Analysis of Childhood Malnutrition and Disease in Bangladesh: A Cross Sectional Study in Chattogram

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Abstract

Background: Malnutrition in children is an important issue for developing countries since it has a direct impact on social and health policies. Malnutrition is one of the key public health challenges of the 21st century, and relative improvement trends in malnutrition show significant disparity, especially for South Asia. Malnutrition is associated with 1 to 2 million preventable annual child deaths and chronic illness puts children at risk of malnutrition. The magnitude of malnutrition in Bangladesh is a matter of great concern and is a complicated issue which depends on several factors. The aim of the study to determine prevalence of malnutrition in the selected participants and the causes of malnutrition in the selected participants

Materials and methods: A cross sectional study was implemented among a sample of 250 children aged 6-59 months enrolled from tertiary hospitals and government health complexes across Chattogram. The timeline of the study was from January to June 2022. SPSS was used to analyze the collected data, with the presence of acute malnutrition as the dependent variable.

Results: The results show that among the 250 children enrolled for the data collection, the prevalence of Acute Malnutrition (AM) was determined to be 7.6% (n=19). Among these, one (5.3%) had Severe Acute Malnutrition (SAM) while the remaining 18(94.7) had Mild Acute Malnutrition (MAM).

Conclusion: The burden of Acute Malnutrition (AM) among children under 5 years of age is still high compared to the worldwide prevalence, which is a disturbing issue for policy makers. In this study, apart from the children's age, factors such as low protein intake, lower level of paternal education and incidences of respiratory illnesses were associated with acute malnutrition.

Key words: Acute malnutrition; Children; Policy; Wellbeing.

Introduction

Malnutrition in children remains a scourge in many developing countries.[1] Estimates suggest that malnutrition is associated with about 50% of all deaths among children in developing countries.[2] Malnutrition is common throughout the developing world and is a key contributor to global childhood morbidity and mortality.[3] Malnutrition in children is a result of poverty, lack of knowledge, poor child feeding practices, lack of care and infection.[4] Malnutrition is associated with 1 to 2 million preventable annual child deaths and chronic illness puts children at risk of malnutrition.[5,6] Children with acute malnutrition are common in developing countries due to an inadequate food supply caused by social, economic and environmental factors.[7] Diseases increase the risk of malnutrition in children and chronic illness puts children at risk for developing malnutrition.[8,6]

Despite advancements in child health, malnutrition remains one of the main public health challenges of the 21st century in developing countries.[9] Relative improvements in trends for malnutrition indicate considerable disparity, with South Asia still showing a high trend.[9] Child malnutrition in South Asia will continue to be high in the region, and is also the only region where girls are more likely to be underweight than boys.[10] Modulating malnutrition appears to be extremely demanding in South Asia, which is home to half of the world's poor, approximately 1.4 billion people.[11] South Asia remains one of the major areas of hunger in the world and prevalence of micronutrient deficiencies is particularly high, despite recent successes in economic growth, health care and agricultural output.[12,13]

Malnutrition continues to be a significant public health issue for Bangladesh.[14] Although Bangladesh has significantly reduced the proportion of under five children suffering from malnutrition, the magnitude of the problem is still great.[15] Malnutrition is a complicated issue which depends on several factors and needs to be studied on a constant basis. Demographic characteristics are the most significant factors for chronic

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malnutrition.[16] Malnutrition is connected to macronutrient deficiency and is characterized by stunting, wasting and underweight.[17] A study found the overall prevalence of acute malnutrition in Bangladeshi children to be about 10%, while Sayeed et. al. in their study found the prevalence of stunting, wasting and overweight among children under 5 to be 30.72%, 8.44% and 2.21% respectively.[18,19] Bangladesh is one of the countries with the highest rates of malnutrition and child malnutrition in the country is influenced by socioeconomic inequalities.[20,21a] Large disparities in child malnutrition are present across gender, geographical regions and economic groups.[21b] The aim of the study to determine prevalence of malnutrition in the selected participants and the causes of malnutrition in the selected participants.

Materials and methods

The study was a cross-sectional study conducted in Chattogram using primary data collected from children in Boalkhali Health Complex and Chittagong Diabetic General Hospital over a period of 6 months from January 2022 to the end of June 2022 and ethical clearance was taken from the institutions.

250 children, all in the outpatient departments, between the ages of 6 months to 59 months selected through purposive sampling at different parts of the study area, and their parents were interviewed using a pretested semi structured questionnaire. After obtain permission from the parents, the children's Mid-Upper Arm Circumference (MUAC) was measured using a Shakir's Tape and the results were recorded. Children younger than 6 months and older than 59 months were excluded from the sampling process.

The children were then classified according to WHO (2007). The nutrition status of the under 5 children was categorized with cutoff points of MUAC as follows: Normal children had a MUAC of ≥ 125mm while children with acute malnutrition had a MUAC < 125mm. Cases of acute malnutrition were further divided into SAM as MUAC < 155mm and MAM as 155mm < MUAC <1 25mm.

Descriptive statistics were compiled to determine the prevalence of AM (SAM + MAM). A univariate analysis was conducted keeping acute malnutrition as the dependent variable, and multiple variables were compared. Chi Square Test was used for qualitative data and Student's t-test was used for quantitative data. The statistical package SPSS (Version IBM, 22) was used to conduct the analysis. A value of $p<0.05$ was considered statistically significant for the analysis.

Results

250 children aged between 6 months to 59 months of age were enrolled for this study. The mean age of study subjects was 28.5 ± 16.3 months. The male to female ratio was 1.4:1. The prevalence of Acute Malnutrition (AM) among the study subjects was 7.6% (n=19). Among these, one (5.3%) had Severe Acute Malnutrition (SAM), while the remaining 18 (94.7) had moderate acute malnutrition (MAM). The mean circumference was 14.03± 1.23 cm. The data is represented in Figure 1.

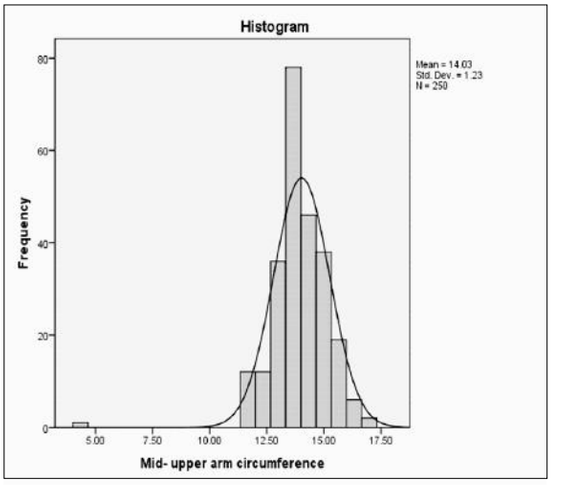

Figure 1 Histogram of MUAC range in the study subjects

A univariate analysis was conducted based on the status of acute malnutrition. Variables such as gender, age, SES, maternal and paternal education level and occupation, their living conditions, and family sizes were considered. Table I summarizes these findings.

Table I Univariate association between presence of acute malnutrition and different demographic characteristics

Variables	Categories	Acute malnutrition Yes (%)	Acute malnutrition No (%)	Total (%)	*p-value
Gender	male	8 (42.1%)	136 (58.9%)	144 (57.6%)	0.076
	female	11 (57.9%)	95 (41.1%)	106 (42.4%)	
Child's age	Mean ± SD	17.0 ± 8.8	29.46 ± 16.4	28.52 ± 16.3	
	6-23 months	13 (68.4%)	99 (42.9%)	112 (44.8%)	0.016
	24-59 months	6 (31.6%)	132 (57.1%)	138 (55.2%)	

Variables	Categories	Acute malnutrition		Total (%)	*p-value
		Yes (%)	No (%)		
Maternal age	Mean ± SD	24 ± 4.96	25.84 ± 4.37	25.70 ± 4.43	
	<20 years	2 (10.5%)	13 (5.6%)	15 (6%)	
	20- 29 years	14 (73.7%)	165 (71.4%)	179 (71.6%)	0.895
	≥30 years	3 (15.8%)	53 (22.9%)	56 (22.4%)	
Maternal education	None	3 (15.8%)	17 (7.4%)	20 (8.0%)	
	PSC	0 (0%)	45 (19.5%)	45 (18.0%)	
	SSC	10 (52.6%)	100 (43.3%)	110 (44.0%)	0.214
	HSC	6 (31.6%)	46 (19.9%)	52 (20.8%)	
	Graduate	0 (0%)	23 (10.0%)	23 (9.2%)	
Maternal occupation	Student	0 (0%)	2 (0.9%)	2 (0.8%)	0.998
	Home maker	19 (100%)	29 (99.1%)	248 (99.2%)	
Family planning method	IUD	0 (0%)	4 (1.7%)	4 (1.6%)	
	Pill	12 (63.2%)	101 (43.7%)	113 (45.2%)	
	Injection	1 (5.3%)	56 (24.2%)	57 (22.8%)	0.5
	None	6 (31.6%)	70 (30.3%)	76 (30.4%)	
Paternal education	None	4 (21.1%)	26 (11.3%)	30 (12.0%)	
	PSC	6 (31.6%)	65 (28.1%)	71 (28.4%)	
	SSC	9 (47.4%)	82 (35.5%)	91 (36.4%)	0.021
	HSC	0 (0%)	41 (17.7%)	41 (16.4%)	
	Graduate	0 (0%)	17 (7.4%)	17 (6.8%)	
Paternal occupation	Unemployed	2 (10.5)	11 (4.8%)	13 (5.2%)	
	Farmer	2 (10.5)	8 (3.5%)	10 (4.0%)	
	Laborer	6 (31.6)	55 (23.8%)	61 (24.4%)	0.156
	Service holder	5 (26.3)	134 (58%)	139 (55.6%)	
	Business	4 (21.1)	23 (10%)	27 (10.8%)	
No. of family members	Mean ± SD	6.16 ± 2.70	6.12 ± 2.63	6.12 ± 2.65	
	1-5	11 (57.9%)	116 (50.2%)	127 (50.8%)	
	6-10	7 (36.8%)	95 (41.1%)	102 (40.8%)	0.884
	11-15	1 (5.3%)	18 (7.8%)	19 (7.6%)	
	>15	0 (0%)	2 (0.9%)	2 (0.8%)	
Monthly income	<10,000	12 (63.2%)	99 (42.9%)	111 (44.4%)	
	10,000 - 50,000	5 (26.3%)	109 (47.2%)	114 (45.6%)	0.375
	>50,000	2 (10.5%)	23 (10.0%)	25 (10.0%)	

* Chi squared test.

On comparing the various demographic characteristics against the presence or absence of malnutrition, it was observed that no significant association exists between the exposure variables and presence of acute malnutrition except for child's age and paternal education. In case of malnutrition, the male: female ratio was 1:1.38. As for child's age, children of a younger age were more likely to suffer from acute malnutrition as compared to older children (p= 0.016). No significant association was found between maternal age or maternal education against child's nutritional status, however, fathers with a lower level of education were associated with having children suffering from malnutrition (p=0.021) as compared to fathers with a higher level of education.

A univariate analysis was conducted to evaluate the relation between household characteristics as well as the feeding habits of children with and without acute malnutrition. A chi-squared test was applied to the variables. Results of the test are displayed in Tables II.

Table II Univariate association between presence of acute malnutrition and household living conditions

Variables		Categories	Acute malnutrition		Total (%)	p-value
		Yes (%)	No (%)			
Home owned or rented	Owned	14 (73.7%)	172 (74.5%)	186 (74.4%)	0.942	
	Rented	5 (26.3%)	59 (25.5%)	64 (25.6%)		
House built with	Bricks	9 (47.4%)	62 (26.8%)	71 (28.4%)	0.067	
	Semi-brick	3 (15.8%)	45 (19.5%)	48 (19.2%)		
	Tin-shed	3 (15.8%)	56 (24.2%)	59 (23.6%)		
	Bamboo	4 (21.1%)	56 (24.2%)	60 (24.0%)		
	Mud	0 (0%)	12 (5.2%)	12 (4.8%)		
Rooms congested or not	Yes	6 (31.6%)	108 (46.8%)	114 (45.6%)	0.249	
	No	13 (68.4%)	123 (53.2%)	136 (54.4%)		
Type of latrine	Open	0 (0%)	13 (5.6%)	13 (5.2%)	0.607	
	Sanitary	19 (100%)	218 (94.4%)	237 (94.8%)		
Wash hands before eating food	Yes	5 (26.3%)	85 (36.8%)	90 (36%)	0.46	
	No	14 (73.7%)	146 (63.2%)	160 (64%)		
Wash hands after eating food	Yes	2 (10.5%)	36 (15.6%)	38 (15.2%)	0.586	
	No	17 (89.5%)	195 (84.4%)	212 (84.8%)		
Washes hands after using toilet	Yes	9 (47.4%)	143 (61.9%)	152 (60.8%)	0.229	
	No	10 (52.6%)	88 (38.1%)	98 (39.2%)		
Take a shower regularly	Yes	14 (73.7%)	98 (42.4%)	112 (44.8%)	0.015	
	No	5 (26.3%)	133 (57.6%)	138 (55.2%)		

* Chi squared test.

Most of the study subjects owned houses (74.4%) and the houses were most commonly built with bricks (28.4%). Majority of children lived in non-congested rooms (54.4%) and used sanitary latrines (94.8%). About 64% washed hands before eating, while 84.8% washed hands after eating. 60.8% washed hands after using the toilet and only 44.8% took a shower regularly. Children of acute malnutrition were significantly (p=0.015) more likely to shower regularly (73.7%) as compared to normal children (44.8%).

Table III Univariate association between presence of acute malnutrition and feeding habits of children

Variables	Categories	Acute malnutrition		Total (%)	*p-value
		Yes (%)	No (%)		
Breast fed	Yes	16 (84.2%)	122 (52.8%)	138 (55.2%)	0.016
	No	3 (15.8%)	109 (47.2%)	112 (44.8%)	
Weaning in months	Mean ± SD	7.68 ±1.07	7.71 ±2.12	7.71 ±2.05	[a] 0.921
Meals per day	1 meal/day	2 (10.5%)	11 (4.8%)	13 (5.2%)	
	2 meals/day	11 (57.9%)	80 (34.6%)	91 (36.4%)	0.084
	3 meals/day	5 (26.3%)	112 (48.5%)	117 (46.8%)	
	>3 meals/day	1 (5.3%)	28 (12.1%)	29 (11.6%)	
Vitamins	Yes	6 (31.6%)	93 (40.3%)	99 (39.6%)	0.627
	No	13 (68.4%)	138 (59.7%)	151 (60.4%)	
Proteins	Yes	3 (15.8%)	105 (45.5%)	108 (43.2%)	0.015
	No	16 (84.2%)	126 (54.5%)	142 (56.8%)	
Appetite	Good	5 (2.2%)	0 (0%)	5 (2%)	0.948
	Bad	226 (97.8%)	19 (100%)	245 (98%)	

* Chi squared test, [a] student's t- test.

The table above displays the comparison of feeding habits between children with and without acute malnutrition. The majority of the children were breast fed (55.2%) and took three meals per day (46.8%). Most of the children did not take vitamins (60.4%) and proteins (56.8%) daily and had a bad appetite (98%). However, children with acute malnutrition were significantly more likely to be breastfed (p=0.016) with 84.2% of malnourished children who had been breast fed. Such children also had a significantly lower daily intake of proteins (p=0.015) with only 3 children (15.8%) who took proteins daily.

History of diseases among the study subjects are displayed in Figure 2. At least seventeen diseases or health problems were observed with respiratory illness (21.2%), scabies and other skin infections (20.4%) diarrhea (9.6%) oral soars (8.8%) and gum problems (4.4%) being among the top five disease conditions. Apart from this, decreased appetite (4.4%), allergies (3.2%) vomiting (2.8%) weakness (2.8%) eye/ear infection (2.8%) fever (2.4%) nose infection (2.4%) constipation (2.4%) abdominal bloating and pain (2.4%) body aches/limb pain (2.4%) and other diseases (4.8%) were also present. Disease history of about 3.2% of study subjects could not be recalled.

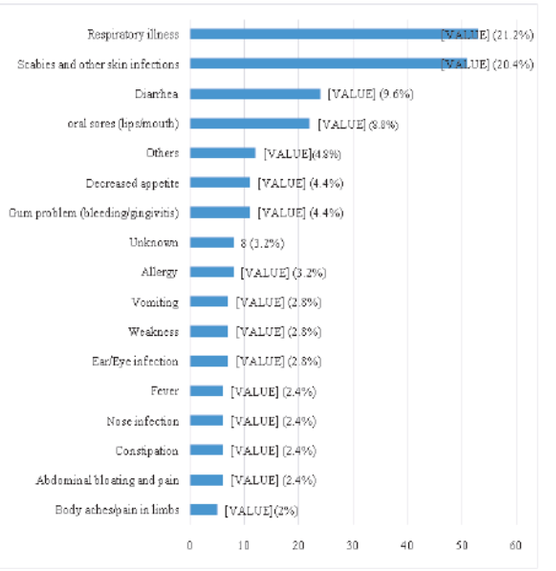

Figure 2 Diseases within the last 6 months

A univariate analysis was conducted to find an association between acute malnutrition and the top 5 most common illnesses among the study subjects. The results are presented in Table IV.

Table IV Univariate association between presence of acute malnutrition and top five common illnesses among study subjects

Variables	Categories	Acute malnutrition		Total (%)	*p-value
		Yes (%)	No (%)		
Respiratory illness	Yes	9 (47.4%)	44 (19%)	53 (21.2%)	0.007
	No	10 (52.6%)	187 (81%)	197 (78.8%)	
Skin infections	Yes	2 (10.5%)	49 (21.2%)	51 (20.4%)	0.380
	No	17 (89.5%)	182 (78.8%)	199 (79.6%)	
Diarrhea	Yes	0 (0%)	24 (10.4%)	24 (9.6%)	0.231
	No	19 (100%)	207 (89.6%)	226 (90.4%)	
Oral soars	Yes	2 (10.5%)	20 (8.7%)	22 (8.8%)	0.677
	No	17 (89.5%)	211 (91.3%)	228 (91.2%)	
Bleeding gums/gingivitis	Yes	1 (5.3%)	10 (4.3%)	11 (4.4%)	0.589
	No	18 (94.7%)	221 (95.7%)	239 (95.6%)	

* Chi squared test.

As displayed in the table above, only respiratory illness showed a significant association with acute malnutrition. Children with acute malnutrition were observed to have a significantly higher percentage of respiratory illnesses (p=0.007) as compared to well-nourished children. All other diseases do not show any significant association between disease condition and acute malnutrition.

Finally, parental knowledge and attitude towards the health of their child was evaluated using three measures: Knowledge about malnutrition, nutritionist advice and place of treatment. As observed in the bar chart below (Figure 3) only 13.6% of the study population took their children to private clinics for treatment, 7.2% took advice from a nutritionist among which none of them were malnourished and 17.2% had some knowledge about malnutrition. Among them, parents of malnourished children were more likely to get their children treated at district hospitals (6.8%). None of the caregivers of malnourished children took any advice from nutritionists and very few had some knowledge about malnutrition (0.8%).

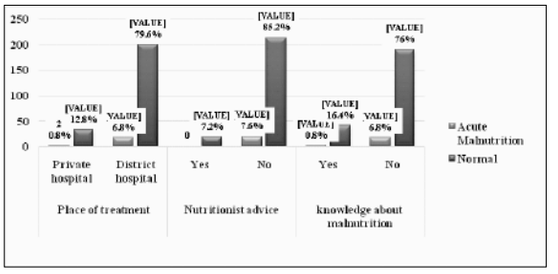

Figure 3 Awareness about malnutrition among the parents of study subjects (n=250)

Discussion

To identify cases of malnutrition, Mid Upper Arm Circumference (MUAC) was measured as this is a quick and simple way to determine whether a child is malnourished. MUAC, measured using a simple colored plastic strip (Shakir strip) in children aged 6–59 months gives an indication of the degree of acute malnutrition status. A total of 250 children from 6 months to 59 months of age were enrolled for this study. The mean age of study subjects was 28.5 ± 16.3 months with a male to female ratio of 1.4:1. The mean age is slightly higher than the one reported in a study by Hossain et al. and another study by Bari et al.[22,23] It is slightly lower than the Karim study which shows a mean age of 29.72 ±14.59 months.[24] As for gender, like this study, all three above-mentioned studies had a slight male predominance in their respective study populations.

The prevalence of Acute Malnutrition (AM) was found to be 7.6% (n=19) in the current study. Out of these, one (0.4%) had Severe Acute Malnutrition (SAM) while the remaining 18 (7.2%) had Mild Acute Malnutrition (MAM). The prevalence of acute malnutrition was found to be comparatively higher (8.7%) in another recent study conducted on preschoolers[24] In that study 2.2% were reported to have SAM while 6.5% had MAM. According to a report on malnutrition, around 6.7% of under-five children suffer from muscle wasting (A form of acute malnutrition) out of which majority of the children are from southern Asian countries.[25] The present study determined a Mean Upper Arm Circumference (MUAC) of 14.03 ± 1.23 cm. This is much better than the MUAC reported in other studies where the mean mid-upper arm circumference is 10.3 ± 1.3 cm and 13.6 ± 1.4 cm respectively.[23,22]

On comparing demographic characteristics among children with malnutrition, the male: female ratio was 1:1.38 with a not so significant difference between gender (p= 0.076). In the study by Karim et al. female children were significantly more likely to suffer from acute malnutrition in comparison to males (p=0.018).[24] Conversely, another study in Bangladesh found that the prevalence of severely malnourished children was higher for males than females (5.3% vs 5.1%) while moderately malnourished children were higher for females (18.1% vs 17.4%).[26] However, no significant difference between the two genders has been reported. Since the study involved only one male patient with SAM and only 18 patients with MAM out of which 7 were male and 11 females, the study agrees more with the Haq et al. study.[26]

As for child's age, children of a younger age were more likely to suffer from acute malnutrition in comparison to older children (p= 0.016). This is consistent with findings in another study by Karim et al. where children 6-23 months old were more likely to be malnourished as compared to children from 24-59 months.[24] The reasons for this are varied and many. According to an Ethiopian study initiation of complementary feeding was one of the factors significantly associated with acute malnutrition.[27] The age between 6-23 months is the time when children are supposed to be gradually weaned off breast feeding by introduction of complementary feeding. However, this may not have been done adequately, leading to malnutrition. This was further reemphasized by

our finding where 16 out of the 19 malnourished children were breast fed (p=0.016) at the time of this study. One other study from Nepal identified exclusive breastfeeding practice as a contributor to severe acute malnutrition.[28] Though none of the study subjects in the present study were exclusively breast feed, their dependency on breastmilk was more than that on complementary feeding. Another reason could be that the first two years are a critical period for the growth and development of a child. Hence, any inadequacies in feeding habits can easily risk acute malnutrition among children in this age group as compared to older age groups.[29] In the present study, a significant association was found between acute malnutrition and lower daily intake of proteins (p=0.015). Since adequate proteins are required for growth and development of a child, shortage in this proximate principle of food can result in muscle wasting exhibited as acute malnutrition.

In case of education, many studies have observed association between maternal age or maternal education with child's nutritional status.[30,31,32] A significant association has been found between paternal education and malnutrition with children of lowly educated fathers suffering from acute malnutrition (p=0.021). This finding is coherent with various other national and international studies.[18,29,33] One reason for this could be that fathers with a lower level of education bring in lower income and as a result are more likely to suffer from food shortages. Since almost all mothers are housewives and lack any additional source of income, their level of education may be able to improve the home environment, but it is not enough to provide adequate feeding for the child and result in malnutrition. Another credible reason for this variation could be that fathers are decision makers in the families and lower levels of education could have led to poor decision making on their behalf.[33]

When considering the living conditions, no significant association was detected between type of house owned and living conditions of the children. However, one specific habit observed was that children of acute malnutrition were significantly (p=0.015) more likely to shower regularly (73.7%) as compared to normal children (44.8%). No plausible reason could be identified for this finding. When an attempt was made to associate increase in showers with increase in respiratory tract or gastrointestinal tract infections due to lack of clean water, no significant association was found. Thus, this finding could be an accidental finding and further research is required to explain this.

At least 17 different diseases or health problems were present among the study subjects within the last 6 months. The most common among them were respiratory illness (21.2%), scabies and other skin infections (20.4%), diarrhea (9.6%), oral soars (8.8%) and gum problems (4.4%). Between them, respiratory illness was the only disease that showed a significant association with acute malnutrition (p=0.007). This finding is consistent with studies where malnutrition was a risk factor for respiratory illnesses.[34,35]

Limitations

The most significant limitation of the study includes the lack of information on other risk factors for acute malnutrition such as birth weight, maternal age during delivery, ANC visits, immunization status and details on breastfeeding among the study population. Besides, since the study was conducted in a restricted amount of time with a small sample size of 250 children, many parameters that were expected to show a significant difference did not. A larger sample would have yielded more accurate results. Finally, the study conducted was a cross sectional study. Hence comparisons between acute malnutrition and normal children could not be made accurately.

Recommendation

A better study would have been possible with a case control study where the different determinants could be compared between cases of malnutrition and controls.

Conclusion

Acute Malnutrition (AM) among under five children is still high compared to the worldwide prevalence, which is a disturbing issue for policy makers. The findings can help authorities of both governmental and non-governmental organizations to upgrade their health policies and target specific determinants to reduce the prevalence of acute malnutrition in the country. Steps such as ensuring food security, adequate education of both parents

and community health education on cheaper alternatives of nutritious foods can have a positive impact on society.

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Contribution of authors
TT-Conception, acquisition of data, data analysis, drafting & final approval.
SRC-Design, interpretation of data, critical revision & final approval.

Disclosure
Both the authors declared no competing interests.

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