

Maternal Risk Factors of Acute Malnutrition Among Under Five Years Children in secondary and Tertiary Hospitals in Bangladesh

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Abstract

Background: Malnutrition in early childhood has far-reaching adverse consequences on child survival, wellbeing, economic productivity and overall personal and national development. Malnutrition damages a child's physical and cognitive development and it is largely irreversible and perpetuating illness, poverty and inequality. So a current characterization of risk factors is essential for preventive intervention programs.

Methods: This case-control study regarding maternal risk factors of acute malnutrition in children was carried out following ethical approval from Sir Salimullah Medical College Hospital, Dhaka. Total 180 children aged 6-59 months (90 WHZ < -2 and 90 comparing children with WHZ ≥ -2) were included for this study according to selection criteria. Informed written consents were taken from the guardians of all participants. Detail history was taken and anthropometric measurements of children and their parents were measured by measuring tape and weight machine. BMI of children and parents, and weight-for-height, weight-for-age, height-for-age, BMI-for-age and MUAC-for-age Z scores of children were calculated. Data were collected by a semi-structured questionnaire and collected data were analyzed by the SPSS 23. Chi-squared (χ^2) and unpaired t-test were performed to compare the frequencies and means between the groups. **Results:** The mean age of the acute malnourished children was 26.07±14.21 months with slight male predominance (male female ratio 1.2:1). The mean weight for height Z score of the cases was -2.82±0.41 and 31.10% acute malnourished cases had severe acute malnutrition. Monthly family income <10000 BDT, younger mother (age ≤20 years), less educated mother (Illiterate or upto primary), undernourished mother (BMI <18.50 kg/m²) and predominant breast feeding stop before 4 months had found to be significantly associated with acute malnourishment (p<0.05). **Conclusion:** Acute malnutrition was found to be significantly associated with low monthly family income, younger mother and father, less educated mother and father, undernourished mother and early stop of predominant breast feeding.

Key words: acute malnutrition, under 5 children, Bangladesh

Introduction

Childhood is a short part of life but it is very important time for

gaining optimum physical and mental growth and preventing many life-threatening diseases

at later age.¹ Optimal growth of children is a prerequisite for a healthy nation. Proper nutrition in early life builds the foundation of lifelong optimum health. Besides achieving physical strength and coordination, early formative years are also the most important time where a child's social, cognitive, and emotional developments are polished.²

Childhood is the most important time for normal physical and mental growth and development of a human being. Proper nutrition in a child's early life is essential for healthy growth and development and also achieving a strong start in life.³ In fact, well-nourished young children are better prepared to reach their full potential. In contrast, childhood acute malnutrition is not only associated with serious morbidity and mortality but also associated with loss of future productivity of a human being. Malnutrition in early childhood has many adverse consequences for child survival and future well-being. Also, it has far-reaching adverse consequences on human capital, economic productivity, and overall national development. The burden of malnutrition is a noteworthy concern for policy makers in Bangladesh because about 14% of Bangladeshi children under 5 years are suffering from acute malnutrition (wasting or low weight-for-height).⁴ Globally, chronic malnutrition is declining very slowly while acute malnutrition still impacts the lives of many young children. In 2018, more than two thirds of all acute malnutrition children under 5 years lived in Asia and 73% of all acute malnourished children live in lower and lower middle-income countries.⁵ Acute malnutrition is defined as weight for height Z-score below -2 or MUAC <125 mm. It is of two types- moderate acute malnutrition and severe acute malnutrition.⁶ Acute malnutrition is an

unsteady condition and results from a comparatively short duration of nutrition deficit and it is often complicated by concomitant infection. Malnourished children have relatively lower resistance to infection and are more vulnerable to common childhood ailments like diarrheal disease and respiratory infection.⁷

Despite significant economic progress with poverty reduction, about 35% of Bangladesh's population remains in food scarcity, and around 10 percent of ever-married women reported moderate or severe food insecurity.⁸ Beside this socioeconomic burden, diarrhoea and other infectious diseases also contribute to undernutrition in under five years children. Gender inequality related to household consumption and privileges also acts as a key factor for poor nutritional status of female and young children. The inadequate breast feeding practices may also contribute to both acute and chronic malnutrition in under five children.^{9,10} Malnutrition also slows overall economic growth and perpetuates poverty. Malnutrition related Mortality and morbidity represent a direct loss in human capital and productivity of the individual. In total, the economic cost of malnutrition is estimated to range from 2 to 3 percent of Gross Domestic Product, to as much as 16 percent in most affected countries.¹¹ Indirect losses for the country's economy are mainly caused by poor cognitive function of individual and reduced school attainment that originate in early childhood undernutrition. In fact, the education break and consequent poorer skill-level of malnourished workforce substantially delays the development of countries.¹² Undernutrition in early childhood also makes an individual more prone to non-communicable diseases later in life, including diabetes and heart disease, significantly increasing health costs

in resource constrained health systems.¹³ The adverse effects of childhood malnutrition are long-term and trap generations of individuals and communities in the vicious circle of poverty.¹⁴ As malnutrition damages a child's physical and cognitive development, especially during the first five years of a child's life and it is largely irreversible, perpetuating illness, poverty and inequality, it is very much important to understand details about the factors associated with acute malnutrition for its prevention and management.¹⁵ It also helps to understand the effectiveness, lacking of undergoing health promotional programs and provide information for updating ongoing health promotional programs.

Methods

This hospital based case-control study was conducted in Sir Salimullah Medical College hospital, Dhaka and Chapainawabganj General Hospital, Chapainawabganj. Children aged 6-59 months attending at the selected hospitals constituted the study population. Hospital attended children having acute malnutrition (Weight for height Z-score < -2) aged 6-59 months were enrolled as a case, and age and sex matched healthy children (Weight for Height Z-score \geq -2) were enrolled as controls. Purposive sampling technique was adopted. After fulfilling inclusion and exclusion criteria 90 cases (45 from SSMC and 45 from Chapainawabganj general hospital) and 90 controls (45 from SSMC and 45 from Chapainawabganj general hospital) individually matched with age and gender of the cases were enrolled into the study from the study population. After taking informed written consent data collection was done using semi-structured questionnaire by face to face interview and by measuring anthropometric

measurements of the respondents with ensuring privacy and confidentiality. Height of the respondents were measured by measuring tape and Stadiometer, and weight of the respondents were measured by weight machine. Z-scores were calculated using WHO anthropometric calculator (Version 3.2.2).

The study protocol was approved by Institutional Review board as well as institutional Ethical Committee of Sir Salimullah Medical College, Dhaka. The study was conformed with the ethical guidelines of the current declaration of Helsinki.

Data obtained were analyzed using the statistical package for social science version 23. Unpaired t-test was performed to compare the mean between the two groups and Chi-squared Test (χ^2) was performed to compare frequency between the groups.

Results

Present study revealed that 68.90% cases had moderate acute malnutrition (weight for height Z score between -2 to -3) and 31.10% had severe acute malnutrition (weight for height Z score below -3) (figure I). The mean age of the acute malnutrition cases was 26.07 ± 14.21 months. Overall 15.56% of the study malnourished cases were in 6-11 months age group, 37.77% were in 12-23 months age group, 46.67% were in 24-59 months age group. Among the study acute malnutrition cases, 54.44% were male and 45.56% were female. Among the study acute malnutrition cases 41.11% were urban resident and 58.89% were rural resident. There has no statistically significant association found between the groups regarding residential distribution of the respondents ($P=0.184$). Statistically significant association was noticed between acute malnutrition with monthly family income of the

participants ($P=0.002$). Among the study acute malnutrition cases 21.11% had monthly family income <7500 BDT, 55.55% had monthly family income between 7500-10000 BDT, 20% had monthly family income 10000-15000 BDT and 3.33% had monthly family income >15000 BDT. In control group 11.11% had monthly family income <7500 BDT, 41.11% had monthly family income between 7500-10000 BDT, 31.11% had monthly family income 10000-15000 BDT and 16.67% had monthly family >15000 BDT. The mean weight, height, and MUAC of the study acute malnourished cases were 8.72 ± 2.04 kg, 82.10 ± 10.53 cm, and 12.28 ± 0.77 cm respectively. The mean weight for height Z score of acute malnourished cases was 2.82 ± 0.41 (Table I).

The mean age, weight and BMI of the mother of acute malnourished cases were statistically significantly lower than the mean age, weight and BMI of the mother of the control ($P=0.009$, <0.001 and <0.001 respectively). Mothers of acute malnourished cases were statistically significantly less educated than mothers of controls ($P=0.040$). In case group, 33.33% mothers were illiterate, 13.33% were primarily educated, 32.22% were SSC passed, 17.77% were HSC passed and 3.33% had graduation or above educational qualification. In control group, 15.55% mothers were illiterate, 17.77% were primarily educated, 44.44% were SSC passed, 14.44% were HSC passed and 7.77% had graduation or above educational qualification. The mean duration of predominant breast feeding was statistically significantly lower in case group than control group ($P=0.008$). The mean duration of predominant breast feeding in case group was 3.80 ± 1.57 months and the mean duration of predominant breast feeding in control group

was 4.43 ± 1.57 months (Table II).

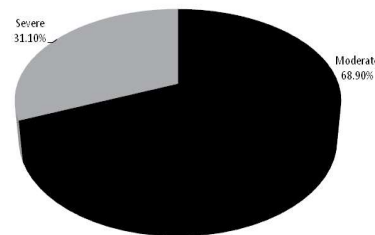


Figure I. Severity of acute malnutrition (N=90).

Table-I: Baseline characteristics of the participants (n=180).

Baseline Characteristics		Case (n=90) N(%)	Control (n=90) N(%)	P value
Age groups (Months)	06-11	14 (15.56)	18 (20)	0.417 [#]
	12-23	34 (37.77)	26 (28.89)	
	24-59	42 (46.67)	46 (51.11)	
Mean age	Mean±SD	26.07±14.21	26.90±14.58	0.702*
Sex	Male	49 (54.44)	47 (52.22)	0.881 [#]
	Female	41 (45.56)	43 (47.78)	
Area of residence	Urban	37 (41.11)	44 (48.89)	0.184 [#]
	Rural	53 (58.89)	46 (51.11)	
Monthly family income (BDT)	<7500	19 (21.11)	10 (11.11)	0.002 [#]
	7500-10000	50 (55.55)	37 (41.11)	
	10000-15000	18 (20)	28 (31.11)	
	>15000	3 (3.33)	15 (16.67)	
Anthropometric measurement	Weight (Kg)	8.72±2.04	11.33±2.81	<0.001*
	Height (cm)	82.10±10.53	85.39±11.53	0.047*
	MUAC (cm)	12.28±0.77	14.59±1.03	<0.001*
Weight for height Z score		-2.82±0.41	-0.51±0.72	<0.001*

Data are expressed as mean ± SD and frequency(percentage); *Unpaired t-test was performed to compare the mean between the groups and #Chi-squared Test was performed to compare frequency between the groups.

Table-II: Association Between Maternal Factors and Acute Malnutrition (n=180).

Baseline Characteristics		Case (N=90)	Control (N=90)	P value
Mean age (Year)	Mean±SD	23.58±3.22	24.82±3.13	0.009*
Height (m)	Mean±SD	1.52±0.044	1.53±0.58	0.236*
Weight (Kg)	Mean±SD	48.24±6.37	52.24±6.31	<0.001*
BMI (Kg/m ²)	Mean±SD	20.96±2.72	22.49±2.89	<0.001*
Educational qualification N(%)	Illiterate	30 (33.33)	14 (15.55)	0.040 [#]
	Primary	12 (13.33)	16 (17.77)	
	SSC	29 (32.22)	40 (44.44)	
	HSC	16 (17.77)	13 (14.44)	
	Graduation and above	3 (3.33)	7 (7.77)	
Occupation N(%)	Housewife	78 (86.66)	80 (88.88)	0.968 [#]
	Businessman	2 (2.22)	2 (2.22)	
	Private employee	5 (5.55)	5 (5.55)	
	Day laborer	3 (3.33)	2 (2.22)	
	Government employee	2 (2.22)	1 (1.11)	
Predominant breast feeding (months) (Mean±SD)	Mean±SD	3.80±1.57	4.43±1.57	0.008*

Data are expressed as mean ± SD and frequency(percentage);

*Unpaired t-test was performed to compare the mean between the groups and #Chi-squared Test was performed to compare frequency between the groups.

Discussion

Acute malnutrition in children is an important factor for childhood morbidity and mortality.¹⁶ Globally, acute malnutrition is a major public health concern affecting approximately 52 million children under five years.^{17,18} This study was conducted to determine the factors associated with acute malnutrition among under five children and to see the regional variations of these factors which was conducted in Sir Salimullah Medical College hospital, Dhaka and Chapainawabganj general hospital, Chapainawabganj. The average age of acute malnourished cases was 26.07±14.21 months and majority of them aged < 2 years (53.33%). About 54.44% of the acute malnourished cases were male (male female ratio was 1.2:1). Hossain et al. (2009)¹⁹ also found mean age of their study cases 23.5±15.30 months and maximum of their study acute

malnourished cases in <2 years age group. Study by Shams et al. (2012)²⁰ also found majority (59.01%) of their study acute malnourished cases in up to 2 years age group. Ahmed et al. (2013)²¹, Chowdhury et al. (2020)²² and Islam et al. (2019)²³ also found male female ratio were 1.13:1, 1.04:1, and 1.33:1 respectively. No significant difference was noticed regarding residence of the respondents between case and control group (P=0.323). About 58.89% malnourished cases were rural resident while 63.13% controls were urban resident. However, statistically significantly higher number of cases were in <7500 BDT and 7500-10000 BDT monthly family income group than controls. In case group 21.11% had monthly family income <7500 BDT and in control group 11.11% had monthly family income <7500 BDT. In case group 55.55% had monthly family income between 7500-10000 BDT, 20% had monthly family income 10000-15000 BDT and 3.33% had monthly family income >15000 BDT; and in control group 41.11% had monthly family income between 7500 BDT-10000 BDT, 31.11% had monthly family income between 10000-15000 BDT and 16.67% had monthly family income >15000 BDT. Chowdhury et al. (2020)²² also found majority of their study cases in rural resident group. In a Study, conducted by Musa et al. (2017)²⁴ also found that majority of their study subjects, acute malnourished cases, were rural residents (70.40%). They also found 80.61% of their study cases in <14500 BDT monthly family income group. Similar to the finding of this study they also observed a significant association between acute malnutrition with low monthly family income (P=0.005). However, in this study, it was observed that a significantly higher number of rural residents were in acute malnourished

group than control ($P<0.001$). In consistent to the finding of this study, Chowdhury et al. (2020)²² also found mothers education and wealth index as two significant factors for acute malnutrition. Besides, they also observed working mother and rural place of residence as significant factors for acute malnutrition in children. The mean weight, height, BMI and MUAC of the study acute malnourished cases were 8.72 ± 2.04 kg, 82.10 ± 10.53 cm, 12.83 ± 0.61 kg/m² and 12.28 ± 0.77 cm. The mean weight for height Z score, weight for age Z score, height for age Z score, BMI for age Z score and MUAC for age Z score of acute malnourished cases were -2.82 ± 0.41 , -2.79 ± 0.58 , -1.58 ± 0.75 , -2.71 ± 0.40 and -2.63 ± 0.53 respectively. The mean weight-for-height, weight-for-age, height-for-age, BMI-for-age and MUAC-for age Z score were statistically significantly lower in case group than control group ($P<0.001$ for all). Among 90 acute malnourished cases 62 (68.90%) had moderate acute malnutrition and 28 (31.10%) had severe acute malnutrition. Fuchs et al. (2014)²⁵ found weight-for-height, weight-for-age, height-for-age, BMI-for-age and MUAC-for age Z score -3.24 ± 1.01 , -3.46 ± 1.34 , -2.16 ± 1.84 and -3.21 ± 1.04 . They also observed statistically significantly lower mean weight-for-height, weight-for-age, height-for-age, BMI-for-age Z score in case group than control group ($P<0.001$). Hoq et al. (2019)¹⁰ also found that mean weight-for-age Z score of acute malnourished cases was -2.90 ± 1 and height-for-age Z score was -1.7 ± 1.8 . The mothers of acute malnourished cases were significantly less aged and less educated ($P<0.05$) than controls. Their weight and BMI were also significantly lower than mothers of controls ($P<0.05$). However, no

significant association was noticed between acute malnourishment with occupation and height of the mothers ($P>0.05$). The mean duration of predominant breast feeding was significantly ($P=0.008$) lower in case group (3.80 ± 1.57 months) than control group (4.43 ± 1.57 months). Study conducted by Rahman et al. (2020)²⁶ also found a significant association between acute malnutrition with undernourished mother and shorter duration of breast feeding practices ($P<0.05$).

Fuchs et al. (2014)²⁵ also found children with acute malnutrition were more likely to have an undernourished (BMI <18.5) mother (OR of 2.8, $\chi^2 = 0.017$), came from a family having a monthly income of less than 10,000 taka (had OR of 2.9, $P = 0.008$), and have shorter period of predominant breastfeeding (had OR of 2.7, $P = 0.013$). Nevertheless, they did not found significant association between acute malnutrition with age of mother in logistic regression. However, Hoq et al. (2019)¹⁰ found significant association between acute malnutrition with age of mother in logistic regression (OR of 1.09, $P=0.010$ respectively).

Conclusion

This study suggests younger mother (≤ 20 years), less educated mother (illiterate or upto primary), undernourished mother (BMI <18.5 kg/m²) and predominant breast feeding stop before 4 months are significant maternal risk factors of acute malnutrition among under five years children.

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