



INTERPRETATION OF BONE MARROW ASPIRATION IN HAEMATOLOGICAL DISORDERS

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ABSTRACT

Background: Haematological disorders are quite frequent in all age groups. Most of the haematological disorders first present as anaemia. Bone Marrow Aspiration plays a major role in the diagnosis of its underlying cause. The aim of this study was to analyse the causes of haematological disorders, its spectrum and to interpret the bone marrow aspiration findings in a tertiary care hospital in Jammu and Kashmir, North India. **Materials and Methods:** This was a retrospective study done for a period of two years. A total of 100 cases were included in this study. Bone marrow aspiration and peripheral blood smear results along with necessary haematological and clinical parameters were recorded. Giemsa-stained slides along with Iron stain, Periodic Acid Schiff (PAS) stain and Myeloperoxidase (MPO) stained slides were examined in all the available cases. Aspirates of inadequate material or dry tap were excluded from the study. Then, data was manually collected and subsequently analysed. **Results:** A total number of 100 cases aged 11 to 80 years with mean age of 48.6 years, were included in this study. Male to female ratio in our study was 1.8:1 with a male predominance. Anaemia was the most common haematological disorder in our study accounting for 59% of cases followed by multiple myeloma accounting for about 23% of cases. Among anaemias, megaloblastic anaemia (26%) was most common followed by dual deficiency anaemia (18%). Acute leukaemia was seen in 4 cases (4%). Out of this, 3 cases (3%) were AML and 1 case (1%) was ALL. Chronic myeloid leukaemia (CML) was seen in 5 cases (5%) and CLL was seen in 2 cases (2%). Multiple myeloma was seen in 23 cases (23%). The percentage of plasma cells in the bone marrow aspirate smears varied from 15 -95%. 58.8% of cases had a mature plasma cell morphology. **Conclusion:** The present study shows that bone marrow aspiration interpretation gives a better understanding of the basic pathology behind various haematological conditions and hence helps in making diagnosis accurately. Bone marrow examination though invasive but is relatively a safe investigation in diagnosing various haematological disorders and can be carried out in outpatient settings.

KEYWORDS : Anaemia, Bone marrow aspiration, Leukaemia

INTRODUCTION

Bone marrow examination is an important diagnostic tool in haematology. It is a simple and relatively safe procedure carried out routinely in hospitals for the diagnosis and management of haematological and to some extent non-haematological disorders. In addition, the procedure may be necessary in staging, prognostication, and evaluation of therapeutic response in some disorders.¹

A normal bone marrow consists of stem cells which are largely primitive undifferentiated cells that are supported by fibrous tissue called stroma. Bone marrow can be one of two types, red or yellow marrow depending on whether it consists mainly of haematopoietic tissues or fatty tissues respectively. Progressive differentiation and maturation of the primitive stem cells results in specific marrow cell type i.e., Leucocytes, Erythrocytes and Platelets.²

Anaemia is common worldwide and particularly so in developing countries.³ Haematological disorder in any age group usually presents with anaemia. The spectrum of haematological disorders is relatively different in the developing world than the developed countries.⁴

Diseases affecting the bone marrow may be primary or a secondary spread to the marrow. In both cases, the normal marrow cellular architecture is distorted. Anaemia is a common presentation in most of these diseases whether haematological or otherwise. Hence, a detailed description of the morphology of the marrow elements may provide sufficient explanation for unexplained cytopenias, leukemias, and

other haematological disorders including metastasis to the bone marrow.¹

AIM

This study was carried out with the aim of finding out the causes of haematological disorders, its spectrum and to interpret the bone marrow findings in a tertiary care hospital in Jammu and Kashmir, North India.

MATERIALS AND METHODS

This was a retrospective study done in the department of Pathology of Acharya Shri Chander College of Medical Sciences and Hospital, Jammu for a period of two years from January 2020 to December 2021. A total of 100 cases were included in this study. Bone marrow aspiration and peripheral blood smear results along with necessary haematological and clinical parameters were recorded.

Giemsa-stained slides along with Iron stain, Periodic Acid Schiff (PAS) stain and Myeloperoxidase (MPO) stained slides were examined in all available cases. Aspirates of inadequate material or dry tap were excluded from the study. Then, data was manually collected and subsequently analysed.

RESULTS

A total number of 100 patients were included in this study aged between 11 years and 80 years. The mean age was 48.6 years. 65 (65%) were males and 35 (35%) were females with (M: F = 1.8:1). Table 1 shows the age distribution of patients.

Table 1: Age distribution of the patients

Age group	No. of patients	Percentage (%)
< 15 years	3	3%
15-30 years	20	20%
31-45 years	24	24%
>45 years	53	53%
Total	100	100%

- Blood count and peripheral blood smear revealed anaemia in 86% cases.
- Pancytopenia was seen in 60% cases and bicytopenia was seen in 26% of cases.
- Thrombocytopenia alone was seen in 14% cases. Though, most of the bone marrow was hypercellular but we did come across normocellular marrows as well (Table 2).

Table 2: Cellularity of the bone marrow in the aspirate smears

Cellularity of the marrow	No. Of cases	Percentage (%)
Hypercellular	56	56%
Normocellular	28	28%
Hypocellular	16	16%
Total	100	100%

Bone marrow examination findings are given in Table 3. Anaemia was the most common haematological disorder in our study accounting for 59% of cases followed by multiple myeloma accounting for about 23% of cases. Among anaemias, megaloblastic anaemia (26%) was most common followed by dual deficiency anaemia (18%). Acute leukaemia was seen in 4 cases (4%). Out of this, 3 cases (3%) were Acute Myeloid Leukemia(AML) and 1 case (1%) was Acute lymphocytic leukemia(ALL). Chronic myeloid leukaemia (CML) was seen in 5 cases (5%) and CLL was seen in 2 cases (2%). Multiple myeloma was seen in 23 cases (23%). The percentage of plasma cells in the bone marrow aspirate smears varied from 15 -95%. 58.8% of cases had a mature plasma cell morphology.

Table 3: Bone Marrow Examination findings

BMA diagnosis	No. of cases	Percentage (%)
Megaloblastic anaemia	26	26%
Iron deficiency anaemia	15	15%
Dual deficiency anaemia	18	18%
Hypoplastic anaemia	3	3%
ITP	1	1%
Multiple myeloma	23	23%
Acute leukemia	4	4%
Chronic myeloid leukemia	5	5%
Chronic lymphocytic leukemia	2	2%
Normal marrow	3	3%
Total	100	100%

DISCUSSION

Examination of the bone marrow is one of the most important pillar in diagnosing haematological disorders.

In our study, the most common age group undergoing bone marrow aspiration was above 45 years. In a study done by Niazi et al, the majority of the patients were from the age group 01-30 years.⁵ In our study, the age of the patients ranged from 11 – 80 years with the mean age of 48.6 years. 65 (65%) were males and 35 (35%) were females with ratio of M:F = 1.8:1. Age and sex distribution was compared with other studies as shown in Table 4.

Table 4: Comparison of age and sex distribution in different studies

Study	Age(years)	M: F
Egesie et al3	3-80	1.5:1
Gayathri et al6	2-80	1.2:1
Kibria et al4	3.5-80	1:0.59
Niazi et al5	1-75	1.7:1
Jha et al7	1-79	1.5:1

The commonest indication of bone marrow aspiration was Pancytopenia (60%) followed by bicytopenia (26%). Similar to our study Pancytopenia was also the commonest indication in a study done by Ahmed et al.⁸ However contrasting to these studies, a study done by Bashawri et al found pancytopenia as the third common indication (11.9%).⁹ In our study, thrombocytopenia alone was seen in 14% cases.

In our study, Anaemia was the most common haematological disorder accounting for 59% of cases with megaloblastic anaemia being predominant accounting for 26%. In the study done by Atla BL et al, megaloblastic anaemia was the most common finding (44%) followed by aplastic anaemia (11.9%).¹⁰ In a study conducted by Gayathri et al, megaloblastic anaemia was the commonest cause of pancytopenia and was the commonest finding in Bone Marrow Aspiration.⁶

Multiple myeloma was the second largest group accounting for 23% cases. In a study done by Ranabhat S et al, multiple myeloma constituted 13.3% of malignant haematological disorders.¹¹

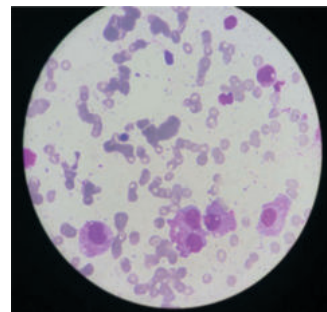


Figure 1: Bone marrow aspirate smear showing plasma cells (100X, Leishman stain)

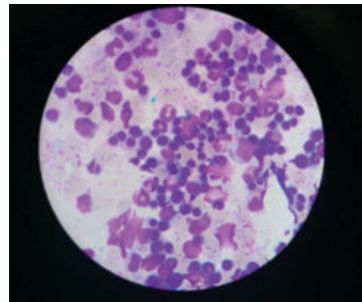


Figure 2: Bone marrow aspirate smear showing megaloblastic anaemia (100X, Leishman stain)

Acute leukemia was seen in 4 cases (4%). Out of this, 3 cases (3%) were AML and 1 case (1%) was Acute Lymphocytic Leukemia(ALL). Pudasaini S et al, in their study diagnosed acute leukemia in 12.3% cases with acute myeloid leukemia (10.5%) more common than acute lymphoid leukemia (1.8%).¹² Acute Myeloid Leukemias were the common cause of haematological malignancies in a study conducted by Atla BL et al.¹⁰

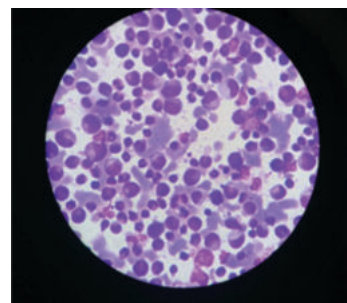


Figure 3: Bone marrow aspirate smear showing Chronic myeloid leukemia (100X, Leishman stain)

Hypoplastic anaemia was seen in 3 cases (3%). In a study done by Atla et al, 19% cases had aplastic anaemia.¹⁰ Hypoplastic anaemia was seen in 5.3% cases in a study done by Pudasaini S et al.¹²

Chronic Lymphocytic Leukaemia (CLL) was seen in 2 cases (2%) in comparison with data reported by Al-Ghazaly (5.7%)¹³, Shorsh (13%)¹⁴, while Aprajita study shows 0.74%.¹⁵

Chronic Myelogenous Leukaemia (CML) was seen in 5 cases (5%) in comparison with data reported by Al-Ghazaly¹³ and Shorsh¹⁴ that showed 13.9% and 4.9% cases respectively.

Immune thrombocytopenic purpura (ITP) was seen in 1 case (1%). Other studies showed 6.21%, 14.5%, 6.8% and 5% cases of ITP respectively in their studies.^{4,8,16}

CONCLUSION

The present study highlights the role of bone marrow examination in describing the basic pathology behind various haematological conditions. Bone marrow aspiration is a simple, reliable, cost-effective, and easily accessible technique in giving a better understanding of cytomorphology of marrow aspirates. The method though invasive is relatively safe and uncomplicated to perform and can yield an accurate diagnosis in a relatively short amount of time. A speedy road to diagnosis and treatment, as well as a nontraumatic experience for the patient, are made possible by the procedure's briefness, the potential of avoiding sedation or general anaesthesia, and the capacity to execute the procedure on an outpatient basis.

Conflicts Of Interest

The authors declare no conflicts of interest.

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