

# Various Bone Marrow Abnormalities in Bone Marrow Aspiration and Bone Marrow Biopsy of Hematological and Non-hematological Disorders

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## Abstract

### Introduction

Bone marrow is the major site of haematopoiesis giving rise to the three cellular elements namely erythrocytes, leucocytes and platelets. Various haematological disorders may arise from abnormality in one of the three lineages. It thus becomes necessary to examine the bone marrow to determine the actual cause. Indications have included the diagnosis, staging, and therapeutic monitoring for lymphoproliferative disorders.

### Materials and Method

- Study design: Retrospective case study
- Study duration: January 2022 to January 2023
- Study group: All case of bone marrow aspiration and bone marrow biopsy investigation received in central laboratory, Dhiraj Hospital
- Sample size: 50 cases
- Source of data: Bone marrow aspiration and bone marrow biopsy reports in central laboratory, Dhiraj Hospital, Waghodia, Vadodara

### Method

- After obtaining informed consent, patients were made to lie in left or right lateral position with knees drawn up.
- The area was cleaned with betadine and 70% ethanol, following which skin, subcutaneous tissue, and periosteum were infiltrated with 5 ml of 2% lignocaine.
- With a boring movement, Salah bone marrow aspiration needle was passed perpendicularly into the iliac cavity.
- After the bone was penetrated, the stylet was removed, 20 ml syringe was attached, and 0.3–0.5 ml of marrow contents was sucked up to make films and needle withdrawn.
- Jamshidi™ trephine biopsy needle was inserted into the bone from the same site but in a different direction, using a to-and-fro movement to obtain a core of tissue.
- Touch smears were made.
- Giemsa staining was done for aspiration, and H and stain was done on biopsy.

## Results

- 0-10 years age group were the most common age group for investigation of bone marrow aspiration and bone marrow biopsy.
- The most common diagnosis is Acute leukaemia (18%), megaloblastic changes (10%), Immune thrombocytopenic purpura (4%), and erythroid hyperplasia (2%). Few other cases include: multiple myeloma (8%), polycythaemia vera (2%), hypereosinophilia (4%), lymphoma (6%), CML (6%), CLL (4%). There are 18% inconclusive result and 16% shows normal bone marrow picture for age.

## Conclusion

Acute Leukaemia was the most common diagnosis encountered in this study.

Aspiration gives us information on results based on the cytomorphology of cellular components of the marrow whereas, a biopsy section is far more superior when it comes to assessing the histology and architectural pattern of the marrow involvement.

**Keywords:** Leukaemia, Bone Marrow Biopsy, Haematological Disorder

## Introduction

Bone marrow is the major site of hematopoiesis giving rise to the three cellular elements namely red blood cells (erythrocytes), white blood cells (leucocytes) and platelets (thrombocytes).

Various hematological disorders may arise from abnormality in one of the three lineages. It thus becomes necessary to examine the bone marrow to determine the actual cause.

The history of in vivo bone marrow examination dates back to as early as 1876 when Mosler used a regular wood drill to aspirate bone marrow particles from a patient with leukemia.

Bone marrow aspiration and trephine biopsy have their own advantages and limitations. The two processes are regarded as complementary. Aspirates are unequalled for the demonstration of fine cytological detail, permitting a wider range of cytochemical stains and immunological markers and may well be performed alone in selected diseases.

Trephine biopsy is essential when a "blood tap" or "dry tap" occurs, which allows complete assessment of marrow architecture as well as distribution pattern of an abnormal infiltrate.

Bone marrow examination is useful in the diagnosis of both hematological and non-hematological disorders.

Indications have included the diagnosis, staging, and therapeutic monitoring for lymphoproliferative disorders, such as chronic lymphocytic leukemia, Hodgkin's and Non-Hodgkin's lymphoma, hairy cell leukemia, and plasma cell myeloma. Furthermore, evaluation of cytopenia, thrombocytosis, leukocytosis, anemia, and iron status can also be done.

## Aim

This study is aimed to assess the distribution of various bone marrow abnormalities in haematological and non-haematological disorders and diagnostic importance of bone marrow aspiration and bone marrow biopsy.

## Objectives

- To study the prevalence of various bone marrow disorders.
- To study relative distribution of various bone marrow disorders.
- To study age and sex proportion of bone marrow examination.
- Diagnostic importance of bone marrow aspiration and bone marrow biopsy.

## Materials and Method

- Study design: Retrospective case study
- Study duration: January 2022 to January 2023
- Study group: All case of bone marrow aspiration and bone marrow biopsy investigation received in central laboratory, Dhiraj Hospital
- Sample size: 50 cases
- Source of data: Bone marrow aspiration and bone marrow biopsy reports in central laboratory, Dhiraj Hospital, Waghodia, Vadodara

## Method

- After obtaining informed consent, patients were made to lie in left or right lateral position with knees drawn up.
- The area around the posterior iliac spine was cleaned with betadine and 70% ethanol, following which skin, subcutaneous tissue, and periosteum were infiltrated with 5 ml of 2% lignocaine.
- With a boring movement, Salah bone marrow aspiration needle was passed perpendicularly into the iliac cavity.
- After the bone was penetrated, the stylet was removed, 20 ml syringe was attached, and 0.3–0.5 ml of marrow contents was sucked up to make films and needle withdrawn.
- Jamshidi™ trephine biopsy needle was inserted into the bone from the same site but in a different direction, using a to-and-fro movement to obtain a core of tissue.
- Touch smears were made by rolling the core between two glass slides. The biopsy tissue was immediately fixed in neutral buffered saline, with tincture benzoin seal applied on the puncture site.
- Giemsa staining was done for aspiration, and haematoxylin and eosin (H and E) stain was done on biopsy.
- Perl's Prussian blue for iron, reticulin, Ziehl–Neelsen, nonspecific esterase (NSE), Sudan black, and periodic acid–Schiff stains were done where necessary.

## Results

A total 50 cases of BMA & BMB were studied. In the studied cases 50% male patient and 50% female patient were found. Age distribution with sex proportion of cases are given in Figure 1.

As given data in Figure 1, 0-10 years age group were the most common age group for investigation of bone marrow aspiration and bone marrow biopsy.

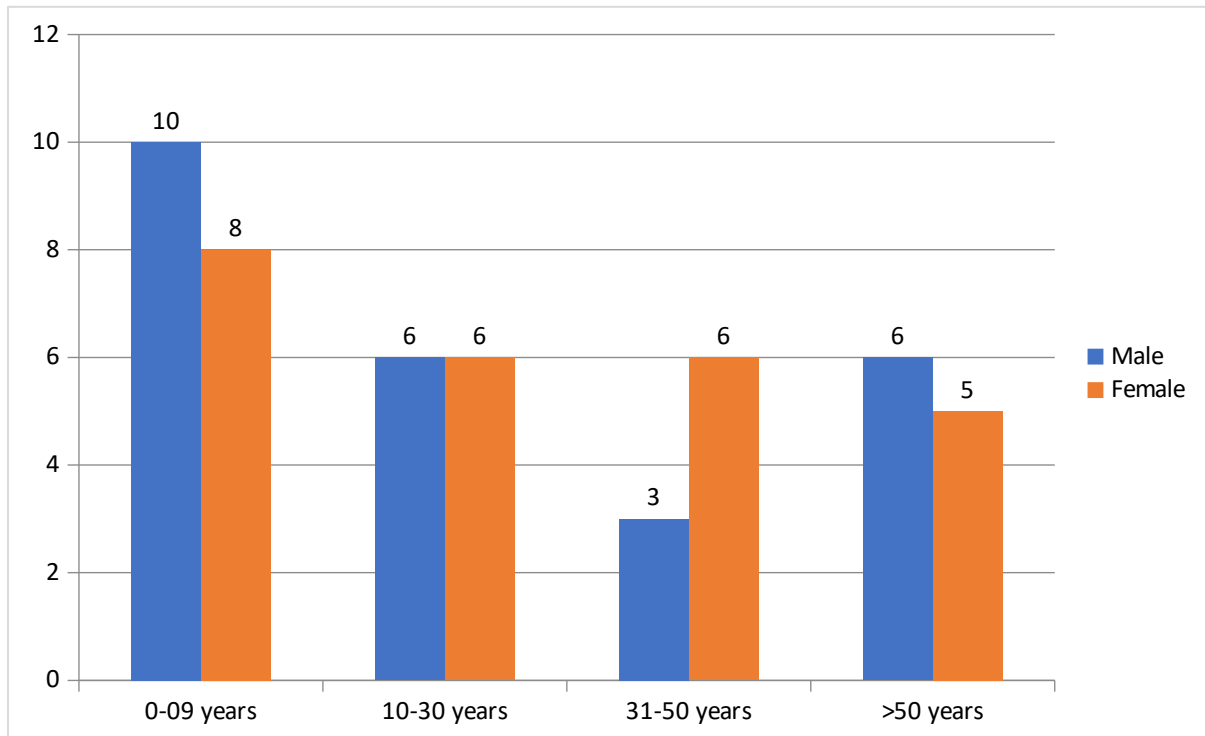


Figure 1: Age and Sex wise Proportion of Cases of Bone Marrow Examination

The proportion of various cases diagnosis in bone marrow examination of this study are presented in Figure 2 by a pie chart.

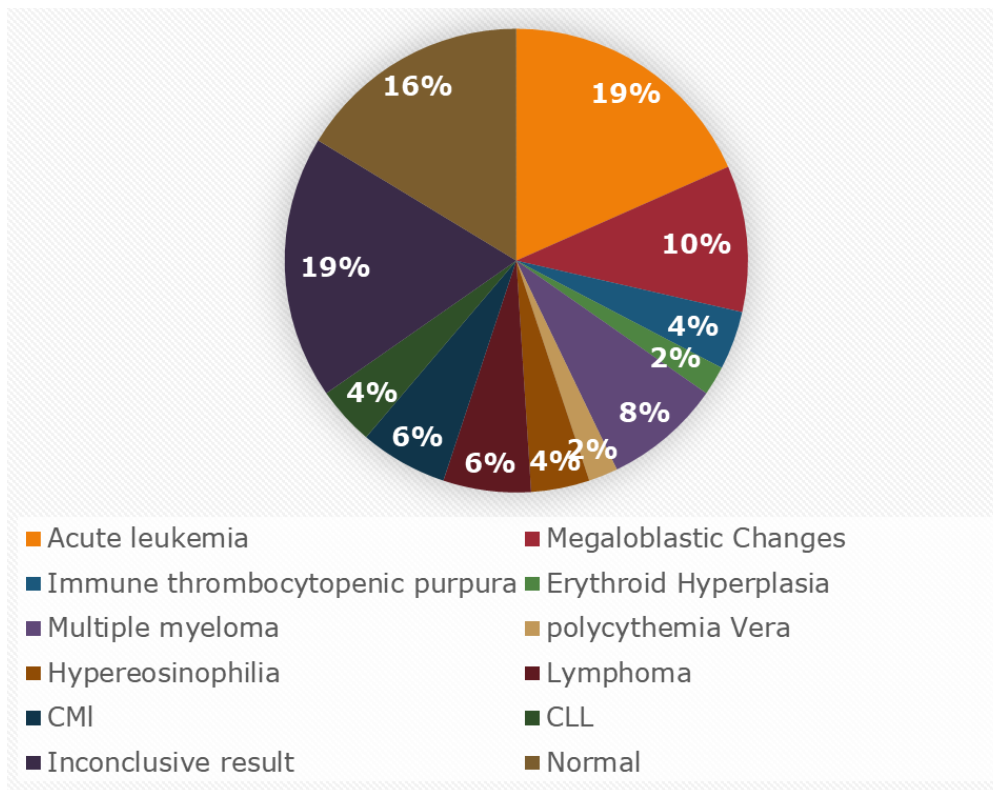
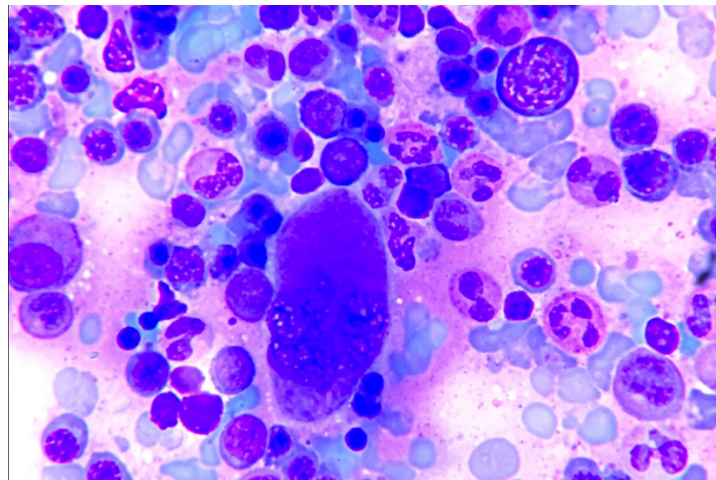


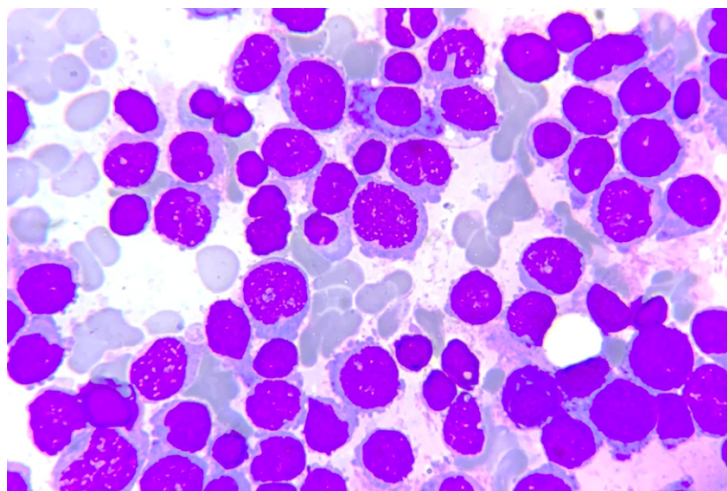
Figure 2: Frequency and Distribution of Diagnosis of BMA & BMB Reports

From Figure 2, The most common diagnosis is megaloblastic changes with Acute leukemia (18%), Megaloblastic changes (10%), Immune thrombocytopenic purpura (4%), and Erythroid hyperplasia

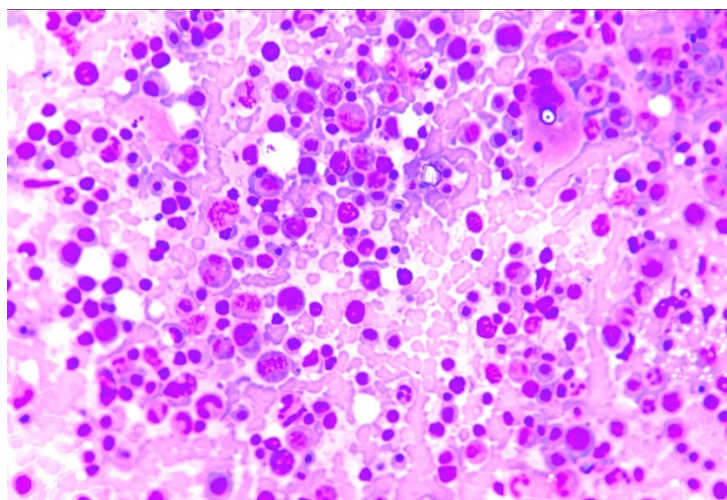
(2%). Few other cases include: multiple myeloma (8%), polycythemia vera (2%), Hyper eosinophilia (4%), Lymphoma (6%), CML (6%), CLL (4%). There are 18% inconclusive result and 16% shows normal bone marrow picture for age.



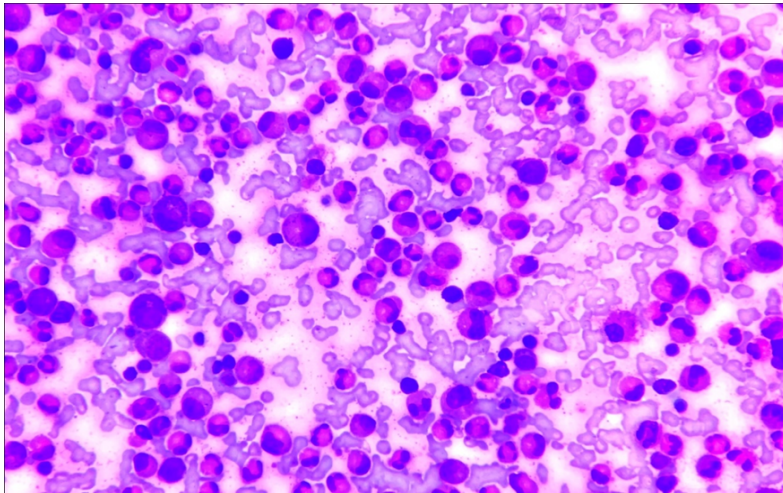
Megaloblastic: BMA (100x)



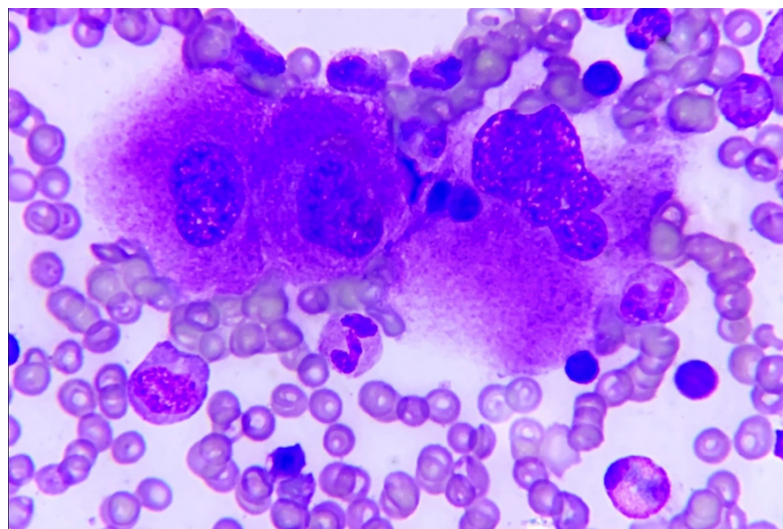
Acute Leukemia: MBA (100x)



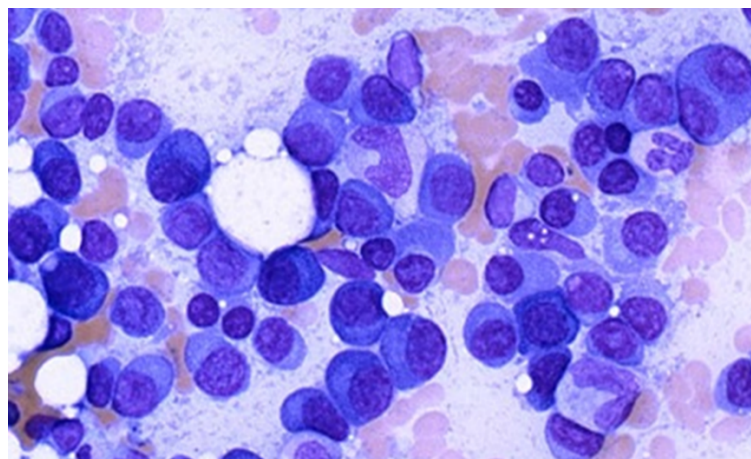
Polycythemia Vera: BMA (10x)



Hyper eosinophilic Syndrome: BMA (10x)



Immune Thrombocytopenic Purpura: BMA (100x)



Multiple Myeloma: BMA (40x)

**Conclusion**

The study concludes the bone marrow examination is important investigation in diagnosis of various haematological and non-haematological disorders.

Acute Leukaemia was the most common diagnosis encountered in this study.

Aspiration gives us information and clues us on a result based on the cytomorphology of cellular components of the marrow whereas, a biopsy section is far more superior when it comes to assessing the histology and architectural pattern of the marrow involvement.

### References

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