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Original Article

Stunting and its associated factors in under-five children: evidence from Bangladesh Demographic and Health Survey 2014

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Abstract

Impaired growth and development experienced by children, referred to as stunting, is a major impediment to human development. Although the Bangladesh economy has experienced high growth in recent decades, malnutrition still remains a public health problem. This study assesses the prevalence and risk factors associated with stunting among children under-five in Bangladesh. This analysis uses data from the Bangladesh Demographic and Health Survey 2014, a community-based cross-sectional study. A total of 6,965 children were enrolled in the study. The prevalence of stunting was 36.5% [95% confidence interval (CI): 34.8-38.3%] and 40.2% [95% CI: 37.4-43.1%] for children aged 0-59 months and 0-23 months respectively. Multivariate logistic regression revealed that the significant factors for stunting for children aged 0-59 months and 0-23 months were maternal working status, mother education, mothers age at childbirth, birth order, delivery mode, receiving antenatal clinic visit, media habits, perceived size of child at birth, child sex, children having had diarrhea in last two weeks, wealth and geographical region. In order to meet the nutrition indicators under zero hunger sustainable development goal and 2025 target of World Health Assembly, policy interventions are needed to reduce stunting specially focusing on eastern region of Bangladesh.

Keywords: *Stunting, Under-5, Under-2, Nutrition, Bangladesh*

INTRODUCTION

Even though child mortality is decreasing, children are still suffering from delayed physical growth in developing countries like Bangladesh[1-3]. It is defined as the percentage of children, aged 0-59 months with height for age ratios below minus two standard deviations (SD) from the median of the World Health Organization (WHO) child growth standard [4-6], while those below three standard deviations are considered to be severely stunted. An estimated 178 million children aged under five years are stunted worldwide [6]. Stunting under-5 as well as under-2 is a well-established risk marker and has adverse short-term effects on child cognitive, motor, language and behavioral development [7,8]. Short stature, weakened immune systems and lower physical stamina are long term effects of stunting which also contributes to greater risk of serious diseases such as diabetes, cardiovascular disease, hypertension and cancer later in life [2,6]. Mothers who were stunted at early age increase the risk of obstetric complications and delivering an infant with low birth weight, resulting in an intergenerational chain of malnutrition [9,10]. In 2012, the World Health Assembly (WHA) Resolution 65.6 set a global target to reduce 40% stunting of under-five age by 2025 [11]. Of the 17 Sustainable Development Goals (SDGs), 2.2.1 indicator under goal of zero hunger (goal 2) focus on reducing stunting. Although Bangladesh has met several targets of the SDGs, Millennium Development Goals (MDGs), stunting still remains a challenging obstacle to overcome[12].

A slightly older cross-sectional study conducted in Bangladesh [13] revealed that, wealth, the exposure of mother to the mass media, child age, size of child at

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Highlights

1. **Bangladesh has achieved several targets of the Millennium Development Goals objectives but stunting still remains a difficult barrier.**
2. **More than one-in-three under-5 children suffer from stunting.**
3. **Three divisions (Barishal, Chattogram, Rangpur and Sylhet) out of eight have a higher burden of stunting.**
4. **Interventions to reduce stunting should consider several risk factors: socioeconomic deprivation, mother's age at childbirth, antenatal clinic visits, media exposures, delivery mode, perceived size at childbirth, birth order, child sex and diarrhoeal disease.**

birth, and parents' education were significantly associated with stunting. This study was conducted using 2011 Bangladesh Demographic and Health Survey (BDHS) data. Another recent prospective cohort study [14] conducted in Bangladesh revealed that age, sex, length-for-age (LAZ) at birth and wealth were strong predictors of stunting. This study only covered urban slam in Bangladesh for 12-24 months children. Another old cross sectional study [15] showed that parents education, economic status, media, age, birth order, month of breast feeding, size of child at birth, mothers BMI, mothers height, age of household head were the risk factor for stunting and severe stunting. But this study used 1999-2000 Bangladesh Demographic and Health Survey. Recently, one author[16] analyzed 2014 Bangladesh Demographic and Health Survey to find moderate and severe stunting. The study only considered fewer factors and didn't used general stunting. Most of the studies considered only children aged 0-59 months, used relatively older data and considered fewer factors. We found no recent studies using children 0-23 months to investigate factors associated with stunting and severe stunting.

To address these gaps, our study attempts to investigate the major socio-economic, demographic, health and environmental determinants of stunting age 0-23 months and 0-59 months in Bangladesh using BDHS 2014 data. The research outcome would be helpful to health care provider and policy maker in designing and policy making for improving the growth of stunting.

METHODS

This study uses data from the Bangladesh Demographic and Health Survey (BDHS 2014). A nationally representative sample of 18,000 households was selected using two-stage stratified sampling. In the first stage, 600 enumeration areas (EA's) were selected with probability proportional to the enumeration area size,

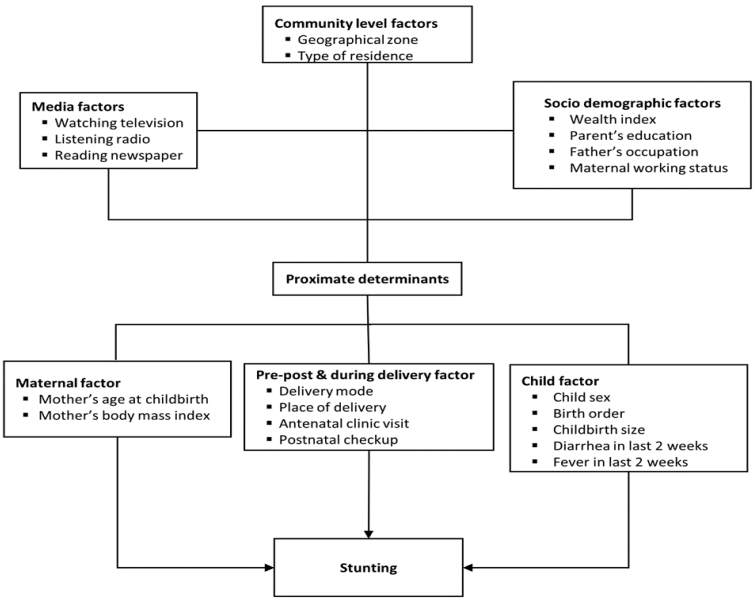

FIGURE 1 Conceptual framework for factor associated with stunting [Adopted source: UNICEF Conceptual Framework 2013][1, 4]

with 207 EA's in urban areas and 393 in rural areas. In the second stage of sampling, a systematic sample of, on average, 30 households were selected per EA to provide statistically reliable estimates of key demographic and health variables for the country as a whole, for urban and rural areas separately, and for each of the seven divisions.

Potential risk factors

The potential risk factors were classified into four categories: community level factors, media factors, socio-demographic factors, and proximate factors (**Figure 1**). Community level factors comprised region and residence type. Region is defined based on the administrative divisional boundaries in Bangladesh. The media factors included reading newspaper, watching television, and listening radio. Socio demographic factors comprised mothers working status, categorized into two levels: working/non-working mother; fathers occupation type was grouped into two levels: agricultural and non-agriculture; parents education was grouped into three labels: no education, primary, secondary and above; a wealth index was used as a composite measure of household living standard calculated using Principal Component Analysis (PCA)[17]. The index was categorized into five national-level wealth quintiles. Since the source of drinking water is used to calculate the wealth index, we do not include it as an additional explanatory variable.

Proximate determinants comprised of delivery factor, maternal factors and child factors. Among maternal factors, mother's BMI was calculated using the formula weight/height^2 (kg/m^2) from the measured height and weight and was categorized <18.5 as underweight, 18.5

TABLE 1 Community and socioeconomic factors of parents of the participating under-5 children

Variables	Overall [n=6965 (%)]	Stunting			
		0-59 months		0-23 months	
		Unweighted count (n=2567)	Weighted prevalence	Unweighted count (n=1173)	Weighted prevalence
Mothers working status (n=6964)					
Working	1747 (26.2)	712	41.9	316	46.4
Non-working	5217 (73.8)	1855	34.6	857	38.1
Mothers' education					
No education	1076 (16.3)	543	47.7	227	54.2
Primary	1934 (28.0)	870	44.2	400	49.8
Secondary and above	3955 (55.7)	1154	29.5	546	32.2
Partners occupation (n=6898)					
Agriculture	1688 (26.5)	721	42.3	329	47.8
Non agriculture	5210 (73.5)	1820	34.5	835	37.8
Partners education (n=6963)					
No Education	1736 (25.8)	871	48.3	386	52.9
Primary	2100 (30.1)	873	41.2	388	44.7
Secondary and above	3127 (44.1)	823	26.5	399	30.6
Mother watching TV					
No	2872 (41.9)	1274	42.7	571	47.5
Yes	4093 (58.1)	1293	32.1	602	35.3
Mother read newspaper (n=6953)					
No	5900 (86.1)	2324	38.8	1046	42.8
Yes	1053 (13.9)	240	22.8	124	25.2
Mother listen radio					
No	6649 (95.1)	2499	37.5	1144	41.5
Yes	316 (4.9)	68	18.1	29	17.7
Wealth index†					
Poorest	1515 (22.7)	776	49.5	352	54.0
Poorer	1307 (18.8)	543	43.2	237	48.1
Middle	1379 (19.8)	523	36.6	237	40.5
Rich	1420 (19.9)	452	31.5	213	34.4
Richest	1344 (18.8)	273	19.6	134	22.6
Residence type					
Rural	4777 (74.8)	1860	38.4	839	41.9
Urban	2188 (25.2)	707	30.9	334	35.3

† Wealth index was calculated using principal component analysis based on composite measure of household assets

TABLE 2 Proximal determinants of stunting in Bangladeshi under-5 children

Variables	Overall [n=6965 (%)]	Stunting			
		0-59 months		0-23 months	
		Unweighted count (n=2567)	Weighted prevalence	Unweighted count (n=1173)	Weighted prevalence
Mothers age at childbirth, years					
Less than 19	5085 (73.2)	2001	39.1	907	43.2
20 or more	1880 (26.8)	566	29.7	266	32.2
Birth order					
First-born	2700 (38.4)	894	32.1	417	34.8
2nd-4th	3195 (46.4)	1158	36.4	535	41.9
5th or more	1070 (15.2)	515	48.2	221	49.6
Preceding birth interval (n=4251)					
<= 24 months	542 (12.8)	263	48.8	123	55.9
25 months or more	3709 (87.2)	1407	38.0	632	42.0
Delivery place (n=4199)					
Home	2542 (61.7)	991	38.1	846	46.8
Health facility	1657 (38.3)	411	24.7	325	29.4
Delivery mode (n=4048)					
Non-caesarean	3066 (75.5)	1121	35.6	931	43.8
Caesarean	982 (24.5)	202	20.7	164	25
Antenatal clinic visit (n=6961)					
None	3765 (53.8)	1635	43.2	413	53.7
1-3 times	1899 (27.9)	615	32.4	500	40.8
4 or more times	1297 (18.3)	316	23.3	260	273
Postnatal checkup					
No check-ups	4347 (63.0)	1762	40.1	508	43.4
1-2 times	2284 (32.0)	699	30.3	578	37.5
3 or more times	334 (5.0)	106	32.1	87	42.4
Body mass index (mothers)					
< 18.5 kg/m2	1569 (22.2)	717	43.8	353	47.7
18.5-24.9 kg/m2	4058 (59.3)	1514	37.7	686	40.6
≥ 25 kg/m2	1338 (18.5)	336	24.1	134	28.0
Childbirth size (n=4205)					
Small	804 (19.5)	371	44.2	297	51.4
Average	2849 (67.9)	904	31.6	760	39.3
Large	552 (12.7)	130	22.8	116	28.8
Child had diarrhea within last 2 weeks (n=6959)					
Yes	337 (5.7)	154	46.1	88	49.2
No	6622 (94.3)	2411	36.0	1085	39.6
Child had fever within last 2 weeks (n=6958)					
Yes	2569 (37.3)	1027	39.3	489	43.1
No	4389 (62.7)	1538	34.9	684	38.6

-24.9 as normal and ≥25 kg/m^2 as obese [18]. Mother's age at childbirth was categorized as: 19 years or less, 20 years and above. Birth order categorized as: first born, 2nd-4th born, 5th or more. antenatal clinic visit categorized in three levels: none, 1-3, 4 days or more. Postnatal check-up was grouped into three levels: no checkup, 0-2 days and 3 days or more [1].

Statistical analysis

A multivariate logistic regression was used to determine the factor associated with stunting among under 0 to 59 months and 0 to 23 months child. The dependent variables were expressed as dichotomous variables where a child who is more than two standard deviations below the median (-2 SD) of the WHO

reference population in terms of height-for-age is considered stunted. Analysis was performed using R version 4.1.1 and IBM SPSS version 26. R library package, "*survey*" was used to adjust the cluster, primary sampling unit and weight. '*svyglm*' and '*step*' functions in R were used to calculate multivariate logistic regression with backward elimination procedure.

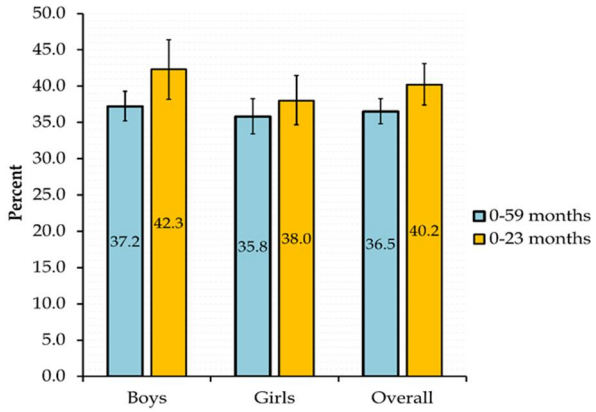

FIGURE 2 Prevalence of stunting for children aged 0-59 months and 0-23 months

RESULTS

A total sample of 6965 child aged 0-59 months, of which 2861 child were aged 0-23 months, was enrolled in the study. Almost one-fourth (26.2%) were working mothers and 16.3% of mothers have no formal education. Over one-thirds (38.3%) child were delivered at health facilities whereas one-fourth (24.5%) were caesarean. Over half (53.8%) of the mothers didn't receive antenatal clinic visit and around two-third (63.0%) didn't receive any post-natal checkup. Around one-fifth (18.5%) mothers were overweight and 22.2% were underweight. Among media habits, more than half (58.1%) watched TV, while only 13.9% read newspapers and 4.9% listened to the radio. A majority (74.8%) lived in the rural areas **(Tables 1 and 2)**.

The prevalence of stunting was 36.5% [95% CI: 34.8-38.3%] and 40.2% [95% CI: 37.4-43,1%] respectively for children aged 0-59 months and 0-23 months **(Figure 2)**.

Geographical distribution of stunting

Stunting prevalence varied considerably across divisions in Bangladesh. Among all 7 divisions, the highest prevalence rate (45% or more) was observed in Sylhet division for both age group 0-59 months and 0-23 months followed by Barishal (40-45%) and Chattogram (40-45% for children aged 0-23 months and 35-40% for children aged 0-59 months) **(Figures 3a and 3b)**.

Predictor for stunting

Children aged 0-59 months

Table **3** represents the factors associated with stunting among children aged 0-59 months. Children of working mother were more likely to be stunted (OR=1.3, 95% CI: 1.0-1.6) than children of non-working

TABLE 3 Odds ratios (95% confidence interval) for stunting in Bangladeshi under-5 children

Variables	Children aged 0-59 months
Mothers working status (n=6964)	
Working	1.3 (1.0-1.6)*
Non-working	1.0
Mothers age at childbirth, years	
Less than19	1.3 (1.1-1.6)*
20 or more	1.0
Delivery mode (n=4048)	
Non-caesarean	1.4 (1.1-1.8)*
Caesarean	1.0
Antenatal clinic visit (n=6961)	
None	1.6 (1.2-2.1)*
1-3 times	1.3 (1.1-1.6)*
4 or more times	1.0
Mother listen radio	
No	2.9 (1.8-4.6)*
Yes	1.0
Mother watching TV	
No	1.4 (1.1-1.7)*
Yes	1.0
Child sex	
Male	1.3 (1.1-1.6)*
Female	1.0
Childbirth size (n=4205)	
Small	2.6 (1.9-3.6)*
Average	1.6 (1.2-2.1)*
Large	1.0
Child had diarrhea within last 2 weeks (n=6959)	
Yes	1.7 (1.2-2.4)*
No	1.0
Wealth index†	
Poorest	2.1 (1.4-3.2)*
Poorer	1.9 (1.3-2.7)*
Middle	1.6 (1.2-2.3)*
Rich	1.4 (0.9-1.9)
Richest	1.0
Region‡	
Barishal	1.6 (1.1-2.2)*
Chattogram	1.3 (0.9-1.7)
Dhaka	1.3 (0.9-1.7)
Khulna	1.3 (0.9-1.8)
Rangpur	1.6 (1.2-2.3)*
Sylhet	1.8 (1.3-2.5)*
Rajshahi	1.0

Note: Adjustment of odds ratios for all the variables included in the model
*P<0.05; † Wealth index was calculated using principal component analysis based on composite measure of household assets; ‡ Administrative divisional boundary.

mother. Children whose mother were aged less than 19 years at the time of birth were more likely to be stunted (OR=1.3, 95% CI: 1.1-1.6). Non-caesarean children were higher chance of being stunted (OR=1.4, 95%CI: 1.1-1.8). Mothers who had 1-3 times antenatal clinic visits (OR=1.3, 95% CI: 1.1-1.6) and who didn't visit (OR=1.6, 95% CI: 1.2-2.1) were more likely to be stunting than who those whose mothers visited four or more times. Mothers who did not watch TV (OR=1.4, 95% CI: 1.1-1.7) or did not listen radio (OR=2.9, 95% CI: 1.8-4.6) were more prone to be stunted. Male were more likely to be stunted (OR=1.3, 95% CI: 1.1-1.6) than their counterpart. At the time of delivery, children who were perceived by their mother to be average size (OR=1.6, 95% CI: 1.2-2.1) and those perceived to be small (OR=2.6, 95% CI: 1.9-3.6) were significantly more likely to be stunted than children of the same age perceived to be large. Children who had recent episodes of diarrhea (within the last two weeks) were more likely to be stunted (OR=1.7, 95%CI: 1.2-2.4) than normal children. Children from middle income household (OR=1.6, 95% CI: 1.2-2.3), those from poorer household (OR=1.9, 95% CI: 1.3-2.7) and those from poorest household (OR=2.1, 95% CI: 1.4-3.2) were at greater risk to be stunted than children from richest household. Children who lived in Barishal (OR=1.6, 95% CI: 1.1-2.2), Rangpur (OR=1.6, 95% CI: 1.2-2.3) and Sylhet (OR=1.8, 95% CI: 1.3-2.5) were less likely to be stunted than children who lived in the Rajshahi region.

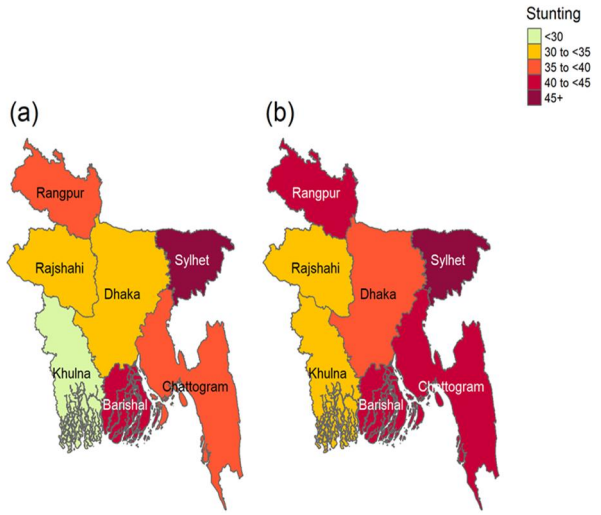

FIGURE 3 Geographical distribution of childhood stunting in Bangladesh (a) aged 0-59 months, and (b) 0-23 months

Children aged 0-23 months

Mothers who had no formal education (OR=1.5, 95% CI: 1.1-2.0) and primary education (OR=1.3, 95% CI: 1.0-1.6) has higher chance of being stunted those mothers who had secondary and above education. Second to forth born child were more likely to be stunted (OR=1.2; 95% CI:1.0-1.5) than first born child. Non-caesarean children were higher chance of being stunted (OR=1.4, 95% CI: 1.1-1.9).

TABLE 4 Odds ratios (95% confidence interval) for stunting in Bangladeshi under-2 children

Variables	Children aged 0-23 months
Mothers' education	
No formal education	1.5 (1.1-2.0)*
Primary	1.3 (1.0-1.6)*
Secondary and above	1.0
Birth order	
First-born	1.0
2nd-4th born	1.2 (1.0-1.5)*
5th or more	1.1 (0.8-1.5)
Delivery mode (n=4048)	
Non-caesarean	1.4 (1.0-1.9)*
Caesarean	1.0
Antenatal clinic visit (n=6961)	
None	1.7 (1.1-2.5)*
1-3 times	1.4 (1.1-1.9)*
4 or more times	1.0
Mother listen radio	
No	2.7 (1.5-4.9)*
Yes	1.0
Childbirth size (n=4205)	
Small	2.7 (1.9-3.9)*
Average	1.7 (1.2-2.3)*
Large	1.0
Child had diarrhea within last 2 weeks (n=6959)	
Yes	1.6 (1.0-2.3)*
No	1.0
Wealth index†	
Poorest	2.4 (1.4-4.0)*
Poorer	2.2 (1.5-3.2)*
Middle	1.9 (1.3-2.7)*
Rich	1.4 (0.9-2.1)
Richest	1.0
Region‡	
Barishal	1.6 (1.1-2.4)*
Chattogram	1.5 (0.9-2.2)
Dhaka	1.3 (0.9-1.8)
Khulna	1.3 (0.9-2.0)
Rangpur	1.6 (1.1-2.7)*
Sylhet	2.2 (1.5-3.2)*
Rajshahi	1.0

Note: Adjustment of odds ratios for all the variables included in the model
*P<0.05; † Wealth index was calculated using principal component analysis based on composite measure of household assets; ‡ Administrative divisional boundary

Mother who did not received any antenatal clinic visit (OR=1.7, 95% CI: 1.1-2.5) and mothers who received 1-3 visit (OR=1.4, 95% CI: 1.1-1.9) were significantly greater risk to be stunted than who visited at least 4 times. Children's whose mother didn't listen radio were at higher risk to be stunted (OR=2.7, 95% CI: 1.5-4.9). Mothers perceived small size (OR=2.7, 95% CI: 1.9-3.9) and average size child (OR=1.7, 95% CI: 1.2-2.3) was at greater risk to be stunted than mothers perceived large size. Children who had diarrhea within last two weeks were at greater risk to be stunted (OR=1.6, 95% CI: 1.0-2.3). Children from poorest (OR=2.4, 95% CI: 1.4-4.0), poorer (OR=2.2, 95% CI: 1.5-3.2), and middle-income household (OR=1.9, 95% CI: 1.3-2.7) were at greater risk to be stunted than children from richest household. Children who live in Barishal (OR=1.6, 95% CI: 1.1-2.4), Rangpur (OR=1.6, 95% CI: 1.1-2.7), Sylhet (OR=2.2, 95% CI: 1.5-3.2) were more likely to be stunted than children who lives in Rajshahi region **(Table 4)**.

DISCUSSION

This paper examines the factors associated with stunting among children aged 0-59 months and 0-23 months in Bangladesh using data from the 2014 wave of the Bangladesh Demographic and Health Survey. The prevalence rate of stunting under five and under-two are 36.5% and 40.2% respectively which is high according to WHO estimated prevalence [19]. For comparison, the prevalence rate of stunting for pre-school children among other South Asian countries are 38.7% in India, 45% in Pakistan, 35.8% in Nepal, 19% in Maldives, 40.9% in Afghanistan and 15% in Sri Lanka [20-24].

A number of factors correlate with stunting in Bangladesh. Children of working mother have a higher chance of being stunted than the children of non-working mothers, this could reflect a greater need to work amongst low-income mothers who may also be unable to afford more nutritious foods, alternatively working may be associated with reduce caring times and lower rates of breast feeding which is turn affects in children health. Similar results were found in Nigeria, Ethopia, sub-Saharan Africa and India [1,25–27].

Children whose mothers had secondary and above educational levels were significantly less likely to be severely stunted as opposed to children whose moms had never attended formal school. This conclusion was similar to the study done in Ethiopia and Bangladesh which reported that as mother's educational levels increase, the risk of their children being stunted and underweighted will be lessened.

Children born to relatively younger mothers (<19 years) had a significantly greater risk to be stunted. This findings is consistent with previous study in Tanzania [28]. This may be attributed to the fact that this mother would not physically appropriate to conceive a child.

Compared to children from families with fewer than four people, children from families with four or more members were more likely to be stunted. Similar findings were observed in studies from the Tigray Region of Ethiopia[29] and India[30]. Preschool stunting is associated with high family sizes, which can be somewhat explained by the fact that as the number of families in a household grows, so does the amount of food consumed and spent. Because of this, there is a lower likelihood that children will receive appropriate nutrition and energy, even though children require more energy and micronutrients to sustain their rapid growth and development.

In our study we observed that non-caesareans children are more prone to stunting compared. This might be the fact that most of the non-caesarean child delivered at home in developing country like Bangladesh which was less hygienic. Women who birth at a health care facility are more likely to receive prenatal and postnatal care, medical assistance for labour problems, vaccines, and even dietary advice.

In order to assure healthy pregnancy outcomes for women, antenatal care is crucial. By improving mother's knowledge, attitude, and practice in nutritional education, together with counseling during prenatal care impacts mother's and children's outcomes [31]. Our study indicates that an increased number of antenatal clinic visits was significantly negatively associated with stunting. This result is consistent with previous research [32–34].

Exposure to the media is crucial for gathering knowledge. Information provided by the mass media is essential to improving parents' knowledge and

awareness of issues affecting their daily lives. According to our study, children whose mothers did not watch television, or listen to the radio at least once a week had a greater chance of being stunted children than those mothers who had watch mass media. Watching television may raise awareness of the dangers of solid biomass fuel, the risks associated with the cooking environment, and the programs and policies pertaining to the healthcare services for their children. Previous study in Bangladesh, also reported similar findings [13,15].

Male children below five years of age are more likely to become stunted than their counterparts. These gender variations in stunting may be explained by social factors including gender dynamics, preferential feeding practices such as early weaning for boys, girls being closer to the house and having greater access to food being prepared while boys play outdoors and eat less while using more energy. This is in line with other studies[1,26,28,35,36].

Children who had diarrheal two weeks before to this survey were more likely to be stunted, while the episode of diarrhea was unlikely to cause stunting, it may be correlated with past episodes but also may be a biproduct of poorer health associated with stunting. Similar results found by a study in Ethiopia [37].

Several studies in Bangladesh, Ethiopia, Vietnam, and Colombia have reported that stunting was highest among severely food-insecure households ranked in the poorest quintile and lowest among food-secure households in the highest wealth quintile [38,39]. Similarly, our study found that poorest, poorer and moderately food-insecure households were more likely to have stunted children than those reported as being food secure.

Small birth size consequently low birth weight has adverse consequences on infant and child health. Our finding shows that small birth sizes are associated with an increased risk of child stunting. This finding is an indication to plan for intervention during pregnancy/ prior to pregnancy to prevent low birth size in infants. One study in Indonesia reported low birth weight is the most dominant predictor associated with stunting among children age 12-23 months [40].

In addition, this study observed that the children living in the east region (Sylhet & Chattogram division), Barishal and Rangpur were more likely to be stunted compared to those in other regions. This association may be related to dietary intake, access of food and cultural diversity in that environment. A previous study in Bangladesh also showed that Sylhet and Chattogram division was higher stunting prevalence compared to other regions in Bangladesh [15,41] .

However, the study had several limitations. First, the study used secondary data and there was no information on food habits or insufficient dietary practices to sustain stunted and severely stunted children. Second, it is difficult to get reliable income and spending statistics in a poor developing country like Bangladesh; therefore, an asset-based index is usually regarded as a fair proxy for household wealth status. Third, health information based on women reports (concerning child diarrhoea, use of maternal care) may invite recall bias.

Despite these limitations, the major strength is the nationally representative large sample size makes our findings comprehensive and reliable for the total population of Bangladesh. Since the high response rates (98%) in the survey, selection bias is unlikely to impact the study's findings. Also, the current study considered large independent variable sets and used more recent data, the evidence is potentially more helpful to guide national policy interventions resulting in stunting prevention.

Conclusion

More than one-in-three under-5 children are suffering from stunting. In conclusion, reducing stunting is one of the major targets in the Millennium Development Goal and goal 2 of sustainable development goal. Hence, at the community level, interventions to prevent stunting should focus on improving food insecurity, increasing mother's education, family planning and reproductive health services through mass media access at high stunting regions in Bangladesh. At individual level improving women's health to reduce disparity, sensitize mother on antenatal checkups, maintained personal as household hygiene to protect diarrheal & other food/water borne diseases.

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Author Contributions

- Conception and design: MSI[1], MSI[2], RC and MMZ
- Acquisition, analysis, and interpretation of data: MSI[1], MSI[2]
- Manuscript drafting and revising it critically: MSI[1], RC, MMZ
- Approval of the final version of manuscript: MSI[1], MSI[2], RC, MMZ
- Guarantor accuracy and integrity of the work: MSI[1]

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Conflict of Interest

The authors declare no conflict of interest. The authors alone are responsible for the views expressed in this article, and they do not necessarily represent the views, decisions, or policies of the institutions with which they are affiliated.

Ethics approval

Not applicable

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