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RESEARCH ARTICLE

PATTERN OF HEMATOLOGICAL DISORDERS ON BONE MARROW EXAMINATION: A STUDY OF 130 CASES

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ABSTRACT

Bone marrow examination is the simplest, cheapest and most reliable method to diagnose most of the malignant and non malignant hematological disorders in a short span of time. The aim of this study was to evaluate the pattern of hematological diseases diagnosed by bone marrow examination among patients with suspected hematological disorder .This was a prospective study conducted on bone marrow aspirations and biopsies performed from 1st April 2013 to 30th September 2014. A total of 130 bone marrow aspirations ± biopsy were studied during this time period. Age ranged from 15-80 years. There were 68 females and 62 males with female to male female ratio of almost 1:1. The most frequent indications for bone marrow examination were unexplained anemia or pancytopenia found in 80% of request forms. The most common hematological disorder encountered was anemia accounting for 62.3% of all cases. This was followed in order of frequency by acute leukemias (9.23%), plasma cell dyscrasias (6.92%), lymphoproliferative disorders (6.15%), Myeloproliferative disorder (6.15%), platelet disorders (3.84 %), and Myelodysplastic syndrome (2.3%). In addition metastatic deposits of adenocarcinoma were observed in 1.5% cases. The study provided a valuable insight into the pattern of involvement of bone marrow by various hematological disorders in our community.

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INTRODUCTION

Hematological disorders are quite common and affect all ages and genders. However its spectrum is relatively different in the developing world than the developed countries (Young, 2000). Even with the advent of specialized biochemical and molecular assays that capitalize on advances in understanding of the biology of hematopoiesis, the primary diagnosis of hematologic malignancies and many non-neoplastic hematologic disorders relies on visual examination of the marrow. Commonly it is done for the evaluation of unexplained cytopenias and malignant conditions like leukemia. Bone marrow examination is also done for the diagnosis or staging of a neoplasm and storage disorders (Shastry, 2012). It gives more complete picture of reaction of the hemopoietic tissue to various hematological disorders (Egesie, 2009). This study is undertaken with a view studying the pattern of hematological disorders on bone marrow examination and to generate a baseline data usable for future planning and practice.

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MATERIALS AND METHODS

The present study was a hospital based observational study which was conducted over a period of 18 months from 1st April 2013 to 30th September 2014, in the Department of Pathology, Government Medical College, Srinagar. A total of 130 cases who underwent bone marrow aspiration (with or without trephine biopsy) for the evaluation of various hematological disorders were included in the study. Complete clinical data including physical examination, CBC, PBF with relevant investigations were recorded. Bone marrow aspiration was carried out in these patients and smears obtained were stained with Romanowasky stains and examined under light microscope. Cytochemichal stains like Periodic acid schiff and Sudan black stains were used when needed.

RESULTS

Out of 130 patients in our study there were 68 females and 62 males with the female to male ratio of almost 1:1. The most frequent indication w for bone marrow examination was pancytopenia (42.3%), followed by unexplained anemia (27%). (Table 1)

Table 1. Accepted indications for bone marrow examination

Indication	No.	Frequency
Pancytopenia	55	42.3%
Unexplained anemia	35	27%
Abnormal PBF finding	15	11.5%
Suspected hematological malignancy	10	7.7%
Thrombocytopenia	8	6.15%
Staging of tumors with suspected bone Metastasis	7	5.3%
Total	130	100%

The age range of patients in our study ranged from 13-80 years. The peak frequency was observed in the age group of 11-20 years and 41-50 years. (Table 2)

Table 2. Age Wise Distribution of Hematological Disorders

Age (years)	No. of cases	Percentage
11-20	24	18.46
21-30	14	10.76
31-40	20	15.38
41-50	24	18.46
51-60	17	13.07
61-70	21	16.15
>70	10	7.69
Total	130	100

On examination of bone marrow aspirates (Table 3)the most common hematological disorder encountered was deficiency anemias accounting for 61% of all cases. This was followed in order of frequency by acute leukemias (9.23%), plasma cell dyscrasias (6.92%), lymphoproliferative disorders (6.15%), Myeloproliferative disorder (6.15%), platelet disorders (3.84 %), Myelodysplastic syndrome (2.3%) and aplastic anemia (1.53%). This study also revealed few uncommon and rare cases like hemophagocytic syndrome (0.76%) and storage disorder (0.76%). In addition deposits of adenocarcinoma was seen in 1.5% of cases.

Table 3. Distribution of Various Haematological Disorders

Disorders	No. of cases	Percentage %
Deficiency Anemias	79	61
Acute leukemias	12	9.23
Plasma cell Dyscrasias	9	6.92
Lymphoproliferative disorders	8	6.15
Myeloproliferative Disorders	8	6.15
Platelet Disorders	5	3.84
Myelodysplastic syndromes	3	2.3
Aplastic anemia	2	1.53
Tumor metastasis	2	1.53
Hemophagocytic syndrome	1	0.76
Storage disorder	1	0.76
Total	130	100

Out of 130 cases 84 (67.6%) were non-malignant and 42 (32.3%) were malignant hematological disorders. Out of 67.6 % of non-malignant hematological disorders 40% were present in females and 27.6% in males and among 32.3% of malignant hematological disorders 19.93% were present in males and 12.23% in females. In our study Non-malignant hematological disorders were more frequent in age group of 11-20 years while malignant hematological disorders were more frequent in 61-70 years of age group. (Table 4)

Table 4. Age Wise Distribution of Non-Malignant and Malignant Hematological Disorders

Age in years	Non- Malignant hematological disorder	Malignant hematological disorder
11-20	21 (16.15%)	3 (2.3%)
21-30	11 (8.46%)	3 (2.3%)
31-40	16 (12.3%)	4 (3.07%)
41-50	15 (11.5%)	10 (7.69%)
51-60	10 (7.69%)	4 (3.07%)
61-70	8 (6.15%)	15 (11.5%)
>70	7 (5.38%)	9 (6.92%)
Total	42 (32.3%)	88 (67.6%)

Among the malignant hematological disorders, multiple myeloma accounted for 9 (%) cases and was found to be the most common malignant hematological disorder, followed by acute myeloid leukemia 7(5.38%),chronic myeloid leukemia 6(4.61%), acute lymphoid leukemia, chronic lymphoid leukemia 5(3.84%) each, myelodysplastic syndrome, NHL 3(2.3%) each, myelofibrosis and metastatic deposits 2(1.53%) each. (Table 5)

Table 5. Distribution of Malignant Hematological Disorder

Malignant hematological disorders	No.of cases	Frequency
Multiple myeloma	9	6.92
Acute myeloid leukemia	7	5.38
CML	6	4.61
Acute lymphoid leukemia	5	3.84
CLL	5	3.84
Myelodysplastic syndrome	3	2.3
NHL	3	2.3
Myelofibrosis	2	1.53
Metastatic deposits	2	1.53
Total	42	32.25

In the present study we observed that malignant hematological disorders were more frequent in males (19.93%) than females (12.23%) with female to male ratio of 1.62:1. Most of the malignant hematological disorders were seen above 40 years of age (Table 6).

Table 6. Distribution of Malignant Hematological Disorders According To Age Group

Disorder	11-20	21-30	31-40	41-50	51-60	61-70	>70	Total
Multiple myeloma	0	0	0	3	2	3	1	9
AML	0	0	1	3	0	3	0	7
CML	0	0	1	1	0	3	1	6
ALL	2	1	1	1	0	0	0	5
CLL	0	0	0	1	1	2	1	5
MDS	0	0	0	1	1	1	0	3
NHL	1	1	0	0	0	1	0	3
Myelofibrosis	0	1	1	0	0	0	0	2
Tumor metastasis	0	0	0	0	0	2	0	2
Total	3	3	4	10	4	15	9	42

DISCUSSION

The spectrum of hematological disorders both in children and adults is very wide. Bone marrow examination is a useful test in reaching the final diagnosis (Lab Test on Line @ 2001 - 2012. · Age range of the patients in our study was from 13-80 years with the mean age of 30(SD ±16.97) years. Female to male ratio of patients in our study was almost 1:1 while in the study done by Kibira *et al* (2010) male to female ratio was 2:1.

Easy fatigability 115(88.46%) was the most common presenting symptom of patients with hematological disorders .Pallor 111(85.38%) was the most common presenting sign of patients with hematological disorders which also correlates with the study done by Gayathri *et al*. (2011). Pancytopenia was the most common indication for bone marrow examination found in 55(42.3%) of cases. Out of a total of 130 cases, 88 (67.6%) were non-malignant hematological disorders and 42 (32.3%) were malignant hematological disorders. Deficiency anemias 79 (61%) were the most common hematological disorder in our study. Dimorphic anemia 32(25%) was the most common non-malignant hematological disorder followed by iron deficiency anemia 26(20%) and megaloblastic anemia 21(16%) (Fig 1), which is similar to that found by SG Kibria *et al*. (2010), Gayathri *et al*. (2011) and Jha *et al*. (2008).

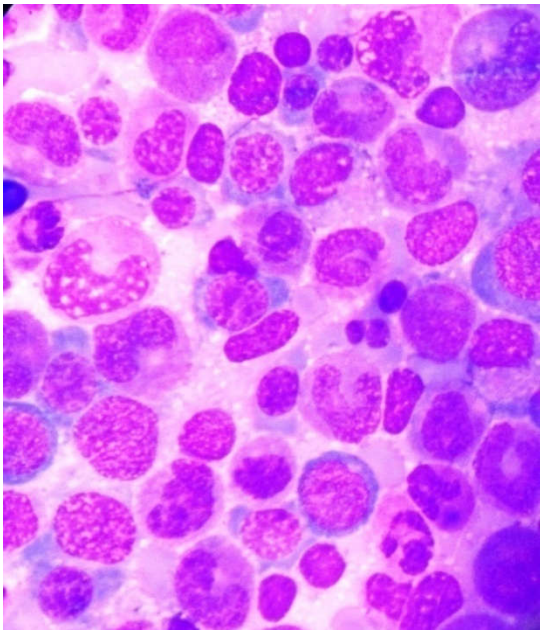

Fig. 1. Megaloblastic Anemia, Bone Marrow Aspiration smears showing megaloblastoid features with sieve like nuclear chromatin and enlarged cell size in erythroid as well as myeloid lineage cells (Giemsa 1000x)

Multiple myeloma 9(6.92%) (Fig 2) was the most common malignant hematological disorder followed by acute myeloid leukemia 7(5.38%),chronic myeloid leukemia 6(4.61%), acute lymphoid leukemia, chronic lymphoid leukemia 5(3.84%) each, myelodysplastic syndrome, NHL 3(2.3%) each, myelofibrosis and metastatic deposits 2(1.53%) each while in the study done by Pudasaini *et al*. (2012) acute leukemia was diagnosed in 7 cases (12.3%) and among this acute myeloid leukemia (10.5%) was more common than acute lymphoid leukemia (1.8%). Myelodysplastic syndrome and multiple myeloma was seen in 3.5 % cases each. While in the study done by Rahim *et al*. (2005) acute lymphoblastic leukemia accounted for 76 (17.92%) cases and was found to be the most common disorder, followed by acute myeloid leukemia 27 (6.36%), lymphomas 5 (1.17%) (Fig. 3), chronic myeloid leukemia and neuroblastoma (0.47%) each.

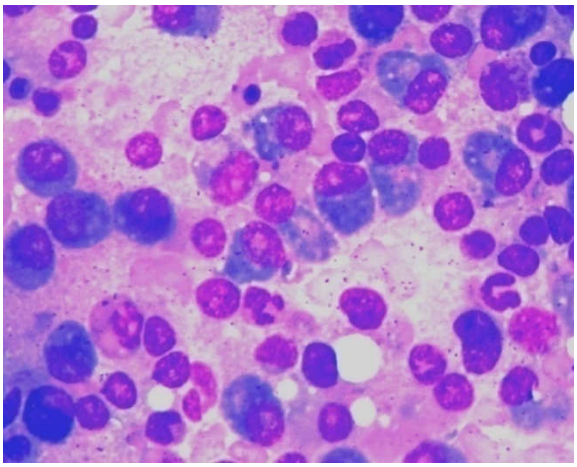

Fig. 2. Multiple Myeloma. Bone Marrow Aspiration smears showing prdominant population of marrow comprising of mature and immature plasma cells. (Giemsa 1000x)

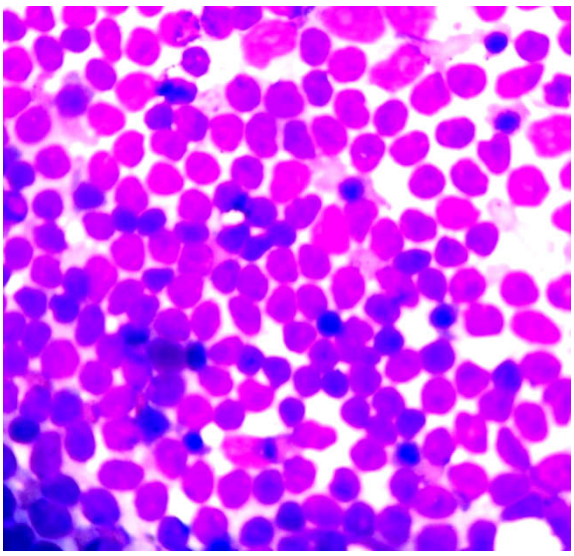

Fig. 3. Lymphoma Infiltration. Bone Marrow Aspiration Smears showing almost complete replacement of msroow elemts by lymphomatous cells (Giemsa 1000x)

Conclusion

Bone marrow aspiration and biopsy though invasive are relatively safe investigations in diagnosing various hematological disorders and can even be carried in outpatient settings. It gives a better understanding of the basic pathology behind various hematological conditions.

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