THE PREVALENCE OF ANAEMIA AMONG MALES AND FEMALES IN RURAL BANGLADESH

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CONTENTS

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Abstract

This is the first report of a collaborative research project between the Research and Evaluation Division (RED), BRAC, Bangladesh and the Department of Epidemiology and Public Health, Umeå University, Sweden. The study aimed at investigating the prevalence of anaemia among men and women in a typical Bangladesh rural community. The survey was conducted in a perceived healthy population in March 1996 in 12 villages of Fulbaria Thana of Mymensingh District located about 100 km north of Dhaka city. One hundred and six males 228 non-pregnant females aged 11-48 years were purposively selected. Information was obtained on haemoglobin concentration, parasitic infestation and household socio-economic status. About 69% of males and 70% of females were found to be anaemic according to WHO anaemia criteria. There was no difference in anaemia prevalence between males and females. Literacy and perceived economic status were associated to anaemia prevalence among females, but not among males. Anaemia was also more common among those holding little or no land and among those having current ascaris infestation. The study suggests that anaemia is highly prevalent in the rural communities of Bangladesh which affects both males and females equally. Further studies should be undertaken to confirm the findings and also to examine the causes of anaemia both in males and females in the rural areas of the country in order to undertake necessary preventive and control measures by the concerned agencies.

Introduction

Anaemia is one of the major public health problems in many developing countries (1-3). According to WHO, about 700 million individuals around the world were suffering from anaemia of which a major proportion was from South Asia (3). Many studies world-wide have reported higher prevalence of anaemia in females than in males (3-5,8). The anaemia prevalence particularly in pregnant women of the developing countries was estimated to be as high as 55-60% (4). According to the Bangladesh National Nutrition Survey of 1981-82, about 74% of the adult women, 80% of the pregnant women, 73% of the under-five children and 40% of the adult men were suffering from anaemia (6).

The most important factors known to be associated with anaemia in a community include low socio-economic status (7,8), poor diet (9,10) and infections and infestations (11-15) as a result of widespread poverty. However, there are variations in these factors in relation to the prevalence and severity of anaemia in different parts of the world and even within countries (16-20). In the United States, the highest anaemia prevalence was observed in infants 1 to 2 years of age, girls 15 to 17 years of age, young women and elderly men, and on the other hand, the lowest prevalence was in children 6 to 8 years of age and in males 12 to 44 years of age (21).

Apart from the results of the 1981-82 National Nutrition Survey, there are a few reports available on anaemia prevalence in the rural Bangladesh. Some reports based on hospital or clinic-based studies are available which do not necessarily show the true anaemia situation of the typical rural communities (22-24). Community based data showing anaemia prevalence both among males and females so far is not available in the country.

The Research and Evaluation Division (RED) of BRAC in collaboration with the Department of Epidemiology and Public Health, Umeå University, Sweden and

the Department of Microbiology, Mymensingh Medical College, Bangladesh conducted a community based survey on anaemia prevalence among males and females in 12 villages of Mymensingh district in Bangladesh. The study primarily aimed at investigating the prevalence of anaemia among males and females in a rural Bangladesh community. Moreover, the association of anaemia in males and females with some selected variables, such as, sex, age, perceived household socio-economic status, level of education, household land holding and current parasitic infestation was also investigated.

Methodology

Subjects

The survey was conducted in March, 1996 in 12 villages of Fulbaria Thana under Mymensingh District located about 100 km north of Dhaka city. Fulbaria is situated in the central part and represents a typical rural Thana of Bangladesh. Like other areas of the country, agriculture and related activities dominate the occupation of the population in this area. The sampling was done through two stages. Firstly, the villages were purposively selected based on two criteria: (i) availability of government Health Assistants (HA), and (ii) absence of anaemia or worm infestation control programmes. Secondly, the individuals who were available during the home visits, reported to be healthy and were willing to participate in the study were included in the sample. Thus, 106 males and 228 non-pregnant females aged 11 to 48 years were included in the sample. None of the selected individuals refused to participate in the study and all of them were found co-operative.

Methods

A collaboration was made with the Department of Microbiology, Mymenshingh Medical College and the Government managed Thana Health Complex, Fulbaria, Mymensingh to collect blood and stool samples and to perform

laboratory tests. Two teachers of the Department were responsible to supervise the sample collection at the field level and to carry out laboratory tests to ensure quality control.

A team of interviewers jointly formed by the field workers of the Research and Evaluation Division (RED) and the Reproductive Health and Disease Control Programme of BRAC collected the data using structured pre-tested questionnaires. The interviewers were provided a two days training on the questionnaire before conducting the survey. Each individual was asked about his/her perception on the last one year's household economic status. A household was characterised as being deficit in case the last year's household earnings (cash and kind) were less than the total expenditure and, on the other hand, a household was characterised as being non-deficit in case the earnings were equal to or more than the expenditure. The individuals who could not sign were categorised as 'illiterate', the individuals who had non-formal or formal education from class 1 to 5 were categorised as 'non-formal and primary' and the individuals with formal education more than class 5 were categorised as 'above primary'. The household land holding was calculated in decimals and the homestead was not included in the calculation. Households with less than 50 decimals of land was categorised as 0-<50 land holding category and the rest were categorised according to the actual amount of land ownership.

Laboratory technicians collected the blood samples by finger pricking through home visits. All blood samples were collected by one trained technician accompanied by a RED field staff. 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 had been prepared and bottled in the previous night. 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 using a

Chemistry Analyser (25). The haemoglobin concentration of 189 subjects, in addition to Chemistry Analyser, was estimated using a HemoCue Photometer (26,27) to cross-check the validity of the results using blood from the same finger pricks.

The stool samples were collected by the interviewers in a small container supplied on the previous day. Morning stool samples were brought to the laboratory within six hours of collection for examination. Microscopic examination of stool samples was done to estimate the presence of ova/egg of parasites.

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 (3). Bivariate tables were generated from the compiled data to examine the anaemia prevalence between males and females and also to explore the relation of different variables to the anaemia prevalence. Statistical significance was tested by the Chi-square test and p values less than 0.05 was considered significant. The pooled analysis of males and females Mantel-Haenszel Chai-square and two-tailed p-values were calculated, adjusting for sex. Differences between means were assessed by F-test.

Results

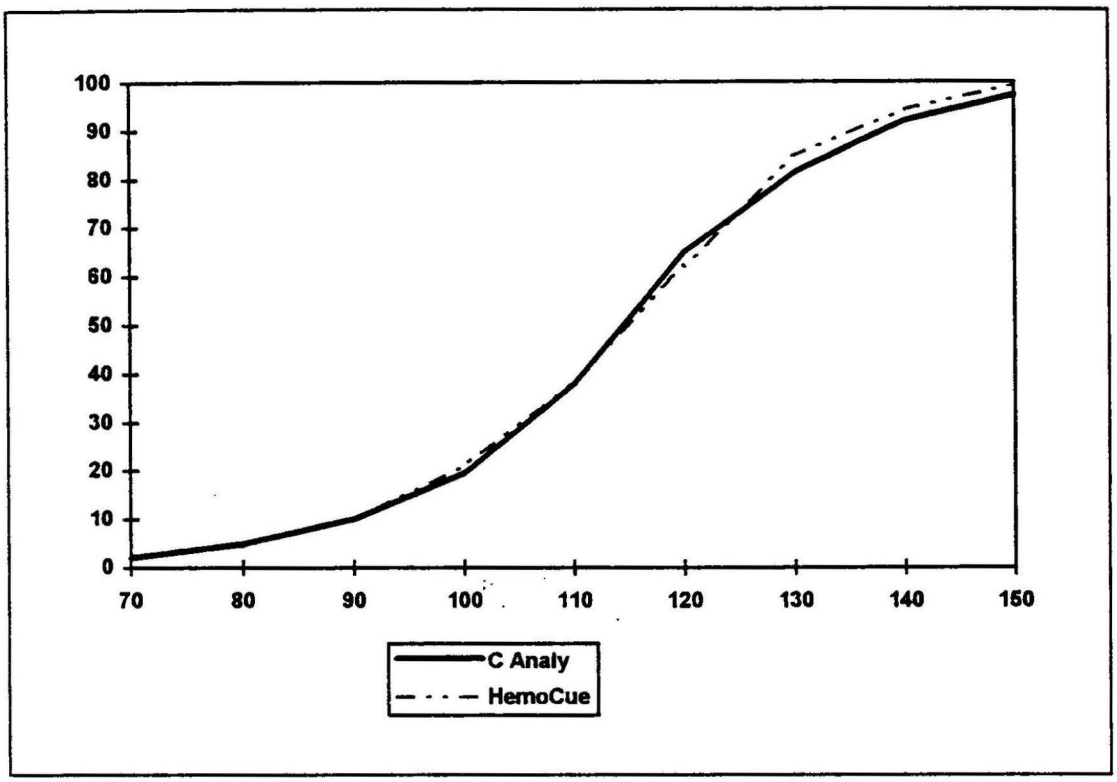
The general characteristics of the study population by sex are given in Table 1.

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

Characteristics	Males (n=106)	Females (n=228)	All (N=334)
Age (year)			
11-19	49	69	118
20-34	25	108	133
35-48	32	51	83
Education level			
Illiterate	26	97	123
Primary & non-formal	27	78	105
Above primary	53	53	106
Perceived household economic status			
Deficit	51	112	163
non-deficit	55	116	171
Land holding (decimals)			
0-<50	35	131	166
50-<200	46	59	105
200+	25	38	63

Figure 1 shows the mean haemoglobin concentration differences measured on the same subjects by two different techniques, i.e., Chemistry Analyser and HemoCue Photometer in relation to the different interval of haemoglobin values. The differences were calculated by subtracting the each HemoCue value from the corresponding Chemistry Analyser value. It is revealed from the figure HemoCue Photometer overestimated the haemoglobin concentration for the subjects with lower haemoglobin levels and underestimated for the subjects with higher haemoglobin levels compared to Chemistry Analyser.

Figure 1. Cumulative percents of haemoglobin concentration estimated by HemoCue and Chemistry Analyser.



Distribution of haemoglobin concentration values according to different cut-off levels are shown in Table 1. About 8%, 64% and 81% of the total subjects had haemoglobin concentration <90 g/L, <120 g/L and <130 g/L respectively.

Table 1. Distribution of haemoglobin values according to different cut-off points by sex.

Sex	Sample size	Blood haemoglobin (g/L)		
		<90 (%)	<120 (%)	<130 (%)
All	334	8	64	81
Males	106	6	51	74
Females	228	10	70	84

Age and gender

Table 2 shows mean haemoglobin concentration and anaemia prevalence by age and gender. There was no overall gender difference in anaemia prevalence among males and females. A higher trend in mean haemoglobin concentration was observed among males aged 20 years and above than the females of the similar age group. Age did not show any association to anaemia prevalence among males (p=0.55) and females (p=0.14). However, means of haemoglobin concentration of females seemed to be positively associated to increased age (p=0.04) (Table 2).

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

Age group	Mean ± sd (g/L)		Anaemia prevalence (%)	
	Males	Females	Males	Females
All	118±17	112±18	69	70
11-19	115±16	116±17	69	61
20-34	120±17	111±17	76	72
35-48	120±18	108±18	62	76

Economic status

A higher proportion of females in the economically deficit households were anaemic than the non-deficit households (p=0.03). The perceived SES did not show any association with the anaemia prevalence in males (p=0.68) (Table 3).

Table 3. Anaemia prevalence by respondent's perceived household economic status and gender.

Perceived household economic status	Anaemia prevalence (%)	
	Males	Females
Economically Deficit	67	77
Economically non-deficit	71	63

Level of education

Anaemia prevalence in males and females was not significantly different by literacy level (Table 4) (Females: p=0.35, males: p=0.10).

Table 4. Anaemia prevalence by respondent's level of education and gender.

Education level	Anaemia prevalence (%)	
	Males	Females
Illiterate	61	74
Non-formal and primary	85	63
Primary and above	64	72

Land holding

According to Table 5, those who belonged to the medium land holding group (50-199 decimals) had a significantly lower prevalence of anaemia than those belonging to the lower land holding group (females and males pooled data, p=0.02). This numerical tendency was shown both among males and females, although not statistically significant when analysed for sexes separately. The small group having more than 200 decimals of land had numerically a higher anaemia prevalence, although with a broad confidence interval of the estimate.

Table 5. Anaemia prevalence by household land holdings.

Land holding (decimal)	Anaemia prevalence (%)	
	Males	Females
0-<50	74	74
50-<200	62	58
200 and above	72	74

Parasitic infestations

The prevalence of *Ascaris lumbricoids (AL)* in males and females was 29% and 39% respectively. The prevalence of hookworm was found to be very low in the study population, i.e., 2% in males and 1.5% in females. Those with *Ascaris lumbricoids* infestation had a significantly higher prevalence of anaemia (pooled analysis, males and females $p<0.01$) (Table 6).

Table 6. Anaemia prevalence by the presence of intestinal parasites and gender (*Ascaris lumbricoids*).

***Ascaris lumbricoids* infestation**	**Anaemia prevalence (%)**	
	Males	**Females**
Present	86	78
Absent	67	63

Discussion and conclusion

This study clearly indicates that anaemia is highly prevalent in the rural Bangladesh communities affecting about 69% males and 70% non-pregnant females (Table 2). The prevalence figure for adult women corresponds to the findings of the 1981-82 Bangladesh National Nutrition Survey where about 74% of the women were found to be anaemic (6). However, it is surprising to notice a very high anaemia prevalence in men in the present study which is at the same level as that of women. It contradicts with the previous study finding where only 40% of men were found to be anaemic (6).

This survey was undertaken in a typical rural population of Bangladesh. The area was selected purposively to be similar to most rural areas of the country. Since the subjects were drawn from only 12 villages, they do not necessarily represent the rural Bangladesh population. More females compared to males were included in the study. Males in Bangladesh are still considered as the major 'bread earners' who are traditionally involved in outdoor activities like farming, marketing of agricultural products, manual labour, etc. Females, to a large extent, are engaged in home based activities which in general require lesser mobility. This is perhaps a major reason why comparatively higher proportion of females compared to males was included in the study. Sick individuals, pregnant women and individuals aged lower or higher than 11-48 years were purposively excluded from the study as it aimed at investigating the anaemia prevalence in a healthy population aged 11-48 years. Furthermore, when discussing the results of the study, one should keep in mind that only one outcome measure, i.e., haemoglobin concentration, was used to assess anaemia and, thus, the present study does not provide any indication to what extent the observed anaemia was linked to nutrition or to infections, infestations or other factors.

The study was conducted at the day time and, therefore, it might be so that a small proportion of men who were present at home during that time could not go out to work because of mild sicknesses which they did not feel to report. However, all subjects were reportedly healthy and no obviously sick person was included in the survey.

A perceived poor economic situation was associated to a higher prevalence of anaemia among females, but not among males while no or limited land holding was linked to anaemia prevalence among males and females. Education was not associated to anaemia prevalence. The presence of ascaris infestation, which may be interpreted as a poverty and poor hygiene indicator, was associated to anaemia among both males and females. The finding corresponds to the National Health and Nutritional Examination Survey II (NHNESII) of the United States where the prevalence of iron deficiency was higher in women fall below the poverty level (21). This might partially be explained by a study of Yip and Dallman in where they observed that the higher anaemia prevalence in individuals of lower socio-economic group may be related to persistent inflammatory conditions and iron deficiency (15).

Because of the fact that this study was done on a population limited in a smaller geographical area, it does not claim to have assessed the anaemia prevalence among men and women in rural Bangladesh communities. However, it does point the fact that anaemia is highly prevalent in the communities equally affecting males and females. However, further research is needed to explore the causes of anaemia among both males and females in the rural Bangladesh communities. Also, research should be done to explore further programmatic strategies to strengthen on-going anaemia control programmes in Bangladesh presently targeted only to pregnant women.

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