

# Assessment of Nutritional Status in Children Aged 6 to 59 Months Using MUAC: An OPD-Based Study in a Tertiary Children Health Care Centre in Bangladesh

Dr. Md. Ziaur Rahman<sup>1\*</sup>, Prof. Dr. AFM Salim<sup>2</sup>, Prof. Dr. Nabo Krishna Ghosh<sup>2</sup>, Prof. Dr. Azmeri<sup>2</sup>

<sup>1</sup>Assistant Professor, Department of Pediatrics, Ibn Sina Medical College Hospital, Dhaka, Bangladesh

<sup>2</sup>Professor, Department of Pediatrics, Dr. MR Khan Shishu Hospital & Institute of Child Health, Dhaka, Bangladesh

DOI: <https://doi.org/10.36348/sjmpps.2025.v11i01.012>

| Received: 14.12.2024 | Accepted: 20.01.2025 | Published: 23.01.2025

\*Corresponding author: Dr. Md. Ziaur Rahman

Assistant Professor, Department of Pediatrics, Ibn Sina Medical College Hospital, Dhaka, Bangladesh

## Abstract

**Background:** Malnutrition is a major public health concern among children under five years of age in low- and middle-income countries, contributing to high morbidity and mortality. Despite progress, malnutrition remains a significant issue in Bangladesh and is influenced by socioeconomic disparities and maternal education. Mid-Upper Arm Circumference (MUAC) is a practical tool for assessing nutritional status in resource-limited settings. This study aimed to determine the nutritional status of children aged 6–59 months in the outpatient department (OPD) of a tertiary hospital in Bangladesh.

**Methods:** A retrospective observational study was conducted at Department of Pediatrics, MR Khan Shishu Hospital & Institute of Child Health, Dhaka, from January 2010 to January 2011. Data from 200 children aged 6–59 months were analyzed. Nutritional status was classified as normal, moderate or severe based on MUAC values. Associations among demographic factors, maternal education, and malnutrition were also explored. **Results:** Among the 200 children, 24.5% were malnourished, including 10.5% with severe malnutrition and 14% with moderate malnutrition. Children aged 36–59 months had the highest malnutrition prevalence (29%). Females (21%) were more likely to be malnourished than males (16.5%). Maternal education strongly affected outcomes, with malnutrition being the highest among children of illiterate mothers (47.5%). **Conclusion:** Gender and maternal education influence the nutritional status of children in Bangladesh. For nutritional assessment, the MUAC is an effective tool that underscores the need for interventions that target these disparities.

**Keywords:** MUAC, Malnutrition, Nutritional assessment, maternal education, Gender disparities.

**Copyright © 2025 The Author(s):** This is an open-access article distributed under the terms of the Creative Commons Attribution 4.0 International License (CC BY-NC 4.0) which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use provided the original author and source are credited.

## INTRODUCTION

Children under 5 years old are still at risk of malnutrition, which is a major public health problem in low and middle income countries and is associated with higher morbidity and mortality [1, 2]. The prevalence of undernutrition largely reflects disparities in food security, healthcare access and socioeconomic conditions, and vulnerable populations bear a disproportionate burden [3, 4]. The Mid-Upper Arm Circumference (MUAC) is known as a simple, rapid, and reliable anthropometric measure among various anthropometric measures as an indicator of nutritional status of children [5, 6]. In resource constraints areas it is preferable to use it as a screening method compared to weight for height indices, because it is more effective at identifying acute malnutrition [7].

An estimated 45 million children under five are affected by wasting globally, with South Asia carrying the biggest burden [8]. However, Bangladesh has made progress in reducing child mortality in recent decades yet this region is one of alarming malnutrition rates [9]. A large number of children less than five years in Bangladesh suffer from moderate to severe malnutrition, as shown in the National Nutrition Survey [3]. Nutritional outcomes are influenced by socioeconomic factors including maternal education and household income [10].

The validation of MUAC has shown its accuracy in predicting mortality and diagnosing children with SAM in diverse settings [11, 12]. Its utility has been highlighted through studies from Ethiopia, Nigeria, and

South Asia where limited resources exist [13, 14]. MUAC has also been used effectively in Bangladesh's community based programs to identify and treat malnourished children [15]. But little research has been done on its application in tertiary healthcare especially in outpatients departments (OPDs).

This study aims to gain insights on the prevalence and patterns of malnutrition in a healthcare setting where nutritional assessments can directly affect clinical management, stratified by age and gender. In addition, this work evaluates demographic determinants, specifically focusing on the relationship between maternal educational levels and nutritional outcomes.

The findings of this study will help to add to the growing body of evidence supporting MUAC as a reliable and practical method of nutritional assessment. It also underscores the importance of targeted interventions aimed at stopping the underlying causes of malnutrition in pediatric populations.

### Objective

The objective of this study was to assess the nutritional status among the children age 6 to 59 months using MUAC.

## METHODOLOGY & MATERIALS

This retrospective observational study conducted at Department of Pediatrics, MR Khan Shishu Hospital & Institute of Child Health, Dhaka from January 2010 to January 2011. Data from 200 children aged 6–59 months were analyzed. Nutritional status was classified as normal, moderate, or severe malnutrition based on MUAC values. Associations between demographic factors, maternal education, and malnutrition were explored.

### Selection Criteria:

#### Inclusion Criteria

- Children aged 6–59 months attending the OPD.
- Complete medical records with MUAC data.
- Guardians consented to data use for research.

#### Exclusion Criteria

- Incomplete or missing medical records.
- Chronic illnesses or congenital anomalies.
- Emergency cases requiring immediate treatment.

**Data Collection:** Previous medical records of children aged 6 to  $\geq 59$  months attending at the outpatient department (OPD) of Department of Pediatrics, MR Khan Shishu Hospital & Institute of Child Health, Dhaka. Demographic characteristics, maternal education, nutritional status were extracted for information. Mid-Upper Arm Circumference (MUAC) assessed with cutoff values to categorize children into normal, moderate, or severe malnutrition was done. The data was reviewed systematically in a managed format and recorded likewise for consistency and accuracy. For analysis, only complete and relevant records meeting the study's inclusion criteria were considered.

**Statistical analysis of data:** The data was analyzed using descriptive statistical methods. Categorical variables like age groups, gender distribution, maternal education levels, and nutritional status categories were converted into frequencies and percentages. Continuous variables were summarized using mean and standard deviations, such as MUAC values in different age and gender groups. Patterns and variation of the nutritional status were presented on tables.

## RESULTS

**Table 1: Demographic Characteristics of the Participants (n=200)**

Characteristics		Frequency (n)	Percentage (%)
Age (months)	6-11	70	35.00%
	12-23	77	38.50%
	24-35	30	15.00%
	36-59	23	11.50%
Sex	Male	107	53.50%
	Female	93	46.50%
Maternal Education	Illiterate	95	47.50%
	Primary	72	36.00%
	Secondary	26	13.00%
	Graduate	7	3.50%

The demographic characteristics of the 200 children are presented in this table. A majority of the participants (73.5%) was aged between 6 and 23 months, with the highest percentage (38.5%) being in the 12–23

months age group. Males made up 53.5% of the sample, slightly more than females. About half (47.5%) of the mothers were illiterate and only a small proportion (3.5%) was educated up to graduate levels.

**Table 2: Nutritional status of the children based on MUAC (n=200)**

Nutritional status	Frequency (n)	Percentage (%)
Severe malnutrition (MUAC < 11.5 cm)	21	10.50%
Moderate malnutrition (MUAC 11.5-12.5 cm)	28	14.00%
Normal (MUAC >12.5 cm)	151	75.50%

Table 2 presents an overview of the nutritional status of the participants as per MUAC. The findings reveal that 10.5% of the children had severe malnutrition (MUAC < 11.5 cm), while 14% were moderately

malnourished (MUAC 11.5–12.5 cm). The majority (75.5 %) were categorized as having normal nutritional status (MUAC > 12.5 cm).

**Table 3: Prevalence of malnutrition by age and gender (n=200)**

Variables		Malnourished	Normal nutrition
Age group (months)	6-11	8 (12.00%)	62 (88.00%)
	12-23	10 (13.00%)	67 (87.00%)
	24-35	6 (20.0%)	24 (80.00%)
	36-59	7 (29.00%)	16 (71.00%)
Gender	Male	18 (16.50%)	89 (83.50%)
	Female	20 (21.00%)	73 (79.00%)

Table 3 shows the prevalence of malnutrition by age and gender. The 29% malnourished children in the 36–59 months age group were most prevalent.

Prevalence of malnutrition was higher among both genders compared to males (16.5%) and males (21%).

**Table 4: Distribution of mean MUAC by age and sex (n=200)**

Age group (months)	Male		Female	
	N (%)	Mean MUAC (cm)±SD	N (%)	Mean MUAC (cm)±SD
6-11	22 (11.0%)	11.1±0.7	18 (9.0%)	11.3±0.6
12-23	35 (17.5%)	11.7±0.8	30 (15.0%)	11.9±0.7
24-35	28 (14.0%)	12.8±0.6	27 (13.5%)	12.6±0.7
36-59	23 (11.5%)	13.3±0.5	17 (8.5%)	13.1±0.4

The mean MUAC values by children for age and gender are shown in the table. Mean MUAC values were higher with age in the males and females, suggesting improved nutritional status in older children. Across all age groups males had slightly lower mean MUAC values than females and the lowest values were in the 6–11 months group.

## DISCUSSION

The nutritional status of children aged 6 to 59 months using the Mid-Upper Arm Circumference (MUAC) was assessed in a tertiary hospital setting. It was found that 24.5 per cent of the children were malnourished, with 10.5 per cent classified as severely malnourished and 14 per cent as moderately malnourished. These findings highlight the burden of malnutrition in Bangladeshi pediatric populations, in particular, disadvantaged communities.

This study showed malnutrition prevalence similar to the finding of Ahmed *et al.*, that high rates of undernutrition among hospitalized children were observed in Tanzania [9]. Ghimire *et al.*, also found a high prevalence of severe acute malnutrition in children under five in Nepal, demonstrating that malnutrition is a global problem in low resource settings [14]. However, the figures were notably higher in community based

studies, such as the survey of national nutrition in Bangladesh, 31% of children stunted and 8% wasted. However, the relatively lower rates, seen in this hospital based study, may reflect the often seen characteristics of the OPD population [3]. Similar to Das *et al.*, found high prevalence of malnutrition in rural Bangladesh [16], they found that socioeconomic disparities and mother education mattered in determining nutritional outcomes. The consistent finding from these studies is that maternal education matters dramatically for children's nutrition, and our data are consistent with this finding: children of illiterate mothers had higher rates of malnutrition.

In this study, gender differences in malnutrition were found, with the prevalence for females at 21% compared to 16.5% for males. These findings are consistent with Saha *et al.*, who found significant gender disparities in nutrition in rural Bangladesh that is often related to culture and practices that favor the male child in food distribution and healthcare access [17]. Despite the need to address these gender disparities to improve overall nutritional outcomes in country, these gender disparities are addressed.

The age-specific prevalence of malnutrition in our study showed higher rates among older children aged 36-59 months (29%), consistent with the findings of

Rahman *et al.*, who reported that children in this age group are at increased risk due to weaning challenges and inadequate dietary diversity [18]. However, in community based studies such as Alam *et al.*, increasing malnutrition rates were seen in younger age groups (6-23 months), which should be tackled with appropriate feeding during the critical early years [19].

MUAC has been widely documented as a tool for assessing malnutrition in Bangladesh and other low resource settings. MUAC has been validated by Kabir *et al.*, for the reliability in identification of acute malnutrition in settings with limited resources [20]. The information provided by our study further supports its practicality for use in a rapid and reliable nutritional assessment in a tertiary hospital OPD environment.

In summary, malnutrition among Bangladeshi children continues to be a serious public health problem, and there are wide disparities in malnutrition based on gender, age, and mother's education. The findings point to the necessity of targeted interventions, including those focused on maternal education and reducing gender disparities. The MUAC is still an important nutritional assessment tool and should be adopted and promoted widely in both the community and clinical settings for assisting the identification and the treatment of malnutrition.

## CONCLUSION

This study emphasizes that children aged 6 months to 59 months of age shoulder a large burden of malnutrition, with nearly one quarter malnourished. Nutritional status was determined in large part by maternal education and gender disparities. The findings also highlight that MUAC is an ideal tool for rapid nutritional assessment and that targeted interventions for malnutrition are urgently needed.

## LIMITATIONS AND RECOMMENDATIONS

The study was limited to a single hospital with a relatively small sample size, which may not represent the broader community. Future research should include larger, population-based studies to validate these findings. Comprehensive interventions addressing maternal education, gender disparities and socioeconomic factors are essential for reducing childhood malnutrition and improving overall nutritional outcomes.

## REFERENCES

- Musa, T. H., Musa, H. H., Ali, E. A., & Musa, N. E. (2014). Prevalence of malnutrition among children under five years old in Khartoum State, Sudan. *Polish Annals of Medicine*, 21(1), 1-7.
- Asim, M., & Nawaz, Y. (2018). Child malnutrition in Pakistan: evidence from literature. *Children*, 5(5), 60.
- UNICEF. National Nutrition and Health Survey (NNHS) 2018. NBS, UNICEF; 2018.
- Shinsugi, C., Gunasekara, D., & Takimoto, H. (2020). Use of mid-upper arm circumference (MUAC) to predict malnutrition among Sri Lankan schoolchildren. *Nutrients*, 12(1), 168.
- Asif, M., Khan, S., Abbas, A., Nazir, F., Rahman, A., & Arshad, R. (2020). Nutritional status assessment of Pakistani children based on mid-upper arm circumference (MUAC), a hospital-based study from Pakistan.
- Ahmad, D., Afzal, M., & Imtiaz, A. (2020). Effect of socioeconomic factors on malnutrition among children in Pakistan. *Future Business Journal*, 6, 1-11.
- Bari, A., Nazar, M., Iftikhar, A., & Mehreen, S. (2019). Comparison of Weight-for-Height Z-score and mid-upper arm circumference to diagnose moderate and severe acute malnutrition in children aged 6-59 months. *Pakistan Journal of Medical Sciences*, 35(2), 337.
- Black, R. E., Allen, L. H., Bhutta, Z. A., Caulfield, L. E., De Onis, M., Ezzati, M., ... & Rivera, J. (2008). Maternal and child undernutrition: global and regional exposures and health consequences. *The lancet*, 371(9608), 243-260.
- Ahmed, M. M., Hokororo, A., Kidenya, B. R., Kabyemera, R., & Kamugisha, E. (2016). Prevalence of undernutrition and risk factors of severe undernutrition among children admitted to Bugando Medical Centre in Mwanza, Tanzania. *BMC Nutrition*, 2, 1-6.
- Gupta, V. M., & Shukla, K. K. (1992). Epidemiological correlates of protein energy malnutrition in preschool children. *Indian Journal of Preventive and Social Medicine*, 23, 26-32.
- John, C., Ocheke, I. E., Diala, U., Adah, R. O., & Envuladu, E. A. (2017). Does mid upper arm circumference identify all acute malnourished 6-59 month old children, in field and clinical settings in Nigeria?. *South African Journal of Clinical Nutrition*, 30(3).
- Tadesse, A. W., Tadesse, E., Berhane, Y., & Ekström, E. C. (2017). Comparison of mid-upper arm circumference and weight-for-height to diagnose severe acute malnutrition: A study in Southern Ethiopia. *Nutrients*, 9(3), 267.
- Asif, M. U. H. A. M. M. A. D., Aslam, M. U. H. A. M. M. A. D., & Altaf, S. A. I. M. A. (2017). evaluation of nutritional status of children using mid-upper arm circumference (MUAC): A study from Pakistan. *Pak Pediatr J*, 41(3), 163-7.
- Ghimire, U., Aryal, B. K., Gupta, A. K., & Sapkota, S. (2020). Severe acute malnutrition and its associated factors among children under-five years: a facility-based cross-sectional study. *BMC pediatrics*, 20, 1-9.
- Singh, P. K., & Mukherjee, B. (2015). Assessment of nutritional status by mid upper arm circumference (MUAC) among rural children of Katihar district in Kosi region of Bihar. *Journal of Evolution of Medical and Dental Sciences*, 4(22), 3823-3829.

16. Das, S., Banik, S. D., & Bose, K. (2013). Mid-upper arm circumference for age and undernutrition among 2 to 6 year old Bauri and Santal children of Purulia, West Bengal, India. *Hum Bio Rev*, 2(4), 359-372.
17. Saha, K. K., Frongillo, E. A., Alam, D. S., Arifeen, S. E., Persson, L. Å., & Rasmussen, K. M. (2009). Household food security is associated with growth of infants and young children in rural Bangladesh. *Public health nutrition*, 12(9), 1556-1562.
18. Rahman, M. S., Howlader, T., Masud, M. S., & Rahman, M. L. (2016). Association of low-birth weight with malnutrition in children under five years in Bangladesh: do mother's education, socio-economic status, and birth interval matter?. *PloS one*, 11(6), e0157814.
19. Alam, M. A., Richard, S. A., Fahim, S. M., Mahfuz, M., Nahar, B., Das, S., ... & Ahmed, T. (2020). Impact of early-onset persistent stunting on cognitive development at 5 years of age: Results from a multi-country cohort study. *PloS one*, 15(1), e0227839.
20. Kabir, I., Khanam, M., Agho, K. E., Miharshahi, S., Dibley, M. J., & Roy, S. K. (2012). Determinants of inappropriate complementary feeding practices in infant and young children in Bangladesh: secondary data analysis of Demographic Health Survey 2007. *Maternal & child nutrition*, 8, 11-27.