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Research Article

# STUDY OF CLINICOPATHOLOGICAL PROFILE OF PANCYTOPENIA PATIENTS OF SOUTHERN RAJASTHAN

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**ABSTRACT**

**Objective:** To study clinical presentation, demographic profile, and hematopathological profile of pancytopenia patients.

**Methods:** An observational, cross-sectional study was conducted at Geetanjali Medical College, and Hospital from September 2022 to September 2023 on patients presenting with pancytopenia.

**Results:** A total of 150 patients diagnosed with pancytopenia participated in the study, comprising 84 males and 66 females, with the average age of the participants being 44.90 years. The most common etiology of pancytopenia was megaloblastic anemia, followed by hematological malignancy. Hematological malignancies were observed in 24 patients. The most common cause of hematological malignancy was non-Hodgkins lymphoma followed by plasma cell dyscrasias. Out of 150 pancytopenia study participants, 110 participants had bone marrow examination. The most common observed bone marrow examination finding was hypercellular bone marrow seen in 80 (72.73%) patients.

**Conclusion:** From our study, it can be proposed that despite numerous etiologies available for pancytopenia and its various manifestations, the most common etiology is megaloblastic anemia. Physical findings, complete blood count, and peripheral blood smear examination provide valuable information in the initial workup of the patients presented with pancytopenia and can provide valuable clues to underlying etiology. Bone marrow examination is a gold standard investigation for comprehensive evaluation of pancytopenia and guides further management in these cases.

**Keywords:** Pancytopenia, Megaloblastic anemia, Aplastic anemia.

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## INTRODUCTION

Pancytopenia is a triad of anemia, leukopenia, and thrombocytopenia. The etiology of pancytopenia varies from treatable disorders such as megaloblastic anemia to more serious conditions such as myelodysplastic syndromes which increase the risk of developing hematological malignancies in the future. The causes of pancytopenia can vary from simple deficiency states such as megaloblastic anemia and infectious diseases to malignant conditions such as leukemia, lymphoma, and myeloma. Major causes of pancytopenia are megaloblastic anemia, aplastic anemia, hypersplenism, leukemia, lymphoma, multiple myeloma, and myelodysplastic syndrome. Patients usually present with pallor, easy fatiguability, and bleeding as the disease progresses, primarily affecting the bone marrow. Treatment and prognosis depend on the underlying cause and its severity. Pancytopenia is a significant hematological condition encountered in routine clinical practice. At first, most of the signs and symptoms can be linked to anemia, but leukopenia and thrombocytopenia typically appear later in the disease. The underlying mechanism may be secondary to decreased bone marrow production, marrow infiltration, marrow suppression, ineffective hematopoiesis, or increased peripheral destruction.

### Objectives

- To study clinical presentation, demographic profile, and hematopathological profile of pancytopenia patients
- To estimate the prevalence of different diseases causing pancytopenia.

## METHODS

Observational, cross-Sectional study conducted at Geetanjali Medical College, and Hospital from September 2022 to September 2023 on patients presenting with pancytopenia.

### Inclusion criteria

Both sexes, age of 18 years and above with hemoglobin <10 g/dL and/or TRBC count <4.5 million/cu.mm, leucocyte count <4000/cu.mm, and platelet count <100000/cu.mm.

### Exclusion criteria

Patients on chemotherapy.

### Methodology

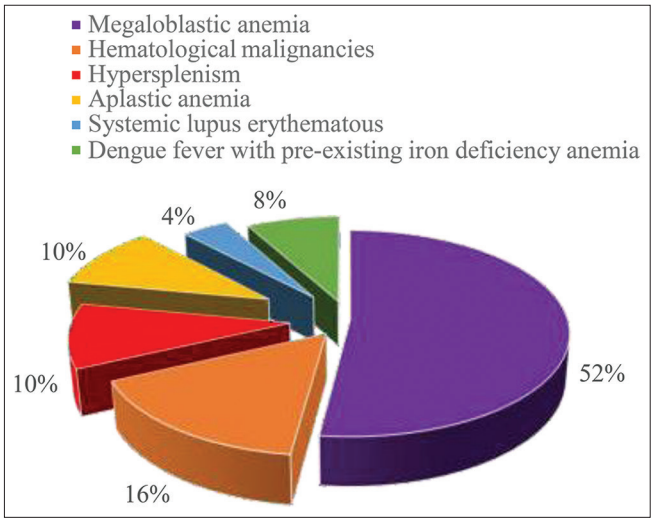
A written informed consent was obtained from all the patients after having fully explained the purpose, protocols, and risks involved in the study. All the patients underwent a detailed medical history and full physical examination followed by blood sampling for investigations i.e. complete blood count with peripheral blood picture, absolute reticulocyte count, erythrocyte sedimentation rate, fasting serum vitamin B12, anemia profile, smear for malarial parasite, liver and renal function test, and viral markers (HBsAg, HCV, HIV), chest x-ray and ultrasonography of whole abdomen. Diagnostic bone marrow aspiration and trephine biopsy was subsequently carried out under aseptic precaution after obtaining written consent from the patient (if needed).

### Statistical analysis

Data were collected according to a predefined protocol (pro forma). Demographic characteristics, family history, diagnostic data, and treatment details were collected. Data were entered in MS Excel software and analyzed using Statistical Package for the Social Sciences version 22. Frequency and percentage were computed for categorical variables such as age and sex distribution, physical findings, peripheral blood picture, hematological parameters, and common causes leading to pancytopenia.

## RESULTS

A total of 150 patients diagnosed with pancytopenia participated in the study, comprising 84 males and 66 females, with the average age of the participants being 44.90 years. In Table 1 and Graph 1 various underlying etiology were observed among pancytopenia study participants. It was observed that megaloblastic anemia, hematological malignancies, hypersplenism, aplastic anemia, systemic lupus erythematous and dengue fever with pre-existing iron deficiency anemia was present in 78 (52%), 24 (16%), 15 (10%), 15 (10%), 6 (4%) and 12 (8%) patients respectively. In Table 2 distribution of hematological malignancies observed among pancytopenia participants is shown. It was observed that non-Hodgkins lymphoma, plasma cell dyscrasia, myelodysplastic syndrome and acute myeloid leukemia was present in 9 (37.5%), 6 (25%), 6 (25%) and 3 (12.5%) patients respectively. In Table 3 mean age of patients with different underlying etiology is demonstrated. It was observed that mean age of acute myeloid leukemia, aplastic anemia, dengue fever with pre-existing iron deficiency anemia, hypersplenism, megaloblastic anemia, myelodysplastic syndrome, non- hodgkins lymphoma, plasma cell dyscrasias and systemic lupus erythematosus was 53.00±1.29, 41.25±3.42, 33.25±2.58, 38.40±5.89, 49.44±24.56, 46.50±8.96, 63.80±18.42, 53.50±4.53 and 25.00±6.42 years respectively. Mean age of the study population was 44.90 years. In Table 4 gender wise distribution of patients is demonstrated. It was observed that total male and female participants were 84 (56%) and 66 (44%) respectively. Male to female ratio in acute myeloid leukemia, aplastic anemia, dengue fever with pre-existing iron deficiency anemia, hypersplenism, megaloblastic anemia, myelodysplastic syndrome, non-hodgkins lymphoma, plasma cell dyscrasias and systemic lupus erythematosus was 2:1, 2:3, 1:3, 3:2, 8:5, 1:1, 2:1, 2:1 and 1:1 respectively. The cumulative male to female ratio was 1.27:1. In Table 5 various complete blood count parameters observed is shown. It was observed that Hb, TLC, Platelet count, MCV, RDW, MPV range was between 2–10 (g/dL), 0.40–3.90 ($\times10^3$/cumm), 3–99 ($\times10^3$/cumm), 54–133 (fl), 7–18, 8–11.6 (fl) respectively with mean value of 5.81±2.10 (g/dL), 2.54±0.99 ($\times10^3$/cumm), 49.12±31.75 ($\times10^3$/cumm), 93.69±19.22 (fl), 12.40±5.09, 9.34±0.99 (fl) respectively. In Table 6 distribution of clinical presentation is shown. It was observed that easy fatiguability, fever, breathing difficulty, loss of appetite and bleeding manifestation was present in 87 (58%), 60 (40%), 45 (30%), 45 (30%) and 21 (14%) number of patients respectively. In Table 7 distribution of physical findings observed is shown. It was observed that petechiae spots, lymphadenopathy, periorbital edema, hyperpigmentation, icterus, hepatomegaly, pedal edema, splenomegaly, and pallor was present in 6 (4%), 6 (4%), 6 (4%), 9 (6%) 18 (36%), 18 (36%), 36 (24%), 42 (28%) and 132 (88%) respectively. In Table 8 distribution of bone marrow examination findings is shown. Out of 150 pancytopenia study participants 110 participants had bone marrow examination. It was observed that hypocellular marrow, normocellular marrow and hypercellular marrow was present in 24 (21.82%), 6 (5.45%) and 80 (72.73%) patients respectively.




**Graph 1: Distribution of pancytopenia patients according to etiology**

**Table 1: Distribution of pancytopenia patients according to etiology**

| Etiology of pancytopenia | No. of patients | Percentage |
|---|---|---|
| Megaloblastic anemia | 78 | 52 |
| Hematological malignancies | 24 | 16 |
| Hypersplenism | 15 | 10 |
| Aplastic anemia | 15 | 10 |
| Systemic lupus erythematous | 6 | 4 |
| Dengue fever with pre-existing iron deficiency anemia | 12 | 8 |
| Total | 150 | 100 |

**Table 2: Distribution of pancytopenia patients of various causes according to hematological malignancies**

| Etiology of pancytopenia | No. of patients | Percentage |
|---|---|---|
| Non-Hodgkins lymphoma | 9 | 37.5 |
| Plasma cell dyscrasia | 6 | 25 |
| Myelodysplastic syndrome | 6 | 25 |
| Acute myeloid leukemia | 3 | 12.5 |
| Total | 24 | 100 |

**Table 3: Distribution of pancytopenia patients of various causes according to age**

| Etiology of pancytopenia | Mean age (years) | Standard deviation |
|---|---|---|
| Acute myeloid leukemia | 53.00 | 1.29 |
| Aplastic anemia | 41.25 | 3.42 |
| Dengue fever with pre-existing iron deficiency anemia | 33.25 | 2.58 |
| Hypersplenism | 38.40 | 5.89 |
| Megaloblastic anemia | 49.44 | 24.56 |
| Myelodysplastic syndrome | 46.50 | 8.96 |
| Non-Hodgkins lymphoma | 63.80 | 18.42 |
| Plasma cell dyscrasias | 53.50 | 4.53 |
| Systemic lupus erythematosus | 25.00 | 6.42 |

**Table 4: Distribution of pancytopenia patients of various causes according to gender**

| Etiology of pancytopenia | Male | | Female | |
|---|---|---|---|---|
| | No. | Percentage | No. | Percentage |
| Acute myeloid leukemia | 2 | 2.38 | 1 | 1.52 |
| Aplastic anemia | 6 | 7.14 | 9 | 13.63 |
| Dengue fever with pre-existing iron deficiency anemia | 3 | 3.57 | 9 | 13.63 |
| Hypersplenism | 9 | 10.71 | 6 | 9.09 |
| Megaloblastic anemia | 48 | 57.14 | 30 | 45.45 |
| Myelodysplastic syndrome | 3 | 3.57 | 3 | 4.55 |
| Non-Hodgkins lymphoma | 6 | 7.14 | 3 | 4.55 |
| Plasma cell dyscrasias | 4 | 4.76 | 2 | 3.03 |
| Systemic lupus erythematosus | 3 | 3.57 | 3 | 4.55 |
| Total | 84 | 100 | 66 | 100 |

**Table 5: Distribution of pancytopenia patients of various causes according to parameter of complete blood count**

| Complete blood count parameters | Minimum | Maximum | Mean | Standard deviation |
|---|---|---|---|---|
| Hb (g/dL) | 2.00 | 10.00 | 5.81 | 2.10 |
| TLC (×103/cumm) | 0.40 | 3.90 | 2.54 | 0.99 |
| Platelet count (×103/cumm) | 3.00 | 99.00 | 49.12 | 31.75 |
| MCV (fl) | 54.00 | 133.00 | 93.69 | 19.22 |
| RDW | 7.00 | 18.00 | 12.40 | 5.09 |
| MPV (fl) | 8.00 | 11.60 | 9.34 | 0.99 |

Hb: Hemoglobin, TLC: Total leucocyte count, MPV: Mean platelet volume, RDW: Red blood cell distribution width

**Table 6: Distribution of pancytopenia patients of various causes according to clinical presentation**

| Clinical presentation | No. of patients | Percentage |
|---|---|---|
| Easy fatiguability | 87 | 58.00 |
| Fever | 60 | 40.00 |
| Breathing difficulty | 45 | 30.00 |
| Loss of appetite | 45 | 30.00 |
| Bleeding manifestation | 21 | 14.00 |

**Table 7: Distribution of pancytopenia patients of various causes according to physical findings**

| Physical finding | No. of patients | Percentage |
|---|---|---|
| Petechiae spots | 6 | 4.00 |
| Lymphadenopathy | 6 | 4.00 |
| Periorbital edema | 6 | 4.00 |
| Hyperpigmentation | 9 | 6.00 |
| Icterus | 18 | 12.00 |
| Hepatomegaly | 18 | 12.00 |
| Pedal edema | 36 | 24.00 |
| Splenomegaly | 42 | 28.00 |
| Pallor | 132 | 88.00 |

**Table 8: Distribution of pancytopenia patients of various causes according to bone marrow examination**

| Bone marrow examination finding | No. of patients | Percentage |
|---|---|---|
| Hypocellular marrow | 24 | 21.82 |
| Normocellular marrow | 6 | 5.45 |
| Hypercellular marrow | 80 | 72.73 |
| Total | 110 | 100 |

## DISCUSSION

Pancytopenia is an important clinico-hematological entity encountered in our day-to-day clinical practice. The causes of pancytopenia can vary from simple deficiency states such as megaloblastic anemia and infectious diseases to malignant conditions such as leukemia, lymphoma, and myeloma.

Most of the studies that have been done on pancytopenia have included the pediatric population along with adults. It is very important to do studies specifically in adults. In our study of 150 patients, the most common etiology of pancytopenia was megaloblastic anemia accounting for 52%. The second most common cause was hematological malignancies accounting for 16%, followed by hypersplenism 10%, aplastic anemia 10%, dengue fever with pre-existing iron deficiency anemia 8%, and systemic lupus erythematous 4%. Gupta *et al*. conducted a study involving 105 patients, finding that aplastic anemia was the leading cause of pancytopenia at 43%, followed by acute leukemia at 25% [1]. Megaloblastic anemia accounted for approximately 6.7% of the cases of pancytopenia, making it the third most common cause. In a study done by Jan *et al*. which included 50 patients, the most common cause of pancytopenia was aplastic anemia (36%) followed by megaloblastic anemia (22%) [2]. Varma and Dash in their study of patients experiencing pancytopenia in India, identified aplastic anemia as the predominant factor, constituting 29.5% of cases [3]. In our study, the majority of the patients were between the age group of 30–50 years. In the study conducted by Hagler *et al*., patients belonged mainly to the age group of 21–40 years [4]. The male-to-female ratio among pancytopenia patients in our study was 1.27:1, which was concurrent with the findings of Gayathri and Rao, Bhushan *et al*., and Khunger *et al*. who also found a male-to-female ratio of 1.2:1 [5-7]. In our study, bone marrow examinations were conducted on 110 pancytopenia patients. The results showed that most patients (72.73%) had hypercellular marrow, with 80 individuals falling into this category. In addition, 24 patients (21.82%) exhibited hypocellular marrow, whereas 6 patients (5.45%) showed normocellular marrow. These findings align with those of Al-Eissa and Al-Nasser who observed hypercellular bone marrow in 87.5% of pancytopenia cases [8].

## CONCLUSION

From our study, it can be proposed that despite numerous etiologies of pancytopenia and its various manifestations the most common etiology is megaloblastic anemia. Bone marrow examination is the gold standard investigation for comprehensive evaluation of pancytopenia. The most common reason for megaloblastic anemia is Vitamin B12 deficiency. Hence, it can be suggested that screening for B12 deficiency should be the initial screening test for evaluation of megaloblastic anemia. Other conditions such as malignancy, hypersplenism, and aplastic anemia should also be kept in mind while ordering further investigations. Treatable causes are important to recognize at the earliest so that appropriate steps at the right time will decrease the morbidity and mortality of these patients.

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