Original Research Article

Study of hematological disorders diagnosed on bone marrow examination in a tertiary care hospital

Avinash Priyadarshi[1*], Ankur Priyadarshi[2], Nirvana Rasaily Halder [3], Babai Halder [4], Surbhi Sinha 5, Md Shahbaz Karim [6], Nupur Singh[7]

[1]Assistant Professor, Department of Pathology, MGM Medical College, Kishanganj, Bihar, India
[2] Assistant Professor, Department of Paediatrics, Jawaharlal Nehru Medical College Bhagalpur, Bihar, India
[3]Associate Professor, Department of Pathology, MGM Medical College, Kishanganj, Bihar, India
[4]Associate Professor, Department of Pathology, MGM Medical College, Kishanganj, Bihar, India
[5] Tutor, Department of Pathology, MGM Medical College Kishanganj, Bihar, India
[6]Tutor, Department of Pathology, MGM Medical College Kishanganj, Bihar, India
[7]Tutor, Department of Obstetrics and gynecology, MGM Medical College Kishanganj, Bihar, India

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Abstract

Background: Bone marrow (BM) examination is most important procedure in the evaluation of hematological disorders. In hematological disorders, the underlying etiology can be diagnosed on the basis of bone marrow examination finding. The aim of the present study is to evaluate and to assess the spectrum of disorders diagnosed on BM examination of patient. **Materials and Methods:** This was a prospective study carried over a period of one and half years started from January 2021 to June 2022 in the Department of Pathology, MGM medical college and LSK Hospital, Kishanganj, Bihar. Bone marrow examination was performed on all suspected case of hematological disorders and a total of 99 cases were included in the study of age group between 2 to 80 yrs.**Results:**Among 99 cases studied, age of patients ranged from 2 to 80 years with male: female ratio of 1.7:1. Most common diseases observed on bone marrow examination were Aplastic anemia and mixed nutritional deficiency anemia (15.1%) each followed by Iron deficiency anemia(12.1%) in cases of nonmalignant hematological disorders. In Hematological malignancies most common were Acute leukemia (ALL 15.1% and AML 12.1%), followed by Chronic leukemia (3%). **Conclusion:** Bone marrow Examination plays a pivotal role in arriving at a definite diagnosis and etiology of varied hematological abnormalities.

Key Words: Bone marrow examination, Acute leukemia, Aplastic anemia and Mixed nutritional deficiency anemia.

Introduction

Anemia is a hematological disorder which may occurs in any age group. It occurs worldwide and particularly in developing countries[1,2]. Etiology of Hematological disorders vary in the developing and developed countries[3]. There are many hematological disorders which are not diagnosed by routine hematologic examination of blood samples. Therefore bone marrow examination (BME), is most important procedure in the evaluation of hematological disorders. Bone marrow picture along with peripheral blood smear and clinical history can help in arriving at a conclusive diagnosis. It gives an assessment of hematopoietic activity along with excellent morphology of cells, differential count and myeloid to erythroid ratio[4]. Bone marrow examination is required for the differential diagnosis of various myelo and lymphoproliferative disorders; their prognosis and assessment of pre and post therapy, storage disorders staging of lymphomas and marrow infiltration by foreign cells[5-7]. It also gives an assesment about presence or absence of iron stores as evaluated by perls prussian blue staining and details about parasites or cell inclusions[4].

Material and methods

It was a prospective study performed at the Department of Pathology, MGM medical college and LSK Hospital, Kishanganj, Bihar. It was conducted for the period of one and half years starting from January 2021 to June 2022. Ninety nine patients were selected for this study based on the following inclusion criteria - age ≥ 2 years and ≤ 80 years. A detailed clinical history, general and systemic examination were performed. Every case was investigated with complete blood count, peripheral blood smear with haemotological parameters like bleeding time (BT), clotting time (CT), reticulocyte count prior to bone marrow examination. A written informed consent was taken from all cases.

Bone marrow aspiration was done using bone marrow aspiration needle under all aseptic precautions after giving local anaesthesia by 2% lidocaine hydrochloride. Bone marrow aspiration was taken from the upper end of tibia in children less than 2 years, Posterior superior iliac crest was used in older children and adults. An aspirate smear was made and stained with Romanowsky's stain. Bone marrow trephine biopsy was performed when the bone marrow aspiration yielded a bloody tap or dry tap and stained with hematoxylin and eosin stain. Prussian blue stain was used for iron staining. The slides were observed under the microscope and findings noted.

Results

Among 99 patients, aged between 2 to 80 years evaluated, majority were males 63 (63.6%) with M:F ratio of 1.7:1(Table 1). In this present study, the age group of the patients was from 2 to 80 years. The maximum number of the cases (36.3%) were in the age group of 11-20 years. In total cases 63.6.% patients were under 30 years of age (Table 2). On bone marrow examination, hematological malignancies were found in 33(33.3%) cases, non-malignant haematological disorders were found in 54(54.5%) cases and normal marrow were in 12 cases (12.1%). Acute leukaemia (ALL, AML) were the most common malignant conditions, 15(15.2%) & 12(12.1%) respectively. The next common malignancies in this study were Chronic myelogenous leukaemia (CML) (3%) followed by myelodysplastic syndrome (2%) and Plasma cell dyscarsia (PCD) (1%). In present study out of 54 cases of non-malignant haematological disorders,

*Correspondence
Dr. Avinash Priyadarshi
Assistant Professor, Department of Pathology, MGM Medical College, Kishanganj, Bihar, India.

maximum numer of cases were of nutritional anemia (36 Cases), out of which 15 patients had Dual Deficiency Anemia (DDA), 12 cases had Iron Deficiency Anemia (IDA), and 9 Megaloblastic anemia. Aplastic anemia in 12% cases and HLH in 3% cases. (Table 3)

Table:1: Sex distribution in the present study

Sex	Number of patients	Percentage
Male	63	63.6%
Female	36	36.4%
Total	**99**	**100%**

Table: 2 Age distribution of the patients

Age group (years)	No. of patients	Percentage (%)
≤10 Years	18	18.1%
11-20	36	36.3%
21-30	09	09.1%
31-40	06	06.1%
41-50	18	18.2%
51-60	09	09.1%
61-70	02	02.1%
71-80	01	01.0%
Total	**99**	**100%**

Table: 3 Distribution of Hematological disorders on bone marrow

Diagnosis	No of cases (n)	% of cases
Acute lymphoid leukaemia	15	15.2
Acute myeloid leukaemia	12	12.1
Chronic myeloid leukaemia (CML)	03	03.0
MDS	02	02.0
Multiple Myeloma	01	01.0
Aplastic anemia	15	15.2
Iron deficiency anemia	12	12.1
Megaloblastic anemia	09	09.1
Mixed nutritional deficiency anemia	15	15.2
Normal marrow	12	12.1
Hemophagocytic lymphohistocytosis (HLH)	03	03.0
Total	**99**	**100%**

Discussion

Bone marrow aspiration is a most important adjunct and a diagnostic tool for evaluation of various hematological disorders. It is one of the most widely distributed organs of the body and is principle site of haematopoiesis. Bone marrow examination is a safe invasive procedure that can be done to arrive at a final diagnosis in certain haematological disorders. A combination of clinical history of patient, examination of patient and different staining preparation on bone marrow aspiration studies aids to arrive at a correct diagnosis. It helps to evaluate cytopenias, anemia, thrombocytosis, leukocytosis and iron status.

In the present study, out of 99 cases there were 63(63.6%) males and 36(36.4%) females. Male: Female was 1.7:1. Similar result were found in various studies[1,4,8,9-11-13]. In present study commonest group of patients were (11-20) years (36.3%), while in other studies commonest age group above 30 years (between 31-50)[1,9,14]. In our study most common finding of BM examination were Acute Lymphoid leukemia, Aplastic anemia and Mixed nutritional deficiency anemia (15.2%) each, followed by Acute myeloid leukaemia and Normal marrow each with (12.1%). Megaloblastic anemia were in 9.1%. This is also similar studies done by Chowdhury MRK et al**[14]**, Qahtani AS**[15]** and Pudasaini S**[16]**. However Nutritional anemia was the commonest etiology followed by Aplastic marrow in the study done by Shastry et al**[17]**. In our studies CML and HLH comprised approximately 3% of each, MDS 2% and Multiple myeloma comprised 1%.

Conclusion

Bone marrow examination plays vital role in diagnosing various hematologic disorders. In present study, the spectrum among these hematological diseases showed that nonmalignant diseases were more common compared to hematologic malignancies. Among these nonmalignant hematologic diseases, the most common disorder was Aplastic anemia and mixed nutritional deficiency anemia, followed by Iron deficiency anemia, normal marrow and megaloblastic anemia. Acute leukemias were common than Chronic leukemias followed by multiple myeloma among hematological malignancies.

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