ORIGINAL ARTICLE

PATTERN OF HEMATOLOGICAL DISORDERS ON BONE MARROW ASPIRATE EXAMINATION

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ABSTRACT

Objectives: To determine the gender, age distribution, and pattern of blood disorders on bone marrow aspirate examination.

Material & Methods: This study was conducted at Bacha Khan Medical College Diagnostic Laboratory, Mardan, Pakistan from April 2013 to September 2015. All patients referred for bone marrow aspirations were included in this study. Patients with known history of bleeding disorders were excluded. Patients with inconclusive bone marrow report were dropped. The demographic variables included gender, age and pattern of the disorder on bone marrow aspirate examination. Data retrieved was analyzed by calculating percentage and frequencies.

Results: Over a period of 30 months a total of 133 bone-marrow aspirations were performed. Out of these, 17(12.78%) cases were dropped (diluted marrow), 74 (55.64%) had non-malignant hematological disorders while 40 (30.07%) had hematological malignancies. Out of all 133 cases, 10 patients had single lineage cytopenia, 37 had bicytopenias while 47 presented with pancytopenia.

Conclusion: Reactive marrow is the most common finding among non-malignant hematological disorders followed by megaloblastic anemia. Acute leukemia is the most common hematological malignancy. Bone marrow aspiration is very helpful in ascertaining the cause of the disease.

Key Words: Malignant, Hematological Disorders; Non-Malignant, Anemia; Bone Marrow Aspiration.

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INTRODUCTION

Hematological disorders are quiet common ranging from simple iron deficiency anemia to hematological malignancies. Bone marrow examination plays a pivotal role in investigating blood disorders. Bone marrow aspirate (BMA) examination is extremely valuable medical procedure in diagnosing and confirmation of different hematological disorders[1,2]. BMA examination is quick, economical and most valuable method in making definitive diagnosis[3,4], but it should be carried out only on indications[5]. BMA examination gives reliable information about bone marrow cellularity, architecture and the stage of maturation of blood cells [6].

It helps to exclude anemias, hematological malignancies, existing/presence of hemoparasites and storage cell disease[7-9]. BMA examination can play a very informative and diagnostic role in finding the etiology of pyrexia of unknown origin (PUO)[10]. In patients with cytopenia, bone marrow aspiration examinations are carried out to exclude malignancies of hematological origin; as hematological malignancies are excluded, further investigations are made to diagnose cytopenias. These may include clinical as well as laboratory investigations[11]. Statistically, among BMA examination, the most common pathology found is anemia, which is mainly due to folate / vitamin B12 deficiency[12], followed by hematological malignancies and the commonest

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among them is acute leukemia[13].

This procedure is used to evaluate therapeutic response as well as to delineate prognosis of the disease . The posterior superior iliac crest is suitable site for bone marrow aspiration in adults as well as in infants and neonates[14]. Every year about 20000 bone marrow aspirations are examined in United Kingdom. Hemorrhage is a known complication of bone marrow aspiration but is rare and contributes 0.05% while unbearable pain in 3.7% patients was reported and was the main complaint[15]. Studies characterizing spectrum of diseases identified on BMA examination among patients of District Mardan are lacking. Findings from the current study will fill this gap and will provide an insight for the attending physicians in devising appropriate management plans in this regard.

MATERIAL AND METHODS

This cross-sectional study was carried out at Bacha Khan Medical College Diagnostic Laboratory, Mardan, Pakistan. All the BMA examinations carried out from April 2013 to September 2015 were enrolled into the study. BMA examinations with inconclusive report, either due to fault in technique or sample lacking fragment were excluded from the study.Proper history was taken and physical examination of patients was carried out especially for anemia, lymphadenopathy and hepatosplenomegaly. Complete blood count, special smear, total and differential leucocyte count, platelet count and blood indices were done using automated hematology analyzer (Mindray BC-3000 plus, China) while reticulocyte counts were performed manually.

Bone marrow aspirations were performed using aseptic technique using Salah needle from the iliac crest while in childrenunder 02 years, upper end of the tibia below level of tibial tubercle. Patients were observed after procedure, blood pressure, pulse and temperature were monitored. Dressing of biopsy site was done to prevent any infection and bleeding. The bone marrow aspirate was collected in a sterile test tube with EDTA (Ethylene-diamine-tetra acetic acid). Slides were prepared, stained with giemsa and examined for cellularity, presence of megakaryocytes, immature cells, nucleated bone-marrow cells and hemo-parasites. Iron stores were assessed using Prussian blue stain. Frequencies of various diseases identified on BMA examinations were identified. The data was analyzed using Statistical Package for Social Sciences (SPSS) version 23.

RESULTS

A total of 133 patients, 71 males and 62 females, were included in the study. Male to female ratio was 1.15:1, the maximum number of patients were 19 years 73 (55%). (Table 1) Out of 133, 17 (12.78%) cases were dropped from analysis due to inconclusive report. Two patients turned out to have normal BM examination. Seventy four (55.64%) patients had non-malignant while the rest (n=40, 30.07%) had malignant hematological disorders.Among the 74 patients with non-malignant disorders, reactive marrow was the most frequent finding (n=20, 27.02%).

Megaloblastic anaemia, idiopathic thrombocytopenic purpura, ,hypersplenism, bone marrow hypoplasia, iron and mixed deficiency anaemia, peripheral destruction of blood cells, hemolytic anemia, storage cell disease and visceral Leishmaniasis followed in respective order of frequency (Table-3). Among the 40 patients with hematological malignancies,acute leukemia (n=23, 57.5%) was the most frequent finding. Chronic myeloid leukemia,lymphoproliferative disorder, chronic lymphocytic leukemia and myelodysplastic syndrome followed in respective order of frequency (Table-2). Cytopenia was the most frequent indication for BM examination. Of all the 133 patients, 10 had

Table 1: Gender based distribution of patients undergoing bone marrow aspiration

Variable	Gender		Total	
	Male	Female	Cases	Percentage %
Age group (years) Under 5	8	7	15	11.3 %
5 to 18	20	25	45	33.8 %
19 and above	43	30	73	54.9 %

Table 2: Malignant hematological disorders based on bone marrow examination (n=40)

Haematological Malignancy	Frequency & %ages
Acute myeloid leukemia	12(30%)
Acute lymphoblastic leukemia	11(27.5%)
Chronic myeloid leukemia	10(25%)
Chronic lymphocytic leukemia	03(7.5%)
Lymphoproliferative disorder	03(7.5%)
Myelodysplastic syndrome	01(2.5%)

Table 3: Non-malignant hematological disorders based on bone marrow examination (n=74)

Non-malignant haematological disorder	Frequency & % ages
Reactive marrow	20(27%)
Megaloblastic anemia	10(13.5%)
Hypersplenism	09(12.1%)
Peripheral destruction of platelets	09(12.1%)
Bone-marrow hypoplasia	08(10.8%)
Mixed deficiency anemia	05(6.7%)
Iron deficiency anemia	05(6.7%)
Peripheral destruction	02(2.7%)
Hemolytic anemia	02(2.7%)
Storage cell disease	02(2.7%)
Myeloid hypoplasia	01(1.35%)
Visceral leishmaniasis	01(1.35%)

Table 4: Pattern of presentation of hematological disorders on complete blood picture (n=114)

Disease	Mean Hemoglobin (g/dL)	Mean Platelets (x109/L)	Mean White blood cells (x109/L)
Acute Myeloid Leukemia	7.7	58.16	32.43
Acute Lymphoblastic Leukemia	6.9	57.72	63.69
Chronic Myeloid Leukemia	9.2	488.95	115.75
Chronic Lymphocytic Leukemia	7.9	165.66	75.90
Lymphoproliferative Disease	8.5	128.00	5.85
Myelodysplastic Syndrome	14.8	951.00	47.00
Reactive Marrow	9.8	188.65	10.02
Megaloblastic Anemia	5.8	119.20	5.17
Hypersplenism	6.9	75.55	5.02
Peripheral destruction of platelets	10.7	25.66	9.95
Bone Marrow Hypoplasia	6.0	27.42	1.60
Mixed Deficiency Anemia	6.3	72.00	2.94
Iron Deficiency Anemia	5.2	374.20	5.84
Peripheral Destruction	10.1	165.00	2.10
Hemolytic Anemia	7.5	97.00	2.95
Storage Cell Disease	3.9	145.00	3.90
Myeloid Hypoplasia	9.7	21.00	.800
Visceral Leishmania	6.6	95.00	4.30

single lineage cytopenia, 37 had bicytopenia whereas 47 had pancytopenia (Table-4).

DISCUSSION

Hematological disorders include a wide range of diseases ranging from nutritional anemias to hematological malignancies. Bone marrow aspiration plays a pivotal role in establishing a definite diagnosis. It is a relatively safe procedure which can be performed on outpatient basis[15]. In our study patients, majority were 19 years and above; 54.9 % and 11.3 % were under 05 years of age. Male to female ratio in our study agrees with thestudy performed by Usman Anjumet al[15]. Our study showed that nutritional anemias were most common non-malignant disorders and megaloblastic anaemia is commonest among them. Similar findings

were recorded by Okinda, N.A. et al[16], Patel J et al[14] and Kibria SG et al[17]. In the current study hematological malignancies were found in 40 (30.07%) patients. Among these patients, 23(57.5%) had acute leukemia, of which 12 (30%) patients were diagnosed to have acute myeloid leukemia while 11 (27.5%) had acute lymphoblastic leukemia. 10 (25%) cases were of chronic myeloid leukemia and 03 (7.5%) cases each of chronic lymphocytic leukemia and lymphoproliferative disease, only 01 (2.5%) case of myelodysplastic syndrome. These results are in accordance with literature/comparable to a Nigerian study by Okinda NAet al[16], Kibria SG et al in India[17], and a three year review study by Ekwere TA et al[18].

In our study only 01 (0.75%) case out of 133 was of visceral Leishmaniasis, Pudasaini S et al[19], also shows a low incidence of visceral leishmania. Visceral Leishmaniasis may present with anemia, myelofibrosis or pancytopenia[19,20]. Incidence is low, bone marrow should be very carefully examined for the identification of the parasite because it is associated with severe morbidities [21,22]. In the current study, peripheral cytopenias were found in 94 patients. In another study conducted in Saudi Arabia peripheral cytopenias were reported in 29.7% [22].This negates findings from the current study. An explanation to this might be the lack of health care facilities, at large, in local settings. Prolonged time-to-diagnose, a consequent finding in settings of inadequate health care facilities, adversely affects normal bone marrow reserves, obviating cytopenia[23,24]. The current study was also delimited by the small sample size. Multi-centric studies tackling larger groups of patients in local settings are suggested for definitive findings.

CONCLUSION

Bone marrow aspirate examination (BME) is a key tool in diagnosing hematological diseases. It gives a proper diagnosis. However, in some cases, additional tests may be required. It is a safe and relatively cheaper procedure to diagnose a wide range of hematological disorders from nutritional anemias to leukemias. Acute leukemia is the most common haematological malignancy.Diagnostic haematological facilities for patients in suburbs, help to save patient's time, money and energy which is otherwise being spent on going to tertiary care centres.

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AUTHOR'S CONTRIBUTION

Following authors have made substantial contributions to the manuscript as under:

Qureshi H: Idea, Data collection proof reading.

Farooq N: Data collection, Manuscript writing.

Amjad M: Data collection, Manuscript writing.

Arif S: Editing, Bibliography.

Ullah Ihsan: Editing.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.