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Bone Marrow Evaluation In Cases Of Pancytopenia: A Cross Sectional Study In A Tertiary Care Hospital.

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ABSTRACT

Pancytopenia is a common hematological finding with a variety of causes that make diagnosis challenging. The objective of this cross-sectional prospective study was to determine the underlying etiology of pancytopenia in patients admitted to a tertiary care hospital in Central India.The study was conducted over a two-year period and included 94 patients with pancytopenia, as defined by a hemoglobin level less than 10 gm/dl, total leukocyte count of less than 4000/mm3, and platelet count less than 100,000/mm3. Bone marrow aspiration (BMA) or biopsy (BMB) was performed in all cases, and the results were compared. The study population ranged in age from 6 to 85 years, with a mean age of 36.74 ± 18.23 years. Of the 94 patients, 30 underwent BMA only, with 14 cases (46.7%) of dimorphic anemia, 13 cases (43.3%) of megaloblastic anemia, and 3 cases (10%) of hypersplenism. Among the 64 patients who underwent both BMA and BMB, megaloblastic anemia was the most common diagnosis (20.3%), followed by aplastic anemia (14.1%), and dimorphic anemia (12.5%). Other diagnoses included acute lymphoblastic leukemia (10.9%), myelodysplastic syndrome (10.9%), and hypersplenism (10.9%). There were also rare diagnoses such as gaucher's disease, idiopathic thrombocytopenic purpura, and waldenstrom macroglobulinemia. The study found that megaloblastic anemia was the most common cause of pancytopenia in this population, followed by aplastic anemia and dimorphic anemia. The findings highlight the importance of a thorough investigation of the underlying etiology of pancytopenia to guide appropriate treatment and management.

Keywords: Bone marrow evaluation, Pancytopenia.

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INTRODUCTION

Pancytopenia is reduction in all three major formed elements of the blood that may result from a number of disease processes [1, 3]. The mechanisms contributing to pancytopenia include, ineffective haematopoiesis with cell death, marrow replacement by abnormal cells, defective cell formation, antibody mediated sequestration or destruction of cells in a hypertrophied and overactive reticuloendothelial system [1, 2]. Several disease processes, primarily or secondarily involving the bone marrow, may cause it [3]. Pancytopenia is not a single disease but rather a triad of symptoms that can be caused by various disease processes. The presenting symptoms are usually caused by anaemia or thrombocytopenia. Leukopenia is an uncommon reason for the patient's initial presentation, but it can become the most serious threat to life as the condition progresses [4-6].

MATERIAL AND METHODS

Type of study

Cross-sectional Prospective study.

Duration of study

2 years.

Study setting

This study was carried out in department of Pathology, Tertiary care hospital, Central India.

Sample size

94.

This was a prospective study conducted on 94 patients over a period of two years admitted in Tertiary Care Centre of Central India.

After approval from Institutional Ethics Committee written consent of all the patients who were admitted in ward for evaluation of pancytopenia or their relatives was taken after explaining to them whole procedure.

Complete history and important clinical details including physical examination, haematological studies and other relevant investigations were collected and proforma was filled.

After taking informed consent bone marrow aspiration (BMA) or bone marrow biopsy (BMB), whichever feasible was performed from posterior superior iliac spine of the patients.

Bone marrow aspiration smears were air dried and stained with Leishman and Giemsa stain for microscopy and when required special stains such as periodic acid-Schiff and myeloperoxidase stain were performed.

Trephine biopsy specimens were processed and hematoxylin and eosin stained sections were examined.

Inclusion criteria

All the cases of pancytopenia with haemoglobin less than 10 gm/dl, total leucocyte count of less than 4000/mm3 and platelet count less than 100,000/mm^3 were included in the study.

Exclusion Criteria

- Patients on myelotoxic chemotherapy and radiotherapy
- Follow up cases of leukemia

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- Pregnant women
- Already diagnosed case of pancytopenia taking treatment

RESULTS

In this study there was a wide age range with the youngest patient being 6 years of age and the maximum being 85 years of age. 21 (22.3%) patients belonged to age group 21-30 years followed by >50 years (20(21.3%)), 11-20 years (18(19.1%)), 31-40 years (17(18.1%)), and 41-50 years (15(16.0%)). Only 3(3.2%) patients were below 10 years. Mean value of age (years) of study subjects was 36.74 ± 18.23.

In 30 patients of pancytopenia exclusively bone marrow aspiration was done. Out of 30 patients 14 (46.7%) patients were of dimorphic anaemia, 13 (43.3%) patients were of megaloblastic anaemia and 3 (10%) patients were of hypersplenism.

Table 1: Bone marrow aspiration (BMA) findings

BMA Findings	Cases (n=30)	
	Frequency	Percentage (%)
Dimorphic anaemia	14	46.7
Megaloblastic anaemia	13	43.3
Hypersplenism	03	10
Total	30	100

In remaining 64 patients both bone marrow aspiration and biopsy was done. 13 (20.3%) cases were diagnosed as megaloblastic anaemia, 9 (14.1%) cases as apastic anaemia and 8 (12.5%) cases as dimorphic anaemia. There were 7 (10.9%) cases each of acute lymphoblastic leukemia, myelodysplastic syndrome, and hypersplenism; 4 (6.3%) cases of micronormoblastic anaemia; 3 (4.7%) cases each of acute myeloid leukemia and multiple myeloma; 1 (1.6%) cases each of gaucher's disease, idiopathic thrombocytopenic purpura and waldenstrom macroglobulinemia.

Among 64 patients in whom both bone marrow aspiration and biopsy was performed, 51 cases had findings similar in both BMA and BMB. In remaining 13 patients where BMA and BMB findings were not similar, was either due to dry tap during bone marrow aspiration or because of faulty technique while performing aspiration.

Table 2: Degree Of Correlation Between Bone Marrow Aspiration And Bone Marrow Biopsy

Correlation between bone marrow aspiration and biopsy	Frequency (n)	Percentage (%)
Yes	51	79.7
No	13	20.3
Total	64	100

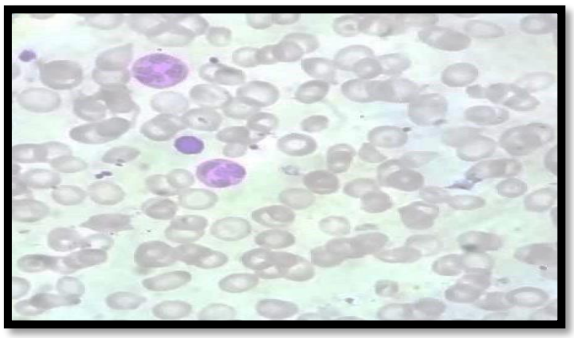

Figure 1: Megaloblastic anaemia: peripheral smear showing macroovalocytes and hypersegmented neutrophils. (PS: Leishman's stain 100X)

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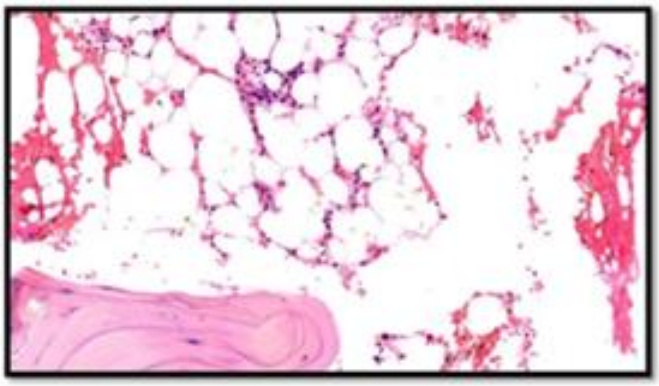

Figure 2: Aplastic anaemia: Biopsy smear shows increased fat cells (BMB: H&E 10X)

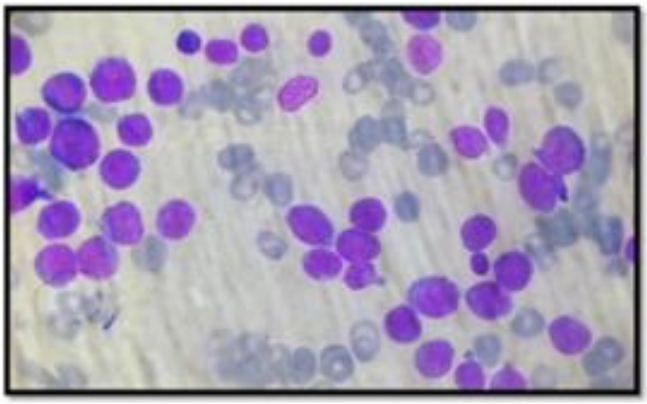

Figure 3: AML: Smear showing blast cells with increased N:C ratio and conspicuous nucleoli (PS: Leishman's stain 100X)

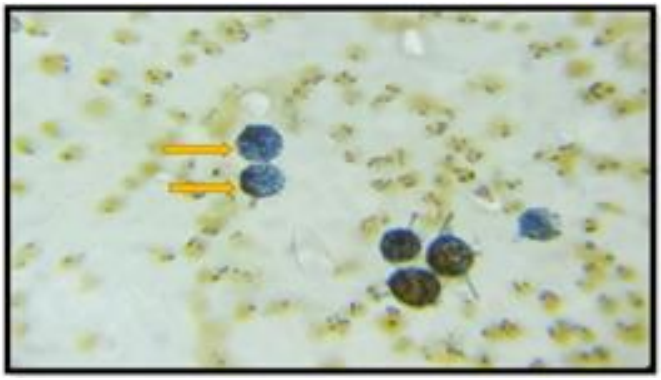

Figure 4: AML: Smear showing blast cells and promyelocyte showing MPO (arrow) positivity. (PS: Special stain: MPO positive)

DISCUSSION

Pancytopenia is a frequent haematological finding that has a variety of clinical manifestations. It frequently makes diagnosis difficult for physicians. Understanding the precise causes of this illness is essential for patient management. Different diagnostic criteria and methodologies, geographic location, the length of the observation period, exposure to myelotoxic substances, and genetic variations have all been linked to variations in the distribution and incidence of different causes of pancytopenia. Bone marrow examination is a frequently requested investigation to identify the cause pancytopenia [7, 8].

Patients with pancytopenia may have normal bone marrow due to sequestration and/or destruction of cells by the action of antibodies or trapping of normal cells in a hypertrophied and over-

reactive reticuolendothelial system. In the present study hypersplenism was seen in 10 cases which accounted for 10.6% of total cases of pancytopenia. Maximum cases of hypersplenism were seen in the age group of 31-40 years accounting 50% of total cases of hypersplenism. Females slightly outnumbered the males with male to female ratio of 1:1.5. Similar finding has been seen in study done by Thakkar et al [9] which showed hypersplenism in 14% of cases. Studies done by Jha et al[2] and Pathak R et al [1] constituted 3.38% and 5.8% cases of hypersplenism respectively.

In the present study, 3 (3.2%) cases of multiple myeloma and a single (1.1%) case of Waldenstrom macroglobulinemia were diagnosed who presented with pancytopenia. All the 3 cases of multiple myeloma in the present study were in the age group of 51-60 years and all were males. Case diagnosed with waldenstrom macroglobulinemia was 67 years old male patient. Multiple Myeloma incidence in pancytopenia patients was reported to be 1% by Khunger et al [10] and 4% by Khodke et al [11]. The serum electrophoresis showed presence of M band. There were 38% of plasma cells in bone marrow with some showing binucleate forms.

CONCLUSION

Herewith we conclude, when compared to bone marrow biopsy, bone marrow aspiration provides more cellular information.

REFERENCES

[1] Pathak R, Jha A, Sayami G. Evaluation of bone marrow in patients with pancytopenia. Journal of pathology of Nepal. 2012 Sep 25;2(4):265-71.
[2] Jha A, Sayami G, Adhikari RC, Panta AD, Jha R. Bone marrow examination in cases of pancytopenia. JNMA J Nepal Med Assoc 2008;47:12-7.
[3] Nigam RK, Chaudhary R, Malik R, Gour D, Shrivastava A, Tripathi A, Ahirwar R, Jain R. Pancytopenia--clinico-haematological studies of bone marrow examination. Journal of Evolution of Medical and Dental Sciences. 2013 Nov 25;2(47):9213-20.
[4] Shah P, Patel RD, Gamit B, Gheewala S. Bone marrow examination in cases of pancytopenia. Int J Res Med Sci. 2017 Apr;5(4):1494-8.
[5] Gayathri BN, Rao KS. Pancytopenia: a clinico hematological study. J Lab Physicians. 2011 Jan;3(1):15-20.
[6] Vaidya S. Evaluation of bone marrow in cases of pancytopenia in a tertiary care hospital. Journal of Pathology of Nepal. 2015 Mar 27;5(9):691-5.
[7] Madhuchanda Kar, Alokendu GhoshJournal,Post graduate clinic:Pancytopenia, Indian Academy of Clinical Medicine :2002; 3(1): 29-34.
[8] Keisu M ,Ost A. Diagnosis in patients with severe pancytopenia suspected of having aplastic anaemia. Eur J Hematol 1990:45:11-14.
[9] Thakkar Et al (1995). "Who really discovered aplastic anemia?". Haematologica. 80 (3): 294.
[10] Khunger JM, Arulselvi S, Sharma U, Ranga S, Talib VH. Pancytopenia--a clinico haematological study of 200 cases. Indian journal of pathology & microbiology. 2002 Jul 1;45(3):375-
[11] Khodke K, Marwah S, Buxi G, Yadav RB, Chaturvedi NK. Bone marrow examination in cases of pancytopenia. J Indian Acad Clin Med 2001;2:55-9