VOLUME - 12, ISSUE - 02, FEBRUARY - 2023 • PRINT ISSN No. 2277 - 8160 • DOI : 10.36106/gjra

Original Research Paper

Pathology

EVALUATION OF PANCYTOPENIA WITH BONE MARROW INTERPRETATION

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ABSTRACT

Background: Pancytopenia is one of the most common clinico-haematological entity observed in our day to day clinical practice. It is a disorder in which all the three major elements of blood (i.e. red blood cells, white blood cells and platelets) are decreased in number. The causes of pancytopenia may be due to decrease in hematopoietic cell production in the marrow resulting from infections, toxins, malignant cell infiltration, post- chemotherapy or post-radiation.

Aims and Objectives:

1) To study the etiology and clinical presentation of pancytopenia in all age groups.
2) To correlate with bone marrow interpretation

Materials & Methods: This is a prospective study which was conducted among 50 patients of pancytopenia in the Clinical Pathology, Government General Hospital,Kurnool from January 2021 to October 2022 Bone marrow aspiration was done by using Salah's bone marrow puncture needle. Smears were made from bone marrow aspirate (BMA) and stained by Leishman stain and special stains like Perl`s wherever necessary. The smears were assessed for cellularity, differentiation and maturation of erythroid, myeloid and megakaryocytic lineage, M:E ratio, Plasma cells, Lymphocytes and parasites/ abnormal cells. **Results:** In the present study the commonest cause of Pancytopenia was Megaloblastic anemia (70%) followed by Dimorphic anemia (20%). The less common conditions were Multiple Myeloma (6%),Chronic Myeloid Leukemia(2%),Acute Leukemia(2%). **Interpretation and Conclusion:** The present study concludes that complete primary hematological investigations along with bone marrow aspiration in pancytopenic patients are helpful for understanding disease process and to diagnose or to the rule out causes of pancytopenia. These are also helpful in planning for further investigations and management.

KEYWORDS : Pancytopenia, Bone marrow aspiration,Dimorphic anemia, Megaloblastic anemia, Acute Leukemia, Chronic Myeloid Leukemia, Multiple Myeloma,

INTRODUCTION:

Pancytopenia is one of the most common clinico-haematological entity encountered in our day to day clinical practice. It is a disorder in which three major elements of blood (red blood cells, white blood cells and platelets) are decreased in number.[1]

The causes of pancytopenia may be due to decrease in hematopoietic cell production in the marrow resulting from infections, toxins, malignant cell infiltration, chemotherapies and radiation.[2]

The causes of pancytopenia may be bone marrow-originated (i.e.aplastic anemia, myelodysplastic syndrome, etc), bone marrow infiltration (i.e.myelofibrosis, acute leukemia, multiple myeloma, metastatic carcinoma, hairy cell leukemia),splenomegaly (i.e.congestive splenomegaly, storage diseases, infections (i.e. tuberculosis, brucellosis, Q fever, Legionnaires' disease, fungal infection and septicemia, and other reasons (sarcoidosis,systemic lupus erythematosus, anorexia nervosa, alcoholism, vitamin B12, folic acid deficiency, coagulopathy).[3]

Careful assessment of blood elements is the first step in assessment of hematologic function and diagnosis of disease. Physical findings and peripheral blood picture provides valuable information towards the work up of pancytopenic patients and help in planning investigations on bone marrow samples.[4]

Bone marrow evaluation is an important diagnostic procedure which helps in confirming the diagnosis of suspected pancytopenia from the clinical features and peripheral blood examination or it may occasionally gives a previously unsuspected diagnosis.[5]

A complete clinical history,physical examination, and review of peripheral smear and bone marrow examination remains fundamental to the diagnosis.[6]

Aims and Objectives:

1) To study the etiology and clinical presentation of pancytopenia in all age groups.
2) To correlate with bone marrow interpretation

MATERIALS AND METHODS:

This is a prospective study which was conducted among 50 patients of pancytopenia in the Clinical Pathology, Government General Hospital,Kurnool from January 2021 to October 2022

Informed consent was obtained from each of the patient fulfilling the inclusion criteria prior to their enrolment in the study. The patients were asked for relevant history including treatment history, history of drug intake, radiation exposure and examined for important physical findings such as pallor, icterus, hepatomegaly, splenomegaly, lymphadenopathy and ascites.

Bone marrow aspiration was done by using Salah's bone marrow puncture needle and stained by Leishman stain and special stains like Perl`s wherever necessary. The smears were assessed for cellularity, differentiation and maturation of erythroid, myeloid and megakaryocytic lineage, M:E ratio, Plasma cells, Lymphocytes and parasites/ abnormal cells.

Inclusion Criteria :

Patients with

1. Hemoglobin < 11.5 gm/dl in females, and < 13.5gm/dl in males
2. Total leukocyte count(TLC) < 4000/ul
3. Platelet count < 100000/ul

Exclusion Criteria :

1. Patients who have already been diagnosed with pancytopenia.
2. Patients who do not give consent for bone marrow aspiration and biopsy.
3. Patients who have recently received blood transfusions.
4. Patients who were on chemotherapy/radiotherapy.

RESULTS:

The following data was recorded and analysed

Table 1: Etiological Distribution Of Pancytopenia Cases

Category	Causes	No. of cases
1. Non-malignant Hematological Disorders	Megaloblastic anemia	35 (70%)
	Dimorphic anemia	10 (20%)
	Total	45 (90%)
2. Malignant Hematological Disorders	Acute leukemia	1(2%)
	Chronic myeloid leukemia	1 (2%)
	Multiple myeloma	3(6%)
	Total	5(10%)
Total no. of cases		50 (100%)

Table 2:clinical Findings In Pancytopenia

Physical exmination	Megaloblastic anemia	Dimorphic anemia	Multiple Myeloma	CML	Acute Leukemia	Percentage
Bleeding	1	2	2			10
Icterus	1	2				6
Lymphadenopathy					1	2
Hepatomegaly	6	3		1		20
Edema	2	2				4
Pallor	23	2	1			52
Spleenomegaly	2	1				6

Most of the patients were in the age group of 21-30 years (38%) and least occurrence was seen in patients 0-10 years (2%). Male to female preponderance is 1:2. Generalized weakness (53%) was the commonest clinical feature in patients with pancytopenia whereas the most common clinical finding was pallor (52%) and hepatomegaly (20%). Less common were edema, bleeding,lymphadenopathy and spleenomegaly.

In the present study the commonest cause of Pancytopenia was Megaloblastic anemia (70%) followed by Dimorphic anemia (20%).The less common conditions were Multiple Myeloma (6%), Chronic Myeloid Leukemia(2%), Acute Leukemia(2%). Out of the 50 patients of pancytopenia, 45 (90%) cases had a hypercellular marrow, 5 (10%) had normocellular or hypocellular marrow.In hypocellular marrow repeat bone marrow aspiration had to be done because of inadequate material.

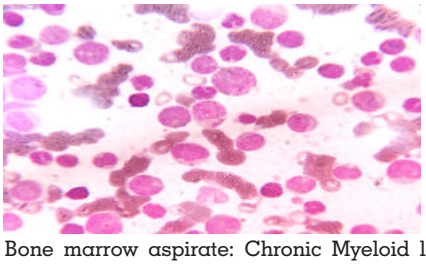

Fig 1: Bone marrow aspirate: Chronic Myeloid leukemia showing myeloblasts, promyelocytes and myelocytes

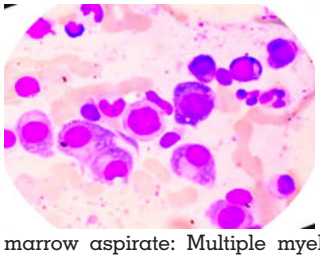

Fig 2: Bone marrow aspirate: Multiple myeloma showing many plasma cells with typical basophilic cytoplasm, nuclear chromatin condensation and peri-nuclear hof.

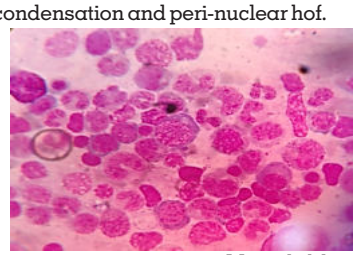

Fig 3: Bone marrow aspirate-Megaloblastic anemia: Predominantly megaloblasts having large size, sieve like nuclear chromatin and basophilic cytoplasm.

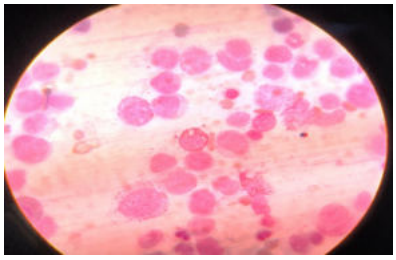

Fig 4: Bone marrow aspirate: Picture of acute leukemia with both myeloblasts and lymphoblasts

DISCUSSION:

In the present study maximum number of patients were observed in the age group of 21 – 30 years was 19(38%) followed by 9 patients(18%) each in the age group of 11-20 years and 31-40 years.The present study is significant with the study conducted by Tareen SM et al[7],Jha A et al[8] Keisu M et al[9] Khunger JM et al[10] maximum number of patients were in the age group of 11-30 years (64%).

The present study showed female preponderance which was not in concordance with the studies conducted by Tareen SM et al[7],Jha A et al[8] Keisu M et al[9] Khunger JM et al[10].

Pallor was the most commonest clinical finding of pancytopenia in all studies whereas hepatomegaly was 2nd most common clinical finding and spleenomegaly was 3rd most common clinical finding. In studies conducted by Tareen SM et al[7],Jha A et al[8] Keisu M et al[9] Khunger JM et al[10] spleenomegaly was 2nd most common clinical finding and hepatomegaly was 3rd most common clinical finding.

Table 3: Comparing the commonest cause of pancytopenia with various studies.

S. No.	Study	No. of Cases	Commonest Cause	Second Most common cause
1	Gayathri *et al*[1]	104	Megaloblastic anaemia (74%)	Aplastic anaemia (18%)
2	Jha *et al*[8]	148	Hypoplastic anaemia(29.5%)	Megaloblastic Anaemia(23.64%)
3	Khunger *et al.*[10]	200	Megaloblastic anaemia (72%)	Aplastic anaemia (14%)
4	Kumar R et al.[11]	166	Aplastic anaemia(29.5%)	Megaloblastic anaemia (22.3%)
5	Osama Ishtiaq *et al.*[12]	100	Megaloblastic Anaemia(39%)	Hypersplenism (19%)
6	Memon *et al*[13]	230	Aplastic anaemia	Megaloblastic Anaemia(13.04%)
7	Present study	50	Megaloblastic Anaemia (70%)	Nutritional anemia (20%)

The incidence of megaloblastic anaemia observed in the Western countries varies from 0.8% to 32.26% of all pancytopenic patients.[9,23] The incidence of megaloblastic anaemia noted in the present study was 70%. This incidence is highly correlating with other studies of India ranging from 44% to 74%. The increased incidence of megaloblastic

anaemia indicates the high prevalence of nutritional deficiency in the Indian subjects. As facilities for estimating folic acid and vitamin B12 levels are not readily available in most centers in India, the exact deficiency remains unidentified most of the time.[24]This may be the reason that our study shows high prevalence of megaloblastic anaemia.

In the present study 2nd most common cause of pancytopenia was dimorphic anemia. Whereas in other studies like Kumar R et al[11] megaloblastic anemia was the 2nd most common cause and Osama Ishtiaq *et al*.[12] hypersplenism was the 2nd most common cause.

In the present study, the numbers of non- neoplastic causes of pancytopenia were 45 (90%) cases and number of neoplastic causes were 5(10%) patients out of total 50 cases. This was comparable to the study by Sharif et al(2014) which showed 92/105 (88%) cases as non neoplastic causes of pancytopenia and13/105 (12.38%) cases as neoplastic causes.

In the present study, the bone marrow was hypercellular in most of the patients 45(90%). Bone marrow is normocellular in 4(8%) and hypocellular in 2% cases. Erythroid hyperplasia with megaloblastic maturation was seen in most of the patients.

CONCLUSION:

Pancytopenia is one of the common haematological problem encountered in clinical practice and should be suspected on clinical grounds when a patient presents with unexplained anaemia, prolonged fever and tendency to bleed. The etiological spectrum of pancytopenia is very much diverse. Megaloblastic anaemia,dimorphic anemia and multiple myeloma are the most frequently diagnosed underlying cause. Other rare causes were Acute Leukemia and Chronic Myeloid Leukemia.

The clinical findings and peripheral blood picture play an important role in planning the investigations in pancytopenic patients.Bone marrow examination is an important diagnostic tool in confirming the underlying cause of the disease.

The severity of pancytopenia and the underlying cause helps in determining the management and prognosis of the patients. Megaloblastic anaemia which is responsive to treatment, so an, early and accurate diagnosis is life-saving.

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