Original Article

Spectrum of hematological disorders in bone marrow aspirate and biopsy at tertiary care hospital, Karachi. Fatima Arshad[®], Mehwish Sajjad[®], Anum Mona[®]

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Abstract

Background: Bone marrow analysis is an invasive practice applicable to identifying, staging, and pursuing tumours. The present study aimed to determine the frequency of malignant hematological disorders using bone marrow aspirate and biopsy at Dr. Ishrat ul Ebad Khan Institute of Blood Diseases (DIEKIBD).

Methodology: In this retrospective study, 756 patient records were examined for bone marrow analysis including both aspiration & biopsy, from January 2014 to December 2018. The posterior superior iliac crest was preferred for bone marrow sampling and aspiration was done with the help of a Salah bone marrow needle.

Results: It was observed that about half of the bone marrow examinations, i.e. 362 (47%), were carried out for tumour staging. Of which 260 (71.8%) were not compromised by primary diseases, while 102 (28.17%) cases contained primary diseases. Among non-malignant hematological disorders, megaloblastic anemia and mixed deficiency anemia were the most frequent, i.e. 24 (3.1%) each. In comparison, chronic myeloid leukemia and chronic lymphocytic leukemia were the most prevalent malignant hematological disorders 42(5.5%) each.

Conclusion: As per the study results, the pathological analysis of bone marrow via aspirate and trephine biopsy has comparatively more significant value in diagnosing and staging the malignant disorders than the non-malignant disorders.

Keywords

Bone Marrow Biopsy, Blood Disorder, Malignant Hematological Diseases.



Introduction

Evaluation of bone marrow is one of the mainstays in the field of hematology. Bone marrow investigation has a significant role in evaluating several disease processes and establishing the final diagnosis of many hematological and nonhematological disorders. Diversities are observed in the distribution pattern of hematological disorders worldwide, mainly categorized as malignant and non-malignant¹.

Bone marrow investigation comprises bone marrow aspiration and bone marrow biopsy²; it aids in the diagnosis, staging and prognosis of hematological malignancies³. It reveals infections in many cases and establishes the diagnosis of storage diseases⁴. Also, it confirms chromosomal abnormalities^{5, 6} and helps in diagnosing metastatic non-hematopoietic malignancies associated with bone marrow⁷. Furthermore, bone marrow investigation also assists in the interpretation of anonymous cytopenias and hematopoiesis⁸. It is also productive in the diagnostic assessment of Pyrexia of unknown origin (PUO)⁹.

Summarily, there are many conditions where bone marrow examination contributes diagnostically essential information, which would not be conceivable¹⁰. Bone marrow examination is an invasive sound technique that holds a principal effect in determining ultimate diagnosis¹¹. Through this research, we aimed to study the spectrum of malignant and non-malignant hematological disorders using bone marrow aspirate and biopsy at Dr. Ishrat ul Ebad Khan Institute of Blood Diseases (DIEKIBD).

Methodology

This retrospective study continued for 5 years from January 2014 to December 2018 at Dr. Ishrat-ul-Ebad Khan Institute of Blood Diseases (DIEKIBD). A total of 756 patients presented for bone marrow biopsy during the study duration. Bone marrow examinations included both aspiration & biopsy. The reports of the patient were retrieved from the department, and the results were recorded using a structured questionnaire. A detailed clinical examination, peripheral blood examination, bone marrow aspiration and bone marrow trephine biopsy were done. The most familiar indications for bone marrow evaluation were pancytopenia, multiple myeloma or lymphoma suspicion or malignancies. All patients were inflicted to gross general and systemic Anemia, fever, lymph nodes examination. hepatomegaly, enlargement, splenomegaly, bleeding diathesis and ostealgia were particularly inspected. Any additional findings were also documented. The posterior superior iliac crest was preferred for bone marrow sampling in all cases. Local anesthesia with 1% xylocaine was given for the smooth running of the procedure. Aspiration was done with the help of a Salah bone marrow needle, and eight or more particulate smears were generated¹². Succeeding the Jamshidi trephine needle was applied to obtain a biopsy core. After the procedure, the aseptic dressing was applied¹³.

The study was approved by the ethical review committee of Dow University of health sciences (IRB-1349/DUHS/Approval/2019; Dated 1st August 2019). Written informed consent was obtained from the patients before including their records in the study. SPSS version 20.0 was used for statistical analysis and presented as frequencies and percentages.

Results

We scrutinized all 756 case reports, inclusive of bone marrow examinations, in the present study. Around 64.5% of the total were males, and the age range of the patients included was 7 to 85 years. Most of the enrolled patients were in between 21 to 30 years (n=156), followed by 41 to 50 years (n=152) and 51 to 60 years (n=124). Around 47.8% of bone marrow inspections were performed for staging (n=362), of which 260 (71.8%) cases presented no primary involvement of bone marrow whereas 102 (28.17%) depicted primary involvement.

Among non-malignant hematological causes, mixed deficiency (n=24) and megaloblastic anemia (n=24) were the most common. While chronic myeloid leukemia (n=42) and chronic lymphocytic leukemia (n=42) were the common hematological malignancies. Bone marrow exhibited reactive changes in 56 cases, hypoplasia among eight, necrosis in four and normal bone marrow in 206 cases.

Disorder		n(%)
	Megaloblastic Anemia	24(3.1)
Non-Malignant	Mixed Deficiency Anemia	24(3.1)
Hematological Disorder	Aplastic Anemia	14(1.8)
	Microangiopathic Hemolytic Anemia	02(0.2)
	Acute Myeloid Leukemia	34(4.4)
	Chronic Myeloid Leukemia	42(5.5)
	Chronic Lymphocytic Leukemia	42(5.5)
Malignant Hematological	Acute Lymphocytic Leukemia	06(0.7)
Disorder	Plasma cell dyscrasia	18(2.3)
	Myelodysplastic syndrome	06(0.7)
	Myelofibrosis	06(0.7)
	Lymphoma	04(0.5)
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Discussion

Bone marrow examination is a useful tool for approaching definitive hematological disorders¹⁴. It is amongst the most familiar and comparably secure invasive techniques performed routinely in the hematology discipline¹⁵. Any infection or excessive bleeding is rarely reported after this procedure¹⁶.

This study shows that mixed deficiency anemia and megaloblastic anemia were the most frequent nonmalignant hematological pathologies (Table 1), followed by aplastic anemia observed in 1.8% of patients. The frequent etiology under megaloblastic anemia was folate deficiency and vitamin B12 deficiency. The observed frequency of megaloblastic anemia in other national and international studies ranges between 24% to 68%, which is quite higher than that reported in this study (3.1%)^{17, 18}. Similar is the case for mixed deficiency anemia, the frequency described by Rahim et al. was 15%. Furthermore, due to the lack of incidence studies for these malignancies in Pakistan, we do not have standard comparative reliable literature. But studies do suggest that there is a comparatively higher frequency of aplastic

anemia in developing countries than the industrialized western areas¹⁹⁻²². Our findings are contradictory and much lower than the frequencies reported in the existing literature; the reason for this might be that mixed anemia and iron deficiency anemia are diagnosed on smear examination and are treated as outpatients.

More malignant hematological disorders were diagnosed in our study compared to a similar study¹⁴. Among them, chronic lymphocytic leukemia and chronic myeloid leukemia were the most frequent malignancies, followed by acute myeloid leukemia (Table 1). A similar study reported leukemias among 24.76% of the studied bone marrow examined cases, with acute lymphoblastic leukemia as the commonest hematological malignancy²³. In contrast, a more recent study from KPK reports a high prevalence of acute leukemia than chronic leukemia²⁴. Most frequent among acute leukemias were acute lymphocytic leukemia (49.5%) followed by acute myelogenous leukemia (31.25%), while among chronic conditions, chronic myelogenous leukemia was observed in only 10% of the enrolled

population, followed by chronic lymphocytic leukemia (9.25%).

Despite the limitations, this study provided beneficial information regarding the hematological disorders among patients presenting to DIEKIBD.

Conclusion

It is concluded that chronic myeloid leukemia and chronic lymphocytic leukemia are the most frequent malignant hematological disorders followed by acute myeloid leukemia. While nonmalignant hematological disorders were less common, and among them, megaloblastic anemia and mixed deficiency anemia were the most frequently observed.

Conflicts of Interest

The authors have declared that no competing interests exist.

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