

Determinants of Stunting among Under Five Children in Bangladesh: A Cross Sectional Study



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**DEDICATED TO MY
PARENTS**

Acknowledgement

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DECLARATION

I do solemnly declare that the research work presented in this dissertation entitled “Determinants of Stunting among Under Five Children in Bangladesh: A Cross Sectional Study” has been conducted by myself and not been submitted to any other university or academic institute for an academic qualification or certification degree previously. I certify that this is the true copy of my thesis with final revisions and approved by my thesis review committee.

I do hereby warrant that the work has been presented here does not breach any existing copyright and any material reproduced in this project has been properly acknowledged.

Sincerely,

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Declaration by the Supervisor

This is to certify that Md. Abdul Mutalib worked on, “Determinants of Stunting among Under Five Children in Bangladesh: A Cross Sectional Study”, under my supervision. I have gone through the paper. It is up to the mark and to my full satisfaction.

Signature of the Supervisor

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LIST OF CONTENTS

ACKNOWLEDGEMENT.....	ii
DECLARATION BY THE STUDENT.....	iii
DECLARATION BY THE SUPERVISOR.....	iv
Abstract.....	viii
CHAPTER 1.....	1-3
<i>1.1 Introduction.....</i>	<i>1</i>
<i>1.2 Objective.....</i>	<i>3</i>
<i>1.2.1 General Objective.....</i>	<i>3</i>
<i>1.2.2 Specific Objective.....</i>	<i>3</i>
CHAPTER 2.....	5-7
<i>2.1 Methodology.....</i>	<i>5</i>
<i>2.2 Study Design.....</i>	<i>6</i>
<i>2.3 Sample size.....</i>	<i>6</i>
<i>2.4 Variable.....</i>	<i>6</i>
<i>2.4.1 Dependent Variable.....</i>	<i>6</i>
<i>2.4.1 Independent Variables.....</i>	<i>6</i>
<i>2.5 Statistical Analysis.....</i>	<i>7</i>
CHAPTER 3.....	8-22
<i>3.1 Result.....</i>	<i>8</i>
<i>3.2 Discussion.....</i>	<i>22</i>
CHAPTER 4.....	25-29
<i>4.1 Recommendation and Limitation.....</i>	<i>25</i>
<i>4.2 Conclusion.....</i>	<i>26</i>
<i>4.3 References.....</i>	<i>27-29</i>

LIST OF FIGURE

Figure 3.1.1 : Pie Chart for Prevalence of Stunting.....	9
Figure 3.1.2: Bar Chart for Frequency Distribution of Education of Mother.....	10
Figure 3.1.3: Pie Chart of Sex of Child.....	11
Figure 3.1.4: Types of Place of Residence.....	11
Figure 3.1.5 : Divisional Distribution of Respondents.....	12

LIST OF TABLES

Table 3.1.6 : Frequency distribution of selected variables	13
Table 3.2 : Distribution of stunting by potential factors.....	15
Table 3.3 : Factors associated with stunting among under five children in Bangladesh.....	17
Table 3.4 : Factors determinants of stunting among under five children in Bangladesh.....	20

ABRIVIATION

BDHS : Bangladesh Demography and Health Survey

NIPORT: National Institute for Population Research and Training

HAZ: Height-for-age Z-score

MCHC: Maternal and Child Health Care

SD: Standard Deviation

CI: Confidence Interval

OR: Odds ratio

COR: Crude Odds Ratio

AOR: Adjusted Odds ratio

Ref: Reference

Abstract:

Background: Malnutrition among children is still a major public health issue in many areas of the world, particularly in developing countries like Bangladesh. This situation is caused by a number of socioeconomic and demographic reasons.

Objective: The purpose of this study was to discover the risk variables among Bangladeshi children under the age of five.

Methodology: The data for the present study are extracted from the Bangladesh Demographic and Health Survey, 2017-18. Frequency distribution and bivariate analysis was used to determine the differences in stunting prevalence, and a multivariate logistic regression was used to investigate the association between stunting and potential risk variables.

Result: The overall prevalence of stunting was 31.4% and was significantly higher among the children from the poorest wealth index households. Children from Mymensingh division are significantly more likely to be stunted (odds ratio = 1.745; 95% confidence interval= 1.174, 2.594). The risk of developing stunting among the child who were delivered by caesarean section is 24.7% [OR=0.753, 95% CI= 0.593, 0.956] lower than the child is delivered through normal delivery.

Conclusion: The factors that primarily influence the prevalence of stunting in children under five years in Bangladesh are socioeconomic factors, particularly household wealth index, geographical position like division and the child delivery through caesarean section. To minimize the prevalence of stunting in children under the age of five, multi-sector and integrated initiatives are required to boost household income and knowledge to cesarean delivery.

CHAPTER 1
INTRODUCTION

1.1 Introduction:

Bangladesh has long been concerned about child malnutrition, as it is one of the world's countries with the worst rates of stunting. Stunting is defined as a lack of height for one's age. It is caused by chronic or recurring malnutrition, which is frequently linked to poor socioeconomic situations, poor maternal health and nutrition, frequent illness, or unsuitable baby and young child feeding and care in early life. Stunting prevents children from realizing their full physical and mental potential (1). Childhood stunting is the most accurate representation of social inequities and the best overall indication of children's well-being (2).

When children are adequately fostered and nourished with enough and nutritional dietary intake, they are more likely to be healthy and have linear growth around the world. Apart from illnesses and disability, stunting is an underlying cause of child death and disease burden, accounting for around 3.1 million or 45 percent contributes to more than half of global child death each year (3).

According to the most recent data, 38 percent of South Asia's children whose age are below five years are stunted as because of chronic nutritional deficiency. The number is almost 64 million children (4). Stunting featured prominently on the international agenda over the last few weeks. Countries with the highest rates of stunting in the world include Burundi, Eritera and Timor-Leste where over 50% of the under 5 population are stunted. On the other hand the lowest rate of stunting is recorded in Germany and Chile where they have reached less than 2% of their stunting rate (5).

All of these countries with high burdens have had turbulent histories that have disrupted key services such as health, education, crucial infrastructure, and food supplies. Stunting is an

accurate representation of a country's history. In 2020, 22% of children under the age of five, or more than one in every five, had stunted growth. However, the trends are overall encouraging. Stunting prevalence reduced from 33.1% to 22% globally between 2000 and 2020, and the number of children affected fell from 203.6 million to 149.2 million. Nearly two out of every five stunted children resided in South Asia in 2020, while another two out of every five lived in Sub-Saharan Africa. Between 2000 and 2020, the number of children under the age of five who were stunted fell from 203.6 million to 149.2 million worldwide. At the same time, the number of people in West and Central Africa has risen alarmingly, from 22.8 million to 29.3 million (6).

Stunted children may never reach their full height, and their brains may never fully develop cognitively. As a result, stunting has both short- and long-term effects on children's health, development, and productivity throughout generations and throughout their lives (7). Infections disease, particularly diarrheal and respiratory disorders, as well as malaria, are more common among stunted children.

Malnutrition among children under the age of five fell from 32.6 percent to 22.2 percent worldwide between 2000 and 2017. Despite a global drop in under-5 malnutrition rates, the risk of malnutrition remains significant, and it is the leading cause of under-five morbidity and mortality in African countries, particularly in Sub-Saharan Africa (8). The frequency of stunting has been reported to be 39 percent in South Asia, which is a public health concern (9).

Stunting is most common in Sub-Saharan Africa and Asia, accounting for 90 percent of all stunted children, with South Asia at the center of the worldwide child stunting epidemic.

According to the most recent data, 38 percent of South Asia's under-fives are stunted. This rate is nearly twice as high as in Sub-Saharan Africa (37%) and nearly twice as high as in the Middle East and Northern Africa (18%), and more than three times higher than in East Asia and the Pacific (12%) or Latin America and the Caribbean children (11%) (10).

Due to most recent data of the most recent year, our neighboring country like India, the prevalence of stunting was 34% in 2017, This prevalence was 36% in Nepal in 2017, in Pakistan it was 37.6% in 2018 and in Myanmar it was 26.7% in 2018. In case of Bangladesh, this prevalence was 28% in 2019 (11). The 2017-18 BDHS results showed that 31% of children under age 5 are stunted and 9% are severely stunted in Bangladesh. The prevalence of stunting in children has been steadily decreasing in Bangladesh, from 51% in 2004 to 31% in 2017 (12). Stunting has decreased steadily, although more progress is needed to meet the 2030 target.

1.2 Objectives

1.2.1 General Objectives:

The general objective of the research is to find out the risk factors associated with stunting among under five Bangladeshi children.

1.2.2 Specific Objectives:

1. To find out the socio-demographics characteristics of under-five years Bangladeshi children.
2. Assess the impact of socio-economic status on child nutrition in Bangladesh.
3. Find out the association between stunting and socio-demographic characteristics and others variables.
4. Evaluate the current situation of stunting in Bangladesh.

CHAPTER 2 METHODOLOGY

2.1 Methodology:

The data used for the present study has been derived from BDHS, 2017-18, a nationally-representative survey conducted by the National Institute for Population Research and Training (NIPORT) of the Ministry of Health and Family Welfare. The 2017-18 BDHS collected data on the nutritional status of children by measuring the height and weight of all children aged under 5 in the selected households. The sample for the BDHS-2017-18 is nationally representative and covers the entire population residing in non-institutional dwelling units in the country. The survey used a sampling frame from the list of enumeration areas (EAs) of the 2011 Population and Housing Census of the People's Republic of Bangladesh, provided by the Bangladesh Bureau of Statistics (BBS). For the current study, the data has been screened for the under-five children for whom height are available. Therefore, the study uses a sample of size 7902 extracted from of BDHS 2017-18 data. Three standard indices of physical growth that describe the nutritional status of children are: (i) Height-for-age, (ii) Weight-for-height, and (iii) Weight-for-age. In this study only height-for-age is considered as dependent variable. Stunting is detected by measuring a child's length or height and comparing the results to a set of accepted standard values. Children are considered stunted if their height is less than 2 SDs below the WHO Child Growth Standards median for the same age and sex. Similarly, if a child's height is less than 3 SDs below the WHO Child Growth Standards median for the same age and sex, they are termed severely stunted. Height measurements were carried out with measuring boards made by Shorr Productions. Children younger than age 24 months were measured lying down (recumbent) on the board, while standing height was measured for older children. One male health technician and one female technician from each team were deployed to take the measurements.

2.2 Study Design:

The study was a descriptive cross sectional study.

2.3 Sample Size:

The sample size used in the analysis is 7902 children. Note that all the children are of age between 9 and 59 months and they are the last child of respective respondents prior the survey.

2.4 Variables:

2.4.1 Dependent Variable:

Height for age is considered as dependent variable. It is considered as (-200 SD) standard deviations below the reference median of the WHO reference population in terms of height-for-age was defined as stunted and recoded into binary number =1, other values are considered as normal and recoded into binary number =0.

2.4.2 Independent Variables:

- 1. Age of Mother:** The respondent's current age in completed years is determined using the century month code of his or her date of birth.
- 2. Sex of Child:** Male and female child is considered in this study. Other child is not included.
- 3. Place of residence:** Here we have considered Rural and Urban group of child.
- 4. Divisions:** There are eight divisions of Bangladesh like Barishal, Chittagong, Dhaka, Khulnam Mymensingh, Rajshahi, Rangpur and sylhet are included in this study.
- 5. Education of Mother:** This is categorical variable and it has four categories. Those are No Education, Primary, secondary and Higher group of education.

6. Wealth Index: Within the wealth index we have considered five groups. Poorest, Poorer, Middle, Richer and Richest.

7. Religion: in this study Islam, Hinduism, Buddhism and Christianity these four groups are considered.

8. Delivery by Caesarean Section: We have considered two groups Delivery by Caesarean Section and Normal Delivery.

9. Mothers currently working: Two groups working and not working.

10. Sex of Household Head: Two groups Male and Female.

11. Gave Child Fortified Baby Food: We considered here Yes No binary variable.

12. Breastfeeding: We considered here Yes No binary variable also.

2.5 Statistical analysis:

We performed descriptive analysis to determine the characteristics of the study participants, which were presented with the frequency and percentage. Bivariate analysis was done to examine the association between the dependent variable and all other independent variable separately. Multivariate logistic regression model is fitted to determine the significant effect of predictors on outcome variables. Missing values had been avoided in advanced analysis. The analysis is conducted at 5% level of significance and 95% confidence interval for odds ratio. A p value < 0.05 is considered as statistical significant for the association between stunting prevalence and independent variables. Statistical software Statistical Package for the Social Sciences SPSS (version 22) has been used to carry out the analysis.

CHAPTER 3
RESULT AND DISCUSSION

3.1 Result:

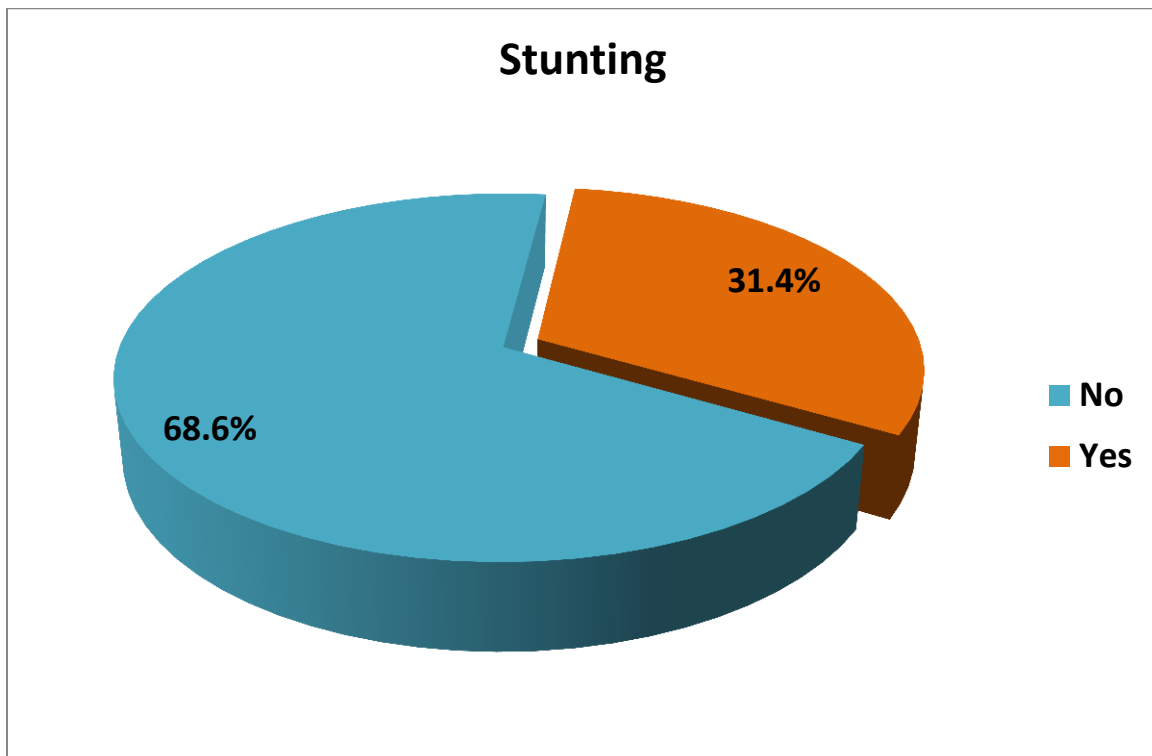


Figure 3.1.1 : Pie Chart for Prevalence of Stunting

The pie chart upholds the frequency of stunting among under five children in Bangladesh in this study. A total of 7902 children age <5 years had been included in the study, of whom 31.4% child are stunted where 68.6% child are not stunted. So, Stunted child consist the lesser part in this regard.

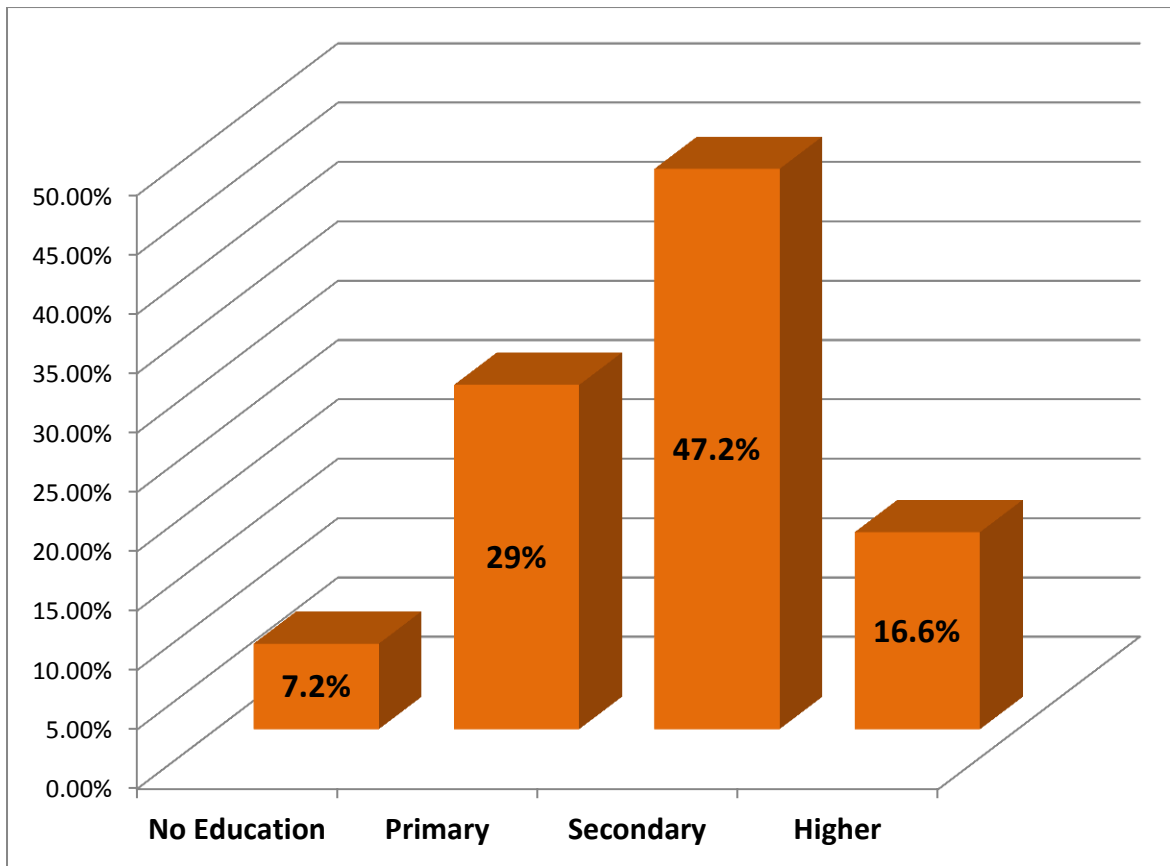


Figure 3.1.2: Bar Chart for Frequency Distribution of Education of Mother

The bar chart illustrated above shows the frequency distribution of highest level of education of respondents in this study. Chart reveals the highest amount of mother has the secondary level of education (47%) that is almost half of all and the lowest amount of mother have no education (7.33%) where a few mother are highly educated than primary educated mother (16.6% versus 29.1%) in this study.

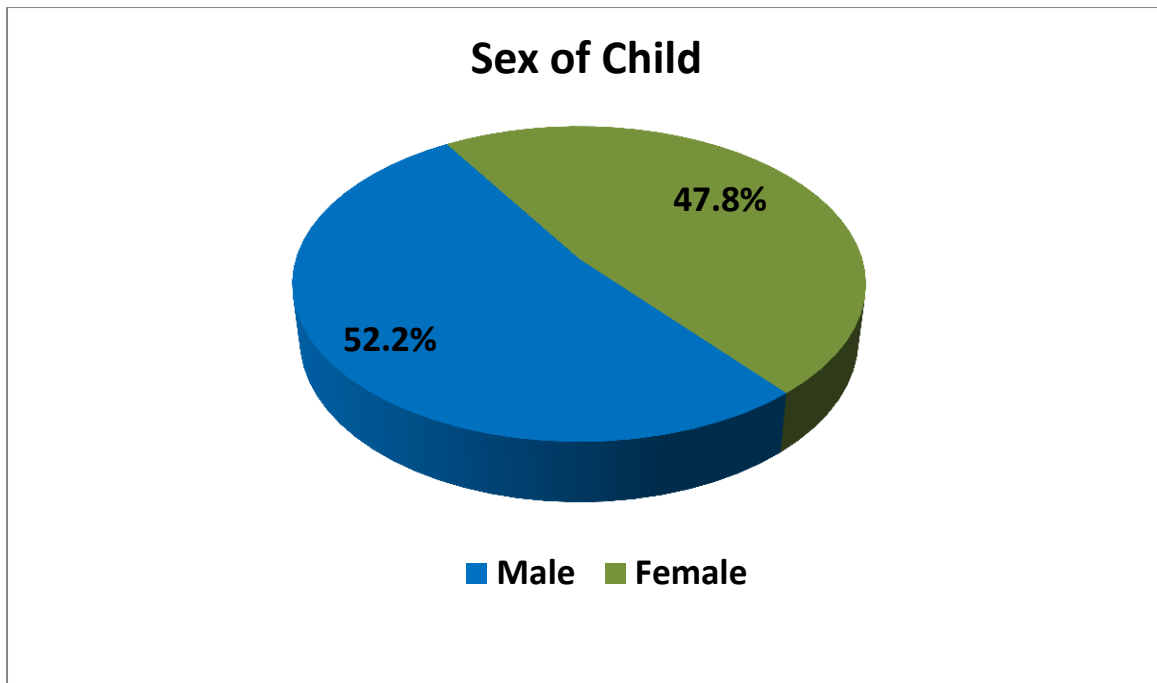


Figure 3.1.3: Pie Chart of Sex of Child

A total of 7902 children age <5 years had been included in the study, of whom 4125 (52.2%) were male and 3777 (47.8%) were female

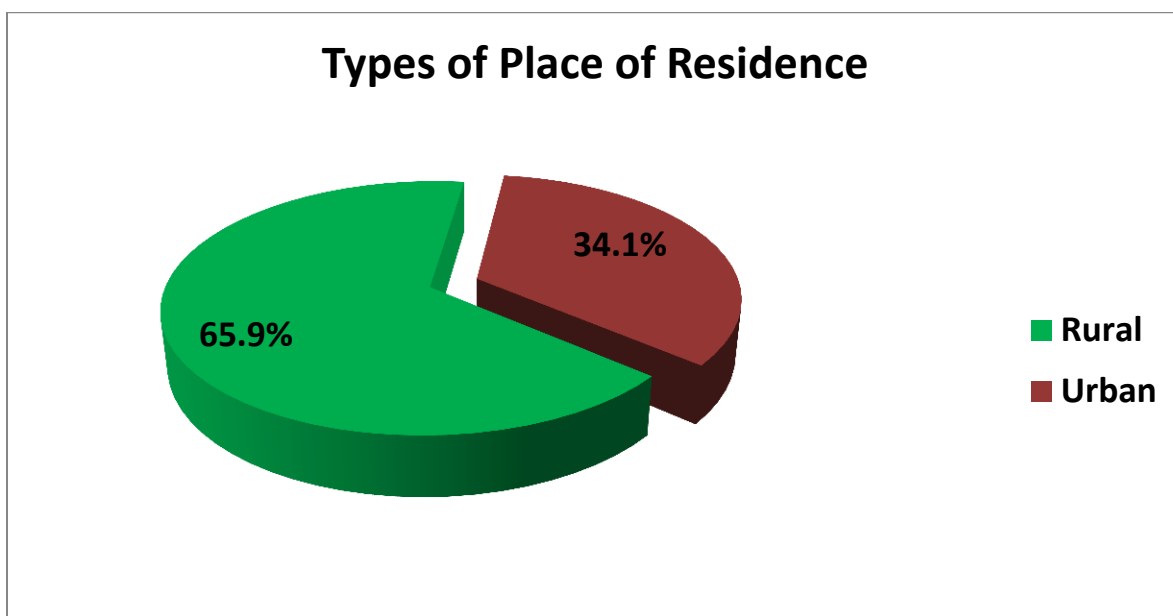


Figure 3.1.4: Types of Place of Residence

Above figure showed that majority (65.9%) respondents are lived in rural area, on the other hand only 34.1% are lived in urban area.

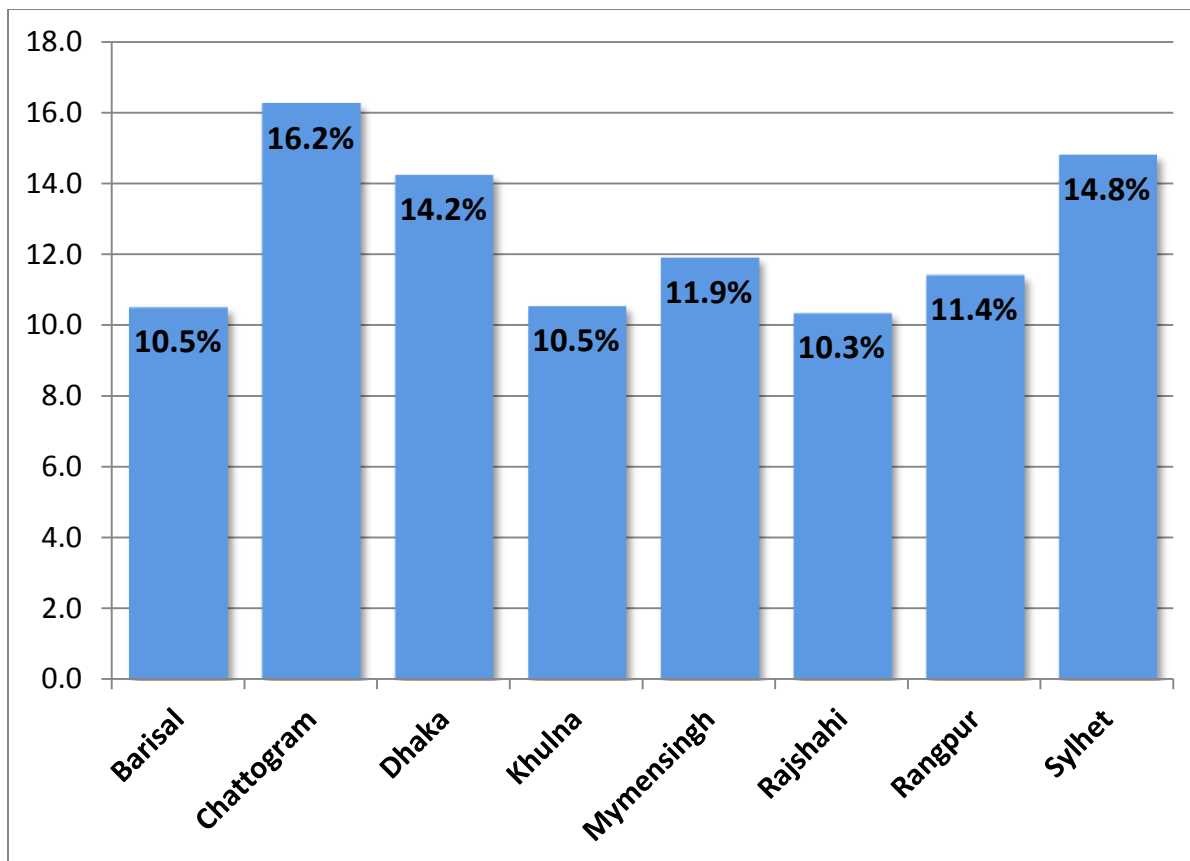


Figure 3.1.5 : Divisional Distribution of Respondents

The bar chart provides information about the percentage of respondents from different division of Bangladesh. The maximum respondents are from Chattogram division (16.2%) among all the division where the minimum respondents are from Rajshahi division (10.3%). The respondents are from Barisal and Khulna division are the same, that is 10.5%. 14.8%, 14.2%, 11.9%, and 11.4% respondents are from Sylhet, Dhaka, Mymensingh and Rangpur division respectively.

Table 3.1.6 : Frequency distribution of selected variables

Variables			Frequency	Percentage (%)
Age of Mother	Mean:	25.8		
	SD	±5.64		
Age of Mother				
Below 25			4240	53.7
25-34			3034	38.4
Above 35			628	7.9
Wealth Index				
Poorest			1767	22.4
Poorer			1597	20.2
Middle			1430	18.1
Richer			1565	19.8
Religion				
Muslim			7226	91.4
Others			676	8.6
Delivery by Caesarean Section				
No			3260	66.8
Yes			1619	33.2
Mothers Working Status				
No			4519	57.2
Yes			3380	42.8
Sex of Household Head				
Male			6920	87.6
Female			982	12.4
Gave Child Fortified Baby Food				
No			3807	94.9
Yes			203	5.1
Breastfeeding				
No			109	2.2
Yes			4884	97.8

A total of 7902 children age <5 years had been included in the study, of whom 4125 (52.2%) were male and 3777 (47.8%) were female (Table 3.1.6). Mean age of mother is 25.8 years in this study. More than half of mother's age below 25 years group (53.7%) and a few respondent in this study who are above 35 years age group(7.9%). The table 3.1.6 also shows the highest respondents are in the poorest wealth index group (22%) and the lowest are the middle wealth index group (17.8%) among five groups. Religion of majority of the respondents are Muslim(91.4%), on the other hand only 8.6% are respondents are from Hinduism, Buddhism, Christianity and other religion. Most of the child in this study is born by normal delivery (66.8%) and 33.2% child is born by caesarean section. Table also shows that more than half of the mother (57.2%) dose not wok outside where 42.8% mother work anything. Most of the household head are male (87.6%) and only 5.1% children has given fortified baby food. A little amount of mother dose not breastfeed their child (2.2%) where most of the mother breastfeed their child those are 97.8% in this study.

Table 3.2 : Distribution of stunting by potential factors

Variables	Stunting		P Value
	No (%)	Yes (%)	
Age of Mother			
Below 25	68.5	31.5	0.762
25-34	68.9	31.1	
Above 35	67.4	32.6	
Education of Mother			
No Education	55.1	44.9	0.000
Primary	60.6	39.5	
Secondary	69.8	30.2	
Higher	84.7	15.3	
Sex of Child			
Male	68.5	31.5	0.846
Female	68.7	31.3	
Types of place of residence			
Urban	73.3	26.7	0.000
Rural	66.1	33.9	
Division			
Barisal	68.6	31.4	0.000
Chittagong	68.1	31.9	
Dhaka	74.8	25.2	
Khulna	74.8	25.2	
Mymensingh	64.7	35.3	
Rajshahi	70.7	29.3	
Rangpur	70.4	29.6	
Sylhet	58.7	41.3	
Wealth Index			
Poorest	59.2	40.8	0.000
Poorer	61.2	38.8	
Middle	69.2	30.8	
Richer	72.3	27.7	
Richest	82.6	17.4	
Religion			
Muslim	68.5	31.5	0.729
Others	69.2	30.8	
Delivery by Caesarean Section			
No	64.5	35.5	0.000
Yes	77.0	23.0	
Mothers Working Status			
No	70.8	29.2	0.000
Yes	65.6	34.4	
Sex of Household Head			
Male	68.2	31.8	0.084
Female	71.0	29.0	
Gave Child Fortified Baby Food			
No	70.1	29.9	0.003
Yes	79.8	20.2	
Breastfeeding			
No	75.8	24.2	0.097
Yes	67.7	32.3	

Table 3. 2 represents the results obtained from the bivariate analysis for stunting with all independent variables. Out of all independent variables five appears insignificant as p-value is greater than 0.05. These five variables are Age of mother, sex of the child, religion, sex of household head and breastfeeding. Note the p-values for these five variables are 0.762, 0.846, 0.729, 0.084 and 0.097, respectively. Out of remaining seven significant variables, under the level of education, higher education group has the lowest stunting that is 15.3% and the secondary and primary group have 30.2% and 39.5% stunting respectively. No education group has the highest stunting which is 44.9%.

Stunting is slightly higher in rural area (33.9%) in comparison to urban area (26.7%). The highest stunting among Sylhet division which is 41.3% and the lowest among Dhaka combined Khulna division (25.2%). Stunting among Rajshahi, Rangpur, Barisal, Chittagong and Mymensingh are 29.3%, 29.6%, 31.4%, 31.9% and 35.3% respectively. 40.8% stunting among poorest group of people, which is the highest among all groups and the lowest stunting among the richest group of people, which is 17.4%. Stunting among poorer group is 38.8%, middle group is 30.8% and the richer group of people is 27.7%.

Stunting is lower among the child who are delivered by caesarean section (23%) compared to normal delivery (35.5%). Stunting is higher among the child of working mother (34.4%) where 29.2% child are stunted among not working mother. Only 20.2% child are stunted who has given fortified baby food that is lower compared to the group of child who has not given fortified baby food (29.9%).

Table 3.3 : Factors associated with stunting among under five children in Bangladesh

Factors	Stunting			
	Crude OR	95% Confidence Interval		p value
		Lower	Upper	
Age of Mother				
Below 25	Ref			
25-34	0.947	0.792	1.133	0.553
Above 35	0.933	0.777	1.122	0.462
Education of Mother				
No Education	Ref			
Primary	0.799	0.664	0.962	0.018
Secondary	0.530	0.443	0.635	0.000
Higher	0.222	0.178	0.278	0.000
Sex of Child				
Male	Ref			
Female	0.990	0.900	1.089	0.835
Types of Place of Residence				
Urban	Ref			
Rural	1.408	1.271	1.561	0.000
Division				
Barisal	Ref			
Chittagong	1.119	0.845	1.229	0.844
Dhaka	0.733	0.601	0.894	0.002
Khulna	0.735	0.593	0.910	0.005
Mymensingh	1.188	0.975	1.449	0.088
Rajshahi	0.901	0.731	1.112	0.333
Rangpur	0.917	0.747	1.125	0.405
Sylhet	1.533	1.271	1.848	0.000
Wealth Index				
Poorest	Ref			
Poorer	0.921	0.802	1.057	0.241
Middle	0.647	0.558	0.749	0.000
Richer	0.557	0.481	0.644	0.000
Richest	0.305	0.259	0.359	0.000
Religion				
Muslim	Ref			
Others	0.967	0.815	1.147	0.697
Delivery by Caesarean Section				
No	Ref			
Yes	0.543	0.474	0.622	0.000
Mothers Working Status				
No	Ref			
Yes	1.270	1.154	1.397	0.000
Sex of Household Head				
Male	Ref			
Female	0.878	0.758	1.017	0.082
Gave Child Fortified Baby Food				
No	Ref			
Yes	0.594	0.419	0.843	0.004
Breastfeeding				
No	Ref			
Yes	1.494	0.931	2.400	0.097

Our results showed that negative relationship between stunting and education level of mother. The odds of giving stunting of children by primary education of mother is 20%, secondary level education of mother is 47% and higher level of education of mother is 77.8% lower than no education of mother keeping other variables at fixed level. This relationship is significant at 5% level of significance ($p\text{-value} < 0.05$). So education of mother is considered as a potential factor which has the significant effect on stunting.

Rural children are found significantly 40.8% more stunted compared to urban child. This prediction is highly significant ($p\text{-value} < 0.001$) and true for the population. It is evident that the place of residence is the risk factor for stunting.

The odds of developing stunting for Chattagram is 11.9%, Mymensingh is 18.8% and Sylhet is 53.3% higher than that of Barishal division. On the other hand the odds of developing stunting for Dhaka is 26.7%, Khulna is 26.5% , Rajshahi is 9.9% lower compared to Barisal division keeping other variable at fixed level. Since $p\text{-value} < 0.005$ at 5% level of significance for Dhaka, Khulna and Sylhet division, So, these three division has the significant effect on stunting. It means this prediction is true for the population.

Table 3.3 also shows the negative association between stunting and wealth index group of people. The odds of stunting among middle wealth index group is 35.3%, richer wealth index group is 44.3% and the richest wealth index group is 69.5% lower compared to poorest wealth index group keeping other variables constant. Since this prediction is significant ($p\text{-value} < 0.001$) at 5% level of significance, for population this prediction is true that means these wealth index group can be the risk factor for stunting.

Caesarean child is found significantly 45.7% less like to be stunted than normal delivery child. Here the 95% confidence interval for odds ratio doesn't contain the null value 1 [OR=0.543, 95% CI for OR = 0.474, 0.622], so this variable has the significant effect on stunting. It is evident that the delivery by caesarean section is the risk factor for stunting.

The table also reveals that the child of working mother is 1.270 times higher stunted than the child of those mother who are not working outside. This relationship is highly significant at 5% level of significance (p -value < 0.001) keeping other variable at fixed level. So the working mother is considered as a potential factor which has the significant effect on stunting.

The odds of developing stunting among the child who has given fortified baby food is 40.6% less stunted compared to the child who has not given fortified baby food. As p -value < 0.001 , it conclude that the fortified baby food has the significant effect on stunting. So, it is one of the potential risk factor for stunting.

Table 3.4 : Factors determinants of stunting among under five children in Bangladesh

Factors	Stunting			
	Adjusted OR	95% Confidence Interval		p value
		Lower	Upper	
Age of Mother				
Below 25	Ref			
25-34	0.917	0.736	1.141	0.436
Above 35	1.209	0.799	1.830	0.369
Education of Mother				
No Education	Ref			
Primary	1.097	0.738	1.631	0.648
Secondary	0.910	0.609	1.360	0.647
Higher	0.778	0.482	1.256	0.304
Sex of Child				
Male	Ref			
Female	0.872	0.715	1.062	0.173
Types of Place of Residence				
Rural	Ref			
Urban	0.909	0.718	1.151	0.427
Division				
Barisal	Ref			
Chittagong	1.087	0.736	1.604	0.675
Dhaka	0.942	0.618	1.435	0.780
Khulna	1.228	0.789	1.913	0.363
Mymensingh	1.745	1.174	2.594	0.006
Rajshahi	1.006	0.646	1.567	0.979
Rangpur	1.311	0.865	1.985	0.202
Sylhet	1.430	0.959	2.133	0.079
Wealth Index				
Poorest	Ref			
Poorer	0.918	0.687	1.226	0.560
Middle	0.833	0.612	1.135	0.248
Richer	0.639	0.457	0.892	0.008
Richest	0.470	0.314	0.703	0.000
Religion				
Muslim	Ref			
Others	1.008	0.684	1.487	0.967
Delivery by Caesarean Section				
No	Ref			
Yes	0.753	0.593	0.956	0.020
Mothers Working Status				
No	Ref			
Yes	0.992	0.798	1.232	0.939
Sex of Household Head				
Male	Ref			
Female	1.268	0.939	1.714	0.121
Gave Child Fortified Baby Food				
No	Ref			
Yes	1.048	0.640	1.716	0.852
Breastfeeding				
No	Ref			
Yes	1.496	0.697	3.213	0.301

Table 3.4 displays the socioeconomic risk factors for child stunting, which were calculated using binary logistic regression. The odds of developing stunting for Mymensingh division is 74.5% higher compared to Barisal division. This association is significant (p-value = 0.006) at 5% level of significance keeping other variable at fixed level. Though this division shows significant effect on stunting after adjusting odds ratio, it was insignificant (p-value=0.088) when we analyze crude odds ratio. Table 4 upholds the Mymensingh division as a potential risk factor on stunting.

The risk of stunting among the children who are richer wealth index group is significantly 36.1% [OR= 0.639, 95% CI= 0.457, 0.892] and the richest wealth index group is significantly 53% [OR= 0.470, 95% CI= 0.314, 0.703] lower risk to be stunted than the children who are poorest wealth index group. As p-value <0.05, we may conclude that with increase in the wealth, decrease in the prevalence of stunting.

The risk of developing stunting among the child who were delivered by caesarean section is 24.7% [OR=0.753, 95% CI= 0.593, 0.956] lower than normal delivery child. Here 95% confidence interval does not contain null value 1, So this variable is a remarkable risk factor for stunting.

3.3 Discussion

In this present study, stunting among children below 5 years of age was assessed by calculating Z score for one indicator height for age- widely used anthropometric measurement technique of assessing stunting. This study found 31.4% child are stunted in Bangladesh where in sub Saharan Africa this prevalence is found 41% (13). The reason may be food insecurity and nutritional imbalance of this low income country.

Mother education level was found as a key factor in boosting nutrition in children under the age of five in our study. According to the results of our research, women who have finished secondary or higher education, stunted growth was greatly reduced than a mother who is uneducated. Other research that indicated an association backed up the conclusion. There is a link between mother education and improved child development outcomes of Indian children (14). Highly educated mother is aware about healthcare behavior like Health education, family planning, Child immunization, visit to local health clinic and nutrition rich food for children (15). Furthermore, it is widely accepted that better education leads to higher earnings. As a result, higher household earnings allows parents to spend more on health care and good nutrition for their children. This might be the reason of reduced stunting rate of educated mother.

Our research shows that geographical location, reflected in divisions (eight divisions in Bangladesh), is a strong predictor of stunting. Among Bangladesh's eight divisions, Mymensingh has the highest rate of stunting (75%). The odds ratio to be stunted among children of Rajshahi, Chittagong , Khulna, Rangpur, and Sylhet divisions were 1.006, 1.087, 1.228,1.311,and 1.430 times more likely to be stunted than children from Barisal division. Memensingh division is is Haor & Char area in Bangladesh.It is the poor district and flash flood and disaster prone area also. More than half of the population in this region lives below

poverty line. They are much more lag behind than other district because of flash flood, drought, unemployment and low literacy rate. This may be the reason to develop stunting at the highest rate compared to other division.

Child from the richest wealth index quintile is 53% less likely to be stunted compared with the poorest wealth index quintile. Economic inequality was found to be strongly associated with child stunting. Living in poorer condition with inadequate food intake, lack of fundamental health services and greater risk to infections made the children to be stunted. In addition to this the quality of antenatal care relates closely to the wealth. This result supported the findings from earlier research in other developing countries like Ghana (16) and Bangladesh (17) further confirmed that household economic condition is a key component of nutritional status of children under five years in developing countries.

This present study shows that those of child is born by cesarean delivery is 24.7% lower chance to be stunted compared to the child is born by normal delivery. A research was done in Ghana entitled “Caesarean Section Delivery and Risk of Poor Childhood growth” . This article opposes our findings. They found prevalence of stunting was still significantly higher among children born through caesarean delivery than normal delivery (49.2% versus 31.1%) (18) Possible reason may be maternal and child health care in Bangladesh. During cesarean delivery mother and child are directly supervised by a specialist doctor. Mother is well advised to early breastfeeding of child. This is very important for a new born baby. Cesarean mother receives advice for her and her child a certain period interval.

CHAPTER 4
RECOMMENDATION, LIMITATION AND CONCLUSION

4.1 Recommendation:

- Special consideration should be given to the lower income population.
- Program should be run to the poor population.
- Myemensingh division should be given special consideration.
- Initiative should be taken to reduce stunting among normal delivery babies.

4.2 Limitation:

- The cross sectional study design does not prove causality. The findings are correlations, not causations with the inability to decide the direction of the effect.
- BDHS 2017-18 data is a nationally representative huge data which increases the risk of recall bias which could affect the accuracy of study result.
- Recent study with around five years age data.
- Time duration is another limitation for this study. More time was needed for proper completion of the research.
- Despite those limitations the study carries a public health consideration in investing this important topic.

4.3 Conclusion:

Bangladesh still has a high rate of child malnutrition. The factors that primarily influence the prevalence of stunting in children under-five years in Bangladesh are socioeconomic factors, particularly household wealth index, geographical position like division and the child delivery through caesarean section. To minimize the prevalence of stunting in children under the age of five, multi-sector and integrated initiatives are required to boost household income and knowledge to cesarean delivery.

4.3 Reference:

1. Fact sheets - Malnutrition [Internet]. [cited 2021 Nov 28]. Available from: <https://www.who.int/news-room/fact-sheets/detail/malnutrition>
2. de Onis M, Branca F. Childhood stunting: a global perspective. *Matern Child Nutr* [Internet]. 2016 May 1 [cited 2022 Jan 5];12(Suppl 1):12. Available from: </pmc/articles/PMC5084763/>
3. Chowdhury TR, Chakrabarty S, Rakib M, Afrin S, Saltmarsh S, Winn S. Factors associated with stunting and wasting in children under 2 years in Bangladesh. *Heliyon* [Internet]. 2020;6(9):e04849. Available from: <https://doi.org/10.1016/j.heliyon.2020.e04849>
4. Stunting is holding back the development of South Asian children and nations [Internet]. [cited 2022 Feb 16]. Available from: <https://www.unicef.org/rosa/press-releases/stunting-holding-back-development-south-asian-children-and-nations>
5. Countries ranked by Prevalence of stunting, height for age (% of children under 5) [Internet]. [cited 2022 Jan 7]. Available from: <https://www.indexmundi.com/facts/indicators/SH.STA.STNT.ZS/rankings>
6. Malnutrition in Children - UNICEF DATA [Internet]. [cited 2022 Jan 7]. Available from: <https://data.unicef.org/topic/nutrition/malnutrition/>
7. Khan JR, Hossain MB, Awan N. Community-level environmental characteristics predictive of childhood stunting in Bangladesh - a study based on the repeated cross-sectional surveys. *Int J Environ Health Res* [Internet]. 2022;32(3):473–86. Available from: <https://doi.org/10.1080/09603123.2020.1777947>

8. Woldeamanuel BT, Tesfaye TT. Risk Factors Associated with Under-Five Stunting, Wasting, and Underweight Based on Ethiopian Demographic Health Survey Datasets in Tigray Region, Ethiopia. *J Nutr Metab*. 2019;2019.
9. Sarma H, Khan JR, Asaduzzaman M, Uddin F, Tarannum S, Hasan MM, et al. Factors Influencing the Prevalence of Stunting Among Children Aged Below Five Years in Bangladesh. *Food Nutr Bull*. 2017;38(3):291–301.
10. Akram R, Sultana M, Ali N, Sheikh N, Sarker AR. Prevalence and Determinants of Stunting Among Preschool Children and Its Urban–Rural Disparities in Bangladesh. *Food Nutr Bull*. 2018;39(4):521–35.
11. Prevalence of stunting, height for age (% of children under 5) | Data [Internet]. [cited 2022 Jan 8]. Available from:
<https://data.worldbank.org/indicator/SH.STA.STNT.ZS?end=2020&start=2020&view=bar>
12. Survey H. Bangladesh. 2017;
13. Quamme SH, Iversen PO. Prevalence of child stunting in Sub-Saharan Africa and its risk factors. *Clin Nutr Open Sci* [Internet]. 2022;42:49–61. Available from:
<https://doi.org/10.1016/j.nutos.2022.01.009>
14. Corsi DJ, Mejía-Guevara I, Subramanian S V. Risk factors for chronic undernutrition among children in India: Estimating relative importance, population attributable risk and fractions. *Soc Sci Med* [Internet]. 2016;157(January 2018):165–85. Available from: <http://dx.doi.org/10.1016/j.socscimed.2015.11.014>

15. Semba RD, Pee S De, Sun K, Sari M, Akhter N, Bloem MW. Semba RD, Pee S De, Sun K, Sari M, Akhter N, Bloem MW. Effect of parental formal education on risk of child stunting in Indonesia and Bangladesh: a cross-sectional study. *Lancet*. 2008;371(9609):322–8.
16. Hong R. Effect of economic inequality on chronic childhood undernutrition in Ghana. *Public Health Nutr*. 2007 Apr;10(4):371–8.
17. Hong R, Banta JE, Betancourt JA. Relationship between household wealth inequality and chronic childhood under-nutrition in Bangladesh. *Int J Equity Health* [Internet]. 2006 Dec 5 [cited 2022 May 16];5:15. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/17147798>
18. Saaka M, Hammond AY. Caesarean Section Delivery and Risk of Poor Childhood Growth. *J Nutr Metab*. 2020;2020.