Original Article

Prevalence of Aplastic Anemia Among Adult Patients with Anemia

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ABSTRACT

Objective: To analyze the demographic and hematological characteristics of adults presenting with anemia versus those without aplastic anemia and to support timely clinical recognition and management.
Study Design: A Cross-sectional study.
Place and Duration of Study: This study was conducted at the General Medicine Department, Sandeman Provincial Hospital / Bolan Medical Complex Hospital Quetta from June 2025 to August 2025.
Methods: One hundred adult patients with anemia were enrolled in a cross-sectional study at a tertiary care hospital. These patients underwent a detailed assessment and laboratory testing, including a complete blood count, reticulocyte count, and peripheral blood smear. Patients with peripheral blood smears showing a reticulocyte count. We're working up with anemia and bone marrow aspirations. Aplastic anemia was diagnosed according to Camitta criteria. Data were collected, including demographics, hematological, and clinical variables. SPSS version 24 was used to perform statistical analyses of these variables, and inter-group differences in cases were assessed using chi-square tests and independent t-tests between aplastic and non-aplastic anemia.
Results: The 100 participants (mean age 42.8 ± 13.6 years; 54% male), the incidence of aplastic anemia was 12%. Anemia was commonly accompanied with, fatigue (83% of cases), infections (58%), and bleeding (42%). Pancytopenia was significantly more prevalent in cases of aplastic anemia (92) compared to non-18 cases; (p <0.001). Hemoglobin levels (6.1 ± 0.9 g/dL vs. 8.4 ± 1.2 g/dL; p <0.001), and the count of platelets and neutrophils was significantly lower within the aplastic group. When looking at the severity, 50% were categorized as severe, 33% fall into the very severe category, and 17% were indicated as non-severe.
Conclusion: A significant proportion of adult anemia cases are due to aplastic anemia with severe cytopenias. This demonstrates the need for prompt diagnostic evaluations and timely bone marrow assessments.
Key Words: Aplastic anemia; prevalence; pancytopenia; adults

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INTRODUCTION

Aplastic anemia is a rare but serious disorder of the blood and bone marrow, accounting for fewer than 1% of cases of anemia worldwide. It also carries the risk of opportunistic infection, bleeding, and death, in addition to debilitating fatigue. It is thus a potentially severe global health concern[1]. In low and middle-income countries, anemia is one of the most frequent complaints of outpatients and inpatients in most clinical settings.

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In most of these cases, diagnostic investigations are focused on nutritional, hemolytic, or chronic disease anemias. Because of this, bone marrow failure syndromes like aplastic anemia are often missed. This has, unfortunately, led to missed opportunities to diagnose and clinically manage individuals suffering from these syndromes[2]. The causes of aplastic anemia are highly variable and include autoimmune stem cell destruction, environmental toxins like benzene, drug reaction, viral infections (especially hepatic), and certain inherited disorders. The causes of a significant number of cases, however, remain unknown[3]. The incidence of aplastic anemia also varies widely by region, with the highest rates occurring in Asia by a large margin. These differences are likely due to a combination of environmental, socio-economic, and differences in health care availability. The actual impact and prevalence of aplastic anemia and its complications are not fully understood. They are likely not fully appreciated by the physician community in South Asia and other regions of the world[4,5]. Clinically, aplastic anemia is associated with complications emanating from the lack of functioning bone marrow. Bone marrow insufficiency leads to anemia and consequent fatigue and pallor, infections due to neutropenia, and

bleeding due to thrombocytopenia[6]. Such complications are non-specific and are therefore likely to be encountered in numerous other related disorders, further slowing the rate of accurate diagnosis. Obtaining a correct diagnosis is greatly assisted by the presence of complications, as evidenced by laboratory findings of anemia in the normocytic or macrocytic range, associated with reticulocytopenia and other cytopenias. The gold standard for the most accurate diagnosis is a bone marrow biopsy, which is likely to show a hypocellular marrow with few of the cells expected in a normally functioning bone. Such a condition significantly impedes the ability to diagnose in a timely fashion. This is of great importance because the commencement of immunosuppressive therapies and/or hematopoietic stem cell transplantation will lead to significantly improved health outcomes[7,8]. Given the limited local prevalence data and the unique challenges posed by this condition, identifying aplastic anemia in adults with anemia is a high priority. This can benefit clinical practitioners in clinical diagnosis and also help in the pragmatic parallel allocation of health resources[9]. Methodical and straightforward data collection of demographic details alongside clinical findings, in the form of a blood test, will provide the clinician with a 'softer' option for anemia, compared to the numerous other causes of anemia that are likely to have a more complex treatment plan. The objective of this study is to address this knowledge gap to enhance clinical practice in resource-constrained healthcare settings, where advanced diagnostics may not be readily available.

METHODS

Study Design & Setting: This cross-sectional study was conducted in the General Medicine Department of a tertiary care teaching hospital. The study included adult patients presenting with anemia who underwent diagnostic evaluation

Participants: The World Health Organization's criteria for hemoglobin levels were used to include participants aged 18 or older with a diagnosis of anemia. Those with known hematologic malignancies and/ or recent chemotherapy treatment, pregnant patients, individuals with acute blood loss, and those who suffer from chronic renal failure were excluded from analysis. All participants in this study have undergone a standard medical history, a complete medical examination, and a complete blood analysis. Any cases in the study suspected of having osteoporosis were referred for bone marrow biopsy.

Sample Size Calculation: Applying the expected 5% prevalence rate of the condition, the 95% confidence level (Z=1.96), and 4% margin of error, the sample size was determined as $n = Z^2P(1-P)/d^2$. However, given the time and budget resources, 100 patients were selected, while the calculated sample size was 114.

Inclusion Criteria: Men aged 18 years or older have a hemoglobin level of 13 g/dL, whereas women of the same age have a hemoglobin level of 12 g/dL. Approve participation

Ethical Approval Statement: The study protocol and synopsis titled “Prevalence of Aplastic Anemia Among Adult Patients with Anemia” were reviewed and approved by the Research Evaluation Unit of the College of Physicians and Surgeons Pakistan (CPSP) (Ref No: CPSP/REU/MED-2022-001-19384, Dated May 30, 2025). The approval confirms that all research procedures comply with ethical standards for conducting studies involving human participants. A copy of the acceptance letter is available from the corresponding author upon request.

Exclusion Criteria: Hematologic cancer, which is known. Recent treatment with chemotherapy or radiotherapy. Women who are pregnant, Patients with severe acute hemorrhage

Diagnostic and Management Strategy: A complete blood count, reticulocyte count, and peripheral blood smear were done on each patient. Bone marrow biopsy was done on those with suspected marrow failure. Aplastic anemia was diagnosed according to the Camitta criteria, and subsequently, confirmed patients received supportive care, transfusions, and infection prophylaxis, and were referred for evaluation of immunosuppressive therapy.

Statistical Analysis: Demographic and laboratory values statistics were summarized descriptively and analyzed utilizing SPSS version 24. Prevalence was calculated in percentages. An independent t-test was used to compare the means of two continuous groups, and a chi-square test was used to assess the relationship between categorical variables. A p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 100 adult patients with anemia were evaluated. The mean age of participants was 42.8 ± 13.6 years, with 54 males (54%) and 46 females (46%). The overall prevalence of aplastic anemia among the study population was 12% (n=12). Fatigue (83%), recurrent infections (58%), and bleeding manifestations (42%) were common presenting symptoms in aplastic anemia cases. Pancytopenia was significantly more frequent in the aplastic group (92%) than in non-aplastic anemia patients (18%) ($p < 0.001$). Mean hemoglobin was markedly lower in aplastic anemia patients (6.1 ± 0.9 g/dL) compared to non-aplastic cases (8.4 ± 1.2 g/dL) ($p < 0.001$). Platelet count and absolute neutrophil count were also significantly reduced in patients with aplastic anemia ($p < 0.01$). Bone marrow biopsy confirmed hypocellularity in all diagnosed cases. Based on severity classification, 50% were classified as severe, 33% as very severe, and 17% as non-severe aplastic anemia. Early diagnostic evaluation

through hematological and marrow assessment helped establish timely diagnosis and guided appropriate management pathways.

Intervention Outcome:

Individuals with aplastic anemia received supportive management, including blood transfusions, infection prophylaxis, and requests for consideration of immunosuppressive therapy. Early detection during workup for anemia strengthened management planning and minimized complications. Timely marrow evaluation enabled more immediate clinical decisions, which might improve long-term outcomes, especially in settings with fewer healthcare resources.

Table No. 1: Baseline Demographic Characteristics of Study Participants

Variable	Total (n = 100)	Aplastic Anemia (n = 12)	Non-Aplastic Anemia (n = 88)	p-value
Mean Age (years) ± SD	42.8 ± 13.6	39.5 ± 12.8	43.3 ± 13.9	0.28
Gender (Male), n (%)	54 (54%)	7 (58.3%)	47 (53.4%)	0.72
Gender (Female), n (%)	46 (46%)	5 (41.7%)	41 (46.6%)	—

Baseline demographic distribution of adult patients evaluated for anemia, comparing those diagnosed with aplastic anemia versus non-aplastic causes.

Table No. 2: Hematological Parameters of Study Participants

Parameter	Aplastic Anemia (n = 12)	Non-Aplastic Anemia (n = 88)	p-value
Hemoglobin (g/dL), mean ± SD	6.1 ± 0.9	8.4 ± 1.2	<0.001
Platelet Count ($\times 10^9$/L), mean ± SD	32 ± 14	156 ± 48	<0.01
Absolute Neutrophil Count (ANC), mean ± SD	0.7 ± 0.3	2.8 ± 1.1	<0.01
Reticulocyte Count (%)	0.3 ± 0.1	1.2 ± 0.6	<0.001
Pancytopenia, n (%)	11 (92%)	16 (18%)	<0.001

Comparison of key hematological indices between aplastic anemia patients and those with non-aplastic anemia, showing significantly lower counts in the aplastic group.

Table No. 3: Prevalence and Severity Classification of Aplastic Anemia

Category	n	%
Total Aplastic Anemia Cases	12	12%
Severe Aplastic Anemia	6	50%
Very Severe Aplastic Anemia	4	33%
Non-Severe Aplastic Anemia	2	17%

Distribution of aplastic anemia severity based on Camitta criteria among diagnosed patients.

Table No. 4: Clinical Features Among Aplastic vs. Non-Aplastic Anemia Cases

Clinical Feature	Aplastic Anemia (n = 12)	Non-Aplastic Anemia (n = 88)	p-value
Fatigue	10 (83%)	61 (69%)	0.31
Recurrent Infections	7 (58%)	19 (22%)	<0.01
Bleeding Manifestations	5 (42%)	9 (10%)	<0.01
Pallor	12 (100%)	88 (100%)	—
Fever	6 (50%)	17 (19%)	<0.05

Frequency of major clinical symptoms among anemic adults, demonstrating significantly higher rates of infections and bleeding in the aplastic anemia group.

DISCUSSION

The presence study investigated the frequency of aplastic anemia among adult patients presenting with anemia at a tertiary care facility and found a 12% prevalence. This underscores the significant burden of bone marrow failure in everyday clinical practice. Anemia in low-resource settings is often attributed to malnutrition and/or chronic illnesses; however, our results indicate that aplastic anemia should be considered a significant differential diagnosis, especially in patients with pancytopenia or unexplained cytopenias. 92% of patients with aplastic anemia had pancytopenia, compared with 18% of patients without aplastic anemia, underscoring the importance of combined cytopenias in the diagnosis[11]. The prevalence of aplastic anemia in our study is comparable to that reported in other recent regional and international studies. An investigation performed in India reported a prevalence level of about 10.4% in patients suffering from primary cytopenia. This indicates that syndromes involving bone marrow failure remain very important clinically in the South Asian population[12]. Study-based evidence from a 2021 multi-center study in China shows that there is a growing incidence of aplastic anemia, particularly in the younger population. This is consistent with our analysis, which found that 67% of the patients in the study were under 45 years old[13]. There is a notable trend in the environment and specific occupations that affects the population, as seen in the previously mentioned study and other recent ones. Patients with aplastic anemia have much lower hemoglobin levels, lower platelet counts, and fewer neutrophils than patients with different types of anemia. This trend follows descriptions related to previously conducted hematological studies, where a 2020 investigation revealed that if anemia is present, with the added characteristic of a low reticulocyte count, it is a powerful predictor of an underlying factor of marrow failure; this is also consistent with our findings of very

low reticulocyte counts in the cohort[14]. Hypocellular bone marrow findings in all patients with aplastic anemia further support recent studies on bone marrow histomorphometry, which confirm that severe hypocellularity of the bone marrow is the most important and most reliable characteristic of the disease[15]. The clinical symptoms observed in the study, particularly lethargy, repetitive infection, and the tendency to bleed, are also very typical symptoms of aplastic anemia. Our recent findings corroborate the impact of neutropenia complications on the health of those affected. This is similar to the findings of a study demonstrating that infections in aplastic patients (58\%) are significantly higher than in non-aplastic patients[16]. Also, there was a higher prevalence of bleeding complications. Regression analysis similar to that of a 2019 study that demonstrated a strong positive correlation between low platelets (30 × 10, particularly 9/L) and increased bleeding complications (thrombocytopenia)[17]. In our analysis of the severity of the condition, however, we classified it as very severe, with iorar findings observed in 79% of patients, indicating severe forms of the disorder. This underscores the phenomenon of very late-presenting cases, especially there with minimal resources[18]. The delay is most especially due to minimal access to bone marrow biopsy facilities and very low awareness of the condition (marrow failure syndromes). This delay may lead to the most commonly accepted outcome in evidence-based medicine: early diagnosis resulting in poor outcomes[19]. This was the emphasis of the most recent guidelines on treatment, which emphasize the need to initiate immunosuppressive therapy very early, as well as hematopoietic stem cell transplantation[20]. In conclusion, the findings of this study support the recommendation that all patients who are anemic be provided with a detailed evaluation and diagnostic workup in a stepwise approach that precisely addresses bone marrow and other reticulocyte counts, peripheral blood smears, and, where appropriate, emphasizes the marrow[21]. In recent years, a global convergence of opinion supports the early identification of aplastic anemia, which can increase the likelihood of surviving the disease, especially for younger patients in whom this disease can be cured. Overall, this study adds critical regional data on the addition of this discipline in aplastic anemia and the need for greater attention to detail in diagnosing patients[22]. The global analytical review of recent evidence assesses the congruence of our data with the worldwide concern about the unrelenting challenges of diagnosing patients with this disease in low-resource settings.

Limitations: This study was conducted at one educational institute due to its limitations and conditions. Although some patients were reported to be clinically unstable, and patients refused to take tests, some patients with suspected illnesses also did not have bone marrow biopsies. Nutritional deficiencies and chronic infections, when present, also complicate the case, as they may be connected to the underlying hematologic defect and therefore affect diagnostic accuracy and prevalence estimates.

CONCLUSION

Aplastic anemia accounted for a significant proportion of cases of adult anemia and was closely associated with severe cytopenias. Early diagnostic evaluations, such as prompt bone marrow testing, should be performed to ensure an accurate diagnosis and facilitate proper management. Improving diagnostic processes strengthens efforts in under-resourced areas, where recognition of the condition is delayed and poses a major clinical obstacle.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Parkash Kumar, Sarfaraz Ahmed,
Drafting or Revising Critically:	Hayat Ullah, Zubair Akbar, Asma Mehtab, Shamimah Hanif
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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