

## Prevalence and Risk Factors of Child Malnutrition in Bangladesh

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### Research Article

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#### ABSTRACT

This study attempts to examine the child malnutrition status and the prevalence and risk factors of child malnutrition of Bangladesh. Bi-variate and multivariate designs were employed to light on the objectives of the study. Research shows that 48.30% children are still malnourished in Bangladesh. Children residential status, mother's education, household status, quality of sanitation, first birth age of mother's, parents education and household wealth inequality are strongly associated with child malnutrition. Research ends by recommending that delaying respondent's age at first birth, increasing media access, improving sanitation facility, reducing poverty and making health related services more available and accessible to the poor are essential to improve overall childhood health and nutritional status in Bangladesh.

### INTRODUCTION

Malnutrition is a severe problem in under developed and developing countries. Lack of proper nutrition leads the child to disease and ultimately death. Malnutrition in children is common globally and results in both short and long term irreversible negative health outcomes including stunted growth which may also be linked to cognitive development deficits, underweight and wasting [1].

According to the World Health Organization [2], malnutrition accounts for 54 percent of child mortality worldwide about 1 million children. Major causes of malnutrition are high food price and low access to nutritious food items, poor feeding practices, such as inadequate breastfeeding, offering the wrong foods and not ensuring that the child gets enough nutritious food, contribute to malnutrition. Infection-particularly frequent or persistent diarrhea, pneumonia, measles and malaria also undermines a child's nutritional status. Malnutrition passes from one generation to the next because malnourished mothers give birth to malnourished infants. If they are girls, these children often become malnourished mothers themselves and the vicious continues [3]. Malnourished children have lower resistance to infection and are more likely to die from common childhood ailments, such as diarrheal diseases and respiratory infections [4].

World Health Organization (WHO) defines malnutrition as "the cellular imbalance between the supply of nutrients and energy and the body's demand for them to ensure growth, maintenance and specific functions". The term malnutrition refers to both under nutrition as well as over nutrition. However in maximum cases, the terms malnutrition is used interchangeably with under nutrition. Nutrition includes processes leading to and involved with the utilization of nutrients for growth, development, maintenance and activity.

In Bangladesh, millions of children and women suffer from one or more forms of malnutrition. Although Bangladesh has made good progress in the last 2 decades to achieve Millennium Development Goals, MDG-1, the eradication of extreme poverty and hunger, MDG-4 for child mortality and MDG-5 for material health, more needs to be done. MDG-1, MDG-4 and MDG-5 are directly related to nutrition. Improving nutrition status, especially for under-five children and for mothers, is very important to achieve Millennium Development Goal (MDG). Malnutrition rates have seen a marked decline in Bangladesh throughout the 1990's but remained high at the turn of the decade (CMNS, 2012).

There has been some improvement in child nutritional status over the past decade. The level of stunting among children under age 5 has declined from 51 percent in 2004 to 36 percent in 2014. In the last three years it declined by 5% points. Wasting

increased to 17 percent in 2007 from 15 percent in 2004 and has gradually declined since then, to 14 percent in 2014. The level of underweight has declined from 43 percent in 2004 to 33 percent in 2014 [4].

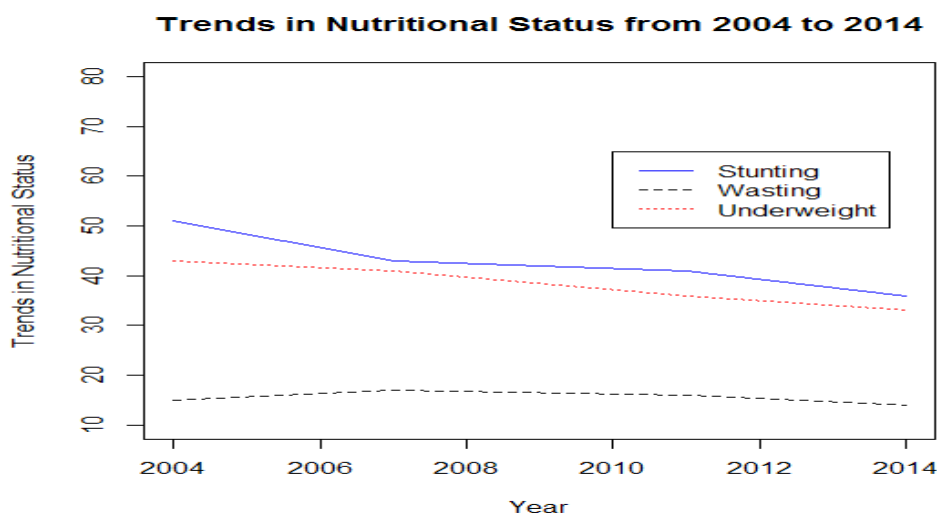


Figure 1. Trends in Nutritional Status during 2004-2014.

A few months ago World Bank declares Bangladesh as lower middle income country. To carry this progression in future the most important factor will be strong human power. Today’s children are the future of Bangladesh. To make an active man power we need to develop our children as healthy and strong enough as possible. To achieve this goal we need to overcome malnutrition. Good nutrition is a prerequisite for the national development of countries and for the wellbeing of individuals. On the other hand, decrease in the malnutrition rate indicates overall socio-economic improvement of a country. Therefore, the main aim of this research is to examine the status of malnutrition and its associated risk factors among under five year children in Bangladesh.

### OBJECTIVES Of The STUDY

1. To estimate the current malnutrition status of under five year children in Bangladesh.
2. To examine the relationship between risk factors and malnutrition status of under five year children of Bangladesh.
3. To determine in what extent the risk factors were associated with child malnutrition in Bangladesh.

### METHODS

This study utilized the secondary data extracted from a nationally representative survey, Bangladesh Demographic and Health Survey (BDHS), [6]. A total of 8,325 children under age 5 (unweight) in the BDHS sample households were eligible for anthropometric measurements. This study focuses on the 7,886 (weighted) children for whom complete and credible data are available.

There are three types of malnutrition status: stunted, wasted, and underweight. Height-for-age (stunted) measures linear growth. A child who is more than two standard deviations below the median (-2SD) of the WHO reference population in terms of height-for-age is considered short for his or her age or stunted. We convert the range below -2SD as 1 (stunted) and others as 0 (not stunted). We follow same procedure for weight-for-height (wasting) and Weight-for-age (underweight) as well. Then we sum the values of these three types and categorize the sum values 1 or 2 or 3 as 1 and all other values which are 0 as 0. Research considered malnutrition as a dichotomous response variable and coded as “1” as malnourished child and “0” as nourished child.

Major risk factors for causing under five malnutrition were grouped into two factors: demographic factors and socio-economic factors. Demographic factors considered, “divisions, place of residence, respondent’s education, first birth age of respondents, age of child”. Respondent’s education, partner’s education, toilet quality, media exposure, type of cooking, wealth index of respondent’s, currently working, received BCG, diarrhoea in last two weeks were considered as a socio-economic factors.

Two models had been considered in this study. Model 1 considered malnutrition as a dependent variable and demographic factors as a explanatory variable. Model 2 considered socio-economic factors as a explanatory variable and malnutrition as dependent variable. In bivariate analysis, 27 variables were categorized as they were in the original file. Each woman’s age was recorded in complete year as well as in five year age group as 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, and 45-49. The region of the data set is referred the seven administrative divisions, Dhaka, Chittagong, Barisal, Khulna Rajshahi, Rangpur and Sylhet. According to the residence respondents we categorized them as urban, and rural. From literature we found that education is an important factor to have a sound health care facility. It is known to all that education opens the eyes and educated people are

more concern their nutritional status. In our study, the socio-economic variable representing respondent's education has four categories. These are categorized as no education, primary, secondary and higher. For family health awareness it is necessary to have education not only for respondent own but also her partner. Educated husbands are more concern about the health care of his wife and his coming baby. This socio-economic variable partner's education status categorized as no education, primary, secondary and higher education.

The variable religion was categorised as non-muslim and muslim. Household size was crucially related to child health. Household size was categorized as 1-5, 6-10 and 11 or more. A safe and adequate domestic water supply is an important resource to preserve good health. Available evidence suggests that drinking contaminated water adversely affects health of young children in developing countries. According to the WHO and UNICEF [2,7-12] definition, source of drinking water and sanitation were grouped as improved and unimproved.

The demographic variable, " number of under-five year children" in a household was categorized into two groups, 1-2 and 3 or more. Household head was classified into two classes such as male and Female. Mass media exposure has great impact on consciousness about child's health and nutrition and was computed from the data of reading newspaper, listening to radio and watching television. It was coded as no access to media and having access to media. Method of cooking was categorized as electricity or gas and wood or others. Wealth index was categorized into three categories such as poor, middle, rich. Moreover, bearing children at a young age involves substantial risks to the health of both the mother and child. First birth age of respondents was categorized as 10-18 and 19-49.

Breastfeeding Status of the Respondents was coded as No and Yes. Body mass index was categorized as 18.5 to 25 as normal BMI and remaining respondents are classified as not normal BMI. Currently working status was categorized as not currently working and currently working. Preceding birth interval in months was classified as 1 year or less and more than one year. Health Card was coded as not having health card and having health card. Received vaccination was categorized as not received vaccination and received vaccination. Diarrhoea in last two weeks was coded as not having diarrhoea in last two week and having diarrhoea in last two week. Size of child at birth was constructed by three categories, large, average and small. Delivery by caesarean section was coded as not caesarean method and caesarean method.

Univariate analysis was employed to estimate current malnutrition status. To determine the significance of association between variables, bivariate analysis was performed. Chi square tests for independence were applied to investigate the association between demographic and socio-economic factors and malnutrition status of a child. Based on the results of bi-variate analysis, variables were showing statistically significant association with malnutrition status were simultaneously entered into the multivariate logistic regression model. The multivariate technique Cox's linear logistic regression model [13] was applied to examine the net effect of each explanatory variable. The model is,

$$\pi_i = \frac{\exp\left(\beta_0 + \sum_{i=1}^p \beta_j X_{ij}\right)}{1 + \exp\left(\beta_0 + \sum_{i=1}^p \beta_j X_{ij}\right)}$$

Where  $l = 1, 2, \dots, n$ ;  $j = 1, 2, \dots, p$  and is the probability of success of binary dependent variable on ith risk factor.  $\beta_0$   $X_{ij}$  s are regression coefficients which are to be estimated.  $X_{ij}$  indicates j<sup>th</sup> category of i<sup>th</sup> risk factor. Since it is easier to interpret of odds, the logistic equation can be written in terms of odds as,

$$odds = \left(\frac{\pi_i}{1-\pi_i}\right) = \exp\left[\beta_0 + \sum_{i=1}^p \beta_j X_{ij}\right]$$

The exponential of the power  $\beta_j$  is the factor by which the odds change when the j<sup>th</sup> independent variables increased by one unit. If  $\beta_j$  is negative the factors will be less than 1, which leaves the odds unchanged. Data analysis were done with the help of statistical software SPSS 20.0 version.

## RESULTS AND DISCUSSIONS

Univariate analysis shows that 48.30% children under age five were malnourished and 51.7% children were nourished (Figure-1).

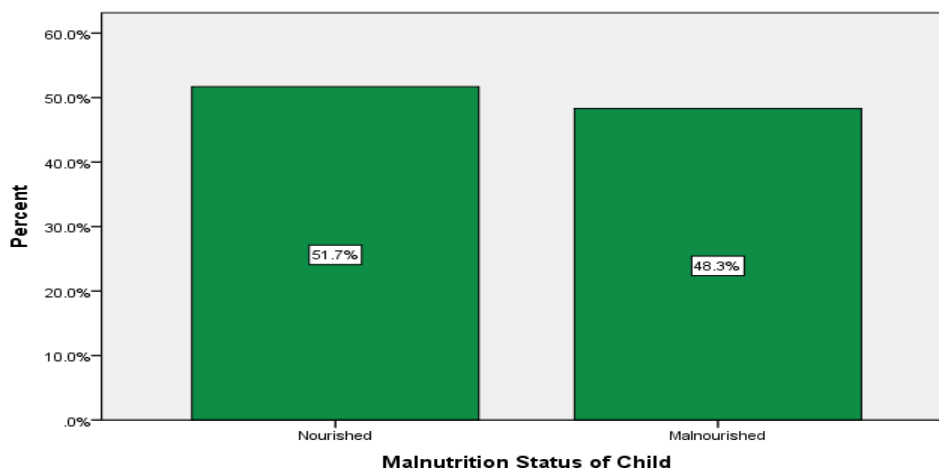


Figure 1. Malnutrition Status of Child.

Table 1. Bivariate association between malnutrition status of children under age five and their socio-demographic characteristics

Variables	Chi-Square	P-Value	Variables	Chi-Square	P-Value
Respondents age	2.84	0.24 *	Household Head	0.01	0.90 *
Division	73.60	0.00	Breastfeeding status	2.26	0.13 *
Place of residence	52.88	0.00	Body mass index	0.66	0.41 *
Respondents education	267.65	0.00	Currently working	16.35	0.00
Partner's education	265.01	0.00	Sex of child	2.24	0.13 *
Drinking water quality	2.71	0.10 *	Age of child in months	135.51	0.00
Birth order of current child	2.19	0.33 *	Preceding birth interval	0.21	0.64 *
Religion	2.51	0.11 *	Toilet quality	107.54	0.00
Household Size	0.64	0.72 *	Health card	2.14	0.14 *
Number of Under Five Year Children	0.22	0.63 *	Delivery by caesarean	0.07	0.78 *
Age at first birth of respondents	46.74	0.00	Diarrhoea in last two weeks	6.20	0.01
Media exposure	64.20	0.00	Child size at birth	0.76	0.68 *
Type of cooking	67.35	0.00	Received BCG	4.11	0.04
Wealth index	291.95	0.00			

Adopting the Chi-Square test of independence, it is identified that among the contextual factors, place of residence, media exposure, maternal education, partners education, sanitation quality, type of cooking, wealth index, division, current employment status, first birth age, age of child, child diarrhea status before two weeks of the survey all had a statistically significant association with malnutrition status of children of Bangladesh. To examine the net effect of each explanatory variable on malnutrition status, these significant covariates were entered into the multivariate regression model.

Table 2. Regression Parameter Estimates ( $\hat{\beta}$ ) using Binary Logistic Regression Model.

Variables	Categories	$\beta$	Wald	d.f	Sig.	Odds Ratio	Confidence Interval for exp( $\beta$ )	
							Lower	Upper
<b>Division</b>	Dhaka <sup>R</sup>	-	-	-	-	1	-	-
	Chittagong	0.25	9.85	1	0.00	1.29	1.10	1.51
	Barisal	0.29	10.38	1	0.00	1.34	1.12	1.61
	Khulna	-0.10	1.11	1	0.29	0.90	0.75	1.09
	Rajshahi	0.01	0.01	1	0.89	1.01	0.84	1.20
	Rangpur	0.00	0.00	1	0.93	1.00	0.84	1.20
	Sylhet	0.52	37.59	1	0.00	1.69	1.43	2.00
<b>Place of Residence</b>	Urban <sup>R</sup>	-	-	-	-	1	-	-
	Rural	0.33	38.82	1	0.00	1.39	1.25	1.55
<b>First Birth Age of Respondents</b>	10-18 <sup>R</sup>	-	-	-	-	1	-	-
	19-49	-0.33	43.28	1	0.00	0.71	0.64	0.79
<b>Age of Child (in months)</b>	0-11 <sup>R</sup>	-	-	-	-	1	-	-
	12-23	0.68	75.61	1	0.00	1.98	1.70	2.31
	24-59	0.74	128.1	1	0.00	2.11	1.85	2.40

**R=Reference Category**

From covariate division, six dummy variables were created by considering Dhaka as reference category. The result of logistic regression analysis shown in the table 2 describes that the children of Sylhet division had highest chance of being malnourished and there were 70% more likely to be malnourished than Dhaka division children. Children from Sylhet, Barishal and Chittagong had respectively 1.69 times, 1.34 times and 1.29 times higher risk of being malnourished as compared to children from other divisions. The chance of being malnourished in the children of Khulna division was 10% lower than Dhaka division. Rural children were 1.39 times more likely of being malnourished than the urban children. From the Covariate age at first birth, respondents whose age at first is 10-18 were considered as a reference category. It was seen that women who started childbearing later, their children were almost 30% less likely to be malnourished than those started childbearing early. Babies aged 12-23 months and 24-59 months were respectively 1.98 and 2.11 times more likely of being Binary Logistic Regression Analysis (Socio-economic characteristics).

**Table 4.** Regression parameter estimates ( ) using binary logistic regression model. R indicates reference category. Significance level: p-value < 0.05

Variables	Categories	$\beta$	Wald	P-value	Odds Ratio exp( $\beta$ )
<b>Respondent's Education</b>	No Education <sup>R</sup>	-	-	-	1
	Primary	-0.02	0.08	0.77	0.98
	Secondary	-0.34	16.36	0.00	0.70
	Higher	-0.52	15.41	0.00	0.59

<b>Partner's Education</b>	No Education <sup>R</sup>	-	-	-	1
	Primary	-0.13	3.58	0.05	0.87
	Secondary	-0.30	14.37	0.00	0.73
	Higher	-0.39	11.82	0.00	0.67
<b>Toilet Quality</b>	Improved <sup>R</sup>	-	-	-	1
	Unimproved	0.10	2.76	0.04	1.11
<b>Media Exposure</b>	No <sup>R</sup>	-	-	-	1
	Yes	-0.20	3.49	0.03	0.81
<b>Type of Cooking</b>	Electricity/Gas <sup>R</sup>	-	-	-	1
	Wood or others	0.07	0.78	0.38	1.08
<b>Wealth Index of Respondents</b>	Poor <sup>R</sup>	-	-	-	1
	Middle	-0.15	4.53	0.03	0.85
	Rich	-0.49	41.61	0.00	0.60
<b>Currently Working</b>	No <sup>R</sup>	-	-	-	1
	Yes	-0.14	6.09	0.01	0.87
<b>Received BCG</b>	No <sup>R</sup>	-	-	-	1
	Yes	-0.02	0.02	0.86	0.98
<b>Diarrhoea in Last Two Weeks</b>	No <sup>R</sup>	-	-	-	1
	Yes	0.24	3.89	0.04	1.27

Multivariate analysis shows that malnutrition status whose mothers studied up to secondary education were 30% less likely to have malnourished child than mothers who had no education in table 4. Similarly partner's education is found to be of the most important determinants of child malnutrition. The estimated coefficient shows declining trend with the level of partner's education. It is also observed that the relative chance of having malnourished children decreased with the increase of father's educational status. Risk of malnourished was 33% and 27% lower according to the children whose fathers had secondary and higher education, compared to the children of uneducated fathers. Wealth index is another strong indicator of child nutrition status. It is also found that malnutrition drastically varies by the wealth status of the mothers. The children of having middle and rich wealth index were 15% and 40% less likely to be malnourished than that of having poor wealth index. Respondents who were used unimproved toilet, their child's are 1.11 times more likely of being malnourished than who used improved toilet. The children whose mothers had media facility, risk of malnutrition were 19% lower compared to the mothers who didn't read newspaper, or watching TV or listening radio. Physical characteristics of a household (such as type of fuel for cooking) were used to assess the general wellbeing and socio-economic status of its members. Respondents who used wood or others for cooking were 1.08 times more likely of being malnourished child than who were using electricity or gas. Study reveals that babies whose mothers were currently working was 1.15 times less likely to be malnourished than who was not currently working.

Mothers receiving status of BCG did not show any significant effect on the child malnutrition ( $p\text{-value} > 0.05$ ). Children's diarrhea in last two weeks before the survey shows statistically significant relation with child malnutrition status. Here, those who affected by diarrhea in last two weeks before the survey were 1.27 times more likely to be malnourished than those who were not had this disease.

## RECOMMENDATIONS

For a healthy and active future generation, it is indispensable to adopt proper interventions in order to remove child malnutrition. The Children of today will be leaders and activists of tomorrow. Their quality and personality will determine the kind of destiny that beacons the nation. If these futures are weak and sick a nation cannot go so far. The study suggests that child nutrition depends on several factors. It is not possible to achieve the goal by controlling a single factor only. The study generates the following recommendations for reducing nutrition vulnerability:

1. Malnutrition has been found varying across divisions. The children of Sylhet, Chittagong and Barisal had significantly higher

odds of being malnourished compared to Dhaka division children. So, special attention is needed to reduce malnutrition in Sylhet, Chittagong and Barisal divisions.

2. Child malnutrition may be reduced by improving mother's education, mother's nutrition status and health service. There is no alternative to educate parents about the importance of a healthy and nourished baby. From this analysis it can also be recommended that women should start their childbearing between 19-35 years because teenage pregnancy may affect growth of their children.
3. Proper curative measures during common diseases, viz, diarrhea will help the children to be free from malnutrition. Therefore household members particularly mothers should be made conscious about the prevention and treatment of acute illness during childhood, supplementation of vitamin A capsule, importance of vaccination within first year of life to bring reduction in child malnutrition.
4. Access to media like newspaper, radio or television was found important factor for reducing malnutrition. Therefore mother should be encouraged to read newspaper, listening radio or watch TV. Malnutrition may be reduced by improving various facilities in rural areas such as health facility, sanitation quality etc. For improving overall childhood health and nutrition, it is necessary to reduce household wealth inequality since most of the children belonging to poor households had highest risk of being malnourished in any form.

### DISCUSSION AND CONCLUSION

Now a day's malnutrition is one of the important barriers for the development of a nation physically and socioeconomically. Research found that children from hill areas (e.g sylhet and Chittagong) have greater chance of being malnourished rather than other areas like Khulna and Dhaka. The place of residence was also found to be significant in child malnutrition status. Rural children were more malnourished than urban children. This is because rural people have less health facility than urban people. Age at first birth had a direct effect on fertility. Early initiation of childbearing lengthens the reproductive period and subsequently increases fertility. Research showed that prevalence of malnutrition increases with age. The reason may be deficiency of proper supplementary food for the children after 6 months of age. Malnutrition drastically varies by the educational levels of the mothers. The estimated coefficient shows declining trend with the level of education to the women, which revealed that children of mothers with no education were much more likely to be malnourished than children whose mothers had completed secondary and higher education. As educated mothers are conscious and know how to take proper care of her child, they have nourished child. On the other hand, the findings support reality that the educated fathers were also conscious about their children health than illiterate fathers. There was a declining trend in the level of wealth status of a woman. Usually children belonging to rich family have better nutrition status than the children of lower income family. Results obtained from the models indicate that the risk of being malnourished for the children decreased with the increase of household wealth index. Mothers who had media facilities, their children were less malnourished. One of the important reasons is that respondents who have access to media are more conscious about child caring and nutrition.

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