RESEARCH BRIEF

Contextual Factors for Stunting Among Children of Age 6 to 24 Months in an Under-Privileged Community of Dhaka, Bangladesh

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ABSTRACT

Objective: To determine factors associated with stunting among children aged 6 to 24 months in a slum of Dhaka, Bangladesh.

Methods: We conducted this case control study during November 2009 to December 2012. Children were classified as case if length-for-age *Z*-score (LAZ) was <-2 and as control if LAZ was >-1 SD. The logistic regression model was used to find the factors associated with stunting.

Results: The significant risk factors for stunting were: child's age >12 months, maternal undernutrition, mother's education <5 years, consumption of untreated drinking water and monthly family income <100 USD.

Conclusion: The findings of this study reiterated the role of maternal undernutrition and less education, consumption of untreated drinking water and poor family income as important associated factors of childhood stunting in resource-poor setting.

Key words: *Epidemiology, Risk Factors, Undernutrition*.

INTRODUCTION

Childhood malnutrition is one of the most common causes of morbidity and mortality among under-Five children in the world. Stunting is the most common form of undernutrition in Bangladesh and other low-income countries. Stunting reflects the cumulative effect of chronic undernutrition status and refers to low length- or height-for-age that is a failure to reach linear growth potential due to inadequate dietary intakes and health conditions accumulated during early childhood [1]. It has long-term severe effects on individuals as well as societies, including: decreased cognitive and physical development, reduced productive capacity and poor health, increased risk of degenerative diseases [2]. Globally the prevalence of stunting among under-Five children decreased from 39.7% to 26.7% and in developing countries from 44.4% to 29.2% over a period of 1990 to 2010 [3]. In Bangladesh, the prevalence of stunting among under-Five children has been decreasing slowly (from 63% in 1990 to 36% in 2014), but still it is very high. Though the stunting is a great public health concern in Bangladesh, there are very few studies to identify the factors related to stunting. Thus, the purpose of this study was to identify factors associated with stunting in children of age 6 to 24 months in a slum of Bangladesh.

METHODS

This study was performed within the ongoing Mal-ED (Etiology, Risk Factors, and Interactions of Enteric Infections and Malnutrition and the Consequences for Child Health) study [4]. The Mal-ED study (ICDDR,B protocol # 2008-020) was approved by the Research Review Committee and the Ethical Review Committee of ICDDR,B in 2008. For participation in this study, written informed consent was obtained from the guardians of each participating child. With case-control design, the study was conducted among residents of an under-privileged urban community in Bauniabadh slum in Mirpur, Dhaka, Bangladesh [5]. Cases were stunted children length-for-age z-score (LAZ) < -2 of the median of a WHO standard aged 6 to 24 months. Controls were well-nourished children aged 6 to 24 months with LAZ > -1.

Field research assistants (FRAs) were trained to identify source population of cases and controls, through obtaining the anthropometric measurements of each child. FRAs measured child body weight and length in the study clinic. Also FRAs measured mother body weight and height. Child body weight was taken without any cloth by the digital scale (Seca 354) to nearest 10 g and length by Infantometer/length measuring board (Seca 416) to nearest 0.1 cm. Ages of children were validated by checking the child's immunization card. Z-scores for length-for-age (LAZ), weight-for-age (WAZ), and weight-for-length (WLZ) were calculated using WHO Anthro Software version 3.1.0. Mother's body weight and height were also recorded. Body mass index (BMI) was calculated using the formula BMI = weight in kg/(height in m)^2.

FRAs also interviewed the mothers using a pretested, structured questionnaire. Information collected from the interviews included: age and sex of child, colostrum and breastfeeding practices, mother's age at first pregnancy, parental education, family size, information about drinking water and latrine, and monthly family income. Household food security was evaluated using Household Food Insecurity Access Scale (HFIAS) generic questions [6], and was categorized as per HFIAS's guideline [6].

Data were entered into Microsoft Office Access and exported to STATA 13 for analysis. Dual data entry method was used to minimize data entry error. Bivariate analysis was done for all explanatory variables to identify those associated with children stunting. Only significant variables in the bivariate analysis were included in logistic regression model. Odds ratios (95% confidence intervals) were calculated to identify the factors associated with stunting, and *P*-value <0.05 was considered statistically significant.

RESULTS

Total 689 children (389 cases and 300 controls) participated in this case control study. In bivariate analysis, we found significant association of stunting with child's age, maternal undernutrition and education, household head's education, treatment of drinking water, sharing toilet, monthly family income, food insecurity, and hand washing habits (***Table* I**). No association was found with child's gender, breastfeeding and complementary feeding practice, mother's age at first pregnancy, family size, and morbidity (***Table* I**).

Logistic regression analysis revealed that the risk factors for stunting were child's age >12 to 17 months (AOR 3.13, 95% CI: 2.08, 4.70) and 18 to 24 months (AOR 4.21, 95% CI:2.69, 6.61); mother's BMI <18.5 (AOR 3.55, 95% CI: 2.34, 5.38); mother's education <5 years (AOR1.53, 95% CI 1.04, 2.23); consumption of untreated drinking water (AOR 1.51, 95% CI 1.03, 2.21); and monthly family income <100 USD (AOR=1.98, 95% CI 1.38, 2.84) (***Fig.* 1**).

DISCUSSION

This study aimed to identify the factors associated with stunting among children aged 6 to 24 months. Logistic regression analysis identified that the factors significantly associated with stunting were: *(i*) more than 12 months of child's age, *ii*) mother's undernutrition (BMI <18.5), *iii*) mother's education less than 5 years, *iv*) consumption of untreated drinking water, and v) monthly family income less than 100 USD.

Limitation of the study is that there may be some recall bias related to previous history recorded from mothers. Another limitation is the data for this study emerged only one slum of Bangladesh.

Svefors, *et al*. [7] and Chowdhury, *et al*. [8] also found that age group >12-24 months was a risk factor of stunting. A recent study from Tanzania [9] also found maternal under-nutrition as a risk factor. Less educated mother as a risk factor of stunting is also echoed by other studies [9-11]. Educational level of mother is vital because educated mothers can better access the health services, usually provide better care, have better hygienic practices, and also have higher status in the family. The effect of maternal factors on infant outcomes has been described earlier [12]. We found that untreated drinking water was another risk factor of stunting, and study by Chirande, *et al*. [9], from Tanzania also found unsafe sources of drinking water as a risk factor of stunting.

The effect of income on stunting, as observed in our study, can be explained by its importance in the purchase of food and consumer goods that promote and protect the health of children. It is also known that better economic conditions increase the living standard of the families, which allow them to take essential care of the children. The previous study from our group showed similar findings as stunted

children more often had short-statured, malnourished and illiterate/less educated mothers, and were more often from lowest quintile of asset index [13].

The findings of this study reiterate the role of maternal nutritional status and education, quality of drinking water and family income as important contextual factors of childhood stunting. Our study recommends that to reduce the under-Five stunting rate in the slums, targeted programs should be developed to improve maternal nutrition and education, drinking water and family income.

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WHAT THIS STUDY ADDS?

- Maternal undernutrition and low education, low family income, and poor quality of drinking water is associated with stunting in 6-24 month old children in slum children from Bangladesh.

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TABLE I SOCIO-DEMOGRAPHIC CHARACTERISTICS, NUTRITIONAL PRACTICE AND HANDS WASHING HABITS OF STUDY POPULATION

Characteristics	*Cases (%) n=389*	*Controls (%) n=300*	*Crude OR (95% CI)*
Age group in months			
6-11	133 (34.2)	185 (61.7)	Ref
12-17	137 (35.2)	68 (22.7)	2.80 (1.94, 4.04)
18-24	119 (30.6)	47 (15.7)	3.52 (2.35, 5.28)
Child sex (female)	174 (44.7)	154 (51.3)	0.77 (0.57, 1.04)
Lack of exclusive breastfeeding (<180 d)	305 (78.4)	219 (73.0)	1.34 (0.76, 1.41)
Lack of practice optimum IYCF	226 (58.1)	189 (63.0)	0.81 (0.60, 1.11)
Colostrum not given	26 (6.7)	15 (5.0)	1.36 (0.71, 2.62)
Prelacteal feeding	122 (31.4)	83 (27.7)	1.19 (0.86, 1.66)
Breastfeeding started after one hour of birth	180 (46.3)	133 (44.3)	1.08 (0.80, 1.46)
Mother's BMI <18.5	147 (38.0)	46 (15.4)	3.36 (2.31, 4.88)
Mother's education <5 y	216 (55.5)	120 (40.0)	1.87 (1.38, 2.54)
Household head's education <5 y	197 (52.0)	128 (44.0)	1.37 (1.01, 1.87)
Mother's age at first pregnancy <18 y	142 (36.6)	101 (33.8)	1.13 (0.82, 1.55)
Family size >4	161 (41.4)	137 (45.7)	0.84 (0.62, 1.14)
Untreated drinking water	157 (40.4)	79 (26.3)	1.89 (1.36, 2.63)
Sharing toilet with other households	357 (91.8)	246 (82.0)	2.45 (1.54, 3.90)
Monthly family income <100 USD*	233 (59.9)	117 (39.0)	2.34 (1.72, 3.18)
Food insecurity household	194 (49.9)	110 (36.7)	1.72 (1.26, 2.34)
Sometime or never hands wash after helping child defecate	149 (38.3)	92 (30.7)	1.4 (1.02, 1.93)
Sometime or never hands wash before preparing food	305 (78.4)	227 (75.7)	1.17 (0.82, 1.67)
Sometime or never hands wash after using the toilet	110 (28.3)	61 (20.3)	1.54 (1.08, 2.21)
Diarrhea in last 3 d	15 (3.9)	20 (6.9)	0.55 (0.28, 1.10)
Cough in last 3 d	124 (32.3)	84 (28.9)	1.18 (0.84, 1.64)
Fever in last 3 days	51 (13.3)	30 (10.3)	1.33 (0.83, 2.15)

IYCF: *Infant and young child feeding *One USD = 78 Bangladeshi taka.*

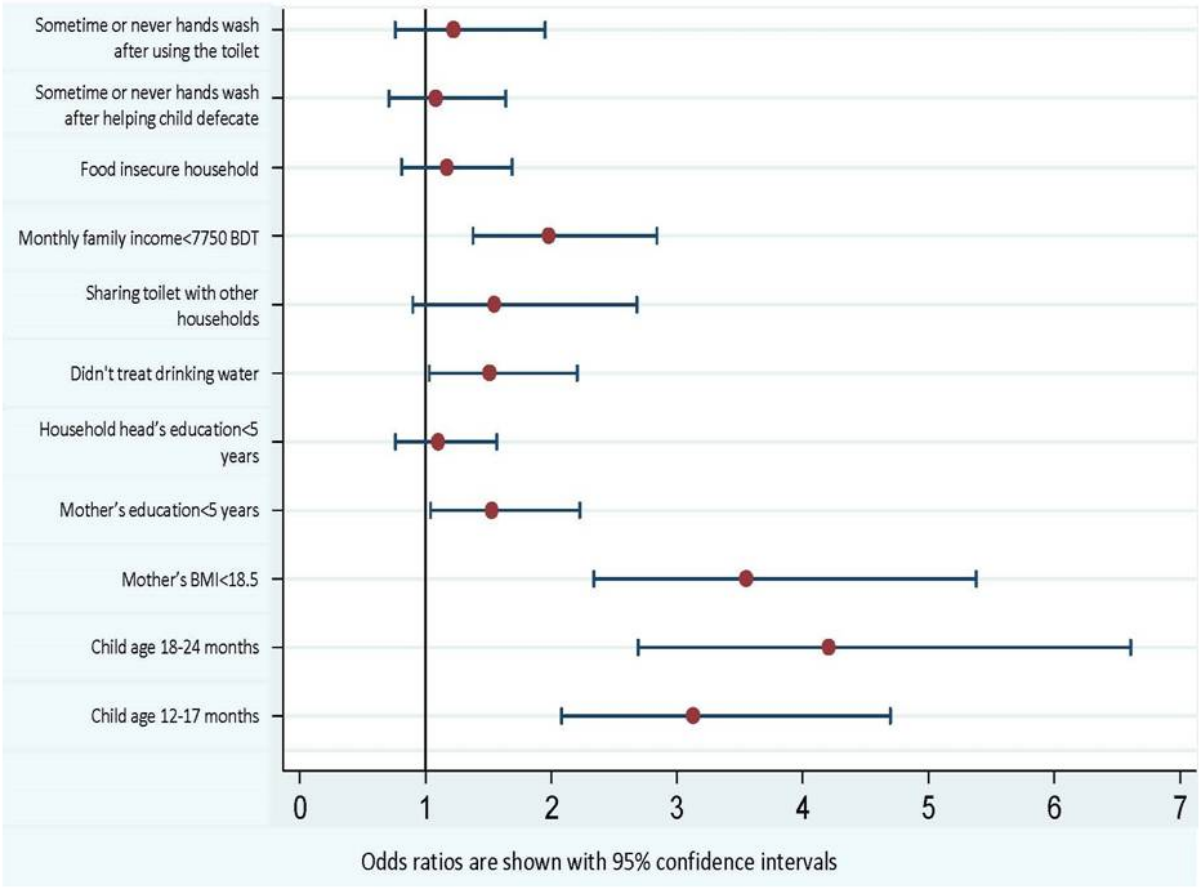

***Fig.* 1:** *Adjusted odds ratios for risk factors significantly associated with stunting.*