

# Prevalence and associated factors of anaemia among pregnant women in a rural area of Bangladesh

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## **Abstract**

This study describes the anaemia prevalence and associated factors among pregnant women in a rural community in Bangladesh. The study women were recruited from 50 BRAC antenatal care centres. A total of 216 pregnant women during second trimester of pregnancy were included from rural communities of Mymensingh during May to November 1997. Information was collected on demographic and socioeconomic factors, reproductive history, last menstrual period, fundal height, mid upper arm circumference, haemoglobin concentration as well as ascaris and hookworm infestations. The result indicates that 56% of the pregnant women were found anaemic according to the WHO criteria. There was no case of severe anaemia and the prevalence of mild and moderate anaemia was 22.7% and 32.9% respectively. Women's age, household landholding and occupation categorised as farming and non-farming were significantly associated with the anaemia prevalence ( $p < 0.05$ ). Malnourished women in farming households had higher anaemia prevalence. However, nutritional status was not associated with anaemia prevalence among women in non-farming households ( $p > 0.05$ ). Anaemia seems to have very high prevalence among pregnant women irrespective of their parity and socioeconomic status. Further studies are required to investigate the causes of anaemia during pregnancy.

## INTRODUCTION

Anaemia is a major public health problem and it is estimated that 2.2 billion individuals are anaemic worldwide (1). Pregnant women are worst affected, particularly in developing countries. The prevalence has been estimated to be 59% in developing countries in contrast to 11% in developed countries (2).

Anaemia may have multiple causes. However, iron deficiency is generally considered the most common cause of anaemia during pregnancy (3). A number of studies indicate that anaemia was associated with negative outcomes such as increased risk of low birth weight, preterm birth and perinatal mortality (4-9). Furthermore, anaemia during pregnancy, directly or indirectly, contributes with a large proportion of maternal deaths in developing countries (10).

The anaemia prevalence is known to be high in South Asia. Studies done among Indian rural pregnant women showed anaemia prevalence ranging from 51% to 88% (11). In Bangladesh, community-based data on anaemia prevalence during pregnancy is limited. National Nutrition Survey in 1995-96 revealed an anaemia prevalence of 60% among pregnant women (n=70) (12). In addition, a few smaller community-based surveys estimated the prevalence among pregnant women ranging from 42-60% (13-15).

Bangladesh is one of the poorest countries in the world, with per capita Gross Domestic Product of US\$ 240 (16). More than 55% of the total population do not have access to health care services, which is indicated by high infant and maternal mortality rate of 77 per 1,000 live births and the maternal mortality rate of 850 per 100,000 live births (17). BRAC, a large non-governmental organisation (NGO) in Bangladesh, provides iron supplements to the rural pregnant women as a component of its regular antenatal care activities. Each antenatal care centre (ANCC) is community-based, covering about 150 households and managed by a woman Community Health Worker (CHW) who is popularly known as Shasthya Sebika (18). Data for this paper are drawn from the base-line assessment of an iron

supplementation study (19).

The aim of this paper is to describe the prevalence and identify the associated factors of anaemia among pregnant women in a rural community in Bangladesh.

## **SUBJECTS AND METHODS**

### **Study area**

The study was conducted in two rural communities of Mymensingh district in Bangladesh from May to November 1997. Mymensingh is located about 110 km north of Dhaka City, the capital of Bangladesh. The study area has high population density, plain agricultural land, low literacy and limited access to health services similar to the rest of the country. Major crops grown include rice, jute, wheat, beans and a variety of seasonal fruits and vegetables. The diet is dominated by rice, lentils and vegetables, and occasionally meat and fish. It is estimated that the contribution of animal product in an average Bangladeshi diet is less than 10% (Jahan & Hossain 1998). According to the district health office, Mymensingh is not a malaria endemic zone and there has not been any reported case of HIV in the study area, which are associated with high anaemia prevalence.

### **Subjects**

The study women were recruited from 50 ANCCs organised by BRAC in rural areas of Mymensingh. In the catchment area of each ANCC, all new pregnancies were identified by the CHW. Pregnant women who had a gestational age less than 24 weeks and had not taken iron supplements during current pregnancy were registered. All the pregnant women were then requested to visit their respective ANCC for a maternity check-up on a specific day. On the day of ante-natal care services, the first four women who visited the ANCC, who had a fundal height less than 22 cm that corresponds to 24 weeks of gestation (ICDDR,B 1994), and who had not taken any iron supplements and who consented to participate were included in the study. Sixteen additional women who refused to participate any more in the iron supplementation trial immediately after the first venipuncture were also included. Thus, a total of 216 pregnant women from 50 ANCCs participated in this study. The original study protocol was approved by the ethical committee of the Bangladesh

### **Data collection**

Data were collected on the study women through house-to-house visits. These included factors related to demographic, socioeconomic, reproductive history and last menstrual period (LMP). The LMP was recalled by the women assisted by a local calendar of events. At the ANCC, the data collected from each participating woman were fundal height in cm measured with a measuring tape; mid upper arm circumference (MUAC) measured in mm with a TALC numerical insertion tape; and haemoglobin (Hb) concentration determined on venous blood with the use of a portable haemoglobin photometer based on an azidimethemoglobin method with the accuracy varified regularly by using a standard cuvette. The HemoCue method has been shown to be comparable in accuracy and precission with the standard cyanmethemoglobin method (20). The quality of the Hb concentration estimation done by the HemoCue photometer was found to have high accuracy compared with a standard laboratory method in a pilot study conducted in the same area (21). Furthermore, stool samples were collected from all participating women to detect ascaris and hook worm infestations by microscopic examinations.

A field supervisor visited the households and ANCCs during the data collection to ensure that the instruments used were properly calibrated. The supervisor performed re-interviews and re-measurements on a sub-sample of the women for quality control. Questionnaire were checked for consistency and accuracy. In a few cases, the interviewers went back to the households and re-interviewed the women.

Anaemia during pregnancy has been defined as a Hb concentration less than 110 g/L (2). A number of variables were tested as potential factors being associated with anaemia. These were: age; parity; nutritional status; household landholding; household principal occupation; women's education; household ownership of assets such as watch, mosquito net, radio and bi-cycle; women's personal ownership of assets such as watch, silver ornaments, poultry, goat, home garden and number of sarees; type of latrine used; and construction material of wall of main living house. Mid upper arm circumference (MUAC) less than 220 mm was defined as malnourished. Household total landholding less than 50 decimals was defined as

landless. Household principal occupation in last one year was categorised as farming (own land and/or some one else land) and non-farming. Type of latrine was categorised as fixed and not fixed based on its location. Construction material of wall of main living house was categorised as poor (straw or polythene), moderate (GI sheet) and good (processed mud or brick and cement).

### **Data analysis**

Bivariate analysis was done to determine if the participating women differed from non-participating women with respect to age, reproductive history and socioeconomic status. Bivariate and stratified analyses were carried out to examine the associated factors of anaemia prevalence. Difference between two mean values was assessed using the t-test. The Mann-Whitney U test was done to test the level of significance of the difference between medians. Chi square test and Mantel-Haenszel test for linear association were used to test the relationship between the categorical variables. A result was regarded as statistically significant if the *p*-value was equal or less than 0.05.

## **RESULTS**

A total of 611 pregnant women were identified from within the households covered by the 50 ANCCs of which 216 participated in the study. A comparison of main characteristics between participating and non-participating women was done (Table 1). The participating women did not differ significantly from the non-participating women in terms of their age and gestational age at recruitment. Parity of the participating women was lower compared to the non-participating women. More participating households were involved in farming compared to the non-participating households. A higher proportion of participating women had access to a fixed latrine. There was no difference between the groups in terms of household land ownership, women's education, household or women's personal assets and construction material of wall of main living house.

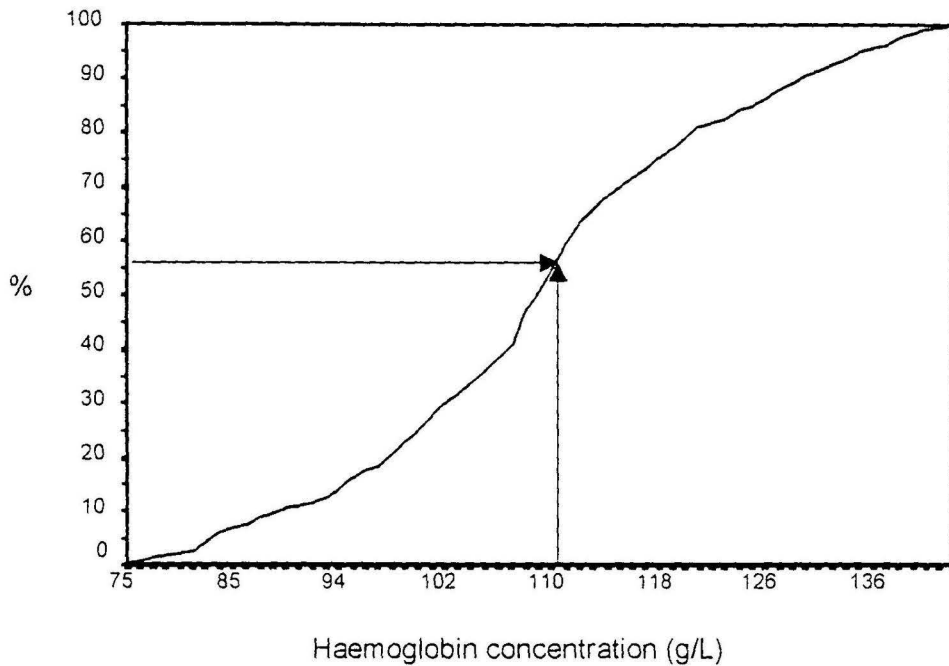
**Table 1. Comparison between participating and non-participating women**

<b>Factors</b>	<b>Participating (n=216)</b>	<b>Non-participating (n=395)</b>	<b>p- value</b>
<b><u>Age and reproductive history</u></b>			
Age in year (median)	24.0	24.0	0.72
Parity (median)	1.0	2.0	0.02
Gestational age in week at time of recruitment (median)	18.6	17.9	0.32
<b><u>Socio-economic status</u></b>			
Landless households, % <50 decimals	62.5 47.7	69.6 37.0	0.07 0.001
Farming households, %			
Women's education, %	44.4	50.1	
Can not sign	17.1	18.7	
Can sign only	26.9	22.3	
Up to primary	11.6	8.9	0.33
Secondary and above			
Household asset ownership, % yes	30.1	31.4	0.74
Watch	16.7	17.0	0.93
Cot	87.5	85.6	0.51
Mosquito net	18.5	21.5	0.38
Radio	13.9	9.9	0.13
Bi-cycle			
Women's personal asset ownership	8.8	7.1	0.45
Watch, % yes	75.9	76.2	0.94
Silver ornaments, % yes	56.5	49.1	0.08
Poultry, % yes	13.0	10.6	0.39
Goat, % yes	6.5	5.3	0.55
Home garden, % yes	3.0	3.0	0.60
Number of saree, median	54.6	44.1	0.01
Households with fixed latrine, %			
Construction material of wall, %	61.9	65.7	
Poor (Straw/polythene)	16.8	15.7	
Moderate (GI sheet)	21.4	18.5	0.82
Good (Processed mud and brick)			

The anaemia prevalence among study women was 56% (95% confidence interval: 49%, 62%) (Figure 1). Mean haemoglobin concentration was 109.5±14.5 g/L. The prevalence of moderate (Hb concentration 70-99 g/L) and mild (Hb concentration 100-109 g/L) anaemia was 22.7% and 32.9% respectively. There was no case of severe anaemia (Hb concentration <70 g/L) in the sample.



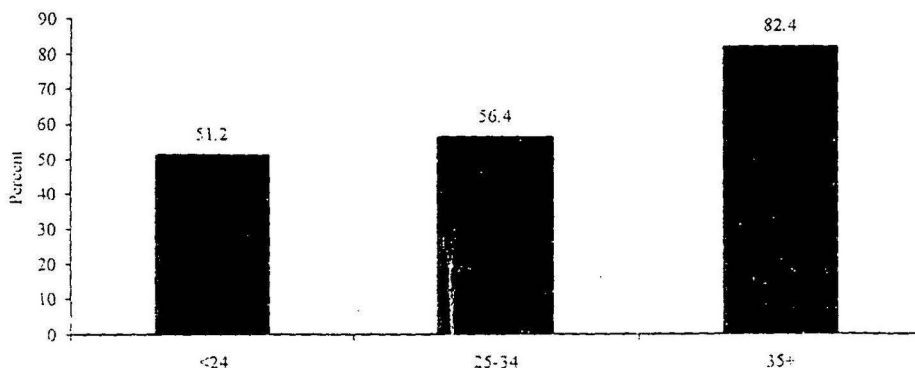
**Figure 1. Cumulative percentage of Hb concentration distribution of pregnant women (n=216)**



**Age**

The mean age for the anaemic and non-anaemic groups was 25 years and 24 years respectively. Anaemia was most prevalent (82.4%) in the 35 years and above (n=37) age group followed by 56.4% in 25-34 years age group (n=58) and the lowest was 51.2% in the <24 years age group (n=121) (Figure 2). After controlling for parity in a logistic regression analysis, older women (35 years and above) had 2.2 times higher chance of being anaemic compared to the younger women (<24 years) (p=0.02).

**Figure 2. Prevalence of anaemia according to age groups**



### Parity

The mean parity of the anaemic and non-anaemic women was 2.0 and 1.8 respectively. Parity did not show a significant association with the anaemia prevalence ( $p=0.83$ ). However, the anaemia prevalence was as high as 70% among women with parity 5 or more.

### Parasites

The prevalence of ascaris and hookworm among the study women were 39.2% and 1.4% respectively. Parasitic infestation was not significantly associated with the anaemia prevalence.

### Socioeconomic status

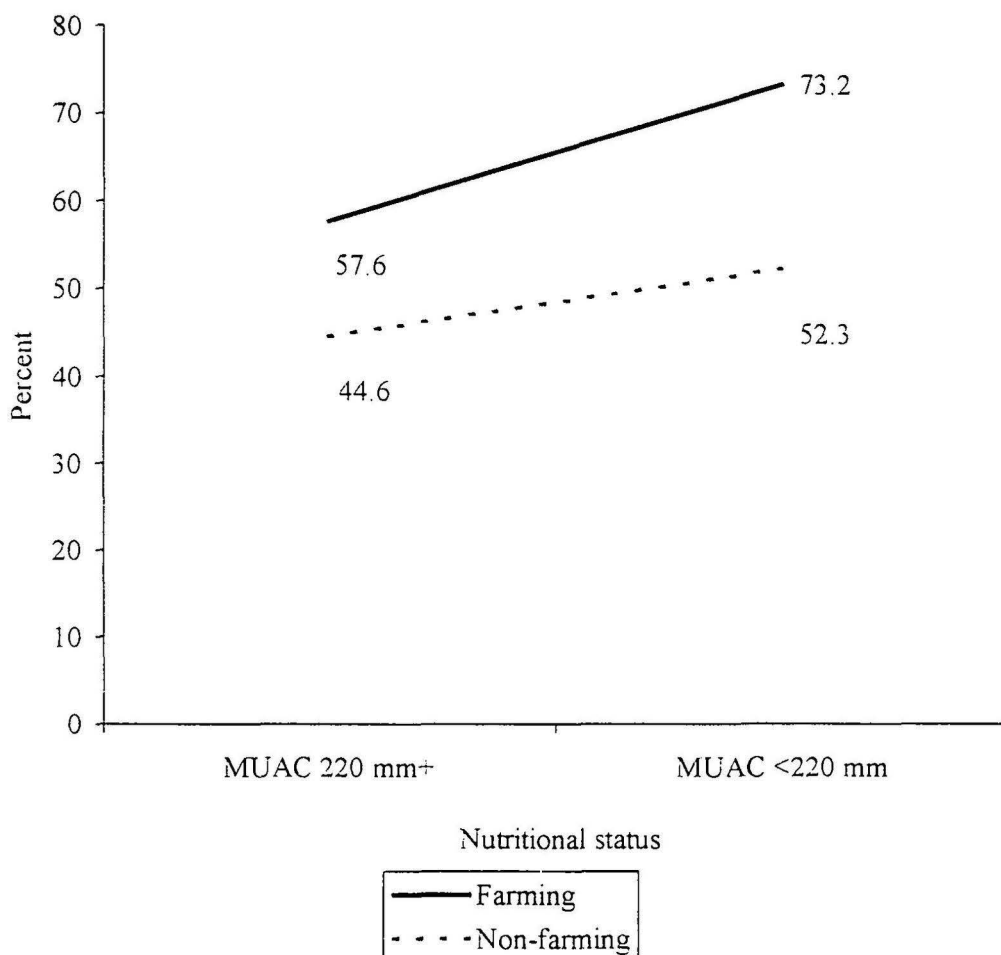
The anaemia prevalence was significantly associated with household total land holding and household occupation category (Table 2). The anaemia prevalence was higher among women in households owning 50 decimals or higher amount of land compared to the households with <50 decimals of land and in households whose major occupation was based on farming compared to non-farm. Household level socioeconomic status indicators such as household ownership of selected assets (watch, cot, mosquito net, radio and bi-cycle) and types of latrine used were not associated with the anaemia prevalence. Neither individual level socioeconomic status indicators such as women's personal ownership of watch, silver ornaments, poultry, goat, home garden and number of sarees were associated with the anaemia prevalence.

**Table 2. Anaemia prevalence by associated socioeconomic status indicators**

Indicators	n	Anaemia (%)	p-value
<i>Household total landholding</i>			
Functional landless (0-49 decimals)	135	50.4	0.05
With land (50+ decimals)	81	64.2	
<i>Household occupation</i>			
Farming	107	63.6	0.02
Non-farming	109	47.7	
<i>Construction material of wall of main living house (%)</i>			
Poor (Straw/polythene)	141	56.0	0.06
Moderate (GI sheet)	33	69.7	
Good (Processed mud or brick)	42	42.9	

There was a modifying effect of farming on the association between nutritional status and anaemia prevalence (Figure 3). In farming households, anaemia prevalence had statistically significant variation with nutritional status, i.e., 73.2% of the women with MUAC <220 mm (poor nutritional status) had anaemia compared to 57.6% among women with MUAC 220 mm + (better nourished women). On the other hand, within non-farming households, the anaemia prevalence did not have much variation with women's nutritional status (Figure 3).

**Figure 3. Anaemia prevalence by nutritional status and household occupation category**



## DISCUSSION

The objective of the present study was to determine the prevalence and identify the associated factors of anaemia among pregnant women in rural areas of Bangladesh. The study has shown a high prevalence of anaemia, suggesting that anaemia is still an alarming public health problem among pregnant women in rural areas of the country.

Since this study was conducted within a small area, questions may arise as to the validity of their being representative of other rural locations of the country. However, the study area was similar to the rest the country in many aspects of demographic and socioeconomic variables. The results obtained here are thus very likely to represent a good estimate of the anaemia situation and its associated factors in Bangladesh. It was revealed from a comparative analysis of the participating and non-participating women that the two groups significantly differed for their parity, household occupation and type of latrine used. Other characteristics of interest as mentioned in Table 1 did not differ from each other. Among the participating women, median parity was lower, proportion of farming households was higher and the proportion of fixed latrine ownership was also higher. High anaemia prevalence showed no association with parity and type of latrine used. Women belonging to farming households had anaemia prevalence of 63.6% compared to 47.7% in non-farming households, indicating that farming was significantly associated with high anaemia prevalence. Because of the inclusion of higher proportion of farming women in the study sample (47.7%) than in non-participating group (37.0%), it may be possible that the estimated anaemia prevalence in this study is an overestimation of the actual situation.

In this study, the prevalence of severe anaemia was absent and the lowest limit of the Hb concentration found was 75 g/L. Thus, anaemia among pregnant women in Bangladesh is of mild to moderate degrees. Although there are many causes of anaemia, physiological deficiencies of iron and other nutrients needed for Hb formation are the main causes of such a high prevalence of mild to moderate degrees of anaemia among pregnant women (Baker 1979). In our study, the high prevalence could perhaps be related to dietary iron insufficiency. More than 90% dietary iron is of plant origin in Bangladesh (12). The mean absorption of iron from foods of plant

origin such as cereals, pulses and vegetables is markedly lower than iron found in foods of animal origin such as meat, fish and poultry (22). Such a low content of animal product in the diet may be an important cause of high prevalence of anaemia among pregnant women in the country. This assumption is supported by a recent study, which showed that anaemia prevalence among subjects in cereal-based diet group was significantly higher than those who took meat or fish in the last 24 hours (88.6% vs. 83.7% (23). Another probable contributory factor of the high anaemia prevalence during pregnancy may be folate deficiency whose requirement rises approximately to double during pregnancy. Many studies have documented the occurrence of folate deficiency during pregnancy particularly among the multigravidae mothers with low socioeconomic status (24). While bioavailability of folate from common diet in Bangladesh may not be an important factor, more important fact is that folate is heat labile (25), causing the loss of folate due to the conventional cooking practice in Bangladesh, which usually involves prolonged and repeated heating of food items.

Although the contribution of a number of diseases such as malaria, AIDs and hookworm infestation in predisposing and aggravating anaemia is well known (1), none of these factors were found to be present in our study area. The presence of another contributing factor such as sickle cell disease is relatively common in Africa. Its distribution in Bangladesh should be investigated to help effective planning. Intestinal parasites, such as, ascaris and hookworm were not associated with anaemia prevalence in the present study. However, infestation with these parasites (especially hookworm) can contribute to anaemia by draining away the nutrients. This is particularly important in case of pregnant women who have relatively higher requirements of these nutrients. Since the prevalence of hookworm infestation was found very low, it may be concluded that, in our study, hookworm infestation is probably not a major contributing factor of anaemia among pregnant women. The low prevalence of hookworm infestation found in this study may be surprising in the light of its high prevalence in developing countries. However, it may be emphasised that most of the households have access to tube-well water as the main source of cooking and drinking water and while shoes may not be worn in the house yards, they are generally worn for longer walking. Also, the use of human feces as a fertilizer is not practiced in Bangladesh.

In the present study, the anaemia prevalence was not found to be associated with most of the single indicators of socioeconomic status. Since the concept of socioeconomic status or poverty is multidimensional, one has to consider a wide range of indicators together in understanding a household's socioeconomic status (26). To overcome this problem, an attempt was made to detect the indicators that would more precisely identify the socioeconomic status of a household. No single indicator found to contain sufficient information. As such the need of using some selected indicators together was felt. It is suggested in many studies in recent years that there has been a gradual shift of occupational pattern in rural Bangladesh from farming to non-farming activities. It is probably due to higher economic profitability in non-farming sectors and also due to better opportunities like provision of micro-credit and other entrepreneurship development activities created by government and non-governmental organisations (27). Moreover, without supported by information such as access to modern technology, inputs, per capita income and expenditure, landholding alone hardly indicate the level of present economic situation of a household.

The anaemia prevalence significantly varied with nutritional status in farming household, but not to that extent in non-farm households. Farming households depends on agriculture alone for their livelihood and thus more vulnerable to natural disaster and seasonal crisis. The non-farm households are supported by multiple sources of livelihood, which are not much affected by seasonal crisis resulting in food shortages. Moreover, women in farming households are exposed more to high physical activities mostly related to post harvest activities than women in non-farm households, making them exposed to high level of chronic energy deficiency. Malnutrition has been recognised as a potential predisposing factor of anaemia.

From the above discussions, it appears that anaemia is highly prevalent among pregnant women irrespective of their parity. The pregnant women's age, nutritional status and household occupation are good predictors of high anaemia prevalence. The prevalence is higher among the older women. Malnourished pregnant women in farming households have the highest anaemia prevalence. Further studies should be conducted to investigate the causes of anaemia among this population group.

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