

ORIGINAL RESEARCH

Investigation of hematological illnesses identified by bone marrow analysis

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ABSTRACT

Aim: Investigation of hematological illnesses identified by bone marrow analysis. **Material and methods:** 100 patients were investigated with complete blood count, peripheral blood smear with haematological parameters like bleeding time (BT), clotting time (CT), reticulocyte count prior to bone marrow examination. Bone marrow aspiration was done using bone marrow aspiration needle under all aseptic precautions after giving local anaesthesia by 2% lidocaine hydrochloride. 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:** On bone marrow examination, hematological malignancies were found in 33(33%) cases, non-malignant haematological disorders were found in 55(55%) cases and normal marrow were in 12 cases (12%). Acute leukaemia (ALL, AML) were the most common malignant conditions, 17(17%) & 12(12%) respectively. The next common malignancies in this study were Chronic myelogenous leukaemia (CML) (2%) followed by myelodysplastic syndrome (1%) and Plasma cell dyscrasia (PCD) (1%). In present study out of 55 cases of non-malignant haematological disorders maximum number of cases were of nutritional anemia (35 Cases), out of which 17 patients had Dual Deficiency Anemia (DDA), 10 cases had Iron Deficiency Anemia (IDA), and 8 Megaloblastic anemia. Aplastic anemia in 17% cases and HLH in 3% cases. **Conclusion:** Bone marrow examination is a vital diagnostic procedure for identifying a wide range of hematological disorders. By analyzing the cellular composition and architecture of the bone marrow, clinicians can diagnose conditions such as leukemias, myelodysplastic syndromes, myeloproliferative neoplasms, multiple myeloma, aplastic anemia, and lymphomas. Accurate diagnosis is essential for guiding appropriate treatment strategies and improving patient outcomes.

Keywords: Hematological disorders, Bone marrow, Iron Deficiency Anemia

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INTRODUCTION

Anemia is a hematological disorder which may occur 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 myeloid 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 assessment about presence or absence of iron stores as evaluated by 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. 100 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 haematological 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 100 patients, aged between 2 to 78 years evaluated, majority were males 65(65%) with M:F ratio of 1.86:1 (Table 1). In this present study, the age group of the patients was from 2 to 78 years. The maximum number of the cases (33%) were in the age group of 11-20 years. In total cases 62% patients were under 30

years of age (Table 2). On bone marrow examination, hematological malignancies were found in 33(33%) cases, non-malignant haematological disorders were found in 55(55%) cases and normal marrow were in 12 cases (12%). Acute leukaemia (ALL, AML) were the most common malignant conditions, 17(17%) & 12(12%) respectively. The next common malignancies in this study were Chronic myelogenous leukaemia (CML) (2%) followed by myelodysplastic syndrome (1%) and Plasma cell dyscrasia (PCD) (1%). In present study out of 55 cases of non-malignant haematological disorders maximum number of cases were of nutritional anemia (35 Cases), out of which 17 patients had Dual Deficiency Anemia (DDA), 10 cases had Iron Deficiency Anemia (IDA), and 8 Megaloblastic anemia. Aplastic anemia in 17% cases and HLH in 3% cases. (Table 3)

Table 1: Sex distribution in the present study

Gender	Number of patients	Percentage
Male	65	65
Female	35	35
Total	100	100

Table 2: Age distribution of the patients

Age group (years)	No. of patients	Percentage
≤10 Years	19	19
11-20	33	33
21-30	10	10
31-40	7	7
41-50	19	19
51-60	10	10
61-70	1	1
Above 61	1	1
Total	100	100

Table 3: Distribution of Hematological disorders on bone marrow

Diagnosis	No of cases	Percentage
Acute lymphoid leukaemia	17	17
Acute myeloid leukaemia	12	12
Chronic myeloid leukaemia (CML)	2	2
MDS	1	1
Multiple Myeloma	1	1
Aplastic anemia	17	17
Iron deficiency anemia	10	10
Megaloblastic anemia	8	8
Mixed nutritional deficiency anemia	17	17
Normal marrow	12	12
Hemophagocytic lymphohistocytosis (HLH)	3	3
Total	100	100

DISCUSSION

Examining bone marrow is an essential diagnostic method for assessing different blood-related illnesses. The procedure encompasses both bone marrow aspiration and biopsy, which provide comprehensive data on the cellular composition, structure, and disease of the bone marrow. 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 100 cases there were 65(65%) males and 35(35%) females. Male: Female was 1.86:1. Similar result were found in various studies[1,4,8,9-11-13]. In present study commonest group of patients were (11-20) years (33%), 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 (17%) each, followed by Acute myeloid leukaemia and Normal marrow each with (12%). Megaloblastic anemia were in 8%. 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 2% of each, MDS 1% and Multiple myeloma comprised 1%.

CONCLUSION

Bone marrow examination is a vital diagnostic procedure for identifying a wide range of hematological disorders. By analyzing the cellular composition and architecture of the bone marrow, clinicians can diagnose conditions such as leukemias, myelodysplastic syndromes, myeloproliferative neoplasms, multiple myeloma, aplastic anemia, and lymphomas. Accurate diagnosis is essential for guiding appropriate treatment strategies and improving patient outcomes.

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