Stunting among under five children in relation to socioeconomic condition of parents in Bangladesh: Analysis from a nationwide cross-sectional data

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This is to certify that Lubna Jeshmin Rahman worked on **“Stunting among under five children in relation to socioeconomic condition of parents in Bangladesh: Analysis from a nationwide cross-sectional data”** under my supervision.I have gone through the paper. It̕s up to the mark and to my full satisfaction.

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Abstract:

Introduction:

Stunting is a leading public health problem especially in developing and under developed countries and it remains associated with various nutritional adverse situation in the later age. Still the burden of stunting persists worldwide and Bangladesh is not difference from the world perspective. The aim of this study is to identify the extend of stunting and its associated factors among Bangladeshi children with a countrywide data.

Method:

Data were used from Bangladesh demographic and health survey (BDHS) 2017. A total of 4642 child data has been observed and descriptive analyses were performed to determine various social and demographic characteristics. Logistic regression model was used to present the factors associated with low birth weight and results were described in terms of odds ratio (OR) with 95% CI for both adjusted (aOR) and unadjusted (uOR) models.

Result:

Among 4642 child sample, 1570 children are from the urban area and 3072 are from the rural area. Among the urban children 26.18% are stunted and 33.14% among the rural children are stunted. 93.69% of mother have attended formal education among them 27.75% completed primary education and 48.10% completed secondary education. Prevalence of stunting is 29.80% vs 29.84% vs 37.91% among the 1st, 2nd and 3rd children and this difference is statistically significant. uOR and aOR of having stunting is lower among the children from higher educated mother (aOR=0.40, 95% CI= 0.29, 0.56) and children from richest economic group (aOR=0.07, 95% CI= 0.58, 0.84). This odd is significant in 95% CI (p-value= <0.05) for both adjusted and unadjusted model.

Conclusion:

The prevalence of stunting among children is declining Bangladesh, but still this burden is high among the all under nutritional status in Bangladesh. Children from poorest family and children of uneducated parents are at risk of being stunted. Special care should be given for the mother and children from lower economic condition and who has less educational qualifications.

Key Words:

Stunting, Bangladesh, Under nutrition, Child Nutrition

Introduction:

Bangladesh is one of the poorest country in the world with one of the largest population. It's the eighth most populous country within the world with approximately 153 million people(1). But it's made significant gains in health, education and other aspects of socioeconomic development(2).Bangladesh's current development, especially in health sector has received wide recognition from the World Health Organization (WHO), and the World Bank (3).Improvements made in terms of the survival of infants and kids under five years old and pregnant women, immunization coverage and tuberculosis control are a part of a stimulating success story for health. The Expanded Program on Immunization (EPI) vaccines are provided by the Government of Bangladesh. It is first introduced in Bangladesh in 1978 (4).The improvements have taken place despite a comparatively low level of paying on health care, a weak health system, widespread poverty and income inequality (4). Despite these macro level achievements, Bangladesh still faces considerable problems including deep rooted poverty, malnutrition and these seem to be exacerbated by an evolving set of 21st Century challenges(4).

Bangladesh asserts that raising the nutrition level and improving public health are among the state's primary responsibilities(1). Although Bangladesh has made significant progress in some health and nutrition indicators over the past few decades, chronic malnutrition rates among children under the age of 5 still be very high. It's alarming to note that two out of every five children below five years old in Bangladesh have stunted growth (5). In 2013, the Bangladeshi government developed a Bangladesh National Nutrition Policy to handle the matter of malnutrition affecting the country(5). The Sustainable Development Goals (SDGs) or Global Goals are a collection of 17 interlinked global goals designed to be a "blueprint to achieve a better and

more sustainable future for all. This Sustainable Development Goals (SDGs), were adopted by all United Nations Member States in 2015 as a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and healthy life by 2030(6).

Although stunting takes a comparatively very long time to develop, its adverse effects have lifelong consequences like cognitive development, productivity and ultimately having a negative impact on the economy of the whole country(7). Several factors are thought to be answerable for things including chronic nutrition deficiency within the child or their mother, food insecurity, repeated infections, low birth weight, poverty, unhygienic living conditions, unhealthy behaviors, practices and an absence of access to health care(8). Stunting severely affects the health of a personal furthermore as their family, society and therefore the nation as a whole(9). It significantly increases the danger of developing variety of chronic short stature and future health problems including diabetes, kidney diseases and neurological deficits. This also play a significant role on increased morbidity and premature death(10). A stunted child fails to grow normally and suffers from cognitive deficits, leading to poor physical capacity and insufficient energy as an adult to hold out work (7). Major future negative impacts on brain and neurological development and functions may cause handicap, physical and mental disability. This, in turn, becomes a burden on the child's parents and has subsequent health and economic consequences(11).

According the recent data from Bangladesh Demographic and Health Survey (BDHS) 2017-18 to spot the foremost crucial factors of stunting among below five children. According to BDHS one in every three children in Bangladesh are stunted, which refers the extend of the adverse nutritional status among Bangladeshi children (12). However, no recent study has identified the factors of stunting among under-five children with

nationally representative data. In our knowledge this is the first study to identify the socio-demographic factors of stunting with the recent demographic and health survey data in Bangladesh. Findings from this study may help public health researchers, stakeholders and policymakers to know this case of stunting and its potential risk factors supported this scenario which may help in taking required steps and initiating interventions to enhance the condition of stunting among children aged 0 to 59 months in Bangladesh.

Research question:

Is there any relation between stunting among under five children with socioeconomic condition of parents in Bangladesh?

Objective:

To find out the association between stunting among under five children in relation to socioeconomic condition of parents in Bangladesh.

Hypothesis:

The study signifies that the higher level of socioeconomic status of parents, the lower the rate of stunting among children below aged five. However, the high level of stunting may reflect the drawbacks and problems associated with socioeconomic condition of parents that resultant impact on child health.

Methodology:

Study design:

This is a cross sectional study.

Data source:

The study data taken from Bangladesh Demographic and Health Survey 2017-18 conducted by Mitra & Associates under the guidance of National Institute of Population

Research and Training (NIPORT), Health Education and Family Welfare Division of the Ministry of Health and Family Welfare under Training, Research and Development operational plan of 4th HPNSP with financial support from US Agency for International Development (USAID). Data collection occurred in five phases, each about 4 weeks in duration. Also, BDHS is the main source for up to date information on demographic information, socioeconomic status and fertility information, maternal and child health, childhood mortality, women empowerment and health seeking information. The present study administrated a situation analysis of stunting in Bangladesh using data National Demographic Health Survey (DHS) conducted by Mitra & Associates under the guidance of the Dhaka based National Institute of Population Research and Training (NIPORT).

Study Duration:

Data for BDHS 2017 were collected from October 24, 2017 to March 15, 2018.

Study Area:

Bangladesh Demography and Health Survey (BDHS) data was collected from a nationwide representative sample, where representation from all eight administrative divisions (Dhaka, Chattogram, Khulna, Barisal, Rangpur, Rajshahi, Sylhet and Mymensingh) were present in the survey.

Study Population:

A total of 20,127 ever-married women age 15-49 were interviewed in BDHS 2017.

Sampling technique:

Using two stage stratified random sampling procedure, first stage total enumeration area (EA) was 675 selecting with probability and the second stage of selection a fixed number of 30 households per cluster had selected with an equal probability of systematic selection from the newly created household listing.

Among the data, information on nutritional status of the children were not available for the children born preceding 5 years. We considered this information as missing data. After removing all the missing data, we have taken a total number of 4642 participants for our analysis.

Data management:

Data entry and cleaning of BDHS was done by experienced data entry operator. All inconsistency checked during data cleaning process and all of the open-ended questions were re-coded by the data entry team.

In our study we have created a sub-set of data from the BDHS dataset with targeted variables. All targeted variables and associated data were extracted from the dataset using analytical software (STATA 14). The variables related to nutrition states were available for the children born preceding 5 years of the survey. After extraction of data set, all variables were checked thoroughly for consistency and completeness. At the cleaning phase all collected data was cross checked to ensure the quality before analysis. The dataset was stored in a password protected computer to protect it from any unwanted change or manipulation.

Data analysis:

After extracting all the variables from BDHS dataset, data scrutinizing, cleaning and inconsistency checking was done prior to analysis. All the identified influential, outlier and missing observations were deleted from the data set. Analytical and descriptive data have been presented for all independent variables. We have calculated the specific prevalence of stunting of all of the independent variable and presented the prevalence with p-value. Logistic regression models were performed to calculate the association between dependent and independent variables. The operated results were presented in

terms of odds ratio (OR) with 95% CI for both adjusted (aOR) and unadjusted (uOR) models. Statistical package STATA (version 14) was used to conduct analysis, and results measured as significant for p-value < 0.05.

Variables:

Dependent Variable:

- Stunting under five children in Bangladesh.

Independent Variables:

- Age of child (Less than 1 year, 1-2 year, More than 2 year)
- Gender of child (Male, Female)
- Birth order of child (1^{st}, 2^{nd} and 3^{rd}, 4^{th} or more)
- Education of mother (No, Primary, Secondary, Higher)
- Age of mother at birth (Less than 20 years, 20-30 years, 30 year or more)
- Type of pregnancy (Wanted, Not wanted)
- Residence pattern (Rural, Urban)
- Wealth index (Poorer, Middle, Richer)

Ethical Consideration:

There is no requirement of ethical consideration as we have conducted this study with a secondary dataset.

Results:

Among the 4642 participants 66.18%(3072) are from rural areas and 33.82% (1570) children are from the urban areas. Among the study participants 42.48% (1972) of the are from poorer economic quartile in this research while second most of the families are from richer39.27% (1823) economic quartile (Table 01).

Prevalence of stunting among the study participants is 30.78% (1429) are stunted and 69.22% (3213) are not stunted. among the study participants 52.52% (2438) are male and47.48% (2204) of the study participants are female. Among the study participants 36.79% (1708) are less than 1 years old and 33.63% (1561) are within one to two years of

age and 29.58% (1373) are more than 2 year of age. In our study 38.17% (1772) of the children are 1st child of their parents and 11.93% (554) are 4th or more in the birth order. Almost 93.69% of mother have attended formal education among them 27.75% completed primary education and 48.10% completed secondary education. 24.45% of the mother's age was less than 20 during the child birth and 62.56% given their child birth between 20-30 years' age. Among the study child 78.74% (3655) were planned and 21.26% (987) of the child were unplanned (Table 01).

Table 1. Study participants Socio-Demographic conditions

Stunting characteristics		
Traits	**Frequency**	**Percentage**
Stunting status		
Yes	1429	30.78
No	3213	69.22
Residence		
Rural	3072	66.18
Urban	1570	33.82
Wealth index		
Poorer	1972	42.48
Middle	847	18.25
Richer	1823	39.27
Gender of child		
Male	2438	52.52
Female	2204	47.48
Age of Child		
<1 year	1708	36.79
1-2 year	1561	33.63
More than 2 year	1373	29.58
Birth order of child		

1st	1772	38.17
2nd &3rd	2316	49.89
4th or more	554	11.93
Education of mother		
No	293	6.31
Primary	1288	27.75
Secondary	2233	48.10
Higher	828	17.84
Age of mother at birth		
<20 years	1135	24.45
20-30 years	2904	62.56
30 year or more	603	12.99
Type of pregnancy		
Wanted	3655	78.74
Not wanted	987	21.26

Traits	**Stunting Status (percentage)**		**p-value**
	Yes	**No**	
Gender of child			
Male	31.83	68.17	**0.015**
Female	29.63	70.73	
Age of Child			

<1 year	20.08	79.92	**0.000**
1-2 year	35.65	64.38	
More than 2 year	38.60	61.40	

Prevalence of stunting in various sociodemographic statuses

Prevalence of stunting is higher among the male children (31.83%) compare to the female counterpart (29.63%) (Table 2). This difference of stunting status among male and female children is statistically significant P value= 0.015. Data from our study shows that rate of stunting increases with the increase of age.

Table 2.1: Age and gander based stunting status of study participants

Extend of stunting is increases with the increase of child's age. Prevalence of stunting is 20.08% among those children who are less than one years old, and is 35.65% among the children of 1 to 2 years' age and this rate is highest (38.60%) among the children who are more than two years of age.

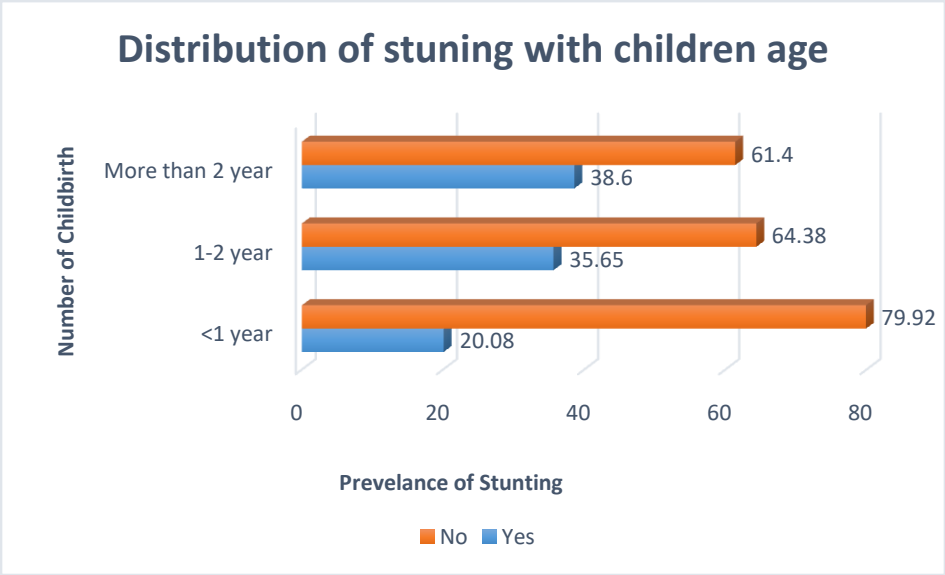

Fig 01: Age bases distribution of stunting status among study child

Prevalence of stunting is higher among the children who were 3rd or more in order among

the siblings. Prevalence of stunting is 37.91% among the children who were 3rd or more in birth order and 29.84% and 29.80% among the 2nd and 1st children.

Table 2.2: Birth order and Place of residence based stunting status of study participants

Traits	**Stunting Status (percentage)**		**p-value**
	Yes	**No**	
Birth order of child			
1st	29.80	70.20	**0.001**
2nd	29.84	70.16	
3rd or more	37.91	62.09	
Residence			
Rural	33.14	66.86	**0.000**
Urban	26.18	73.82	

Also prevalence of stunting is higher among the rural children compare to the children of urban area. Prevalence of stunting is 33.14% among the rural children and 26.18% among their rural counterpart. All of the difference among the covariates are statistically significant (p-value= <0.05).

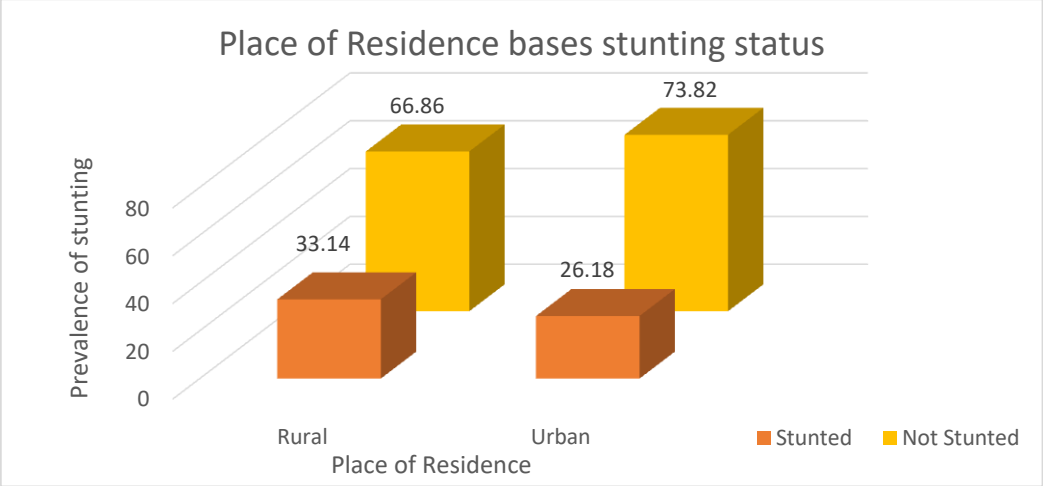

Fig 02: Place of residence based stunting status among study populations

Prevalence of stunting decreases with the increase of mother's educational status.

Prevalence of stunting is 39.93% among the child whose mother do not have any educational qualification. This prevalence is 27.34% for those whose mother have completed primary education and 30.99% when mother have completed secondary education and 16.79% when mother have completed higher education.

Table 2.3: Mother's education and age at birth based stunting status of study participants

Traits	**Stunting Status (percentage)**		**p-value**
	Yes	**No**	
Education of mother			
No	39.93	60.07	**0.000**
Primary	37.34	62.66	
Secondary	30.99	69.01	
Higher	16.79	83.21	
Age of mother at birth			
<20 years	33.83	66.17	**0.029**
20-30 years	29.55	70.45	
30 year or more	31.01	68.99	

Prevalence of stunting is higher among the children when birth age of the mother is comparatively lower or higher. Prevalence of stunting is 33.83% when birth age of the mother is lower than 20 years of age and 31.01% when age of the mother is more than 30 years of age. This prevalence is 29.55% for the children when birth age of the mother is within 20 to 30 years old. This difference of prevalence in various age group is statistically significant (p-value= <0.05).

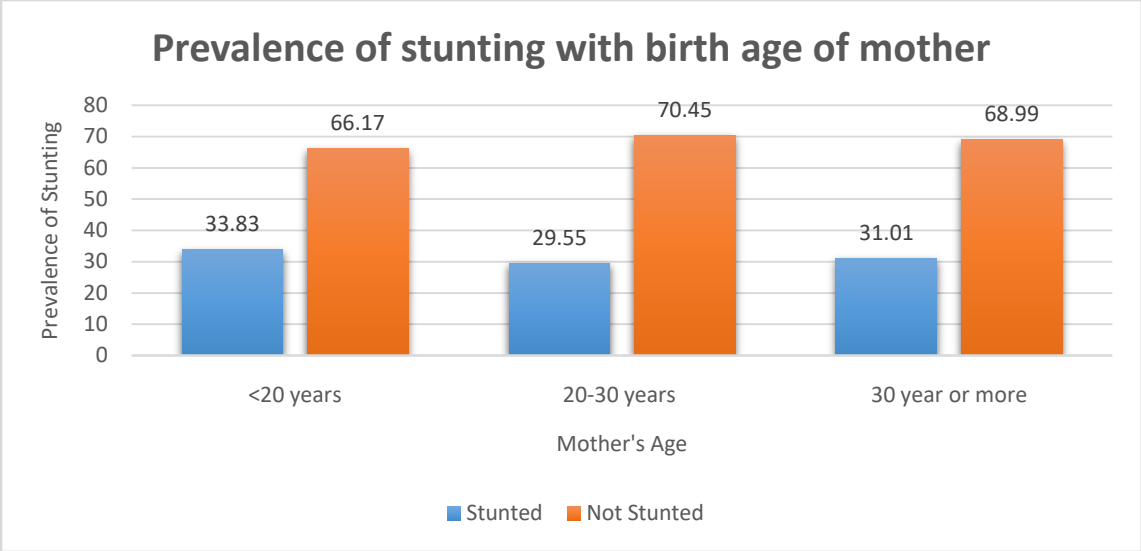

Fig 03: Stunting status among children based on mother's age

There is very few difference in the status of stunting among the wanted and not wanted child. This prevalence is 30.48% vs 31.91% among the wanted vs not wanted children and this difference is not statistically significant (p- value = 0.386).

Table2.4: Type of pregnancy and economic status based stunting status of study participants

Traits	**Stunting Status (percentage)**		**p-value**
	Yes	**No**	
Type of pregnancy			
Wanted	30.48	69.52	**0.386**
Not wanted	31.91	68.09	
Wealth index			
Poorer	37.98	62.02	**0.000**
Middle	32.11	67.89	
Richer	22.38	77.62	

Also child's stunting status varies with family wealth index. Children from low economic status suffer from more stunting compare to the children from richer families. prevalence of stunting is 37.98% among the children of poorer family and 32.11% among the children of middle income family and 22.38% among the children of richer family.

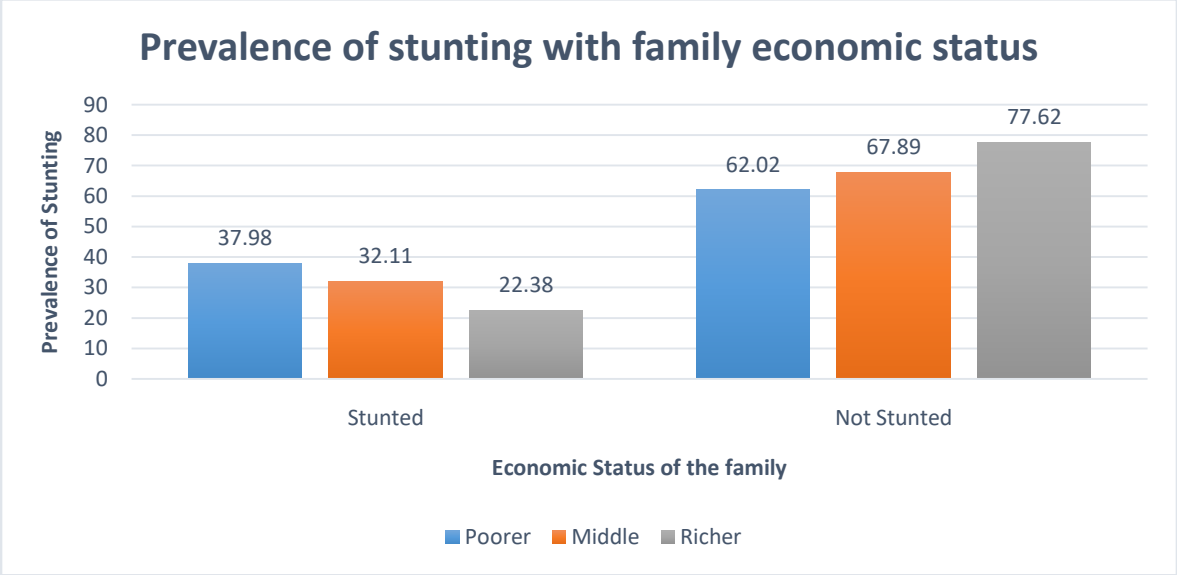

Fig 04: Stunting status among children based on family economic status

Logistics regression results of factors associated with stunting among under five children

Results of bi-variate and multivariable logistics regression analysis of factors affecting stunting of under five children in Bangladesh has been shown in (Table 3). Unadjusted and adjusted odds ratio (uOR and aOR) of having stunting of children have been presented in the table. Women's educational status is significantly associated with stunting of child birth. Odds of having stunting among children reduce with the increase of educational status of mother. aOR of having stunting for children is 33% less (aOR= 0.77, 95% CI= 0.59, 1.01) when mother have completed at least secondary education and 60% less (aOR= 0.40, 95% CI= 0.29, 0.56) when mother have higher education qualification compare to the women who have no education. The association is

statistically significant for higher educated women in both adjusted and adjusted model (p-value= <0.05). But significant only in unadjusted model for the children whose mother have completed secondary and primary education only. Our study result found association between economic status of the family and stunting status of the children are associated. Risk of having stunting is higher among the children from lower economic status. Odds of having stunting is 29% higher among the children (uOR= 1.29, 95% CI= 1.09, 1.53, p-value=0.003) from poorer family compare to the children from reference group (middle income family) also Odds of having stunting is 38% lower among the children (uOR= 0.62, 95% CI= 0.51, 0.74, p-value<0.001) from richer family. However, after adjusting all cofounders this association is only significant for the richer family ((aOR= 0.07, 95% CI= 0.58, 0.84, p-value<0.001). Children from rural areas more affected by stunting compare to the children from urban areas. odds of having stunting is 43% higher (uOR= 1.43, 95% CI= 1.28, 1.60, p-value<0.001) among the rural children in unadjusted model and 8% higher (aOR= 1.08, 95% CI= 0.93, 1.26, p-value=0.298) in adjusted model which is significant in unadjusted model.

Table 03: Factors associated with stunting among children in Bangladesh

	uOR (95% CI)	p value	aOR (95% CI)	p value
Households and Mother's social characteristics				
Mother's education level (ref: No education)				
Primary	0.77 (0.63, 0.94)	0.011	0.93 (0.71, 1.22)	0.12
Secondary	0.52 (0.43, 0.63)	<0.001	0.77 (0.59, 1.01)	0.068
Higher	0.22 (0.18, 0.28)	<0.001	0.40 (0.29, 0.56)	<0.001
Wealth Index (ref: middle)				
Poorer	1.29 (1.09, 1.53)	0.003	1.16 (0.97, 1.39)	0.091
Richer	0.62 (0.51, 0.74)	<0.001	0.07 (0.58, 0.84)	<0.001
Type of resident (Ref: Urban)				
Rural	1.43 (1.28, 1.60)	<0.001	1.08 (0.93, 1.26)	0.298
Gender of child (ref: Male)				

Female	0.95 (0.86, 1.06)	0.426	0.90 (0.79, 1.03)	0.141
Age of the children (Ref: 1-2 years)				
<1 year	0.46 (0.38, 0.52)	<0.001	0.44 (0.37, 0.51)	<0.001
2 and more	1.13 (0.97, 1.31)	0.016	1.13 (0.97, 1.32)	0.101
Birth order of the child (Ref: 1st child)				
2^{nd} and 3^{rd} child	1.00 (0.87, 1.15)	0.937	0.89 (0.75, 1.07)	0.248
4^{th} and more	1.44 (1.18, 1.76)	<0.001	1.09 (0.82, 1.44)	0.543
Age of child Birth (ref: Less than 20)				
20-29 years	0.92 (0.78, 1.09)	0.365	0.94 (0.78, 1.14)	0.56
30 and above	1.04 (0.85, 1.27)	0.684	0.92 (0.69, 1.22)	0.571
Wanted Last Child (Ref: Yes)				
No	1.07 (0.92, 1.25)	0.337	1.01 (0.86, 1.19)	0.899

In our result we found that risk of stunting among children increases with the increase of age. Odds of having stunting is 56% lower (uOR= 0.46, 95% CI= 0.38, 0.52, p-value<0.001) in unadjusted model and (aOR= 0.44, 95% CI= 0.37, 0.51, p-value<0.001) in adjusted model among the children whose age are less than one compare to the children of reference group (1-2 years old). This association is significant for both adjusted and unadjusted model but there is no statistical significant association with the more than 2 years old children. Birth order of the children is also found associated with stunting among the children. Odds of stunting is 44% higher (uOR= 1.44, 95% CI= 1.18, 1.76, p-value<0.001) among the children who are 4^{th} or more in birth order in unadjusted model and 9% higher (aOR= 1.09, 95% CI= 0.82, 1.44, p-value=0.543) adjusted model. This association is found to be significant in the unadjusted model, but no significant association found in the unadjusted model. Also, we have examined association of stunting with birth age of the mother, planned child birth in our research. However, we didn't found any significant association with this two variable in both adjusted and unadjusted model.

Discussion:

The secondary analysis aimed to provide evidence on determinants of stunting among children using nationally representative data. The major objective of this study was to examine the association between stunting with socioeconomic status including (wealth index, type of residence education of the mother) and various demographic condition such as, birth order of the child, current age, age of mother at childbirth, and type of pregnancy. Stunting is a public health problem linked to a wide range of possible predictors. In Bangladesh, as in other developing countries, nutritional status of children is a major public health concern (13). The findings of this study reveal that one out of three children were at stunted in Bangladesh. These statistics indicate that malnutrition among under-five children is chronic in rural Bangladesh. According to the 2011 Bangladesh demographic and health survey, 41.3% of total under five children were stunted, and after a decade this rate is still 30.8%. While, Bangladesh is improving in nutritional status of mother and children but, the prevalence of child stunting is still high in Bangladesh.

One of the predictor of stunting is mothers educational status. In our study we found women's educational status is associated with child's stunting status. Women who are comparatively higher educated risk of being stunted is found to be very low among their children. Also previous studies in Bangladesh and other countries with similar socioeconomic status found same result. A study conducted in Bangladesh indicated that odds of stunting were low among the children when mother was higher educated (14). On the counterpart, children may become stunted due to their mothers' lower educational status and lack of sources of knowledge on child nutrition. Also, a study in Bangladesh identified that the mothers who have more knowledge about child health and nutrition are

educated and come from richer households; they also have greater access to media compared to mothers from poorer households (12). In our study, after controlling all other socio economic factors, we found that children from the richer families are become less stunted compare to their children from poorer counterpart. This result is also aligned with previous study in Bangladesh and other developing countries (14-16). Risk of being stunted is higher among the children from poorer economic quartile in Bangladesh which has been reported in many studies (17). This may be due to children in higher wealth index households were more likely to belong to relatively food secure families. They had comparatively more educated mothers, and lived in better neighborhood with improved health facilities (14). Also financial ability of a household is also another important determinants of household food purchase ability which is directly involve with dietary diversity and food consumption status of a child. It is proven that the child gets the required amount of nutritious foods suffer less from various nutritional adverse situation. Another study in Bangladesh found that mothers from poor households did not have the financial ability to purchase nutritious foods for their children and it results to stunting and underweight of the children (18). A study conducted in Nepal mentioned that richer households have more financial ability or access to nutritious foods and are more capable of ensuring proper care for the children residing in those households (19). These factors might possibly have reduced the risk of underweight among the children living in higher wealth index households. On the other hand, children from richer families also may have affected by stunting. A report suggested that in the richer households stunting may also arise due to inadequate knowledge on food, feeding practices, inappropriate food allocation, and poor hygiene practices (20). This statement proves that lack of maternal

education, lack of maternal knowledge about child nutrition, and lack of financial ability to purchase appropriate foods are the most important factors associated with stunting. However, both of the factors are complementing of each other.

In this study we found that rural children are more likely to be affected by stunting compare to the children from urban areas. Also another previous study mentioned that rural children were lagging behind of urban children in terms of nutrition (15). This study also resulted that risk of stunting increases with the increase of age among the children. Also previous studied indicated that risk of being severely and moderately stunted over normal children increases significantly with age (15). Also previous studies around the world indicated that children aged two years and above were found to be at greater risk of being severely or moderately stunted (21-23). This may be the result of the lack of appropriate food supply among children aged more than one year. Also in our result we found that child's birth order is also associated with their stunting status. Children who are 4^{th} or more in birth order are more likely to suffer from stunting in their child age. This result is aligned with a study which conducted in Vietnam. This study reported that children from families with three or more children were more likely to be underweight, stunted and wasted than children from families with two or less children (13). This happened because, probably mothers with many children have overall less lesser time to extend care equally to each of the children than those who have fewer children.

Limitations of the study:

This is a cross sectional study, so no relationship between the factors and the outcome could be established. Also selection of variables are limited here.

Conclusion and Recommendation:

The results showed that the prevalence of stunting is still high among the children in

Bangladesh. Risk of being stunted is higher among the children whose mother are less educated. Nevertheless, the burden of stunting is still high among the child from poorer economic quartile.

To address all of the issues, knowledge and awareness on child nutrition among mother is important factors for ensuring adequate and appropriate child feeding practices and child care. Adequate nutrition education should be ensured for pregnant women or in the early stage of life. Also proper family planning and feeding practices of the child should be emphasized.

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