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Clinico-hematological study of pancytopenia

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Abstract

Background: Pancytopenia refers to a reduction in all the three cellular elements of blood. The aim of this study was to identify the various causes of pancytopenia

Materials and methods: This is a prospective study conducted in Upgraded Department of Pathology, Osmania General Hospital, Hyderabad, Telangana from June 2019 to July 2021. In this study a total of 150 cases of pancytopenia were included.

Results: In this study , out of 150 cases of Pancytopenia, Megaloblastic anemia (56%) , followed by dual deficiency anemia, hypoplastic/aplastic anemia (14%), Male, female ratio is 1.34:1, the commonest age group for presentation of pancytopenia was between 21 and 30 years.

Conclusion:The most common cause of Pancytopenia is Megaloblastic anemia. Primary hematological investigations along with bone marrow examination in cytopenic patients is helpful for understanding disease process, to diagnose or to rule out the causes of pancytopenia

Keywords: Bone marrow aspiration, Pancytopenia, Megaloblastic anemia

Introduction

Pancytopenia is an important clinico-pathological entity encountered in our day to day clinical practice. Pancytopenia is reduction in all three major elements of blood formed, i.e, erythrocytes, leukocytes, and platelets[1], exists in adult when the hemoglobin level is less than 10g/dL, total leukocyte count is less than $4x10^9$/L, and platelet count is less than $150x10^9$/L[2]. According to the accepted definition by haematologists, pancytopenia is defined as simultaneous presence of anaemia, leucopenia and thrombocytopenia. It is not a disease entity but a triad of findings that may result from a number of disease processes. The haematopoietic cell production can be influenced in the bone marrow by infections, toxins, malignant cell infiltration leading to hypocellular marrow. Ineffective hematopoiesis and dysplasia, maturation arrest of all the cell lines and peripheral sequestration of blood cells or peripheral destruction of all blood cells lineage can also be the cause of pancytopenia[3-6]. Bone marrow examination (bone marrow aspiration and trephine biopsy) is considered essential and a cornerstone for diagnosis and management of most of the haematological disorders including pancytopenia[7]. This

evaluation is done on the basis of cellularity, Myeloid: Erythroid (M:E) ratio, abnormalities seen in erythroid, myeloid or megakaryocytic series, distribution of cells along with any infiltration amongst others. The marrow is generally hypocellular in cases of pancytopenia caused by a primary production defect. Cytopenias resulting from ineffective hematopoiesis, increased peripheral utilization or destruction of cells, and bone marrow invasive processes are usually associated with a normocellular or hypercellular marrow[8]. Physical findings and peripheral blood picture provide valuable information in the work up of pancytopenic patients and help in planning investigations on bone marrow samples[9]. The severity of pancytopenia and the underlying pathology determine the management and prognosis of the patients.

Materials and methods

This is a prospective study conducted in Upgraded Department of Pathology, Osmania General Hospital, Hyderabad, Telangana from June 2019 to July 2021. In this study a total of 150 cases of pancytopenia were included.

Inclusion criteria

Cases showing the parameters as

Hemoglobin (Hb) less than 10gm/dl,

Total leukocyte count (TLC) less than 4000/mm3 and

Platelet count less than 1,50,000/mm3.

Exclusion criteria

- Patients who have already been diagnosed with pncytopenia
- Patients who did not give consent for BMA,
- Patients with severe thrombocytopenia with risk of bleeding manifestations

Medical history and clinical examination findings were obtained for each patient . All the patients were subjected to the following tests:

- Complete blood count,
- Peripheral blood smear &
- Bone marrow aspiration.

Compete blood counts were obtained from automated analyser sysmex.

Peripheral smears were stained with leishman stain and examined.

Bone marrow aspiration was performed from posterior superior iliac spine following aseptic precautions. Slides were stained with leishman stain and examined. Perls stain was done for bone marrow aspiration smears for iron stores.

Results

The commonest age group for presentation of pancytopenia was between 21 and 30 years, with a total of 44 (29.33%) cases belonging to this group, this was followed by 31 to 40 years.(Table 1) The male to female ratio in the present study was 1.34:1.(Chart 1)

The commonest mode of presentation was generalized weakness; other main symptoms were shortness of breath, fever, chills and rigors.(Table 2)

In peripheral smear,(figure 1) Anisocytosis is seen in most of the cases.Normocytic normochromic and dimorphic anemia is seen in some of the cases.

The most common cause of pancytopenia in this study was megaloblastic anemia (56%) [Figures 2 and 3], followed by dual deficiency anemia, hypoplastic/aplastic anemia (14%) (Table 3)

Table 1: Age distribution of cases

Age group in years	No. of cases	Percentage
11 – 20 years	28	18.66%
21 - 30 years	44	29.33%
31 – 40 years	32	21.33%
41 – 50 years	20	13.33%
51 – 60 years	10	6.66%
61 – 70 years	16	10.66%
Total	150	100%

Table 2: Clinical presentation in pancytopenia

Clinical presentation	No. of Cases	Percentage
Generalized weakness	80	53.33%
Shortness of breath	44	29.33%
Fever	40	26.66%
Chills & rigor	20	13.33%
Bleeding manifestations	15	10%
Pallor	70	46.66%
Splenomegaly	60	40%
Hepatomegaly	24	15%
Jaundice	20	13.33%

Chart 1: Sex distribution of the cases studied:

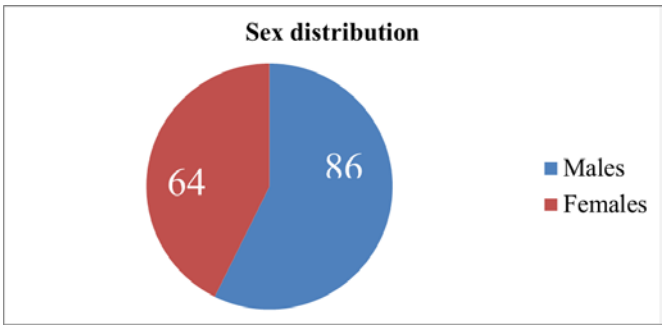

Table 3: The distribution of various causes of pancytopenia

Causes	No. of cases	Percentage
Megaloblastic Anemia	72	48%
Dual deficiency Anemia	51	34%
Hypoplasia of bone marrow / Aplastic anemia	17	11.2%
Acute leukemia	04	2.6%
Myelodysplatic syndrome	03	2%
Hypersplenism	02	1.33%
Myelophthisic marrow – Gaucher's disease	01	0.6%
Total cases	150	100

The Hb levels of patients in this study ranged from 2 to 9 g/dl.Out of 150 cases , 78 cases has hemoglobin less than 6 gm/dl, 52 cases has hemoglobin between 6 to 8 gm/dl, 20 cases has hemoglobin between 8 to 10 gm/dl.(Table 4)

Table 4: Range of hemoglobin in patients with pancytopenia

Hemoglobin (gm/dl)	No. of cases	Percentage
<6	78	52%
6-8	52	34.66%
8-10	20	13.33%
Total	150	100

In this study, the total leukocyte count was ranged between 500 and 4000/cu.mm. In 56% of the cases, the leukocytes count was between 3100 and 4000/cu.mm and leucocyte count was very low in 24 cases between 500 and 1000/cu.mm. (Table 5)

Table 5: Range of leukocyte count in patients with pancytopenia:

Leukocyte count (cells/ mm3)	No. of cases	Percentage
500 - 1000	24	16%
1100 - 2000	38	25.33%

2100 - 3000	42	28%
3100 - 4000	56	37.33%
Total	150	100

The platelet counts of patients in our study ranged from 5,000/mm3 to 1.5 lakh/mm3.Majority of the cases (52 cases) showed platelet count between 76,000/mm^3 and 1 lakh/mm^3.(Table 6)

Table 6: Range of platelet count in patients with pancytopenia:

Platelet count (cells/mm3)	No. of cases	Percentage
5000 - 20000	04	2.66%
21000 - 50000	18	12%
51000 - 75000	32	21.33%
76000 - 100000	52	34.66%
100000 - 150000	44	29.33%
Total	150	100

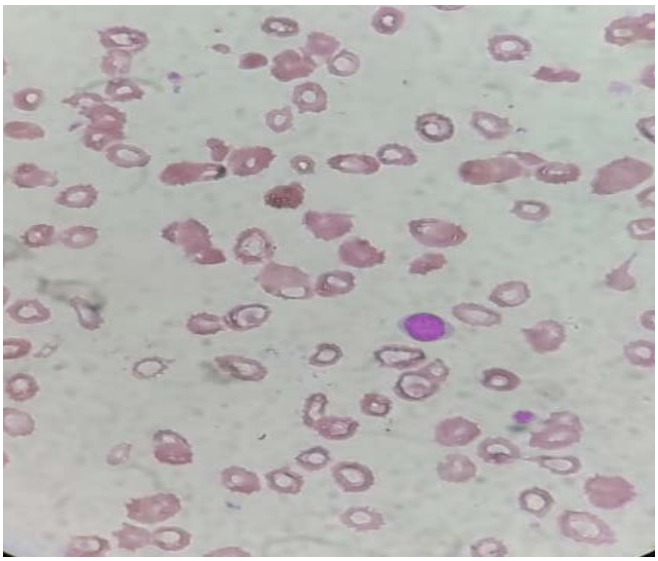

Fig. 1 : Peripheral smear- Pancytopenia

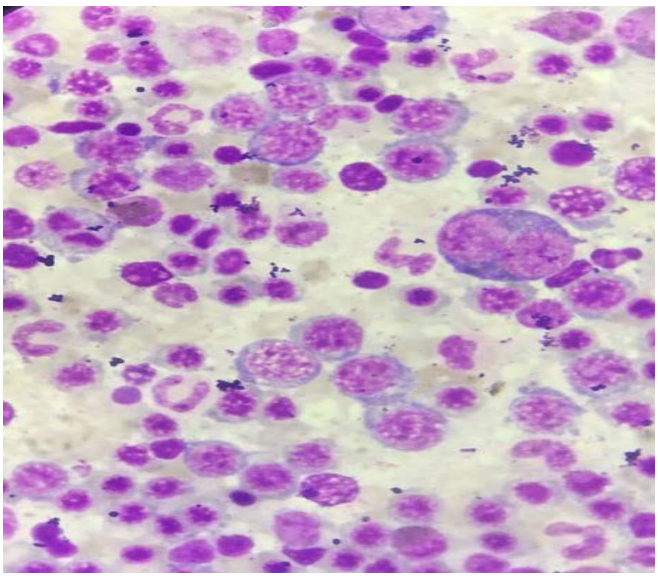

Fig. 2**:** Bone marrow aspiration- Megaloblastic anemia

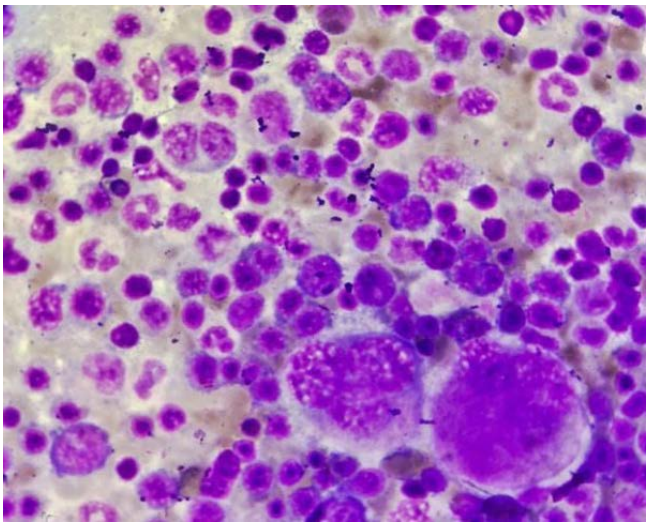

Fig. 3: Bone marrow aspiration- Megaloblastic anemia

Discussion

In the present study of pancytopenia patients, the maximum prevalence of pancytopenia was seen in the age group of 21-30 years (29.33%) similar to study of Nazi and Raziq et al[10]. However, Neha Sharma et al[11] in their study found most common age group was 31-40 (22%).

The male to female ratio in the present study was 1.34:1, while the study of Khodke et al[12] found male to female ratio of 2:1

Pallor (53.33%) and generalized weakness (46.6) are the predominant presenting clinical features followed by Spenomegaly (40%) According to Lakhey A et al[13] pallor was present in 73.9% of cases, followed by fever in 26.1%, splenomegaly in 13.1% and 3.8% with bleeding abnormalities

In this study the most common cause of Pancytopenia was Megaloblastic anemia (48%), similar to the studies of Tilak and Jain et al[9] (68%) and Khunger et al[14] (72%). Hence, megaloblastic anemia should always be kept as first differential diagnosis while evaluating a case of pancytopenia in Indian settings. This is in contrast to the Western world, where leukemia is the leading cause of pancytopenia[15,16].

AML was the most common malignancy diagnosed in 2.6% of the toatal cases, whereas Jha A et al[17] found AML to be 19.59% of total cases.

Incidence of aplastic anemia varies from 10% to 52% among pancytopenic patients[12]. In this study Aplastic anemia was seen in 4.6% cases, higher incidence, 29.5%, was reported by Kumar R et al.[18]

In this study there is a single case of storage disorder (Gauchers disease) whereas Gayathri B N et al[19] reported a single case of storage disorder (Niemann-pick disease).

Conclusion

Pancytopenia is not an uncommon hematological problem encountered in clinical practice and should be suspected on clinical grounds when a patient presents with unexplained anemia, prolonged fever and tendency to bleed. In this study Megaloblastic anemia was the most common cause of Pancytopenia. concludes that detailed primary hematological investigations along with bone marrow aspiration in cytopenic patients are helpful for understanding disease process and to diagnose or to rule out the causes of cytopenia. There are varying trends in its clinical pattern, treatment modalities, and outcome depending on the different causes of pancytopenia which should be kept in mind while managing pancytopenia.

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