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Frequency of Microcytic Hypochromic Anemia Among Young Men and Women at AIMS Hospital, Muzaffarabad, Azad Jammu and Kashmir

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Abstract

Microcytic hypochromic anemia is a common hematologic pattern in low-resource settings and is usually related to iron deficiency. Young women are particularly vulnerable because of nutritional deficits, menstrual blood loss, and pregnancy-related iron demand, yet the burden in routine hospital practice in Azad Jammu and Kashmir has not been described clearly. This study determined the frequency of microcytic hypochromic anemia among young adults presenting to the pathology laboratory of Abbas Institute of Medical Sciences (AIMS) Hospital, Muzaffarabad, and summarized the major hematologic features of identified cases. A descriptive cross-sectional study was carried out from May to September 2025. During this period, 2,381 complete blood counts from patients aged 18–50 years were reviewed. Cases were included when anemia with microcytosis and hypochromia was documented on automated complete blood count and confirmed on peripheral blood film. One hundred eligible cases were identified. Microcytic hypochromic anemia represented 4.2% of all complete blood counts in the target age range. Most cases were between 20 and 39 years of age (83%), and females accounted for 67% of the cohort. Mean hemoglobin was 7.55±0.76 g/dL; 72% of patients had moderate anemia and 28% had severe anemia. The red cell indices were uniformly reduced: mean MCV 65.3±3.1 fL, mean MCH 19.8±2.3 pg, and mean MCHC 27.5±1.8 g/dL. Mean RDW was elevated at 19.4±2.3%, supporting significant anisocytosis. In this hospital-based series, microcytic hypochromic anemia was encountered regularly and showed clear female predominance. The combination of low hemoglobin, low red cell indices, low RBC count, and raised RDW strongly suggests iron deficiency in most cases. Targeted screening, nutritional support, and confirmatory iron studies are warranted.

Keywords: microcytic anemia; hypochromic anemia; iron deficiency; young adults; complete blood count; red cell indices; Muzaffarabad.

Introduction

Anemia remains one of the most common public health problems worldwide and continues to affect women and young adults disproportionately [1,2]. Microcytic hypochromic anemia is identified by reduced red cell size and diminished hemoglobin content, usually reflected by low mean corpuscular volume, low mean corpuscular hemoglobin, and low mean corpuscular hemoglobin concentration. In everyday clinical practice, this pattern most often raises suspicion of iron deficiency, although thalassemia trait, anemia of chronic inflammation, sideroblastic anemia, and lead toxicity may produce a similar picture [3,4]. Iron deficiency still accounts for a large share of anemia globally and remains especially common in low- and middle-income countries where dietary inadequacy, recurrent infection, poor maternal nutrition, and limited access to preventive care overlap [2,5]. Women of reproductive age carry the heaviest burden because menstrual losses, pregnancy, and repeated childbirth increase iron demand. In Pakistan, anemia among women remains a major nutritional concern, and regional data from Azad Jammu and Kashmir have also shown substantial rates among adolescent girls and young females [5,6].

Microcytic hypochromic anemia matters clinically because it is seldom an incidental laboratory curiosity. Reduced hemoglobin compromises oxygen delivery and may lead to fatigue, exertional breathlessness, reduced work capacity, poor concentration, and adverse maternal outcomes in pregnancy [3,7]. If the underlying cause is not recognized promptly, persistent deficiency can impair quality of life and place additional strain on already limited health services. Hospital laboratories therefore provide an important window into the local burden of this condition. Although anemia is widely recognized in Pakistan, locally organized hospital-based data from Muzaffarabad are limited. Knowing how often microcytic hypochromic anemia appears in routine complete blood count testing can help clinicians and administrators judge the size of the problem and identify the groups at greatest risk. The present study was undertaken to determine the frequency of microcytic hypochromic anemia among young men and women at AIMS Hospital, Muzaffarabad, and to describe the principal hematological findings of affected patients.

Materials and Methods

This descriptive cross-sectional study was conducted in the Pathology Department of Abbas Institute of Medical Sciences (AIMS) Hospital, Muzaffarabad, Azad Jammu and Kashmir. The study period extended from 1 May 2025 to 30 September 2025. The laboratory receives specimens from inpatient wards, outpatient clinics, and emergency services, and complete blood count analysis is performed routinely in the hematology section. All complete blood count reports generated for patients aged 18–50 years during the study period were reviewed. Consecutive eligible cases were included. In total, 2,381 complete blood counts were screened, and 100 cases met the study definition of microcytic hypochromic anemia.

Cases were included when hemoglobin was below the age- and sex-

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appropriate reference range, mean corpuscular volume was below 80 fL, and hypochromia was present on red cell indices or peripheral blood film. Peripheral smear confirmation of microcytic hypochromic morphology was mandatory. Both male and female patients were eligible. Repeat samples from the same patient were excluded so that each case contributed only once to the analysis. Patients younger than 18 years or older than 50 years were excluded. Samples with normocytic anemia, macrocytic anemia, mixed red cell morphology, or absent peripheral smear confirmation were also excluded. Pregnancy status was not available in the laboratory database and could not be analyzed separately.

Data were extracted from the laboratory information system and hematology registers using a structured form. Recorded variables included age, sex, hemoglobin, RBC count, mean corpuscular volume, mean corpuscular hemoglobin, mean corpuscular hemoglobin concentration, and red cell distribution width. Statistical analysis was performed in SPSS version 27. Continuous variables are presented as mean±standard deviation and range, whereas categorical variables are summarized as frequencies and percentages. Figures were prepared for age distribution, gender distribution, anemia severity, and mean hematological indices.

Results

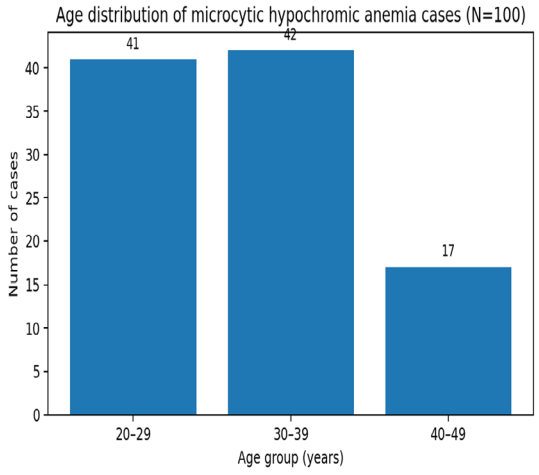
Among 2,381 complete blood counts reviewed during the five-month study period, 100 fulfilled the criteria for microcytic hypochromic anemia, giving a frequency of 4.2%. The mean age of included patients was 32.5±7.3 years, and most cases occurred between 20 and 39 years of age. Females accounted for 67% of cases, whereas males accounted for 33%.

Table 1: *Age distribution of cases (N=100).*

Most patients were younger than 40 years, with the highest proportion in the 30–39 year group.

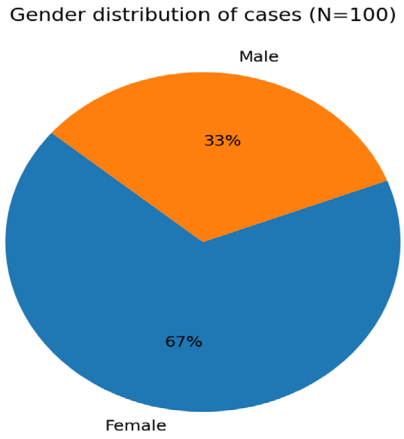
Age group (years)	Number of cases	Percentage
20–29	41	41%
30–39	42	42%
40–49	17	17%

Figure 1: *Age distribution of microcytic hypochromic anemia cases (N=100).*



Younger adults formed the majority of the cohort, with 83% of cases occurring between 20 and 39 years of age.

Figure 2: *Gender distribution of cases (N=100).*



Females represented two-thirds of the study population, demonstrating clear female predominance

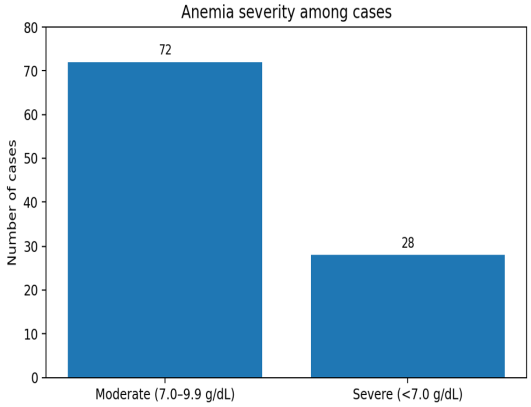
Hemoglobin values ranged from 5.9 to 8.8 g/dL, with a mean of 7.55±0.76 g/dL. Seventy-two patients had moderate anemia and 28 had severe anemia; no mild cases were documented (Table 2; Figure 3).

Table 2: *Severity of anemia among included patients*

No mild anemia cases were identified in the present series.

Hemoglobin category	Number of cases	Percentage
Moderate (7.0–9.9 g/dL)	72	72%
Severe (<7.0 g/dL)	28	28%

Figure 3: *Anemia severity among cases.*



Most patients had moderate anemia, while more than one-quarter already had severe anemia at presentation.

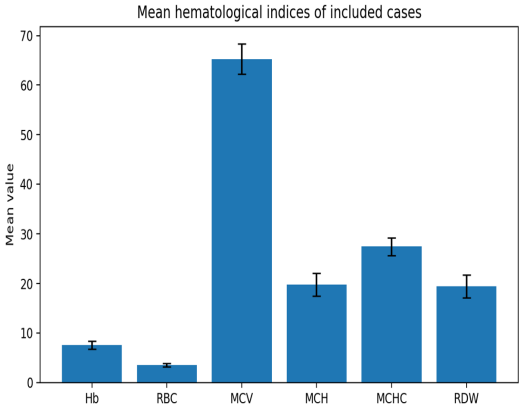
Red cell indices showed a consistent microcytic hypochromic pattern. Mean RBC count was 3.50±0.36 $\times 10^{12}$/L, mean MCV was 65.3±3.1 fL, mean MCH was 19.8±2.3 pg, and mean MCHC was 27.5±1.8 g/dL. RDW was increased in most cases, with a mean value of 19.4±2.3%. Taken together, these findings indicate small, pale, and variably sized red cells, a pattern strongly compatible with iron deficiency anemia in routine practice (Table 3; Figure 4).

Table 3: *Summary of hematological indices.*

All red cell indices were shifted away from adult reference ranges in a direction consistent with microcytic hypochromic anemia.

Parameter	Mean ± SD	Minimum	Maximum	Adult reference range
Hemoglobin (g/dL)	7.55 ± 0.76	5.9	8.8	~12–15 (F), 13–17 (M)
RBC count (×10^{12}/L)	3.5 ± 0.36	2.7	4.0	~4.0–5.5 (F), 4.5–6.0 (M)
MCV (fL)	65.3 ± 3.1	56.6	71.2	80–100
MCH (pg)	19.8 ± 2.3	12.8	23.9	27–33
MCHC (g/dL)	27.5 ± 1.8	23.2	31.8	33–36
RDW (%)	19.4 ± 2.3	13.6	26.1	11.5–14.5

Figure 4: *Mean hematological indices of included cases.*



The overall pattern shows low hemoglobin, low RBC count, reduced red cell indices, and raised RDW.

Discussion

This study shows that microcytic hypochromic anemia was a regular laboratory finding among young adults evaluated at AIMS Hospital, with roughly one case identified for every twenty-five complete blood counts performed in the target age group. The observed frequency is comparable to other hospital-based reports from Pakistan and supports the view that nutritional anemia continues to impose a meaningful clinical burden [5,8]. Female predominance was marked in the present series. This pattern is biologically and socially plausible, as menstrual blood loss, repeated pregnancies, and lower dietary iron intake increase vulnerability among women of reproductive age [2,5,6]. The concentration of cases in the 20–39 year age range further emphasizes the burden in the most active reproductive and working years of life.

The hematologic profile also points strongly toward iron deficiency in most patients. Hemoglobin was clearly reduced, all three major red cell indices were substantially below adult reference ranges, RBC count was low rather than preserved, and RDW was elevated in most cases. This combination fits iron deficiency more closely than thalassemia trait, in which RBC count is often relatively higher and RDW may remain near normal [3,4,9]. The study has practical value because it describes a real hospital workload using routine laboratory data. It also has limitations. The design was cross-sectional, serum ferritin and transferrin studies were not available, pregnancy status was not recorded, and clinical histories were not reviewed. The findings therefore describe the frequency and laboratory pattern of microcytic hypochromic anemia rather than confirm etiologic diagnosis in every individual case. Even so, the data support the need for early screening and nutritional intervention, particularly for women of childbearing age.

Conclusion

Microcytic hypochromic anemia was identified in 4.2% of complete blood counts performed in young adults at AIMS Hospital during the study period. The disorder showed clear female predominance and was characterized by moderate-to-severe anemia, markedly reduced red cell indices, low RBC count, and elevated RDW. These findings are most consistent with iron deficiency in the majority of cases. Focused screening, nutrition-oriented counseling, and confirmatory iron studies should be strengthened, especially for women in the reproductive age group.

Conflicts of Interest

The authors declare that there are no conflicts of interest related to this work.

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Author Contributions

All authors contributed to study conception, data collection, data interpretation, drafting of the manuscript, and final approval of the submitted version. One author should be designated as guarantor on the title page before submission.

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