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Clinico-Hematological Profile Of Pancytopenia: A Retrospective Study

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I. Introduction:

Pancytopenia is a hematologic condition characterized by a decrease in all three peripheral blood cell lines. It is characterized by a hemoglobin value of less than 12 g/dL in women and 13 g/dL in men, platelets of less than 150,000 per mcL, and leukocytes of less than 4000 per ml (or absolute neutrophil count of less than 1800 per ml).[1,2]

It is commonly associated with multiple benign and malignant conditions. The clinical presentation can be variable, with mild pancytopenia being asymptomatic to life-threatening emergencies in severe pancytopenia. Patients can present with manifestations of any of the decreased cell lines.[3]

Pancytopenia develops through three principal mechanisms: reduced bone marrow production, bone marrow infiltration or replacement, and increased peripheral destruction or sequestration of blood cells. Reduced marrow production commonly results from nutritional deficiencies or aplastic anaemia, which may be idiopathic or secondary to infections, drugs, chemotherapeutic agents, or malabsorption. Bone marrow infiltration by haematological malignancies, metastatic cancers, or granulomatous disorders can suppress normal haematopoiesis. Peripheral destruction is typically associated with autoimmune diseases and hypersplenism, where excessive splenic sequestration leads to increased destruction of blood cells, particularly erythrocytes and platelets.[4]

The etiological spectrum of pancytopenia varies considerably across different geographic regions and populations, influenced by nutritional status, prevalence of infections, socioeconomic conditions, and referral patterns. Indian studies have identified megaloblastic anaemia, aplastic anaemia, hypersplenism, infections, and haematological malignancies among the common underlying causes.[5]

Although several studies have evaluated pancytopenia, the relative frequency of its underlying causes differs across institutions and regions. Understanding the local clinico-hematological profile is essential for early diagnosis, appropriate investigations, and timely management.

The present study was undertaken to evaluate the clinico-hematological profile and etiological spectrum of pancytopenia in patients diagnosed at a tertiary care centre and to correlate the clinical findings with hematological investigations.

II. Materials And Methods

This retrospective observational study was conducted in the Department of Pathology, Dr. Shankarrao Chavan Government Medical College and Hospital, Nanded, Maharashtra, from February 2026 to April 2026. A total of 50 adult patients fulfilling the diagnostic criteria for pancytopenia were included. Pancytopenia was defined as haemoglobin <13 g/dL in males and <12 g/dL in females, total leukocyte count <4,000/µL, and platelet count $<1.5 \times 10^5$/µL. Patients receiving chemotherapy or radiotherapy for malignancy were excluded.

Demographic details, presenting complaints, clinical findings (pallor, icterus, lymphadenopathy, hepatomegaly, splenomegaly, and ascites), haematological parameters, peripheral blood smear findings, and bone marrow aspiration findings were retrieved from hospital records. Complete blood counts were performed using an automated haematology analyser, and bone marrow aspiration was carried out in all patients according to standard institutional protocol.

Data were analysed using IBM SPSS Statistics (version 26). Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Statistical significance was considered at a p-value <0.05. The study was approved by the Institutional Ethics Committee.

III. Results

A total of 50 patients with pancytopenia were included in the study. The majority of patients belonged to the **51–60 years** age group (**15, 30.0%**), followed by the **41–50 years** age group (**13, 26.0%**). The mean age was 46.32 ± 13.32 years (range: 22–70 years). There was a slight male predominance, with 28 (56.0%) males and 22 (44.0%) females.

The mean haemoglobin concentration was 6.99 ± 0.95 g/dL, mean total leukocyte count was 2505.92 ± 813.26/µL, and mean platelet count was 72,919.30 ± 34,284.28/µL. The mean RBC count was 2.35 ± 0.45 million/µL. The average MCV was 100.29 ± 11.92 fL, while the mean MCH, MCHC and RDW were 32.41 ± 3.52 pg, 32.87 ± 1.11 g/dL, and 18.61 ± 3.14%, respectively (Table 1a).

Weakness was reported by all patients (100.0%). Breathlessness was the second most common presenting complaint, occurring in 29 (58.0%) patients, followed by fever in 17 (34.0%), weight loss in 9 (18.0%), and bleeding manifestations in 5 (10.0%) patients. Pallor was present in all patients on clinical examination. Splenomegaly was the most frequent physical finding, observed in 12 (24.0%) patients, followed by hepatomegaly in 8 (16.0%), lymphadenopathy in 6 (12.0%), and icterus in 5 (10.0%) patients. Ascites was noted in 1 (2.0%) patient (Table 2).

Peripheral blood smear examination demonstrated characteristic morphological abnormalities, including anisopoikilocytosis, macrocytosis and other changes depending on the underlying etiology. Representative peripheral smear findings are shown in Figure 1.

Bone marrow aspiration revealed a hypercellular marrow in 38 (76.0%) patients. Hypocellular marrow was observed in 8 (16.0%) patients, while 3 (6.0%) had a normocellular marrow. A dry tap was encountered in 1 (2.0%) patient (Table 3). Representative bone marrow aspirate findings are illustrated in Figure 2.

Megaloblastic anaemia was the most common cause of pancytopenia, accounting for 16 (32.0%) cases. This was followed by dimorphic anaemia in 10 (20.0%) patients and aplastic anaemia in 8 (16.0%) patients. Acute leukaemia was diagnosed in 5 (10.0%) patients. Hypersplenism and infection-related pancytopenia each accounted for 3 (6.0%) cases, while myelodysplastic syndrome was identified in 2 (4.0%) patients. Lymphoma, myelofibrosis, and plasma cell myeloma were each diagnosed in 1 (2.0%) patient (Table 4). An automated hematology analyzer report demonstrating severe pancytopenia is shown in Figure 3.

Table 1a. Baseline demographic, clinical and hematological characteristics of study participants (n = 50)

Variable	Value
Age (years), mean ± SD	46.32 ± 13.32
Male, n (%)	28 (56.0)
Female, n (%)	22 (44.0)
Hemoglobin (g/dL), mean ± SD	6.99 ± 0.95
Total leukocyte count (/µL), mean ± SD	2505.92 ± 813.26
Platelet count (/µL), mean ± SD	72,919.30 ± 34,284.28
RBC count (million/µL), mean ± SD	2.35 ± 0.45
MCV (fL), mean ± SD	100.29 ± 11.92
MCH (pg), mean ± SD	32.41 ± 3.52
MCHC (g/dL), mean ± SD	32.87 ± 1.11
RDW (%), mean ± SD	18.61 ± 3.14

Table 1b: Age distribution of study participants (n = 50)

Age group (years)	Frequency (n)	Percentage (%)
21–30	8	16.0
31–40	8	16.0
41–50	13	26.0
51–60	15	30.0
61–70	6	12.0
Total	**50**	**100.0**

Table 2. Clinical presentation of patients with pancytopenia (n = 50)

Variable	n (%)
Presenting complaints	
Weakness	50 (100.0)
Breathlessness	29 (58.0)
Fever	17 (34.0)
Weight loss	9 (18.0)
Bleeding manifestations	5 (10.0)
Clinical findings	

Variable	n (%)
Pallor	50 (100.0)
Splenomegaly	12 (24.0)
Hepatomegaly	8 (16.0)
Lymphadenopathy	6 (12.0)
Icterus	5 (10.0)
Ascites	1 (2.0)

Table 3. Bone marrow findings in patients with pancytopenia (n = 50)

Bone marrow finding	n (%)
Hypercellular	38 (76.0)
Hypocellular	8 (16.0)
Normocellular	3 (6.0)
Dry tap	1 (2.0)

Table 4. Etiological spectrum of pancytopenia (n = 50)

Final diagnosis	n (%)
Megaloblastic anaemia	16 (32.0)
Dimorphic anaemia	10 (20.0)
Aplastic anaemia	8 (16.0)
Acute leukaemia	5 (10.0)
Hypersplenism	3 (6.0)
Infection-related	3 (6.0)
Myelodysplastic syndrome	2 (4.0)
Lymphoma	1 (2.0)
Myelofibrosis	1 (2.0)
Plasma cell myeloma	1 (2.0)

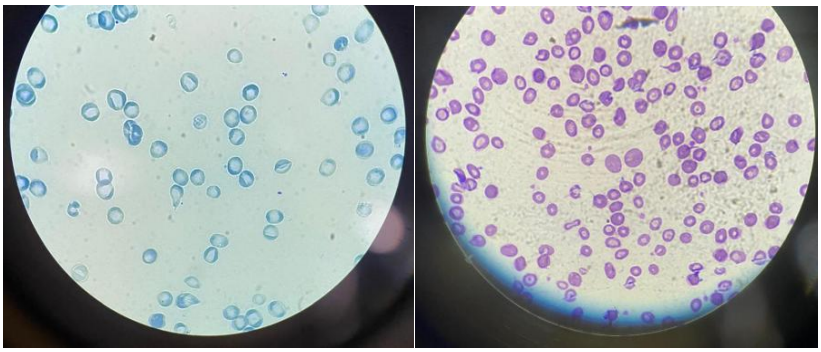

Figure 1 A & B: Peripheral blood smear showing marked anisopoikilocytosis with significant red cell morphological variation.

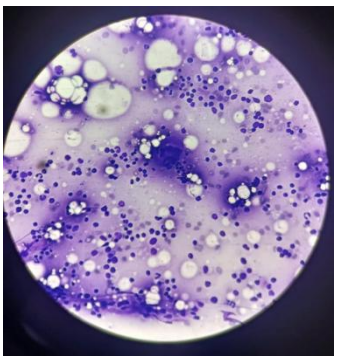

Figure 2: Bone marrow aspirate showing markedly hypocellular marrow with extensive adipose spaces and markedly reduced hematopoietic precursors, consistent with aplastic anemia.

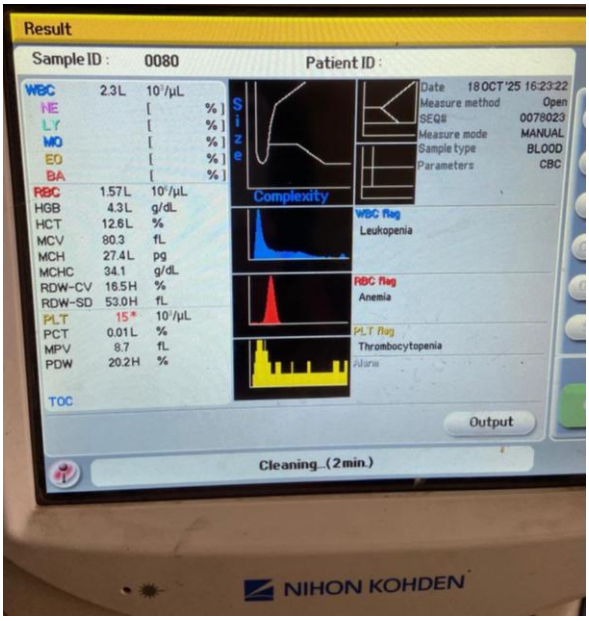

Figure 3: Automated hematology analyzer report demonstrating severe pancytopenia (Hb 4.3 g/dL, WBC 2.3 × 10⁹/L and platelet count 15 × 10⁹/L) with analyzer flags indicating anemia, leukopenia and thrombocytopenia.

IV. Discussion:

Pancytopenia is a hematological manifestation of diverse disorders affecting the bone marrow or peripheral blood cells. Identifying the underlying etiology is essential because the prognosis and management vary considerably among different causes. In the present study, megaloblastic anaemia was the commonest cause of pancytopenia, followed by dimorphic anaemia and aplastic anaemia. Weakness and pallor were the predominant clinical manifestations, while hypercellular marrow was the most frequent bone marrow finding. These observations are comparable with those reported in several recent Indian studies, where nutritional anaemias constitute the leading cause of pancytopenia.[1-6]

The mean age of patients in the present study was **46.32 ± 13.32 years**, with a slight male predominance (56%). Similar male predominance has been reported by Porwal et al., Gajbhiye et al., Parveen et al., Munde et al. and Wadhera et al.[1–5] However, the age distribution differed from many published studies, which reported the majority of patients in younger age groups.[125] Such variation is expected because the age profile largely depends on referral patterns and the underlying etiological spectrum of the study population.

Generalized weakness was the commonest presenting complaint, followed by breathlessness and fever, whereas pallor was observed in all patients. Similar findings have been described by Porwal et al., Parveen et al., Munde et al. and Yadav et al., all of whom identified weakness as the predominant symptom and pallor as the most frequent clinical sign.[1356] Splenomegaly and hepatomegaly were less frequent in the present study and were mainly associated with hypersplenism, hematological malignancies and chronic systemic disorders.

The hematological profile demonstrated severe anaemia with associated leukopenia and thrombocytopenia. The mean MCV of **100.29 ± 11.92 fL** indicated a predominance of macrocytosis, which correlated with the high frequency of megaloblastic anaemia. Similar observations were reported by Porwal et al. and Parveen et al., in whom most patients had haemoglobin levels between **6–9 g/dL** and macrocytic blood films associated with megaloblastic anaemia.[15] Bone marrow examination revealed hypercellular marrow in **76%** of cases, comparable to the findings of Porwal et al. and Parveen et al., whereas Gajbhiye et al. reported predominantly hypocellular marrow because aplastic anaemia was the commonest etiology in their study.[125]

Megaloblastic anaemia accounted for **32%** of pancytopenia cases in the present study, making it the leading etiology. Similar observations have been reported by Porwal et al., Munde et al. and Parveen et al., whereas Gajbhiye et al. identified aplastic anaemia as the commonest cause.[1–5] Dimorphic anaemia constituted **20%** of cases, reflecting the coexistence of iron deficiency with vitamin B_{12} or folate deficiency. Aplastic anaemia was the third most common diagnosis (**16%**) and was consistently associated with hypocellular marrow. Acute leukaemia accounted for **10%** of cases, a frequency comparable with previous Indian studies.[125] Less common causes included hypersplenism, infection-related pancytopenia, myelodysplastic syndrome, plasma cell myeloma, lymphoma and myelofibrosis, demonstrating the broad etiological spectrum of pancytopenia.

The overall findings of the present study were largely comparable with those reported in previous Indian studies. A comparison of the demographic characteristics, clinical profile, bone marrow findings and etiological spectrum of pancytopenia across selected studies is presented in Table 5.

The findings of the present study emphasize that nutritional anaemias remain the predominant cause of pancytopenia in our setting and represent an important group of potentially reversible disorders. At the same time, bone marrow aspiration remains indispensable for diagnosing marrow failure syndromes and hematological malignancies, particularly when peripheral smear findings are inconclusive. Therefore, careful clinical evaluation together with complete blood count, peripheral smear examination and bone marrow study forms the basis of accurate diagnosis and appropriate management.

The present study has certain limitations. It was a retrospective, single-centre study with a relatively small sample size, which may limit the generalizability of the findings. In addition, biochemical assessment of vitamin B_{12}, folate and iron status was not available in all patients. Nevertheless, the study provides useful information regarding the clinical presentation, hematological profile and etiological spectrum of pancytopenia in patients presenting to a tertiary care centre.

Table 5. Comparison of the present study with selected Indian studies on pancytopenia

Parameter	Present study	Porwal et al.[1]	Gajbhiye et al.[2]	Munde et al.[3]	Wadhera et al.[4]	Parveen et al.[5]	Yadav et al.[6]
Study design	Retrospective	Retrospective	Prospective	Cross-sectional	Cross-sectional	Observational	Observational
Sample size	50	100	50	546	100	96	92
Male predominance	Yes (56%)	Yes (64%)	Yes (56%)	Yes	Yes	Yes (57%)	Yes
Mean / common age	46.3 years	21–30 yrs	25–34 yrs	31–40 yrs*	31–40 yrs*	15–30 yrs	21–40 yrs*
Most common symptom	Weakness	Weakness	Fatigue	Weakness	Weakness	Weakness	Weakness
Most common sign	Pallor	Pallor	Pallor	Pallor	Pallor	Pallor	Pallor
Predominant marrow pattern	Hypercellular	Hypercellular	Hypocellular	Hypercellular	Hypercellular	Hypercellular	Hypercellular*
Most common etiology	Megaloblastic anaemia (32%)	Megaloblastic anaemia (58%)	Aplastic anaemia (36%)	Megaloblastic anaemia	Megaloblastic anaemia	Megaloblastic anaemia (39%)	Megaloblastic anaemia

*Report according to the published data available in the respective study.

References

[1]. Vargas-Carretero CJ, Fernandez-Vargas OE, Ron-Magaña AL, Padilla-Ortega JA, Ron-Guerrero CS, Barrera-Chairez E. Etiology And Clinico-Hematological Profile Of Pancytopenia: Experience Of A Mexican Tertiary Care Center And Review Of The Literature. Hematology. 2019 Dec;24(1):399-404.

[2]. Das Makheja K, Kumar Maheshwari B, Arain S, Kumar S, Kumari S, Vikash The Common Causes Leading To Pancytopenia In Patients Presenting To Tertiary Care Hospital. Pak J Med Sci. 2013 Sep;29(5):1108-11.

[3]. Chiravuri S, De Jesus O. Pancytopenia. [Updated 2023 Aug 23]. In: Statpearls [Internet]. Treasure Island (FL): Statpearls Publishing; 2026 Jan-. Available From: Https://Www.Ncbi.Nlm.Nih.Gov/Books/NBK563146/

[4]. Takeshima M, Ishikawa H, Kitadate A, Sasaki R, Kobayashi T, Nanjyo H, Kanbayashi T, Shimizu T. Anorexia Nervosa-Associated Pancytopenia Mimicking Idiopathic Aplastic Anemia: A Case Report. BMC Psychiatry. 2018 May 25;18(1):150.

[5]. Jain A, Naniwadekar M. An Etiological Reappraisal Of Pancytopenia - Largest Series Reported To Date From A Single Tertiary Care Teaching Hospital. BMC Hematol. 2013 Nov 06;13(1):10.

[6]. Porwal A, Jain P, Sinha A, Et Al. Clinicohematological Profile And Etiological Spectrum Of Pancytopenia: A Tertiary Care Centre Experience. IP Journal Of Diagnostic Pathology And Oncology. 2021;6(3):205-210.

[7]. Gajbhiye S, Choudhary A, Verma N, Et Al. Clinicohematological Profile Of Pancytopenia In Adults: A Prospective Observational Study From Central India. International Journal Of Clinical And Diagnostic Pathology. 2022;5(2):39-44.

[8]. Munde P, Munde B, Bais A, Et Al. Clinicohematological Study Of Pancytopenia In A Tertiary Care Centre. International Journal Of Clinical And Diagnostic Pathology. 2021;4(3):166-171.

[9]. Wadhera A, Sharma R, Gupta N, Et Al. Etiological Spectrum And Bone Marrow Findings In Pancytopenia: A Cross-Sectional Study From North India. International Journal Of Advances In Medicine. 2025;12(4):

[10]. Parveen S, Khan S, Fatima N, Et Al. Clinicohematological Profile And Bone Marrow Evaluation In Patients Presenting With Pancytopenia. International Journal Of Research In Medical Sciences. 2025;13(5).

[11]. Yadav RK, Agrawal K, Gupta R, Et Al. Clinicohematological Profile Of Pancytopenia: An Observational Study From A Tertiary Care Centre. Journal Of Evolution Of Medical And Dental Sciences. 2017;6