)	
Boys (143)	$\geq 6-7$	6.4 $\pm$ 0.9	7.7 $\pm$ 1.4	67.0 $\pm$ 5.2	69.5 $\pm$ 5.5
	8-9	6.6 $\pm$ 0.7		68.7 $\pm$ 3.1	
	$\geq 10$	8.9 $\pm$ 0.9		74.4 $\pm$ 3.9	
Girls (108)	$\geq 6-7$	7.9 $\pm$ 0.5	8.5 $\pm$ 0.9	69.9 $\pm$ 1.9	71.1 $\pm$ 3.2
	8-9	8.2 $\pm$ 0.7		70.1 $\pm$ 1.9	
	$\geq 10$	8.9 $\pm$ 0.8		72.1 $\pm$ 3.8	
Mean		7.7 $\pm$ 1.4		70.2 $\pm$ 4.7	

**Table 3: Distribution of children's nutritional status (n=251)**

Nutritional status	HAZ, n (%)	WAZ, n (%)	WHZ, n (%)
Normal ( $\geq -2$ z-scores)	223 (88.8)	210 (83.7)	221 (88.0)
Moderate ( $\geq -3$ and $< -2$ z-scores)	28 (11.2)	41 (16.3)	30 (12.0)
Severe ( $< -3$ z-scores)	0	0	0
Total	251 (100.0)	251 (100.0)	251 (100.0)

HAZ=Height for age z-score, WAZ=Weight for age z-score, WHZ=Weight for height z-score

than girls (16.2% vs. 1.8%). Other morbidities were diarrhea (8.3%) and other problems (5.2%) [Table 5].

### Discussion

The WHO working group's report on measuring the nutritional status of children recommends the use of Z-scores system as they have significant advantages over

**Table 4: Malnutrition of the children according to age group (n=251)**

Age (month)	Prevalence		
	Stunting, n (%)	Underweight, n (%)	Wasting, n (%)
≥6-7	11 (4.4)	20 (7.9)	13 (5.2)
8-9	5 (2.0)	9 (3.6)	4 (1.6)
≥10	12 (4.8)	12 (4.8)	13 (5.2)
Total	28 (11.2)	41 (16.3)	30 (12.0)

**Table 5: Morbidity characteristics of children stratified by gender (n=251)**

Characteristics	Gender		Total (n=251), n (%)
	Boys (n=143), n (%)	Girls (n=108), n (%)	
Morbidity status			
No disease	13 (9.1)	29 (26.9)	42 (16.7)
Single disease	118 (82.5)	57 (52.8)	175 (69.7)
Multiple disease	12 (8.4)	22 (20.4)	34 (13.6)
Patterns of morbidity*			
Cough with fever	77 (53.9)	61 (56.4)	138 (55.0)
Pneumonia	30 (21.0)	16 (14.8)	46 (18.3)
Measles	23 (16.2)	2 (1.8)	25 (9.9)
Diarrhea	10 (7.0)	11 (10.2)	21 (8.3)
Other problems	2 (1.4)	11 (10.2)	13 (5.2)

\*Multiple responses

other approaches.<sup>[11,12]</sup> The present study assessed the prevalence and also underlying morbidity among children under 1 year of age, with special reference to their SES. The prevalence of stunting, wasting, and underweight were 11.2%, 16.3%, and 12.0%, respectively of which all children were moderately stunted, wasted, and underweight.

The current study findings of stunting (11.2%) were lower than the national figure.<sup>[10]</sup> Earlier studies conducted in Bangladesh have reported the prevalence of stunting among children was 44.0% and 48.0%; these findings are inconsistent with the present study.<sup>[13,14]</sup> However, another study had reported that Infants aged 6–12 months had a significantly lower risk of being stunted than children in older age groups.<sup>[15]</sup> Our findings are similar to those from a study in India.<sup>[16]</sup>

The present study revealed the prevalence of underweight as 16.3% which is lower than the national figure (33.0%) of Bangladesh.<sup>[10]</sup> This might be due to small sample size and convenient sampling. A multi-stage cross-sectional study<sup>[17]</sup> done in Vietnam also revealed that the prevalence of underweight was found to be 31.8%. The difference might be due to variation in characteristics and level of progress. A study conducted by Rahman and Biswas in Bangladesh reported that 47.0% children were underweight, which is inconsistent with the present study findings.<sup>[13]</sup>

In our study, the overall prevalence of wasting was 12.0%, which is nearly comparable to the national

figure (14.0%) of Bangladesh.<sup>[10]</sup> This might be due to the similar sociocultural and demographic characteristics of the children. A cross-sectional study conducted in Bangladesh<sup>[13]</sup> and result found that the prevalence of wasting was 10.0% which was almost equal to the present study findings. Another cross-sectional study conducted by Avachat *et al.* had revealed that 15.7% children were wasted, which is inconsistent with the present study findings.<sup>[18]</sup> A cross-sectional community-based survey conducted among 15408 children, under 5 years of age, in Iran had revealed the prevalence of wasting was as 8.19%, which is lower than the present study findings.<sup>[19]</sup>

A study conducted in India revealed that the prevalence of stunting, underweight, and wasting was 70.1%, 71.5%, and 62.7%, respectively, which is higher than the present study findings.<sup>[20]</sup> These may be due to regional variation and socioeconomical influences.

De Souza *et al.* reported the prevalence of stunting and wasting 9.9% and 4.1%, respectively and Zhang *et al.* reported the prevalence of wasting and underweight 3.1% and 7.2%, respectively.<sup>[21,22]</sup> These are nearly consistent with the present study findings. In general, the prevalence of under-nutrition in various parts of the world ranged from 5% to 40% with the different risk factors categorized as child or family characteristics, socioeconomic status, healthcare, and prevalent infectious disease.<sup>[4,23]</sup>

Undernutrition and childhood morbidity have a synergistic relationship, i.e., the illness can suppress appetite precipitating undernutrition of a child, while on the other hand, nutritional deficiencies increase the susceptibility of the child to infectious diseases.<sup>[24]</sup>

The current study revealed that the most (83.3%) of children were suffering from a single or multiple diseases in which 69.7% were suffering from single disease, and 13.6% were suffering from multiple diseases. It was noted in the present study that 55.0% of children suffered from one or multiple episodes of fever with a cough followed by pneumonia (18.3%), measles (9.9%), and diarrhea (8.3%). It was noted in the present study that the majority (45.0%) of the children suffered from one or multiple episodes of diarrhea followed by a respiratory tract infection were (32.0%), pneumonia (18.0%). This is similar to the findings of Bhavsar *et al.*<sup>[25]</sup> A study conducted by Gupta in Punjab had found that 46.0% of under-five children with diarrhea suffered from malnutrition.<sup>[26]</sup> Bisai *et al.* reported that children with prevalent morbidities such as diarrhea, ARI, or measles were more likely to be undernourished.<sup>[27]</sup> Gastroenteritis was reported in 14% and fever in 19% children.<sup>[28]</sup>

The study was not primarily designed to measure sex differentials in morbidity; the present study demonstrates that pneumonia was slightly higher in boys as compared

to girls. Nagaraj *et al.*<sup>[29]</sup> observed that the prevalence of pneumonia was 9.0%. Rao<sup>[30]</sup> carried community-based cross-sectional study and found that the prevalence of ARI was 12.4%. Giri *et al.*<sup>[31]</sup> revealed that 5.8% children were suffering from acute diarrheal diseases. Above findings of morbidity was lower than the present study results.

## Conclusions

Despite the decreased trend of undernutrition in the last years, the prevalence of undernutrition was high in the study population thus highlighting yet again that undernutrition continues to be a public health burden because of its major effect on morbidity and impairment of intellectual and physical development in long-term. Increasing the practice of exclusive breast feeding, the introduction of timely complementary feeding, and standard case management of morbidities would be beneficial to combat the problem of undernutrition.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

**Received:** 03 May 17 **Accepted:** 02 Sep 17

**Published:** 26 Jun 18

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