

The Morphological Pattern Of Anaemia Among The Hospitalized Patients In The Department Of Medicine Of A Tertiary Level Hospital.

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Abstract:

Background: Anaemia is a significant public health challenge in Bangladesh affecting a large number of population. Morphological patterns of anaemia, identified via complete blood count (CBC) and peripheral blood film (PBF), offer valuable insights for diagnosis and treatment, especially in resource-limited settings in Bangladesh.

Methods: A cross-sectional study was conducted at Abdul Malek Ukil Medical College Hospital, Noakhali, with 100 adult anemic patients. Patients were included according to WHO definition of anaemia excluding critically ill and regnant patients. Data were collected through questionnaires focusing on sociodemographic factors from patients and morphological types of anaemia through laboratory analyses. The sociodemographic characteristics of the participants were presented using descriptive statistics. The means, medians, and standard deviations were utilised to represent continuous data. Frequency and percentage were used to express categorical data. Statistical significance was set at $p < 0.05$, with a 95% confidence interval.

Results: The study population had a mean age of 41.74 years with a female predominance (54%). The majority of our participants (35%) were housewives, followed by farmers (25%) and students (14%). A large number (44%) of the participants belong to the lower middle class and 36% of respondents fell into the upper middle-class category while 16% of respondents were classed as low income. The majority had primary education (44%) only. Severe anaemia was present in 52% of the individuals while moderate anaemia affected 34% of patients and mild anaemia was found in 14%. Microcytic hypochromic anaemia (53%) was the most prevalent morphological type. Among other types, 41% of cases were normocytic anaemia, 4% were macrocytic anaemia, and 2% were dimorphic anaemia.

Conclusion: Anaemia in Bangladesh presents predominantly as microcytic hypochromic and is more common in middle-aged women. The high prevalence of severe anaemia underscores the need extensive screening program for targeted public health interventions and accessible diagnostic methods.

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I. Introduction

According to World Health Organization (WHO), anaemia is defined for women as hemoglobin levels less than 12.0 g/dL for females, and for men as levels less than 13.0 g/dL [1]. The most frequent etiologies of anaemia are nutritional deficiencies, malaria, parasitic infections, blood loss, bone marrow replacement, or suppression and hemoglobinopathies [2]. Anaemia is a worldwide public health concern that impacts both

developing and developed countries. According to Global burden of Disease data anaemia affected 24.3% of people worldwide and 1.92 billion cases up to the year 2021. The number of Years lived with disability (YLD) due to anaemia was estimates 52.0 million (35.1–75.1) YLDs in 2021. Iron deficiency anaemia was the leading cause of YLDs due to anaemia (402.4 cases per 100,000 people) [3]. The World Health Organization (WHO) estimates that anaemia affects 40% of children aged 6 to 59 months, 37% of pregnant women, and 30% of women aged 15 to 49 globally [4]. There has been a noteworthy improvement in awareness regarding the cause, prevention and consequences of anaemia over the last decade. In 2012, the 65th World Health Assembly (WHA) committed to reduce the prevalence of anaemia into half in women of reproductive age (15–49 years) by 2025 [5]. As a result, the United Nations also included prevention and treatment of anaemia as Sustainable Development Goals (SDGs) by 2030. In 2020, UN introduced the prevalence of anaemia in women aged 15 to 49 as SDG indicator 2.2.3 under target 2, zero hunger [6].

Anaemia remains a significant public health challenge for Bangladesh for several decades. The overall prevalence of anaemia is 41.8% in Bangladesh and varies by age, gender, and region [7]. The higher prevalence rate is typically observed among children (46.8%) and women of reproductive age (62.5%) [8]. This high prevalence is attributed to factors such as poor nutritional intake, lack of nutrition knowledge in primary education level, limited health care access, socioeconomic factors, and a high burden of infectious diseases. Anaemia in Bangladesh imposes a substantial health burden, affecting not only the well-being of individuals but also the economic and social progress in Bangladesh.

Morphological pattern of anaemia refers to size, shape, and appearance of red blood cells (RBCs), which is a key indicator in diagnosing and classifying anaemia. The complete blood count (CBC) is an affordable, easily accessible test that gives vital information about the red blood cell count, haemoglobin level, and mean corpuscular volume (MCV), mean corpuscular hemoglobin concentration (MCHC) etc. all of which are critical for the diagnosis of anaemia. Peripheral Blood Film (PBF), on the other hand, examines a blood smear under a microscope and offers important information on the shape of white blood cells, red blood cells, and platelets. Different types of anaemia can present with unique morphological characteristics such as microcytosis, macrocytosis, normocytic and dimorphic variations. Understanding these patterns is essential for both diagnosing the types of anaemia as well as to have a clue about underlying causes. This guides physicians for accurate diagnosis, finding appropriate management and better patient care. It will aid the public health professionals and health policymakers to formulate treatment strategies, design successful national supplement programs and other preventive strategies tailored to specific needs of population. In a limited resource country such as Bangladesh, where advanced diagnostic facilities may be expensive or inaccessible to the majority of the population, it is not only practical but also cost-effective to evaluate anaemia by CBC and PBF. Without imposing a substantial financial burden on patients, they enable medical professionals to diagnose and treat anaemia with confidence.

However, this study offered valuable insight of different morphological patterns of anaemia and severity of anaemia in a tertiary care hospital in Bangladesh. It also revealed different socio demographic factors of anemic patients of Bangladesh. In addition, understanding morphological pattern of anaemia in this study helped to identify the predominant types of anaemia in Bangladeshi context. This will guide us to form more specialized and efficient treatment approaches, especially in areas where multiple risk factors of anaemia coexist in Bangladesh.

II. Materials And Methods

Study design, settings and sample:

This cross-sectional study was carried out at the Department of Medicine at Abdul Malek Ukil Medical College Hospital, Noakhali. Following the approval of the study protocol, the study took place between August 2016-february 2017. The population comprised of all adult anaemic patients, who were hemodynamically stable, admitted to the Department of Medicine during this study period. All critically ill patients requiring ICU, pregnant women were excluded from the study. Based on the number of patients admitted per month and the time allocated for data collection, we recruited 100 patients for this study.

Diagnosis and Definition of Patients:

According to WHO guidelines, anaemia has been defined as having a hemoglobin concentration of less than 13 g/dl in men and 12 g/dl in women. The hemoglobin concentration in mild anaemia was considered 11-12.9 g/dl/ for men and 11.0-11.9 for non-pregnant women. Moderate anaemia was defined when Hb concentration was 8-10.9 gm/dl, and severe when Hb conc. < 7.0 gm/dl [9].

The morphological pattern of anaemia was determined by both complete blood count and peripheral blood film analyses result. The participants were divided into four categories of anaemia: microcytic hypochromic, macrocytic, normocytic normochromic, and dimorphic (mixed macrocytic and microcytic) based on mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), and mean corpuscular hemoglobin concentration (MCHC), and their correlation with the morphology of smears in peripheral blood film. Normal

reference range was 76–96 fl for MCV, 27–33 picograms for MCH, and, 33–36 g/dL for MCHC. As a result, MCV less than 76 fl and the presence of microcytic hypochromic RBC indicated microcytic hypochromic pattern, whereas MCV larger than 96 fl with macrocytic RBC on PBF suggested a macrocytic pattern. However, normal MCV, MCH, and MCHC suggested a normocytic normochromic pattern. The appearance of a mixed macrocytic and microcytic pattern in morphology suggested a dimorphic pattern.

Data Collection Process

Data collection was started after obtaining informed written consent from the patients with a clear explanation of study purpose. All physicians in the Department of Medicine were briefed about the study to ensure identification and complete diagnostic workup of anaemic patients upon admission. Firstly, a detailed questionnaire was structured to gather socio demographic data of the participants. The diagnosis and further classification of anaemia was documented by complete blood count and peripheral blood film analyses result. Both the patient-reported information and laboratory report was documented by an expert physician in a questionnaire.

Laboratory Analysis:

Approximately 3 ml venous blood was collected with aseptic precaution into an EDTA vacuum container. The Six-part SYSMEX XN-2000 Haematology Analyzer was used to perform a complete blood count. Peripheral blood smears were created with feathered edge, and stained with Leishman stain to classify anaemia.

Data Analysis and Quality Assurance

The entered data were assessed for completeness, accuracy and consistency before analysis. Data analysis was carried out by using SPSS version 26 (IBM Corp., Armonk, NY).

The sociodemographic characteristics of the participants were presented using descriptive statistics. The means, medians, and standard deviations were utilised to represent continuous data. Frequency and percentage were used to express categorical data. Statistical significance was set at $p < 0.05$, with a 95% confidence interval. Strict quality assurance procedures were used, including accurate diagnosis and supervised documentation of laboratory reports. Patient data confidentiality was strictly maintained during the entire research period.

Ethical consideration

This study was approved by the Ethical Review Committee of Abdul Malek Ukil Medical College Hospital. Written informed consent were collected from all participants. All the methods in the present study were carried out following the ethical guidelines of the 1975 Declaration of Helsinki and its later amendment.

III. Result:

The analysis of the patient data from the study reveals several key demographic and clinical characteristics. The age distribution of the patients revealed that the largest group, constituting 44%, was in between 31-50 years age. The mean age of our patients was 41.74 years, with a standard deviation of 16.73 years ranging from 16 to 75 years. The gender distribution showed a slight prevalence of female patients (54%) compared to male patients (46%). In terms of education, 44% of the patients had finished primary school. Of the patients, 32% had completed their Secondary School Certificate (SSC) and 10% had passed their Higher Secondary Certificate (HSC). Regarding occupational status, housewives made up the largest group (35%) followed by students (14%), and farmers (25%). Our data revealed that 44% of the patients belongs to lower middle-class category. Therefore, 16% of respondents were classified as low income and 36% belonged to the higher middle-class category. (Table 1).

Table 1: Basic characteristics of study participants (n=100)

Sex	Number of patients n (%)
Male	54(54%)
Female	46(46%)
Age (in years)	
15 - 30	30 (30.0%)
31 – 50	44 (44.0%)
51 – 70	22 (22.0%)
71 - 80	4 (4.0%)

Educational Status	
Illiterate	12 (12.0%)
Primary	44 (44.0%)
SSC	32 (32.0%)
HSC	10 (10.0%)
Hafeez E Quran	2 (2.0%)
Occupational Status	
Housewife	35 (35.00%)
Farmer	25 (25.00%)
Student	14 (14.0%)
Driver	6 (6.0%)
Tailor	4 (4.0%)
Business	4 (4.0%)
Shopkeeper	4 (4.0%)
Day laborer	4 (4.0%)
Feriwala	2 (2.0%)
Wood maker	2 (2.0%)
Monthly Income (in taka)	
<600(Low)	16(16%)
6000-15000(Lower middle)	44(44%)
15000-30000(Higher middle)	36(36%)
>30000 (High)	4(4%)

In terms of severity of anaemia, it was observed that over half of the patients (52%) exhibited severe anaemia. Among others, 34% of the patient group had moderate anaemia, and 14% had mild anaemia. (Figure 1)

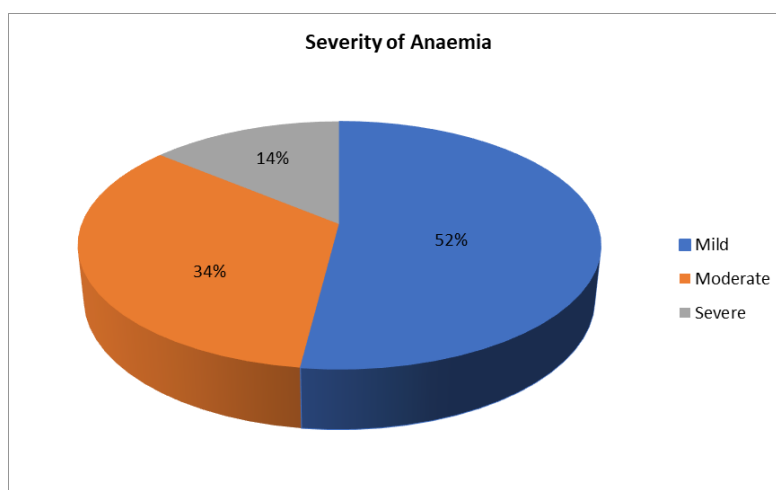


Figure 1: The severity of anaemia among study patients.

Lastly, microcytic hypochromic anaemia accounted for 53% of the morphological type anaemia seen in the study. Subsequently, normocytic anaemia accounted for 41%, macrocytic anaemia for 4%, and dimorphic anaemia for 2%, suggesting a wide variety of anaemia types among the patients under investigation. (Figure 2).

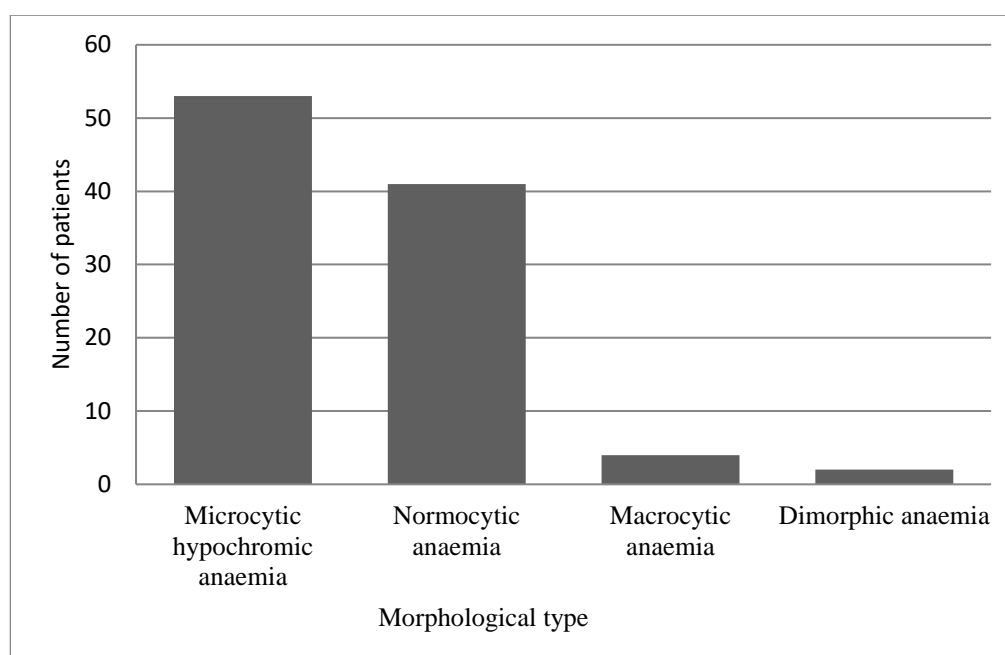


Figure 2: The morphological pattern of anaemia of the study patients.

IV. Discussion:

Our study revealed that middle-aged females (54%) in Bangladesh face a higher prevalence of anaemia than male. This result align with earlier Demographic and Health Surveys Program findings on anaemia, which showed that 41.8% of Bangladeshi women in the reproductive age range (15–49 years) have anaemia and this can be attributed to several factors [10]. In contrast to this scenario, developed countries such as USA have a bimodal age distribution of anaemia with increased prevalence around 30-39 years and 80-85 years. According to Global burden of disease study 2023, males have low incidence of anaemia than females in all ages [11]. For males, working barefoot in agriculture fields can lead to parasitic infections and causes anaemia. In case of females, Menstrual blood loss is a major public health concern worldwide for this age. In addition, repeated pregnancies, with the associated blood loss and increased iron demands, coupled with short recovery time can lead to anaemia in middle aged females. Though Bangladesh government has several national nutritional programs but Poor access to healthcare and lack of education about nutrition can exacerbate these issues. Comprehensive awareness campaigns are crucial in order to enlighten the general public, with a specific focus on middle-aged women, regarding the causes and prevention of anaemia, nutritious diet and regular antenatal checkups.

In light of the socioeconomic factors, the majority of our participants belong to lower-middle-class families, with a primary level of education being the most common. Being from a lower middle class and having less income, have a direct impact on dietary habits, access to healthcare, and knowledge of health-related issues and can raise the risk of anaemia. The illiterate people and primary level of education attained may not have sufficient knowledge to understand the importance of nutrition and health. These socioeconomic indicators are essential for tailoring public health prevention and treatment interventions for anaemia to the specific needs of this population group. It is important to have structured nutrition programs in order to guarantee that these poor people have access to an iron and vitamin supplementation when they needed with no cost. Additionally, iron fortification of our staple foods like rice, bread can be considered.

Our study result showed a high prevalence of severe anaemia (52%) which is concerning and requires urgent medical attention. The results were in conflict with those of a prior study, which showed that severe anaemia is less common in Bangladeshi people, possibly affecting only 2-3% of the population [12]. Bangladeshi patients often seek medical attention only when it reaches a severe stage leading to multiple complications. Limited access to healthcare services, particularly in rural areas, can delay early diagnosis and treatment which can lead to severe anaemia. Multiple factors have contributed to the increase in the incidence of severe anaemia in Bangladesh. Persistent nutritional deficiencies, parasite diseases, and socioeconomic factors that cause limited access to health care and nutritional diet. It is high time to establish more effective public health strategies and

treatments to meet the targets of Sustainable Development Goals (SDG) 2 and 3, which is to improved nutrition, good health, and wellbeing [13].

Severe anaemia leads to a range of physical complications due to less oxygen transport to body. Individuals may experience a range of complications including chronic fatigue, repeated infections, angina, heart failure etc. It usually leads to higher use of health services, including more hospital stays and doctor visits as well as more blood transfusions and other supportive therapies. From an economic perspective, it can diminish a person's capability for work, leading to absenteeism and unemployment.

The morphological pattern of anaemia in our cohort reveals a predominance of microcytic hypochromic anaemia, which is mostly due to iron deficiency, either by inadequate dietary intake or chronic blood loss. In 2007, another case report on anaemia reported 70% women in reproductive age was suffering from iron deficiency anaemia [14]. Our findings aligned with studies previously done in India [15] and Sudan [16] where majority of patients had microcytic hypochromic anaemia. A combination of dietary, economic, and health-related factors contributes to this high prevalence of iron deficiency anaemia in Bangladesh. Traditional rice-based diets in Bangladesh may not include enough iron-rich foods such red meat, chicken, fish, and legumes, particularly for the poor people. Furthermore, blood loss due to chronic diseases, helminthic infections and pregnancy contributes to this. Normocytic anaemia usually suggests chronic diseases affecting red blood cell production. It reflects a rise in chronic diseases among Bangladeshi population as well as their poor health seeking behavior that turns into various complications. The less common macrocytic anaemia is due to deficiencies in B12 or folate, while dimorphic anaemia suggests a combination of iron and vitamin B12 deficiencies or the concurrent presence of chronic disease with iron deficiency.

These results hold significant importance as they provide insights on the prevalence and types of anaemia among the population in Bangladesh. Understanding the morphological patterns of anaemia is crucial for public health experts, as it helps to design targeted interventions for designated people. This study not only highlights the increasing prevalence of severe anaemia but also sheds light on sociodemographic factors.

V. Limitations:

Despite the valuable insights provided by this study, there has been several limitations. Firstly, the study setting in a tertiary care center may not reflect the general population, potentially limiting the generalizability of the findings. Being cross sectional in nature we couldn't include further diagnostic work-ups to find out the etiology of anaemia. A large scale prospective longitudinal study needed to explore the etiology as well as the treatment outcome for different types of anaemia.

VI. Conclusion:

In summary, this study has provided insights into the morphological characteristics of anaemia among the patients at a tertiary medical facility in Bangladesh. The results showed that anaemia is more common in women and microcytic hypochromic anaemia is the most common kind. Given the high prevalence of severe anaemia in middle aged people points to a large burden in the working age population in Bangladesh. Healthcare policymakers and practitioners in Bangladesh should prioritize the implementation of extensive anaemia screening initiatives utilizing accessible and cost-effective techniques. Public health measures are required to encourage proper diet, raise awareness of nutrition, and remove socioeconomic barriers to health.

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