

Frequency of Anaemia and Its Etiological Pattern Among Adult Patients Admitted to a Medical Ward: A Multi-Centre Study from Tertiary Care Hospitals in Pakistan

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ABSTRACT

Objective: To determine the frequency of anaemia and characterise its etiological pattern among adult patients admitted to medical wards at tertiary care hospitals in Pakistan.

Study Design: Cross-sectional descriptive study.

Place and Duration of Study: Medical wards of three tertiary care hospitals in Pakistan, from 18th October 2025 to 18th March 2026.

Methodology: A total of 110 adult patients admitted to medical wards were enrolled through non-probability consecutive sampling. Anaemia was defined and classified using WHO criteria. Complete blood count, peripheral blood film, serum iron studies, serum ferritin, vitamin B12, folate, reticulocyte count, and relevant biochemical investigations were performed. Anaemia was categorised by aetiology as iron deficiency anaemia, anaemia of chronic disease, megaloblastic anaemia, haemolytic anaemia, or anaemia of other causes.

Results: Anaemia was identified in 78 (70.9%) of the 110 patients studied. Iron deficiency anaemia was the most common aetiology (31; 39.7%), followed by anaemia of chronic disease (22; 28.2%), vitamin B12/folate deficiency (14; 17.9%), haemolytic anaemia (7; 9.0%), and other causes (4; 5.1%). Moderate anaemia was the predominant severity category (35; 44.9%). Female patients were disproportionately affected, accounting for 65.4% of anaemic cases. Mean haemoglobin in anaemic patients was 7.9 ± 1.8 g/dL.

Conclusion: Anaemia is highly prevalent among medical ward admissions in Pakistan, with iron deficiency as the leading aetiology. The high burden of nutritional anaemia alongside significant rates of anaemia of chronic disease reflects the dual nutritional and comorbidity burden in this population. Routine screening and targeted management protocols are urgently needed.

Keywords: Anaemia; Iron Deficiency; Aetiology; Medical Ward; WHO Criteria; Pakistan

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INTRODUCTION

Anaemia holds the unfortunate distinction of being the most prevalent haematological disorder in clinical medicine — and one of the most consistently underestimated. Globally, the World Health Organization estimates a burden exceeding 1.62 billion affected individuals, with the heaviest concentration in low- and middle-income countries [1]. The clinical challenge lies not in recognising anaemia but in untangling its cause: it represents a final common endpoint for a wide spectrum of conditions — nutritional deficiencies, chronic inflammation, haemolysis, haematological malignancy, and bone marrow failure — and the treatment differs substantially depending on which of these underlies the presentation [2,3].

In medical ward populations specifically, anaemia presents with a frequency that arguably justifies treating it as a default clinical expectation rather than an incidental finding. Studies from South Asian settings have reported anaemia prevalence rates in admitted medical patients ranging from 50% to as high as 80%,

depending on the population studied and the diagnostic threshold applied [4,5]. This is not surprising given the epidemiological backdrop: chronic infections such as tuberculosis and hepatitis, poorly controlled diabetes mellitus, chronic kidney disease, and nutritional deficiencies are all common in Pakistan and each independently contributes to anaemia through distinct pathophysiological mechanisms [6,7].

Iron deficiency anaemia has long dominated the etiological picture in Pakistani women of reproductive age. The drivers are well characterised: dietary iron inadequacy, heavy menstrual losses, and closely spaced pregnancies combine to create a chronic negative iron balance that is difficult to correct without structured intervention [8]. Anaemia of chronic disease presents a different problem entirely. Driven by hepcidin-mediated iron sequestration and the suppressive effects of inflammatory cytokines on erythropoiesis, ACD is increasingly recognised as a major contributor to anaemia in hospitalised adults of both sexes —

particularly those carrying chronic infections, malignancy, or autoimmune conditions [9]. The clinical distinction between the two is not academic: misclassifying ACD as IDA can result in inappropriate iron supplementation in patients whose iron stores are, in fact, adequate [3,9]. Local data on this subject remain thin. Single-centre studies from Pakistan do exist, but they differ enough in their diagnostic thresholds, patient populations, and laboratory protocols that drawing consistent conclusions across them is difficult [10,11]. What is needed — and what this study attempts to provide — is multi-centre data that more faithfully reflects the range of patients presenting to tertiary medical wards across different institutional settings, and that can more credibly inform screening protocols and resource allocation decisions at the ward level.

The objective of this study was to determine the frequency of anaemia and characterise its etiological pattern among adult patients admitted to medical wards at tertiary care hospitals in Pakistan.

MATERIAL AND METHODS

Study Design and Setting

This cross-sectional descriptive study was conducted at the medical wards of three tertiary care hospitals in Pakistan from 18th October 2025 to 18th March 2026.

Ethical

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki (2013). Institutional ethical approval was obtained from the Research and Ethics Committees of all three participating hospitals prior to commencement of data collection. Written informed consent was obtained from all enrolled patients. All patient data were fully anonymised and handled in accordance with institutional protocols for privacy and data confidentiality.

Approval

Sample

A total of 110 patients were enrolled. Sample size was calculated based on an estimated anaemia prevalence of 60% in medical ward admissions, with a 95% confidence interval and a margin of error of 9%, yielding a minimum requirement of 107 patients; 110 were enrolled to allow for potential attrition.

Size

Sampling

Non-probability consecutive

Technique

sampling.

Inclusion Criteria

- Adult patients aged 18–75 years admitted to general medical wards for any indication.
- Patients willing to provide written informed consent.
- Patients in whom a complete haematological workup could be performed within 24 hours of admission.

Exclusion Criteria

- Patients with a history of recent blood transfusion within the preceding three months.
- Patients with active haematological malignancy as the primary diagnosis.

- Patients with acute haemorrhage as the cause of anaemia.
- Pregnant patients.
- Patients with incomplete haematological investigations or who declined consent.

Data

A structured proforma was used to record demographic data (age, gender, BMI) and relevant medical history (comorbidities, dietary habits, menstrual history in females, history of gastrointestinal symptoms, prior blood transfusions). All enrolled patients underwent complete blood count (CBC), peripheral blood film examination, reticulocyte count, serum iron, total iron binding capacity (TIBC), serum ferritin, serum vitamin B12, and serum folate levels. Renal function tests, liver function tests, and thyroid function tests were performed where clinically indicated. Anaemia was defined using WHO criteria: haemoglobin <12 g/dL in females and <13 g/dL in males. Severity was graded as mild (Hb 10.0–11.9 g/dL in females, 10.0–12.9 g/dL in males), moderate (Hb 7.0–9.9 g/dL), or severe (Hb <7.0 g/dL). Etiological classification was based on the clinical presentation, peripheral blood film morphology, and laboratory indices: iron deficiency anaemia (low serum ferritin, low MCV, microcytic hypochromic film), anaemia of chronic disease (normal or elevated ferritin, low serum iron, normocytic film in the context of a chronic disease), megaloblastic anaemia (low B12 or folate, macrocytic film, hypersegmented neutrophils), haemolytic anaemia (elevated reticulocyte count, indirect hyperbilirubinaemia, positive Coombs test where applicable), and aplastic or other cause.

Statistical

Data were analysed using SPSS version 26.0 (IBM Corp., Armonk, NY). Continuous variables were expressed as mean $\pm$ standard deviation (SD) and compared using the independent samples t-test. Categorical variables were expressed as frequencies and percentages and compared using the chi-square test or Fisher's exact test as appropriate. A p-value of <0.05 was considered statistically significant.

Analysis

RESULTS

Of the 110 patients enrolled across three tertiary care medical wards, 78 (70.9%) were found to be anaemic on the basis of WHO criteria. The mean age of the overall cohort was 46.3 ± 16.2 years. Female patients accounted for 69 (62.7%) of all enrolled patients and constituted 65.4% of the anaemic subgroup — a distribution that, while anticipated, is nonetheless clinically significant. The mean haemoglobin in anaemic patients was 7.9 ± 1.8 g/dL, compared to 13.2 ± 1.1 g/dL in non-anaemic patients ($p < 0.001$). Mean MCV was significantly lower in the anaemic group (72.4 ± 9.8 vs 87.3 ± 6.2 fL; $p < 0.001$), reflecting the predominance of microcytic pathology (Table I).

In terms of severity, moderate anaemia was the most frequently observed category (35 patients; 44.9%), followed by mild anaemia (28 patients; 35.9%) and severe anaemia (15 patients; 19.2%). Three patients in the severe anaemia group required urgent blood

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transfusion during the admission period. Iron deficiency anaemia accounted for the largest single etiological group (31 patients; 39.7%), with a mean haemoglobin of 7.2 ± 1.6 g/dL and a clear female preponderance (74.2%). Anaemia of chronic disease was the second most common aetiology (22 patients; 28.2%), predominantly seen in patients with diabetes mellitus, chronic kidney disease, or chronic infections including tuberculosis and hepatitis C. Vitamin B12 and/or folate deficiency was identified in 14 patients (17.9%), haemolytic anaemia in 7 (9.0%), and aplastic or other causes in the remaining 4 patients (5.1%) (Table II, Figure 1).

BMI was significantly lower in the anaemic group compared to non-anaemic patients (22.4 ± 3.6 vs 24.7 ± 3.9 kg/m²; $p=0.004$), suggesting an association between nutritional status and anaemia burden. Comorbidities including chronic kidney disease (24.4% vs 9.4%), chronic infection (23.1% vs 9.4%), and history of malabsorption or prior gastrointestinal surgery (15.4% vs 3.1%) were all numerically more prevalent in the anaemic group, though these differences did not reach statistical significance in this sample, possibly reflecting the modest size of the non-anaemic comparator group.

Table I: Baseline Demographic and Laboratory Characteristics of Anaemic and Non-Anaemic Patients (n=110)

Variable	Anaemic (n=78)	Non-Anaemic (n=32)	p-value
Age — mean $\pm$ SD (years)	47.3 $\pm$ 16.4	44.1 $\pm$ 15.8	0.341
Gender — Female n (%)	51 (65.4)	18 (56.3)	0.361
Gender — Male n (%)	27 (34.6)	14 (43.7)	0.361
BMI — mean $\pm$ SD (kg/m ²)	22.4 $\pm$ 3.6	24.7 $\pm$ 3.9	0.004
Diabetes Mellitus n (%)	28 (35.9)	9 (28.1)	0.422
Chronic Kidney Disease n (%)	19 (24.4)	3 (9.4)	0.064
Rheumatoid Arthritis / Connective Tissue Disease n (%)	14 (17.9)	2 (6.3)	0.108
Chronic Infection (TB / Hepatitis) n (%)	18 (23.1)	3 (9.4)	0.091

Variable	Anaemic (n=78)	Non-Anaemic (n=32)	p-value
History of Malabsorption / GI Surgery n (%)	12 (15.4)	1 (3.1)	0.071
Mean Haemoglobin — g/dL	7.9 $\pm$ 1.8	13.2 $\pm$ 1.1	<0.001
Mean MCV — fL	72.4 $\pm$ 9.8	87.3 $\pm$ 6.2	<0.001

Table II: Etiological Classification of Anaemia Among Anaemic Patients (n=78)

Aetiology	n (%)	Mean Hb $\pm$ SD (g/dL)	Predominant Gender
Iron Deficiency Anaemia	31 (39.7)	7.2 $\pm$ 1.6	Female (74.2%)
Anaemia of Chronic Disease	22 (28.2)	8.6 $\pm$ 1.4	Equal
Vitamin B12 / Folate Deficiency	14 (17.9)	8.1 $\pm$ 1.9	Male (57.1%)
Haemolytic Anaemia	7 (9.0)	7.4 $\pm$ 2.1	Male (57.1%)
Aplastic / Other Cause	4 (5.1)	6.3 $\pm$ 1.8	Equal
Total	78 (100)	7.9 $\pm$ 1.8	Female (65.4%)

Figure 1. Etiological Pattern and Severity of Anaemia in Medical Ward Admissions — Multi-Centre Study, Pakistan (n=110)

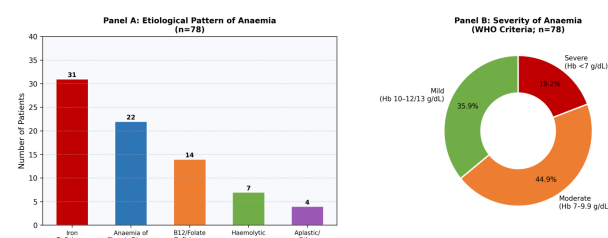


Figure 1. Panel A: Absolute number of patients by etiological category among anaemic patients (n=78). Panel B: Distribution of anaemia severity according to WHO criteria among anaemic patients (n=78). IDA = Iron Deficiency Anaemia; ACD = Anaemia of Chronic Disease; WHO = World Health Organization. Multi-centre study, Pakistan (n=110).

DISCUSSION

A prevalence of 70.9% is, frankly, a striking number. It tells us that nearly three out of every four adult patients admitted to a medical ward in these three centres were anaemic — and that anaemia in this population is not an

incidental comorbidity but rather a near-universal clinical reality. This figure is broadly consistent with data from comparable South Asian settings. Badawi et al. reported anaemia prevalence rates of 68–75% in hospitalised patients across tertiary centres in South Asia [4], and a multi-centre study from India documented prevalence of 72.4% in general medical admissions [5]. Taken together, these figures suggest that anaemia screening should be a routine component of every adult medical admission in this region. Iron deficiency anaemia was the most common aetiology in this cohort (39.7%), with a pronounced female predominance. This is consistent with the well-characterised epidemiology of IDA in Pakistan, where nutritional iron deficiency — compounded by heavy menstrual losses, frequent pregnancies, and low dietary bioavailability of non-haem iron — remains a chronic and partially preventable problem [8,12]. The mean haemoglobin in IDA patients was 7.2 g/dL, which falls in the moderate-to-severe range and suggests that many patients were presenting with longstanding, symptomatic deficiency rather than early-stage disease. This raises questions about the adequacy of community-level screening and supplementation programmes — questions that go beyond the scope of this study but that this data implicitly invites.

Anaemia of chronic disease accounted for 28.2% of cases — the second largest etiological category — and its distribution in this cohort was predictable in the best sense: it clustered around patients with diabetes mellitus, chronic kidney disease, and chronic infections, particularly tuberculosis and hepatitis C [3,9]. These are conditions that are not only prevalent in Pakistan but frequently undertreated and poorly controlled, creating a sustained inflammatory milieu that drives hepcidin upregulation and functional iron restriction [7,13]. The implication is straightforward: as the burden of these chronic diseases continues to grow, ACD's contribution to overall anaemia prevalence is likely to grow with it [6].

Megaloblastic anaemia due to vitamin B12 or folate deficiency was identified in 17.9% of patients — a proportion that is somewhat higher than figures reported from Western populations but aligns with data from South Asian studies where dietary restrictions, malabsorption syndromes, and low meat consumption contribute to B12 depletion [11,14]. What is particularly worth noting is that B12 deficiency is eminently treatable and, in many cases, preventable through dietary counselling or inexpensive supplementation. The identification of 14 patients with this potentially reversible cause of anaemia in a six-month period across three centres is a reminder that clinical history — specifically asking about diet and gastrointestinal symptoms — remains an indispensable investigative tool.

The lower BMI observed in anaemic patients compared to their non-anaemic counterparts (22.4 ± 3.6 vs 24.7 ± 3.9 kg/m²; $p=0.004$) fits a pattern that clinicians in Pakistani hospitals will find familiar — anaemia and undernutrition tend to travel together, and managing one without addressing the other rarely produces lasting benefit [15,16]. The predominance of moderate anaemia

(44.9%) across the cohort is worth emphasising for a different reason: moderate anaemia tends to be overlooked precisely because it is not immediately life-threatening, yet its consequences — impaired cognition, reduced functional capacity, and prolonged hospital stays — are clinically meaningful, especially in older patients [2,16].

LIMITATIONS

Several limitations of this study warrant acknowledgement. The cross-sectional design captures a snapshot of anaemia at the time of admission and does not allow for assessment of treatment response or longitudinal change in haemoglobin during the hospital stay. The exclusion of patients with recent transfusions and haematological malignancies, while methodologically necessary, means that the most severely anaemic or haematologically complex patients were not captured, potentially underestimating the true burden in this population. Bone marrow biopsy was not routinely performed, which may have led to some cases being classified as "other cause" rather than receiving a more specific diagnosis. Finally, despite being conducted across three centres, the study population is limited to urban tertiary care facilities, and the etiological distribution could be different in rural or semi-urban settings where nutritional deficiency may be even more prevalent.

CONCLUSION

Anaemia is highly prevalent among adult patients admitted to medical wards at tertiary care hospitals in Pakistan, affecting more than two-thirds of enrolled patients in this multi-centre study. Iron deficiency anaemia and anaemia of chronic disease together account for nearly 70% of all cases, with the former disproportionately affecting women and the latter reflecting the growing burden of chronic comorbidities. Routine haematological screening on admission, systematic etiological workup, and targeted management protocols tailored to local epidemiology are essential steps toward reducing the clinical and functional burden of anaemia in this setting. Larger prospective studies incorporating follow-up data would provide a more complete picture of treatment outcomes and progression.

CONFLICT OF INTEREST
None

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