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ORIGINAL ARTICLE

Incidence of Anemia and Its Associated Factors among Adult Female Patients Attending Medicine Outpatient Departments in Bangladesh

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ABSTRACT

Background: *Anemia remains a major health problem among women, particularly in South Asia, where nutritional deficiencies, menstrual blood loss, socioeconomic disadvantage, and chronic diseases contribute substantially to its burden. Evidence among adult female patients attending general Medicine outpatient departments in Bangladesh remains limited.* ***Aim of the study:*** *This study aimed to determine the incidence rate of anemia and identify its associated factors among adult female patients attending the Medicine Outpatient Department of a tertiary care hospital in Bangladesh.* ***Methods & Materials:*** *Using a hospital-based cross-sectional design, 430 non-pregnant women aged ≥18 years attending the Medicine Outpatient Department of Chittagong Medical College Hospital, Chattogram, Bangladesh were enrolled using consecutive sampling during the six-month study period from July 2023 to December 2023. Sociodemographic, nutritional, reproductive, and clinical data were collected using a structured questionnaire, while complete blood count parameters were assessed from venous blood samples. Anemia was defined as hemoglobin <12.0 g/dL according to WHO criteria. Associated factors were evaluated using Chi-square/Fisher's exact tests and multivariable logistic regression, with p<0.05 considered statistically significant.* ***Results:*** *Among 430 participants, the mean age was 43.1 ± 13.4 years, and the mean hemoglobin level was 11.85 ± 1.59 g/dL. Anemia was present in 47.2%, predominantly mild (27.4%), with microcytic anemia as the most common morphological type (51.7%). In multivariable analysis, chronic kidney disease (AOR 5.70) and heavy menstrual bleeding (AOR 5.44) showed the strongest associations with anemia. Inadequate dietary iron intake, low animal-protein intake, chronic gastrointestinal symptoms, worm infestation, low family income, underweight status, and recent pregnancy were also significant independent predictors.* ***Conclusion:*** *Anemia was common among adult female Medicine OPD patients and was independently associated with nutritional, reproductive, socioeconomic, gastrointestinal, and chronic disease-related factors. Routine screening and early identification of modifiable risk factors may support timely diagnosis and targeted management.*

Keywords: *Adult women; Hemoglobin; Iron deficiency; Heavy menstrual bleeding; chronic kidney disease*

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INTRODUCTION

Globally, anemia remains one of the most widespread hematological and nutritional disorders, disproportionately affecting women because of menstrual blood loss, reproductive demands, dietary inadequacy, and underlying disease. According to pooled, population-representative data, approximately 29.9% of women aged 15–49 years were anemic in 2019, and progress in reducing the burden remains insufficient to meet international nutrition targets [1]. More recently, Global Burden of Disease analyses have shown that anemia continues to affect nearly one-quarter of the global population, with women carrying a substantially greater burden than men [2,3]. Across South Asia, the burden is particularly high because nutritional deficiencies coexist with poverty, food insecurity, recurrent infections, reproductive blood loss, and limited access to preventive health services. In analyses covering South and Southeast Asian countries, a considerable proportion of women of reproductive age were found to be anemic, although prevalence varied markedly according to socioeconomic, nutritional, and demographic characteristics [4]. Within Bangladesh, nationally representative evidence has similarly demonstrated a substantial anemia burden among women, with socioeconomic disadvantage, poor nutritional status, reproductive characteristics, and household-level inequalities contributing to its occurrence [5,6]. Clinically, anemia is important because reduced hemoglobin concentration compromises oxygen delivery to tissues and may manifest as fatigue, weakness, dizziness, reduced exercise tolerance, impaired concentration, and diminished physical productivity. Among women, iron deficiency remains a major contributor, although anemia is etiologically heterogeneous and may also result from vitamin deficiencies, chronic inflammation, renal disease, gastrointestinal blood loss, infections, and inherited

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hemoglobin disorders [2,7]. Across Asian populations, inadequate iron intake, menstrual blood loss, pregnancy, and poor recognition of iron deficiency remain important challenges to prevention and management [8]. Within Bangladesh, several interacting determinants further complicate the epidemiology of anemia. In population-based analyses, lower body mass index and chronic undernutrition have been associated with increased anemia risk among women, while dietary quality and iron exposure from food and groundwater have also influenced hemoglobin status [6,9,10]. Moreover, food insecurity and socioeconomic deprivation may restrict access to iron-rich foods and adequate healthcare [5,11]. Among rural Bangladeshi populations, additional behavioral factors, including betel quid use, have recently been associated with anemia [12]. Despite this evidence, much of the available Bangladeshi literature has focused on pregnant women, women of reproductive age in community surveys, or selected nutritional populations. Recent studies have documented substantial anemia among pregnant, lactating, and adolescent females, while other investigations have highlighted the coexistence of iron deficiency with overweight and obesity among urban Bangladeshi women [13,14]. However, evidence on anemia among adult female patients attending general Medicine outpatient departments remains limited, where nutritional, reproductive, gastrointestinal, renal, metabolic, and chronic inflammatory conditions may occur simultaneously. Therefore, evaluating anemia in a tertiary-care Medicine OPD may provide clinically relevant information beyond estimates derived from community or obstetric populations. Such assessment can help identify vulnerable subgroups, clarify modifiable risk factors, and support targeted screening and early intervention. Accordingly, the present study aimed to determine the incidence rate of anemia and identify its associated sociodemographic, nutritional, reproductive, and clinical factors among adult female patients attending the Medicine Outpatient Department of a tertiary care hospital in Bangladesh.

METHODS & MATERIALS

This hospital-based cross-sectional study was conducted among adult female patients attending the Medicine Outpatient Department of Chittagong Medical College Hospital, Chattogram, Bangladesh. A total of 430 women aged ≥18 years were included during the study period of six month from July 2023 to December 2023. Based on the single-population proportion formula, the required sample size was estimated using a 95% confidence level, 5% margin of error, and an assumed anemia prevalence of 50%; after allowing for approximately 10% non-response or incomplete data, the final sample size was set at 430. Eligible participants were enrolled using consecutive sampling until the required sample was achieved. Women aged ≥18 years who attended the Medicine OPD and provided informed consent were eligible for inclusion. Those who were critically ill, pregnant at the time of assessment, had received blood transfusion within the preceding three months, or had incomplete clinical or laboratory information were excluded. Following enrollment, information was collected using a structured questionnaire through face-to-face interviews and review of medical records. Sociodemographic variables included age, residence, marital status, education, occupation, and monthly family income. Clinical, nutritional, and reproductive factors included body mass index, menstrual status, heavy menstrual bleeding, parity, recent pregnancy, dietary iron intake, animal-protein consumption, history of worm infestation, gastrointestinal symptoms, diabetes mellitus, chronic kidney disease, and chronic inflammatory conditions. Anthropometric measurements were obtained using standardized procedures. After clinical assessment, venous blood samples were collected for complete blood count, including hemoglobin, hematocrit, mean corpuscular volume, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration, and red-cell distribution width. Anemia was defined as hemoglobin <12.0 g/dL in non-pregnant adult women and categorized as mild, moderate, or severe according to WHO criteria. Morphological classification was based primarily on mean corpuscular volume. Data were analyzed using appropriate statistical software. Continuous variables were summarized as mean ± standard deviation, while categorical variables were expressed as frequency and percentage. Associations with anemia were assessed using the Chi-square test or Fisher's exact test, as appropriate. Variables of clinical relevance and those significant on univariable analysis were entered into multivariable logistic regression. Adjusted odds ratios with 95% confidence intervals were reported, and $p<0.05$ was considered statistically significant. The relevant institutional review board approved the study, and all participants provided written informed consent.

RESULTS

Of the 430 participants, the mean age was 43.1 ± 13.4 years; 55.3% were from rural areas, and 66.5% were homemakers. Regarding socioeconomic status, 41.9% had a monthly family income ≤25,000 BDT. Clinically, 17.7% were underweight, while 24.9% of premenopausal women reported heavy menstrual bleeding. In addition, 46.5% had inadequate dietary iron intake, 42.6% had low animal-protein intake, and 13.3% had chronic kidney disease (*Table I*).

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Table I: Baseline characteristics of the study participants (*n*=430)

Variables	n (%) / Mean ± SD
Age (years)	43.1 ± 13.4
Rural residence	238 (55.3)
Married	328 (76.3)
Homemaker	286 (66.5)
Monthly income ≤25,000 BDT	180 (41.9)
BMI (kg/m^2)	23.5 ± 4.4
Underweight	76 (17.7)
Premenopausal	293 (68.1)
Heavy menstrual bleeding	73 (24.9)
Multiparity (≥3)	176 (40.9)
Inadequate dietary iron intake	200 (46.5)
Low animal-protein intake	183 (42.6)
History of worm infestation	90 (20.9)
Chronic kidney disease	57 (13.3)
Diabetes mellitus	99 (23.0)

Overall, the mean hemoglobin level was 11.85 ± 1.59 g/dL, with a mean MCV of 84.18 ± 7.90 fL. Among all participants, 47.2% were anemic. Regarding severity, 27.4% had mild anemia, 17.0% had moderate anemia, and 2.8% had severe anemia, indicating that mild anemia was predominant (*Table II*).

Table II: Hematological profile and prevalence of anemia

Variables	n (%) / Mean ± SD
Hemoglobin (g/dL)	11.85 ± 1.59
Hematocrit (%)	35.66 ± 4.99
MCV (fL)	84.18 ± 7.90
MCH (pg)	26.95 ± 2.94
RDW (%)	14.72 ± 1.89
Anemia present	203 (47.2)
Mild anemia	118 (27.4)
Moderate anemia	73 (17.0)
Severe anemia	12 (2.8)

Among the 203 participants with anemia, microcytic anemia was the most common morphological pattern, accounting for 51.7%, followed by normocytic anemia in 42.9%. In contrast, macrocytic anemia was relatively uncommon, occurring in only 5.4% of anemic participants (*Table III*).

Table III: Morphological pattern of anemia among anemic participants (*n*=203)

Morphological pattern	n (%)
Microcytic anemia	105 (51.7)
Normocytic anemia	87 (42.9)
Macrocytic anemia	11 (5.4)

Compared with non-anemic participants, anemia was significantly more common among women with low family income (48.3% vs. 36.1%, p=0.014), underweight status (23.2% vs. 12.8%, p=0.007), and heavy menstrual bleeding (26.6% vs. 8.4%, p<0.001). Similarly, anemia was more common among those with inadequate dietary iron intake (59.6% vs. 34.8%), low animal-protein intake (53.7% vs. 32.6%), worm infestation (28.6% vs. 14.1%), and chronic kidney disease (20.2% vs. 7.0%), all showing statistically significant associations (*Table IV*).

Table IV: Factors associated with anemia

Variables	Anemia (n=203)	No anemia (n=227)	p-value
	n (%)	n (%)	
Low family income	98 (48.3)	82 (36.1)	0.014
Underweight	47 (23.2)	29 (12.8)	0.007
Heavy menstrual bleeding	54 (26.6)	19 (8.4)	<0.001
Recent pregnancy	45 (22.2)	29 (12.8)	0.014
Inadequate dietary iron intake	121 (59.6)	79 (34.8)	<0.001
Low animal-protein intake	109 (53.7)	74 (32.6)	<0.001
Worm infestation	58 (28.6)	32 (14.1)	<0.001
Chronic GI symptoms	57 (28.1)	37 (16.3)	0.005
Chronic kidney disease	41 (20.2)	16 (7.0)	<0.001

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After adjustment for potential confounders, chronic kidney disease showed the strongest independent association with anemia (AOR 5.70; 95% CI 2.77–11.73; p<0.001), followed by heavy menstrual bleeding (AOR 5.44; 95% CI 2.78–10.65; p<0.001). Significant independent associations were also observed with inadequate dietary iron intake (AOR 3.66), low animal-protein intake (AOR 3.12), chronic gastrointestinal symptoms (AOR 2.65), and worm infestation (AOR 2.48). In addition, low family income, underweight status, and recent pregnancy remained significant predictors of anemia (*Table V*).

Table V: Multivariable logistic regression analysis of factors independently associated with anemia

Variables	Adjusted OR	95% CI	p-value
Low family income	2.03	1.28–3.23	0.003
Underweight	1.98	1.07–3.64	0.029
Heavy menstrual bleeding	5.44	2.78–10.65	<0.001
Recent pregnancy	1.91	1.02–3.58	0.042
Inadequate dietary iron intake	3.66	2.28–5.87	<0.001
Low animal-protein intake	3.12	1.95–5.00	<0.001
Worm infestation	2.48	1.40–4.39	0.002
Chronic GI symptoms	2.65	1.52–4.61	<0.001
Chronic kidney disease	5.7	2.77–11.73	<0.001

DISCUSSION

The present study demonstrated a substantial burden of anemia among adult female patients attending a tertiary-care Medicine outpatient department in Bangladesh. Overall, 47.2% of the 430 participants were anemic, with a mean hemoglobin concentration of 11.85 ± 1.59 g/dL. Mild anemia accounted for 27.4%, moderate anemia for 17.0%, and severe anemia for 2.8%. This prevalence was higher than the 41.8% reported among Bangladeshi women in a nationally representative analysis by Rahman et al. [5]. Similarly, an analysis comparing Bangladesh with West Bengal reported anemia among 41% of Bangladeshi women, compared with 64% in West Bengal [11]. The comparatively higher prevalence in the current study may reflect its hospital-based setting, because women attending Medicine OPDs are more likely to have nutritional deficiencies, chronic diseases, or symptomatic conditions than community-dwelling women. Comparable burdens have been reported elsewhere in South Asia. In Nepal, approximately 41% of women of reproductive age were anemic, while another multilevel analysis identified marked geographical and socioeconomic variations [15,16]. Among married women in North-East India, anemia affected 40%, with greater prevalence among underweight and socioeconomically disadvantaged women [17]. Conversely, a rural Pakistani study reported a considerably higher prevalence of 61.3%, while national Pakistani data demonstrated anemia in 50.4% of women [18, 19]. Such differences probably reflect variation in dietary patterns, socioeconomic conditions, reproductive characteristics, healthcare access, and population selection. A systematic review from developing countries similarly estimated an average prevalence of 46.5%, which closely approximates the 47.2% observed in the present study [20]. Regarding morphology, 51.7% of anemic participants had microcytic anemia, while 42.9% had normocytic and only 5.4% had macrocytic anemia. This predominance supports an important contribution from iron deficiency, although ferritin and transferrin saturation would be required for etiological confirmation. In Pakistan, iron-deficiency anemia was documented in 18.1% of non-pregnant women and was associated with food insecurity, repeated pregnancy, and inadequate iron-folic acid supplementation [21]. Therefore, morphological findings alone should not be considered diagnostic of iron deficiency, particularly because chronic disease may coexist in Medicine OPD populations. Nutritional factors were prominent in the present analysis. Inadequate dietary iron intake independently increased the odds of anemia more than threefold (AOR 3.66, 95% CI 2.28–5.87), while low animal-protein intake showed an (AOR of 3.12, 95% CI 1.95–5.00). Comparable findings were reported from rural Pakistan, where absence of meat consumption was associated with approximately fourfold greater odds of anemia (AOR 4.18) [18]. Moreover, evidence from Bangladesh indicated that frequent consumption of non-vegetarian foods and improved household food security were associated with lower anemia risk [11]. Underweight status also remained independently associated in the present study (AOR 1.98), consistent with Pakistani data linking underweight with anemia and North-East Indian findings showing a prevalence of 42.18% among underweight women [17, 19]. Reproductive blood loss represented another important determinant. Heavy menstrual bleeding showed one of the strongest associations (AOR 5.44; 95% CI 2.78–10.65). In a study of women attending internal medicine outpatient services, heavy menstrual bleeding occurred in 37.9% and was associated with reduced ferritin levels and poorer quality of life [22]. Similarly, a Cuban study reported an association between heavy menstrual bleeding and anemia (OR 1.92, 95% CI 1.34–2.76) [23]. Recent pregnancy was also independently associated with anemia in the present study (AOR 1.91), supporting the contribution of depleted maternal iron stores following repeated reproductive demands. Among clinical conditions, chronic kidney disease showed the strongest association with anemia (AOR 5.70; 95% CI 2.77–11.73). This finding is biologically plausible because progressive renal dysfunction is accompanied by impaired erythropoietin production, inflammation, functional iron deficiency, and reduced red-cell survival. In a US population study, anemia occurred in 25.3% of adults with stage 3–5 CKD, while an Asian meta-analysis estimated a substantially higher pooled prevalence of 42%, rising to 80% in stage 5 CKD [24, 25]. Furthermore, iron-deficiency anemia affected a substantial proportion of non-dialysis CKD patients and was associated with adverse cardiovascular outcomes, while a Korean cohort reported anemia in 45.0% of CKD patients [27]. From a clinical perspective, these findings support routine hemoglobin screening among women attending Medicine OPDs, accompanied by targeted assessment of menstrual loss, dietary intake, nutritional status, renal function, and gastrointestinal symptoms. Rather than relying solely on empirical iron therapy, evaluating ferritin, transferrin saturation, renal function, and potential sources of blood loss may enable etiologically directed treatment. Such an integrated approach may improve anemia detection, reduce

persistent symptoms, and identify clinically important underlying disease.

LIMITATIONS

As a single-center cross-sectional study, the study had limited causal inference and generalizability. Dietary and menstrual information was self-reported, and iron deficiency was not confirmed using ferritin or transferrin saturation.

CONCLUSION

Overall, anemia was highly prevalent among adult female patients attending the Medicine outpatient department, affecting nearly half of the participants. A greater risk was independently associated with chronic kidney disease, heavy menstrual bleeding, inadequate dietary iron intake, low animal-protein consumption, gastrointestinal symptoms, worm infestation, low family income, underweight status, and recent pregnancy. Therefore, routine screening, nutritional assessment, evaluation of menstrual and gastrointestinal blood loss, and early identification of chronic disease are essential for timely diagnosis and targeted anemia management.

RECOMMENDATIONS

Routine hemoglobin screening should be strengthened for adult women attending Medicine outpatient departments, particularly those with heavy menstrual bleeding, poor nutritional intake, low socioeconomic status, gastrointestinal symptoms, or chronic kidney disease. Early evaluation of iron status and underlying causes, together with dietary counseling, treatment of parasitic infection, and appropriate management of chronic diseases, may help reduce the burden of anemia and prevent related complications.

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CONFLICT OF INTEREST

None declared

ETHICAL APPROVAL

The study was approved by the Institutional Ethics Committee.

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