The Prevalence of Anaemia among Men and Women in Rural Bangladesh

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Table of contents

Abstract

Anaemia is a major public health problem in many developing countries including Bangladesh. Iron deficiency is known to be the commonest cause of anaemia resulting from inadequate iron intake, reduced bio-availability of ingested iron, defective mobilisation of iron reserves, increased needs for iron under certain physiological and pathological conditions and so on. This study aimed at investigating the prevalence of anaemia among rural men and women. The survey was conducted in March 1996 in 12 villages of Mymensingh District located about 100 km north of Dhaka city. Eighty four adult men and 184 adult women aged 15-48 years and 22 adolescent boys and 44 adolescent girls aged 11-14 years were randomly selected. Information was obtained on haemoglobin concentration, parasitic infestation, literacy and on other household socioeconomic parametres. It was revealed from the study that mean haemoglobin concentration of the study population was 114 g/L, and about 69% adult men, 71% adult women, 68% adolescent boys and 64% adolescent girls were suffering from anaemia according to the WHO criteria. This study suggests that anaemia is highly prevalent in the rural communities of Bangladesh which victimises both men and women equally. There is an urgent need to conduct further studies to confirm if male and female are equally anaemic to provide important feedback to the existing anaemia control programmes in the country.

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Introduction

Anaemia is one of the major public health problems in many developing countries (1-3), affecting children, pregnant women and lactating mothers. The most important factors known to be associated with this condition include low socio-economic status, poor diet, poor sanitation, infections and infestations as a result of widespread poverty and ignorance. According to WHO, about 700 million individuals around the world were suffering from anaemia of which a major proportion was from South Asia. It was estimated that about 36% of the people suffer from anaemia in the developing world compared to about 8% in the developed world. Among the developing world, Africa and South Asia have the highest prevalence. Except for adult males, about 40% of the total population in both the regions suffered from anaemia (3). According to the Bangladesh National Nutrition Survey of 1981-82, as high as 74% of the adult females, 80% of the pregnant women, 73% of the under-five children and 40% of the adult males were suffering from anaemia. But, the survey did not specify the causes or types of anaemia in different population groups which might considerably vary from each other.

Iron deficiency is known to be the commonest cause of anaemia especially in women and children (4). Iron deficiency occurs when insufficient amount of iron is absorbed into the body to meet the requirement. This insufficiency may be due to inadequate iron intake, reduced bio-availability of ingested iron, defective mobilisation of iron reserves, increased needs for iron under certain physiological conditions (e.g., pregnancy), and to chronic blood loss. Prolonged iron deficiency leads to a condition which is often called as iron deficiency anaemia. Furthermore, folate deficiency particularly in pregnancy, may also lead to anaemia. Thus, insufficient iron in the diet is a cause but not the only cause of anaemia. Adequate or even more than adequate iron in the diet does not necessarily ensure protection against anaemia. Malaria, hookworm or other parasitic infestations, schistosomiasis and infections play an important role in anaemia particularly in a tropical

country like Bangladesh. In common, infants, adolescents, and women of child bearing age are at greater risk of anaemia. However, adult males may also suffer from anaemia where there is inadequate food intake or frequent infections and infestation.

Reports on the prevalence of anaemia in Bangladesh are scanty. Some reports based on hospital or clinic-based studies are available which do not represent the true anaemia situation in the rural communities. Despite many efforts towards nutritional improvement, the country, so far, does not have a national policy/programme aimed at reducing the severity of anaemia prevalence. This may be, to some extent, due to inadequacy or lack of in-depth information in relation to the problem. In view of the public health importance, there is a need for continuous review of the situation to contribute meaningfully to the effective control of the problem or to implement interventions.

The Research and Evaluation Division (RED) of BRAC in collaboration with the Department of Epidemiology and Public Health, Umea University, Sweden and the Department of Microbiology, Mymensingh Medical College conducted a pilot survey on anaemia prevalence among adult men and women and adolescent boys and girls in 12 villages of Mymensingh district in Bangladesh. The study aimed at investigating the prevalence of anaemia (defined by haemoglobin concentration) as well as some possible causative factors, such as, worm infestations, and some socio-economic, hygiene and reproductive health related indicators which are thought to be related to anaemia prevalence.

Methodology

Subjects

The survey was conducted in March, 1996 in 12 villages of a Thana under Mymensingh District located about 100 km north of Dhaka city. The villages were purposively selected based on two criteria: (i) availability of government Health Assistants (HA) trained in finger pricking; and (ii) absence of anaemia or worm infestation control programmes. The study included 84 adult men and 184 adult non-pregnant women aged 15 to 48 years and 22 adolescent boys and 44 non-pregnant adolescent girls aged 11 to 14 years. All the subjects were selected randomly who were available at home during the visits and gave their consents to participate in the study. Voluntary informed consent was obtained. Permission was also obtained from the Thana Health Administration and community leaders. The study subjects did not receive any iron medication during the field work. One adult men and 4 adult females were dropped from the study because of their faulty haemoglobin values. Thus, a total of 329 subjects, 105 males and 224 females, were included in the study.

A collaboration was made with the Department of Microbiology, Mymenshingh Medical College and Thana Health Complex, Fulbaria, Mymensingh to collect blood and stool samples from the study subjects and to perform laboratory tests. Two teachers of the Department were responsible to supervise the sample collection at the field level and to carryout laboratory tests. The general characteristics of the study population are given in Table 1.

Table 1. Number of study subjects by sex and other characteristics.

Characteristics	Men (n=105)	Women (n=224)	All (N=329)
Age (year)			
11-<15	22	44	66
15-<20	27	24	51
20-<30	14	77	91
30-48	42	79	121
Education level			
Illiterate	26	95	121
Primary & non-formal	27	77	104
Above primary	52	52	104
Perceived household economic status			
Deficit	51	110	161
not-deficit	54	114	168
Land holding (decimals)			
0-<50	35	129	164
50-<200	44	58	102
200+	24	37	61

Materials and methods

Information was obtained on haemoglobin concentration, parasitic infestation, age, sex, education, and household socio-economic status. Information in relation to menstruation, parity, contraceptive use and pregnancy status were collected for women. The suggested haemoglobin levels used in this report to define anaemia were those suggested by WHO: <120 g/L for adult non-pregnant women aged 15-48 years and adolescent boys and girls aged 11-14 years and <130 g/L for adult men aged 15-48 years.

From each subject, 20 microlitre of blood was collected through a haemoglobin pipette and was preserved in a vial containing 5 ml of haemoglobin reagent which was prepared and bottled in the previous night of data collection. At the end of each day, all samples were brought to the laboratory of the Department of Microbiology, Mymensingh Medical College. Haemoglobin was measured by the cyanmethaemoglobin method (5) using a Chemistry Analyser (6). Microscopic examination of stool was done to estimate the presence of ova/egg of parasites.

The reliability of haemoglobin estimation by the Chemistry Analyser was checked by assessing haemoglobin concentration of 189 subjects by using both Chemistry analyser and HemoCue (7, 8) using blood samples drawn through the same fingerpricks. HemoCue was used in the field while Chemistry Analyser was used in the laboratory to estimate haemoglobin concentration.

Laboratory technicians collected the blood samples by finger pricking through home visits and the stool samples were collected in a small container supplied on the previous day. A team of trained interviewers collected the required data using structured questionnaires. Each individual was asked about the preceding one year's household economic status as s/he perceived. A household was characterised as deficit in case the last year's household earning was less than the expenditure and, on the other hand, a household was characterised as not deficit in case the earning was equal to or more than the expenditure. An individual who could not even sign was categorised as 'illiterate' while an individual who could sign or had non-formal education or had education from 1 to 5 was categorised as 'non-formal and primary'. Individuals with formal education more than class 5 were categorised as 'primary +'. The household land holding was calculated in decimal and the homestead was not included in the calculation.

Table 2. Mean blood haemoglobin level and anaemia prevalence by age and sex.

Age group (year)	Mean ± sd (g/L)		Anaemia prevalence (%)	
	Male	Female	Male	Female
All ages	118±17 (n=105)	112±18 (n=224)	69	70
11-<15	111±12 (n=22)	113±15 (n=44)	68	64
15-<20	118±19 (n=27)	120±19 (n=24)	70	56
20-<30	115±20 (n=14)	112±17 (n=77)	86	71
30-48	121±16 (n=42)	108±18 (n=79)	64	76

Note: Means of Hb concentration and anaemia prevalence between males and females are not significantly different (p>0.05)

Economic status

Table 3 shows mean of haemoglobin concentration and anaemia prevalence in males and females by perceived household economic status. Mean haemoglobin concentration in males belonging to deficit (118 g/L) and not-deficit (117 g/L) households seemed to have no difference. However, in females, the haemoglobin level was 109 g/L for deficit households and 114 g/L for not-deficit households. The prevalence of anaemia in males among deficit households (67%) was also not much different from that in not-deficit households (71%). The perceived economic status thus seemed to have positive relation with anaemia prevalence in females. In females, the prevalence of anaemia was 77% in deficit households compared to 63% for not-deficit households (Table 3).

Table 3. Mean blood haemoglobin level and anaemia prevalence by respondent's perceived household economic status.

Perceived household economic Status	Mean ± sd (g/L)		Anaemia prevalence (%)	
	Male	Female	Male	Female
Deficit	118±17 (n=51)	109±18 (n=110)	67	77
Not deficit	117±17 (n=54)	114±17 (n=114)	71	63

Note: Means of Hb concentration and anaemia prevalence between males and females are not significantly different (p>0.05)

Level of education

Mean haemoglobin concentrations and the prevalence of anaemia in males and females by respondents' level of education are shown in Table 4. In males, mean haemoglobin concentration among the 'illiterate' group was highest (123 g/L) followed by 'above primary' (117 g/L) and 'non-formal and primary' (113 g/L) groups. On the contrary, in females, mean haemoglobin concentration was lowest among the 'illiterate' group (108 g/L) while the values were significantly higher among rest of the groups. In females, the prevalence of anaemia among the illiterate, non-formal and primary and above primary groups were 74%, 63% and 72% respectively and, on the other hand, the prevalence figures in males are 61%, 85% and 64% respectively.

Table 4. Mean blood haemoglobin level and anaemia prevalence by respondent's level of education.

Education level	Mean ± sad (g/L)		Anaemia prevalence (%)	
	Male	Female	Male	Female
Illiterate	123±13 (n=26)	108±19 (n=95)	61	74
Non-formal & primary	113±17 (n=27)	115±17 (n=77)	85	63
Above primary	117±18 (n=52)	114±15 (n=52)	64	72

Note: Means of Hb concentration and anaemia prevalence between males and females are not significantly different (p>0.05)

Land holding

Households with less than 50 decimals of land (excluding the homestead) was categorised as 0-<50 land holding category and the rest were categorised according to the actual amount of land ownership. Mean haemoglobin concentrations of males were the same (118 g/L) across all the 3 land holding categories (Table 5). But in females, the mean value for 200+ land holding category was the lowest (109 g/L) and for 50-<200 category was the highest (116 g/L). The mean haemoglobin concentration of females among 0-<50 land holding category was 111 g/L. Both for males and females, the prevalence of anaemia was lowest among 50-<200 land holding category (63% and 58% respectively). The prevalence was about 74% both in males and females among the rest two land holding categories.

Table 5. Mean blood haemoglobin level and anaemia prevalence by household land holdings.

Land holding (dec.)	Mean ± sd (g/L)		Anaemia prevalence (%)	
	Male	Female	Male	Female
0-<50	118±12 (n=35)	111±18 (n=129)	74	74
50-<200	118±20 (n=44)	116±17 (n=58)	63	58
200+	118±17 (n=24)	109±17 (n=37)	72	74

Note: Means of Hb concentration and anaemia prevalence between males and females are not significantly different (p>0.05)

Parasitic infestations

Infestation with *Ascaris lumbricoids* seems to have high co-relation with haemoglobin concentration and anaemia prevalence for both males and females. Mean haemoglobin concentration with *Ascaris lumbricoids* infestation was 110 g/L (anaemia prevalence 86%) in males and 109 g/L (anaemia prevalence 78%) in females. In comparison, mean haemoglobin concentration without *Ascaris lumbricoids* infestation was 119 g/L (anaemia prevalence 63%) in males and 114 g/L (anaemia prevalence 65%) in females (Table 6).

Table 6. **Mean blood haemoglobin level and anaemia prevalence by the presence of intestinal parasites (*Ascaris lumbricoids*).**

Infested with *Ascaris lumbricoids*	Mean ± sd (g/L)		Anaemia prevalence (%)	
	Male	Female	Male	Female
Yes	110±17 (n=28)	109±17 (n=74)	86	78
No	119±16 (n=70)	114±19 (n=122)	63	65

Note: Means of Hb concentration and anaemia prevalence between males and females are not significantly different (p>0.05)

Table 7 shows the effect of background factors on anaemia prevalence combined and desegregated by sex. Sex, age, education level, perceived household economic status, and land holding was used in the combined model. All variables except sex were used in the desegregated model. Controlling for other background factors, no effect of sex on anaemia prevalence was found in the combined model. Education level and perceived economic status seemed to have significant effect ($p<0.05$) on anaemia prevalence among females. Females with primary or non-formal education have about .64 times higher chance to be anaemic compared to the above primary group ($p=0.04$). Females who categorised themselves as being deficit have more than 3 times higher chance of being anaemic compared to the non-deficit group ($p=0.002$). The males did not show such trends.

Table 7. Odds ratio for anaemia prevalence by gender.

Characteristics	Men (n=106)		Women (n=228)		All (N=334)	
	Odds ratio	p value	Odds ratio	p value	Odds ratio	p value
Sex						
Male	--	--	--	--	1.39	0.28
Female	--	--	--	--	1.00	--
Age (year)						
11-<15	1.13	0.85	0.48	0.15	0.67	0.30
15-<20	1.07	0.91	0.44	0.16	0.57	0.19
20-<30	2.40	0.31	0.98	0.96	1.17	0.66
30-48	1.00	--	1.00	--	1.00	--
Education level						
Illiterate	0.93	0.93	0.48	0.18	0.65	0.31
Primary & non-formal	1.94	0.35	0.36	0.04	0.61	0.19
Above primary	1.00	--	1.00	--	1.00	--
Perceived household economic status						
Deficit	0.71	0.58	3.12	0.002	2.01	0.02
Not-deficit	1.00	--	1.00	--	1.00	--
Landholding (decimals)						
0-<50	1.00	--	1.00	--	1.00	--
50-<200	0.63	0.49	0.62	0.23	0.66	0.19
200+	0.71	0.69	1.82	0.24	1.36	0.46

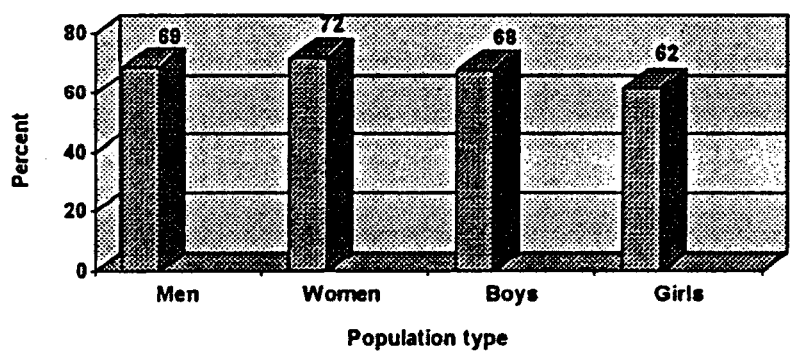
Discussion and conclusion

There are very scarce data on the prevalence of anaemia desegregated by sex in Bangladesh. This survey was undertaken on a rural population from different socioeconomic classes. Since the subjects were drawn from only 12 villages of a rural Thana (sub-district), they do not represent the rural population in Bangladesh as a whole. The sample of this study was biased as pregnant women and subjects aged less than 11 years and more than 48 years were not purposively included. This may imply that the anaemia prevalence figures shown in this study was underestimated on the overall population context. Furthermore, when discussing the results of the study, one should keep in mind that only one parameter, i.e., haemoglobin concentration was used to assess anaemia. This does not provide any indication to what extent the observed anaemia is linked to nutritional factors or to infections and infestations which was widely prevalent

both in men and women in rural areas of Bangladesh. A study on black population in Cape Peninsula, South Africa suggests that majority of the population had low haemoglobin values, relative lymphocytosis with eosinophil indicating the presence of chronic infections which resulted in high prevalence of anaemia in adult population (9).

Men in Bangladesh are usually involved more in outdoor activities compared to women. As a result, a higher number of adult women compared to men were included in the sample. It was thought that the observed difference in anaemia prevalence between men and women was due to the wide range of variations in sample size between men and women. To compare the results, 84 out of 184 women were randomly selected and Figure 2 shows the anaemia prevalence after adjusting for the sample size. According to the Figure, difference between men and women in relation to anaemia prevalence was not statistically significant ($p>0.05$).

Figure 2: Anaemia prevalence by population type



In contrast to all previous studies done in this country and elsewhere, this study suggests that both men and women are equally anaemic in the rural areas. Sex difference was not present even when the means of haemoglobin concentration and anaemia prevalence were examined by different socioeconomic backgrounds. Surprisingly, in females, illiteracy did not have any effect while the primary and non-formal education had negative effect on anaemia prevalence compared to the above primary group. Perceived economic status found to have strong co-relation to anaemia prevalence in females but not in males.

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