

# Mothers nutritional status in an impoverished nation: Evidence from rural Bangladesh

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## Citation

M Rahman, S Nasrin. *Mothers nutritional status in an impoverished nation: Evidence from rural Bangladesh*. The Internet Journal of Nutrition and Wellness. 2008 Volume 7 Number 1.

## Abstract

**Objectives:** The aim of this study was to assess and to identify the factors associated with nutritional status of rural mothers in Bangladesh. **Methodology:** Bangladesh Demographic Health Survey data 2004 for last five years (N=3329) were used for this study. Women's nutritional status was defined in terms of Body Mass Index (BMI/wt in kg/ht in m<sup>2</sup>). Descriptive and multivariate logistic regression methods were employed in analyzing the data. **Results:** It was observed that although maximum numbers of rural mothers were nourished (56.3%) a large portion of them was acute malnourished (43.7%) and the mean height for all ages of women is 150.43 centimeters. This study elucidates that maternal weight was consistently lower for older women and women with higher fertility. Bivariate analysis shows that mothers whose mobility about own health care was not restricted are in the higher percentage of normal weight (57.9%) also the percentage of having normal weight is higher among mothers who gave their first birth at middle age ( $\geq 30$  years) than among the mothers give their first birth during adolescence and women with higher age group. Multivariate logistic regression analysis shows that women who worked for cash were two-and-a-half times more probability of becoming nourished than among women did not work for cash. Women whose husbands had a lower status job were suffering more from acutely malnutrition. It was also found that women with lower household assets index have the highest rates of malnutrition. The other main contributing factors likely to affect nutritional status of women were respondent's education, husband's education, vitamin A and iron supplementation. **Conclusions:** The results indicate several policy options: (a) dietary intake needs to be improved for older higher fertility women; (b) it is equally important that education for women and increased cash incomes is emphasized to bring about a lasting impact on the overall health and nutritional condition of women; (c) there is need to ensure availability of iron and vitamin A supplements; (d) much more attention needs to be placed on reducing household poverty and increasing rural nutritional resources; (e) greater efforts should be made to increase availability and access to food by households and by women. Poor rural households need access to skills training for homestead gardening, income-generating activities and credit which will allow them to purchase or grow more food.

## INTRODUCTION

Possessing a land area of 147,570 square kilometers and over 15 million populations, Bangladesh is the ninth most populous country and one of the most densely populated countries in the world <sup>1</sup>. Over population and poverty are pervasive in Bangladesh and causing population hazards like the problems of malnutrition. Specially, women are particularly vulnerable; suffering from social, economic and nutritional deprivation to a far greater extent than men <sup>2</sup>. The high prevalence of under nutrition in Bangladesh is popularly attributed to a combination of extreme poverty, environmental insult and poor health.

Maternal malnutrition is a chronic problem in rural Bangladesh. Even though the country is self-sufficient in rice production, the diet of rural people is very low in energy

and micronutrients because households do not have access to the resources they need to grow or purchase enough food.

The typical diet is predominantly rice because people cannot afford other nutritious foods such as pulses, vegetables, fruits and animal products. Girls and women often eat last and least in the household due to the persistence of cultural practices that favour boys and men. Consequently, mothers do not eat enough food to meet their energy and micronutrient needs, particularly during pregnancy when these needs are greatest <sup>3</sup>. For social and biological reasons, women in the reproductive age group and children are most vulnerable to malnutrition due to low dietary intakes, inequitable distribution of food within the household, improper food storage and preparation, dietary taboos, infectious diseases, and care. Particularly for women, the high nutritional costs of pregnancy and lactation also

contribute significantly to their poor nutritional status. Under nutrition threatens both the health and survival of mothers because it increases their susceptibility to life-threatening diseases and their risk of dying, especially during childbirth. Undernourished mothers are often physically weak and are unable to perform income-earning activities and household work to their full potential. Mothers who are undernourished before or during pregnancy are more likely to give birth to underweight infants. These infants face a disadvantaged future: they may grow poorly during childhood, do less well at school, and have less productive working lives. In addition infant girls with low birth weight are more likely to become undernourished mothers themselves, thereby perpetuating the cycle of under nutrition from one generation <sup>4</sup>. A recent small-scale study of carried out by NSP survey 2000 of 57000 women revealed that almost one half (45%) of rural mothers and one third (34%) of mothers in urban slums have a BMI less than 18.5 kg/m<sup>2</sup> and are undernourished. Using population projections from the 1991 census, an estimated 9 million women of childbearing age (15-44 years) are undernourished in rural Bangladesh compared with only 0.8 million women in a developed <sup>5</sup>.

As under nutrition impedes social and economic development, policies and programs are needed to address the factors responsible for mothers' poor nutritional status. In order to design appropriate interventions, key stakeholders in health and development need to understand how many mothers are affected, which mothers are at greatest risk, and why these mothers are undernourished. This paper documents the extent of under nutrition among rural Bangladeshi women of childbearing age, and explores a number of socioeconomic factors thought to explain its genesis and distribution. For the purposes of analysis, we employ BMI as a simple and reliable measure of adult nutritional status. It is expected that the findings will lead to consider alternative program strategies for the reduction of poor nutritional status of the mothers of reproductive ages.

## **MATERIALS AND METHODS**

This study utilizes the data extracted from 2004 Bangladesh Demographic and Health Survey (BDHS), which were conducted under the authority of the National Institute of Population Research and Training of the Ministry of Health and Family Welfare in Bangladesh. This study considered only the case for rural children of last five years before the survey i.e., children under five years of age only (N=3269). Bivariate analysis was performed to determine the differentials of nutritional status among women by

explanatory variables. Pearson's Chi-square test of independence was performed to test the existence of significant association between categories of nutritional status and selected risk factors. Considering the fact that among multivariate techniques the Cox's linear logistic regression model is algebraically simple, computationally straightforward and efficient with acceptable degree of precision for a binary dependent variable, this study applied Cox's linear logistic regression model <sup>6</sup> for multivariate analysis.

This study considered the U.S. National Center for Health Statistics (NCHS) standard, for the classification of malnutrition, because of its widely acceptance and is a common recommendation of the World Health Organization. Based on the available information, this study examined the influences of the following risk factors affecting nutritional status of women. Demographic and health care factors: mother's age at birth, children ever born, respondent's say on own health care, micronutrient intake, Socio-economic factors: geographic region, mother's education, mother's occupation, father's education, father's occupation, exposure to media, religion, and household assets index. The study considered 13 independent variables in bivariate analysis, which were categorized as they were in the original data file. In multivariate analysis some variables were recoded for more specification on categories. Mother's body mass index was classified as acute malnourished mother who had less than 18.5 kg/m<sup>2</sup> body mass index (BMI), and nourished mother who had greater than or equal to 18.5 kg/m<sup>2</sup> BMI. The classification of BMI adopted from WHO, 1995; WHO, 2000; WHO, 2004.

## **RESULTS**

Mothers Nutritional Status (an assessment measured by BMI index)

If a mother has normal weight we consider that she is not suffering from malnutrition i.e., she is well-nourished. Table 1 reveals that although maximum numbers of rural mothers have normal weight (56.5%) a large portion of them have unhealthy weight (40.1%) of them 25.3% mild thin, 9.5% moderate thin and 5.3 % severe thin mothers. Only 3.1% rural mothers were over weighted and obesity is about rare (0.2 %).

**Figure 1**

Table 1: Percentage distribution of mothers BMI

Mothers BMI (kg/m <sup>2</sup> )	Frequency	Percentage (%)
Severe thinness (<16.00)	174	5.3
Moderate thinness (16.00-16.99)	310	9.5
Mild thinness (17.00-18.49)	827	25.3
Under weight (≤18.50)	1311	40.1
Normal (18.50-24.99)	1848	56.5
Over weight (≥25.00)	100	3.1
Obese (≥30.00)	10	0.2
Obese class I (30.00-34.99)	8	0.2
Obese class II (35.00-39.99)	1	0.0
Obese class III (≥40.00)	1	0.0
<b>Total</b>	<b>3269</b>	<b>100.0</b>

Source: Adapted from WHO, 1995, WHO, 2000 and WHO 2004

Data on the height and weight of ever-married women ages 10-49 were used to derive two measures of nutritional status: Height and Body Mass Index (BMI). A woman height can be used to predict the risk of having difficulty in pregnancy, given the relationship between height and pelvic size. The risk of given birth to low-weight babies is also higher among women of small stature. The cutoff point at which mothers can be considered at risk because of short stature is normally taken to be between 140 and 150 centimeters. The main advantage of the BMI is that it does not require a reference table from a well-nourished children population. Table 2 shows the percentage distribution of rural mother's weight status, mean height and mean BMI according to current age.

**Figure 2**

Table 2: Percentage distribution of rural mother's weight, mean height and mean BMI according to current age.

Age groups	Number of women	Mothers BMI (%)				Mean BMI	Mean height (centimeters)
		Under weight (≤18.50)	Normal (18.5-24.9)	Over weight (≥25.00)	Obesity (≥30.00)		
<20 years	620	45.0	54.2	0.6	0.2	18.93	150.02
20-29 years	1862	38.2	58.2	3.3	0.3	19.50	150.54
30-39 years	697	39.9	54.8	4.9	0.4	19.53	150.34
40-49 years	102	52.9	46.1	0.0	1.0	18.64	151.62
<b>Total</b>	<b>3281</b>	<b>40.3</b>	<b>56.3</b>	<b>3.0</b>	<b>0.3</b>	<b>19.36</b>	<b>150.43</b>

The result in the table 2 indicates that mean height for all ages of women is 150.43 centimeters and mean BMI is 19.36. The table 2 shows that maximum normal weighted women (58.2%) are in the age group 20-29 years and the minimum (46.1%) are in the age group 40-49 years. The table also reveals that among the married women whose current age is <20 years and between 40-49 years, 45.0% and 52.9% fall in the under weighted category respectively. It is also seen that, the percentage of over weighted mothers is higher (4.9%) in the 30-39 years age group as compared to the mothers of other age groups and there are few mothers in the obesity group, only 1.0% mothers of 40-49 years age group are in obesity and this percentage is comparatively

higher than the mothers of other age groups.

Differentials of Rural Mothers Nutritional status by Selected Characteristics

Table 3 presents differentials of rural mother's nutritional status (an assessment measured by BMI) by selected characteristics. The results presented in table 3 elucidates that about 57.5% respondents have normal weight who gave their first birth when they were 20-30 years old followed by 56.1% and 47.4% respondents have normal weight who gave their first birth at below age 20 and ≥30 years. The percentage of under weighted and over weighted mothers is found to be highest (47.4% and 5.3% respectively) among aged respondents (≥30 years). The respondents who have 1-2 child have normal weight (56.8%), under weight (40.1%), over weight (2.9%) and obesity (0.2%). The percentage of healthy weighted mothers is found to be highest (58.2%) in Sylhet division and the percentage of under weighted (41.4%) respondents is found to be highest in Rajshahi division. The percentage of over weighted mothers is lowest (1.8%) in Chittagong division.

**Figure 3**

Table 3: Percentage distribution of mother's BMI according to some selected background characteristics

Background characteristics	Mothers BMI in new group				Number of cases
	Under weight	Normal weight	Over weight	Obesity	
<b>Respondents age at first birth</b>					
<20 years	40.6	56.1	3.1	0.1	2681
20-30 years	38.7	57.5	2.8	1.0	581
30+ years	47.4	47.4	5.3	0.0	19
<b>Children ever born (CEB)</b>					
1-2 children	40.1	56.8	2.9	0.2	1699
3-4 children	40.4	56.2	2.9	0.4	984
4+ children	40.7	55.1	3.7	0.5	597
<b>Geographic region</b>					
Barisal	39.6	57.2	2.9	0.2	409
Chittagong	41.1	56.6	1.8	0.5	666
Dhaka	40.8	54.9	4.3	0.0	649
Fhalna	40.3	57.2	2.3	0.2	437
Rajshahi	41.4	55.2	3.2	0.3	694
Sylhet	37.3	58.2	3.8	0.7	426
<b>Respondents education</b>					
No education	40.8	53.6	5.6	0.6	1244
Primary	40.2	56.4	3.2	0.2	1032
Secondary	39.7	57.6	2.6	0.1	880
Higher	40.8	55.6	3.3	0.0	125
<b>Respondents employment status</b>					
Working for cash	42.3	58.8	3.6	0.7	26
Working not for cash	37.4	53.3	3.8	0.3	417
<b>Husbands education</b>					
No education	41.1	55.3	3.1	0.4	1349
Primary	39.7	57.2	2.9	0.1	926
Secondary	40.1	56.8	2.6	0.4	755
Higher	38.3	57.3	4.4	0.0	248
<b>Husbands occupation</b>					
Manual	40.3	55.5	3.6	0.0	
Non-manual	39.8	56.5	2.6	0.9	
Others	44.2	48.8	7.0	0.0	
<b>Religion</b>					
Muslim	39.9	56.7	3.1	0.3	2985
Non-Muslim	45.4	51.9	2.4	0.3	293
<b>Exposure to media</b>					
Yes	40.1	56.9	2.7	0.3	2040
No	40.7	55.4	3.6	0.2	1239
<b>Respondents micronutrient intake</b>					
Yes	40.1	57.5	2.4	0.0	459
No	40.3	56.2	3.2	0.4	2821
<b>Respondents say on own health care</b>					
Have no restriction	39.2	57.9	2.7	0.2	1422
Have restriction	41.2	55.1	3.3	0.4	1859

Regarding respondents level of education it is observed that 57.6% secondary educated respondents have normal weight followed by 56.4% primary educated, 55.6% higher educated and 53.6% illiterate respondents. The percentage of under weighted respondents (40.8%) is same among the respondents who are illiterate and higher educated. Incase of over weight, 5.6% illiterate respondents were over weighted followed by 2.6% secondary, 3.2% primary educated and 3.3% higher educated respondents. In case of husband's education 57.3% respondents whose husbands were higher educated have normal weight followed by 38.3% have under weight, 4.4% have over weight. It is also seen that about 58.3% respondents who were not working for cash i.e. who were engaged in their household activities have normal weight followed by 53.8% respondents who were working for cash. The percentage of normal weighted respondents is highest (55.5%) among the respondents whose husbands are non-manual worker followed by 56.5% manual worker also 56.7% Muslim mothers have normal weight followed by 51.9% non-Muslim mothers.

The percentages of respondents who were exposed to mass

media of them 56.9% who have healthy weight, 40.1% were under weighted and the remaining 2.4% were over weighted. The table 3 also depicts that 57.5% of the respondents who received vitamin "A" within two months after delivery have normal weight followed by 56.2% respondents who did not take that vitamin. The mothers whose mobility about own health care was not restricted are in the higher percentage of normal weight (57.9%) followed by 55.1% respondents whose mobility was restricted about that matter.

**DETERMINANTS OF RURAL MOTHERS' NUTRITIONAL STATUS: A MULTIVARIATE LOGISTIC REGRESSION ANALYSIS**

From table 4 it is appeared that mothers who gave first birth at age 20-30 years have 1.34 times higher probability of nourished and the mothers who gave their first birth at age >30 years having 0.875 times lower probability of becoming nourished than among the adolescence mothers (<20 years). Mothers who received vitamin "A" tablets and iron supplementation in the first month after delivery have 1.46 and 1.10 times higher probability of becoming nourished as compared to the mothers who did not received vitamin "A" tablets and iron supplementation. Considering no education as reference category, the relative odds ratio corresponding to primary, secondary and higher educated mothers are 1.028, 1.003 and 1.001, indicating that primary, secondary and higher educated mothers were 1.028, 1.003 and 1.001 times more probability of becoming nourished than among mothers with no education..

Figure 4

Table 4: Logistic regression estimates of the effects of some selected background characteristics on the rural mothers BMI for the five year preceding the survey.

Background Characteristics	Coefficient of $\beta$	Odds ratio Exp ( $\beta$ )
<b>Mothers age at first birth</b>		
<20 years*	--	1.000
20-30 years	0.293	1.340
$\geq 30$ years	-1.445	0.875
<b>Mothers vitamin "A" supplementation</b>		
No*	--	1.000
Yes	0.382	1.465***
<b>Mothers iron supplementation</b>		
No*	--	1.000
Yes	0.563	1.100**
<b>Mothers education</b>		
No Education*	--	1.000
Primary	0.028	1.028***
Secondary	0.003	1.003
Higher	0.006	1.001**
<b>Husbands education</b>		
No Education*	--	1.000
Primary	0.486	1.626*
Secondary	-0.156	0.855
Higher	0.288	1.334**
<b>Husbands Occupation</b>		
Manual*	--	1.000
Non-manual	0.073	1.123*
Others	-0.656	0.519
<b>Respondent's employment status</b>		
Work for not cash*	--	1.000
Work for cash	0.012	2.123***
<b>Religion</b>		
Non-Muslims*	--	1.000
Muslims	0.538	1.713
<b>Household assets index</b>		
Lower*	--	1.000
Middle	0.178	1.123
Upper	0.208	1.232***

\*Reference category. \*\*\*, \*\*, \* indicates  $p < 0.001$ ,  $p < 0.01$  and  $p < 0.05$

It is also found that women whose husbands were primary and higher educated have 1.6269 and 1.334 times higher probability of nourished. The table 4 also depicts that Muslim mothers were 1.71 times more probability of becoming nourished as compared to the non-Muslim mothers and women whose husbands were non-manual workers ( service man, businessman etc., ) were 1.123 times more probability of becoming nourished than among mothers whose husbands were involved in manual works ( day labour, farmers etc., ). It is also found that women with upper class assets have 1.232 times more probability of becoming nourished.

**DISCUSSION**

This study was designed to give a scenario of mother's nutritional status in rural Bangladesh. Women's nutritional status was defined in terms of Body Mass Index (BMI/wt in kg/ht in m<sup>2</sup>). The study found that although maximum numbers of rural mothers were nourished a large portion of them was acute malnourished. A woman height can be used to predict the risk of having difficulty in pregnancy, given the relationship between height and pelvic size. The risk of given birth to low-weight babies is also higher among women of small stature. The cutoff point at which mothers can be considered at risk because of short stature is normally

taken to be between 140 and 150 centimeters. The result in our study indicates that mean height for all ages of women is 150.43 centimeters.

Both bivariate and multivariate analyses indicated that the educational level of wife was positively related to the better nutritional status of women. This is likely to be attributed because education may enable women to make independent decisions, to be accepted by other household members, and to have greater access to household resources that are important to nutritional status <sup>7</sup>. A comparative study on maternal malnutrition in ten sub-Saharan African countries <sup>8</sup> and a study in the SNNPR of Ethiopia <sup>9</sup> showed that the higher the level of education, the lower the proportion of undernourished women.

In this study husbands' education and occupation emerged as important factors that were significantly associated with underweight status among mothers. Analysis showed that mothers whose fathers had higher level of education and professional workers were lower in proportion of weight deficiency than those with illiterate and manual workers fathers. Usually father is the main earner and decision maker of a family and so their higher level of education plays an important role to ensure better nutritional status of the family members. The Nutrition Survey of Rural Bangladesh illustrated that fathers engaged in professional works average per capita calorie intake increased by 300 cal from the lowest to than the fathers engaged with manual works.

The observation that mothers who worked for cash are better nourished is most likely to be attributed due to the fact that women's employment increases household income, with consequent benefit to household nutrition in general and the woman's nutritional status in particular. Employment may increase women's status and power, and may bolster a woman's preference to spend her earnings on health and nutrition. Though employed, women without control over their income and decision-making authority within the household are deprived of economic and social power and the ability to take actions that will benefit their own well-being. Studies in Africa have indicated that, at similar levels of income, households in which women have a greater control over their income are more likely to be food secure <sup>10</sup>

Intake of Vitamin A and iron supplementation also has positive effect on better nutritional status of women. . Vitamin A supports growth especially sketal growth <sup>11</sup>. Our study revealed that the proportion of acutely malnourished mothers was significantly greater among those who had not

taken vitamin A and iron supplementation. The household assets index is an indicator of child and maternal nutritional status. This study elucidates that women with upper class assets have 1.232 times more probability of becoming nourished than mothers with lower quality of household assets index. Rathavuth Hong (2006)<sup>12</sup> found from a case-control study on 977 children aged 0-59, in Bangladesh that mothers poorest household assets are more than three times as likely to suffer from acutely malnourished from the wealthiest households assets index.

Our study also elucidates that higher fertility women appear were more suffering from acute malnutrition this may be probably due to the fact that women with higher fertility to be at greater risk for poor nutritional status because of the stresses of multiple pregnancies and lactations with inadequate recuperative intervals between pregnancies rather than from the stress of excessively long duration of lactation. An overlap of pregnancy and lactation caused additional stress.

These results confirm the importance of programs to improve maternal nutritional status, especially in light of the high levels of chronic malnutrition in Bangladesh. There is a need to improve nutritional levels of girls and women prior to and subsequent to pregnancy, in order that the current patterns of maternal depletion syndrome seen among older, higher parity women can be prevented. These results suggest that much more attention needs to be placed on reducing household poverty, increasing rural nutritional resources. It was found that women's employment for cash is an important determinant of her nutritional status Therefore; strategies must be developed to increase women's productivity per unit of time both in paid work and in domestic production so that women can increase their incomes without scarifying additional time, their children's welfare, or their own health and nutritional status. This may include introducing appropriate technology, which can both augment income-earning opportunities and reduce time constraints. Supporting institutions seeking to empower rural women could be important interventions to improve their nutrition status. The results showed that education of husband and wife are important determinants for mother's nutritional status. Educated mothers are at a lower risk of malnutrition. It is therefore imperative that young girls and boys be enrolled in compulsory primary school education and opportunities should also be given to adult women and

men to take part in non-formal education. Health and nutrition education should also be an integral part of the education process. Adequate birth spacing, especially for rural women, should be promoted; this means that access to family planning must be improved to make birth spacing. Dietary intake needs to be improved for older higher fertility women

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