

A Cross Sectional Study on Stunting Among Under Five Children With Associated Factors in Bangladesh

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Abstract: *Stunting is a severe problem to under five child morbidity and mortality in developing countries like Bangladesh. This study attempts to develop Generalized Poisson Regression Model to identify the number of under-five stunted children in Bangladesh using Bangladesh Demographic and Health Survey 2014 data. The study identified several significant predictors of the outcome variable namely mother's education, mother's working status, father's education, father's occupation, types of place of residence, division, wealth index, religion, number of living children and access to the media. It is found that educated and economically solvent families are at lower risk of having stunting and it is also true for the people living in urban area as well as those who are in touch with different types of media like TV, radio, magazines etc.*

Keywords—stunting; significant; predictors; outcome variable

1. INTRODUCTION

The nutritional status of children is a sensitive index for the health status of a country's people with its economic condition as well. Good nutrition is essential during childhood to ensure healthy growth, proper organ development and function, neurological and cognitive development and a strong immune system. On the other hand, poor nutrition leads to ill health that causes further deterioration in child growth. Undernutrition refers to the insufficient intake of energy and nutrients to meet an individual's needs to maintain good health. Over nutrition means the amount of nutrients that exceeds the requirements for normal growth, development and metabolism [1]. Theoretically malnutrition is a term that refers to both under-nutrition and over-nutrition. People are malnourished if the calories and protein they take through their diet are not sufficient for their growth and maintenance or due to ill health, they are not able to make complete use of the food they eat or if they consume too many calories [1]. Malnutrition among under five children is a chronic problem in developing countries like Bangladesh. During childhood, the physical and mental growth of children can be impeded by poor nutrition that may lead consequently to a high risk for causing communicable disease and even critical infections which ultimately results in a bigger economic burden of a country [2, 3]. The progress in both national and international economic sector as well as health sector are adversely affected by malnutrition among children and mothers [4]. About 35 million people die worldwide because of malnutrition and it is also responsible for 35% morbidities among under five children [5]. Malnutrition usually had three forms which includes mainly stunting or chronic

malnutrition (low height for age), wasting or acute malnutrition (low weight for height) and underweight (low weight for age) [6]. Approximately 50.6 million children under-five in the nineties were found to be malnourished in developing countries and more than 20% were led to hospitalization who were extremely malnourished with a critical illness [7]. During 1990-2000, the percentage of stunting was decreased from 34% to 27% [8]. Beyond health, this slow progress on stunting is impacting the social and economic development of countries. It is estimated that malnutrition in all its forms could cost society up to US\$3.5 trillion per year [9]. In comparison with the other part of the world, the prevalence of acute malnutrition and underweight are visibly higher in the countries belonging to South Asia and the scenario is dreadful in its Southern part. About 20 million children suffer from wasting globally of which only India covers more than 8 million [10]. Bangladesh has made remarkable success in reducing child malnutrition but still millions of children in Bangladesh has become stunted because of poor nutrition status. In 2004, 51% children were stunted in Bangladesh whereas in 2007 the prevalence reduced to 43.2%, in 2011 it was 41% and 36% in 2014 [11-14]. Though a 15% reduction in stunting has been done in a decade, still it is to be achieved the Sustainable Development Goal which is stunted children should be reduced by 40% from 2015 to 2025 [15].

Researchers over the world are restlessness endeavoring to point out the determinants and attempting to find way in managing and developing the nutrition status. Although the task of doing so is much arduous as the term malnutrition is a complicated one, some factors have come out to be the cause of malnutrition like age of child, birth interval,

mother's education, maternal nutrition, child feeding index and fever, size at birth, mother's body mass index and parental education [16, 17]. This study aims to appraise the prevalence of stunting, to find out mean number under five stunted children among different socio-economic and demographic characteristics and to examine how these factors affect to a child being stunted having the data from Bangladesh Demographic and Health Survey (BDHS), 2014 where the number of stunted children was found to be under dispersed.

2. METHODOLOGY

This study has chosen the data from the Bangladesh Demographic and Health Survey (BDHS), 2014 as it is the biggest survey covering the whole country providing information on necessary indicators namely maternal and child health, nutritional status of mothers and children, awareness and use of family planning methods etc. Using a two stage stratified sampling, the survey successfully collected information from 17,300 households interviewing 17863.

2.1 VARIABLES: RESPONSE AND COVARIATES

Among the 17300 households interviewed, children below five years of age were found 6763 who are the interest of this study. After excluding the invalid and missing information for a single characteristic that this study considered, a final sample of 6704 under five children is utilized. This study concentrated on the mean number of stunted children in Bangladesh with the factors presumed to be associated. So, the number of stunted children is considered as the response variable which is of count type. It is noted that stunting was measured in terms of the height for age z-score (HAZ) which is the anthropometric index by DHS using the Child Growth Standards of WHO [18, 19]. A child is considered as stunted if its height for age is below more than two standard deviation of the median of the WHO reference population. For this study a set of covariates is considered to be associated with stunting among under five children: Mother's education (no education, primary, secondary, higher), Mother's working status (working women, housewife) Fathers education (no education, primary, secondary, higher), Father's occupation (physical labor, service, business), Types of place of residence (urban, rural), Division (Barisal, Chittagong, Dhaka, Khulna, Rajshahi, Rangpur, Sylhet), Wealth index (poor, middle, rich), Religion (Muslim, Others), Number of living children (up to 2, 3 or more), Access to media (yes, no).

2.2 STATISTICAL METHODS USED

Significant difference in the mean number of under-five stunted children among different socio-economic and demographic factors and their categories are determined

using one way ANOVA as a bivariate analysis. To assess the adjusted effects on the selected covariates on stunting, a Generalized Poisson Regression Model is used as the response variable is considered a count one and the data was found under dispersed for the number of under- five stunted children that is the variance is found lower than the mean. A simulation study is also conducted to test the under dispersion of the data set which supports the hypothesis of being under dispersed.

2.2.1 GENERALIZED POISSON REGRESSION MODEL

Suppose Y_i is a count response variable that follows Generalized Poisson distribution. The probability density of $Y_i, i = 1, 2, \dots, n$ is given by

$$f(y_i, m_i, a) = \left(\frac{m_i}{1 + am_i} \right)^{y_i} (1 + ay_i)^{y_i-1} \frac{1}{y_i!} \exp\left(-\frac{m_i(1 + ay_i)}{1 + am_i}\right); y = 0, 1, 2$$

Here m is the mean and a, b are the parameters, the estimates of which are obtained using the maximum likelihood estimation method.

3. RESULT

According to this study, a household owns on an average 0.38 under-five stunted children with a variance of 0.28. The mean number of under-five stunted children among different demographic and socio-economic factors are demonstrated in table 1. From this table, significant difference is found in the mean number of stunted children for most of the background characteristics except two namely mother's working status and religion of the family. Among the significant factors, to be specific, mothers who have education up to primary level are at more risk to have under-five children with stunting in comparison to the mothers who have education from secondary level to higher. The result is similar for the education level of fathers. The family with day labor father have mean number of under-five stunted children greater than those with other occupations of fathers. On average, rural child are more stunted than the urban child. The mean number of stunted children does not vary so much in the seven divisions except Sylhet which has the highest mean. Poor, middle and rich families have respectively 0.49, 0.39 and 0.26 as the average number. Families with three or more living children are at more risk of having stunting one. It is clear from the results that media is effectual to make people conscious about child nutrition as the mean number of under-five stunted children are less among those are not exposed to media.

Table 1: Mean number of under-five stunted children by different demographic and socio economic factors with 95% confidence interval

Background Characteristics		Mean number of under-five stunted children (95% CI)	p-value
Mother's Education	No Education	0.52 (0.49, 0.56)	< 0.001
	Primary	0.47 (0.44, 0.50)	
	Secondary	0.32 (0.30, 0.33)	
	Higher	0.19 (0.16, 0.22)	
Mother's working status	Working women	0.40 (0.35, 0.38)	0.102
	Housewife	0.37 (0.38, 0.43)	
Father's Education	No education	0.52 (0.49, 0.55)	< 0.001
	Primary	0.42 (0.40, 0.45)	
	Secondary	0.30 (0.28, 0.32)	
	Higher	0.20 (0.17, 0.23)	
Father's Occupation	Physical labor	0.45 (0.43, 0.47)	< 0.001
	Service	0.32 (0.29, 0.35)	
	Business	0.33 (0.31, 0.36)	
	Others	0.34 (0.32, 0.37)	
Place of residence	Urban	0.32 (0.30, 0.34)	< 0.001
	Rural	0.40 (0.39, 0.42)	
Division	Barisal	0.38 (0.35, 0.42)	0.001
	Chittagong	0.39 (0.36, 0.42)	
	Dhaka	0.34 (0.31, 0.36)	
	Khulna	0.28 (0.25, 0.32)	
	Rajshahi	0.31 (0.28, 0.34)	
	Rangpur	0.35 (0.32, 0.36)	
	Sylhet	0.55 (0.51, 0.58)	
Wealth index	Poor	0.49 (0.46, 0.51)	< 0.001
	Middle	0.39 (0.36, 0.42)	
	Rich	0.26 (0.24, 0.28)	
Religion	Muslim	0.38 (0.37, 0.39)	0.171
	Others	0.35 (0.31, 0.39)	
Number of living children	1-2	0.33 (0.32, 0.35)	< 0.001
	3 or more	0.48 (0.46, 0.51)	
Access to media	No	0.47 (0.45, 0.50)	< 0.001
	Yes	0.32 (0.31, 0.33)	

The estimated parameters of the fitted Generalized Poisson Regression Model to assess the adjusted effects of the selected covariates on stunting of under-five children is represented in the table 2. The findings of the table reveals that the factors associated significantly (at 5% level) with stunting are mother's education, father's education, division, wealth index and number of living children. For the variable

mother's education, it is seen that mothers who attained at least primary education have 2.7% higher odds of having stunted child compared to the totally uneducated mothers. On the other hand, mothers who have secondary and higher levels of education are less likely to have stunted child compared to the uneducated mothers. To be specific with father's education, odds ratio (OR) for the three categories

primary (OR= 0.910), secondary (OR= 0.781) and higher educated (OR= 0.628) fathers are lower than that of uneducated fathers. The odds of being stunted are higher in two divisions Chittagong (OR= 1.117) and Sylhet (OR= 1.327) compared to Barisal and in other two divisions

Khulna (OR= 0.822) and Rajshahi (OR= 0.836), the odds are lower compared to Barisal. Other significant factors for stunting are wealth index (for middle, OR= 0.917, for rich, OR= 0.683) and number of living children (for 3 or more number of living children, OR= 1.131).

Table 2: Coefficients of Generalized Poisson Regression Model to assess factors affecting stunting of under-five children together with their standard error, Odds ratio and the significance.

Variables		b	SE (b)	Odds Ratio	p-value
Mother's education	No education	-	-	-	-
	Primary	0.027	0.058	1.027	0.784
	Secondary	-0.118	0.065	0.889	0.007
	Higher	-0.281	0.118	0.755	< 0.001
Father's education	No education	-	-	-	-
	Primary	-0.094	0.052	0.910	0.004
	Secondary	-0.247	0.063	0.781	< 0.001
	Higher	-0.464	0.101	0.628	< 0.001
Father's occupation	Physical labor	-	-	-	-
	Service	0.034	0.069	1.03	0.556
	Business	-0.021	0.056	0.979	0.579
	Others	-0.004	0.055	0.996	0.775
Place of residence	Urban	-	-	-	-
	Rural	-0.047	0.049	0.954	0.116
Division	Barisal	-	-	-	-
	Chittagong	0.111	0.074	1.117	0.049
	Dhaka	-0.025	0.077	0.975	0.601
	Khulna	-0.196	0.089	0.822	0.003
	Rajshahi	-0.179	0.085	0.836	0.003
	Rangpur	-0.092	0.081	0.912	0.097
	Sylhet	0.283	0.073	1.327	< 0.001
Wealth index	Poor	-	-	-	-
	Middle	-0.086	0.057	0.917	0.021
	Rich	-0.381	0.064	0.683	< 0.001
Number of living children	Up to 2	-	-	-	-
	3 or more	0.123	0.045	1.131	< 0.001
Access to media	No	-	-	-	-
	Yes	-0.017	0.049	0.983	0.511

4. DISCUSSION

The objective of this study is to detect the factors those are responsible for a child aged under five years to be stunted.

The study find the mean number of stunted children is 0.38 per family in Bangladesh which is an alarming number to be conscious about the nutrition status of children and to take steps to minimize this number to achieve the goal of SDG

regarding child nutrition. From this study, it is clear that educated parents are at lower risk of having stunted children as it is of general sense that educated persons are careful about proper health care. The result that mothers with secondary and higher education are at less risk of having stunted children than the mothers with no education agrees with some other studies [20-21]. It is seen from the study that child from some regions of Bangladesh to be specific Chittagong and Sylhet are more likely to be stunted. Policy makers should take these areas into consideration for improving the facilities of nutrition. According to our study, child from economically solvent families in Bangladesh become less stunted than those who are from poor and disadvantaged family. Similar result has been found from Hong and Mishra [21]. This is really a serious issue for any country that the children of poor family face vulnerable health condition because of the dearth of nutrition facilities and it affects the country as a whole. Another important finding this study has which is number of living children in a family is responsible for a child to be stunted or not. Those families with 3 or more children are at more risk of having stunted child. This may be because of lack of care for more children. This result is also an indication of keeping the family smaller. If the facts that affect the nutrition status of under five children are taken into consideration with essential steps, hopefully the problem of stunting will be reduced to the extent to meet the SDG.

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