

Study of Hematological Diseases Diagnosed by Bone Marrow Examination in a Tertiary Care HospitalVijay Kumar¹, Ajay Pratap², Deepak Kumar³¹Tutor, Department of Pathology, Jawaharlal Nehru Medical College, Bhagalpur, Bihar.²Tutor, Department of Pathology, Jawaharlal Nehru Medical College, Bhagalpur, Bihar.³Associate Professor and Head of Department, Department of Pathology, Jawaharlal Nehru Medical College, Bhagalpur, Bihar

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Abstract:**Background:** All age groups are prone to hematological diseases. Anemia is the primary symptom of the majority of hematological diseases. The identification of the root cause of the condition is greatly aided by bone marrow aspiration. The purpose of this study was to identify the range of different hematological abnormalities identified during a bone marrow examination as well as their occurrence by age and sex.**Methods:** From April 2022 to September 2022, this prospective study was carried out at pathology department of Jawaharlal Nehru Medical College, Bhagalpur, Bihar. Patients who were presented with suspected hematological abnormalities had their bone marrow examined, and 94 cases in all were included in the study.**Results:** The male to female ratio was 1.1:1 and the age range was 13 months to 83 years. Erythroid hyperplasia (34.04%) and megaloblastic anemia (10.64%) were the most prevalent disorders found after a bone marrow investigation. Acute leukemias (6.38%) and chronic leukemias (9.57%) made up the majority of hematological malignancies.**Conclusion:** A rapid confirmation diagnosis of many hematological illnesses, including hematologic malignancies, can be made with the help of a bone marrow examination.**Keywords:** Anemia, Bone marrow aspiration, Leukemia, Megaloblastic anemia.

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Introduction

Anemia is a common symptom of hematological disorders in any age group. A widespread condition worldwide, anemia is more prevalent in developing nations.¹ Comparatively to affluent nations, the spectrum of hematological illnesses is somewhat diverse in the developing world.² In the majority of cases, a thorough clinical examination and straightforward testing can yield the diagnosis. Additionally, a bone marrow test may be required in rare cases to confirm the diagnosis. A definitive diagnosis can be made with the aid of the peripheral blood smear, clinical symptoms, and the bone marrow image. The diagnosis of leukemias and the explanation of cytopenias are both aided by bone marrow aspiration. The diagnosis and staging of neoplasms and storage disorders are both done through the testing of the bone marrow.

Material and Methods

This prospective study was conducted at department of Pathology, Jawaharlal Nehru Medical College, Bhagalpur, Bihar from April 2022 to September

2022. A total of 94 cases were included in this study.

The bone marrow register of the Pathology department, bone marrow register was used to collect the patients BMA reports and case sheets for clinical information. The collected data was then subjected to statistical analysis.

After administering 2% xylocaine as local anesthetic either from the sternum or the posterior iliac spine, the bone marrow aspiration technique was carried out. Smears of bone marrow and peripheral blood were examined in Leishman staining. When a bone marrow aspiration results in a bloody tap or a dry tap, a bone marrow trephine biopsy is done as an adjuvant. Leishman-stained bone marrow aspiration smears and hematoxylin-eosin-stained bone marrow trephine biopsy sections were used for the bone marrow evaluation. Using the accepted criteria, the diagnosis of several hematologic diseases was confirmed. This study covered all cases that were referred for bone marrow testing, staging

lymphomas, and metastasis, while excluding infants under the age of one year.

Results

This study comprised 94 individuals who had undergone bone marrow examination, of whom 49 were men and 45 were women, with a M:F ratio of 1.1:1. Table 1 displays this gender distribution.

Table 1: Gender distribution in the present study with M: Fratio of 1.1:1

Sex	Number of patients	Percentage
Male	49	52.13%
Female	45	47.87%

The patients in the current study ranged in age from 13 months to 83 years. The age distribution is illustrated in Table 2 with the age groupings of 31-40 years having the highest percentage of cases (19.15%), 51-60 years coming in second, and 20-30 years coming in third.

Table 2: Age wise distribution of the patients

Age group	No. of cases	Percentage
1-14	7	7.45%
15-19	8	8.51%
20-30	17	18.08%
31-40	18	19.15%
41-50	14	14.89%
51-60	17	18.08%
61-70	9	9.57%
71-80	3	3.19%
81-90	01	1.06%
Total	94	100.0%

The most frequent finding in the current investigation was erythroid hyperplasia (34.04%), which was followed by megaloblastic anemia (10.64%) and chronic leukemia (9.57%). In the current study, Table 3 displays the range of these diverse hematologic abnormalities on bone marrow examination.

Table 3: Spectrum of various hematological disorders diagnosed on bone marrow examination

Disease pattern	No. of cases	Percentage
Erythroid hyperplasia	32	34.04%
Megaloblastic anemia	10	10.64%
Dimorphic anemia	2	2.13%
Anemia of chronic disease	1	1.06%
Hypoplastic marrow	3	3.19%
Acute leukemias	6	6.38%
Chronic leukemias	9	9.57%
Multiple myeloma	5	5.32%
Myelofibrosis	3	3.19%
ITP	4	4.26%
Metastasis	1	1.06%
Staging	4	4.26%
Normal study	9	9.57%
Remission	3	3.19%
Inadequate	1	1.06%
Infective pathology	1	1.06%
Total	94	100.00%

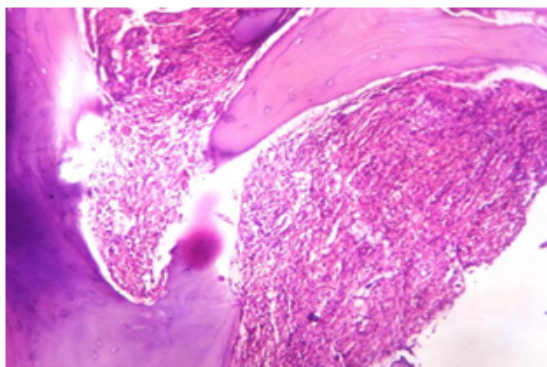


Figure 1: Bone marrow biopsy showing myelofibrosis (H&E)

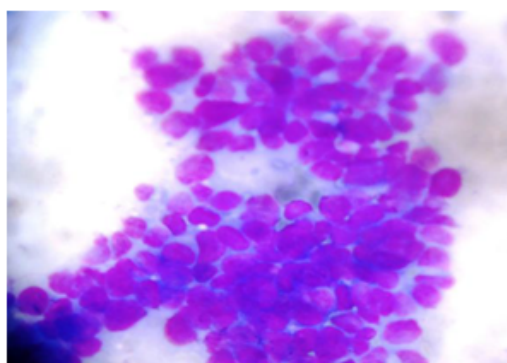


Figure 2: Bone marrow aspiration showing metastatic mucin secreting adenocarcinomatous deposits (Leishman stained, Oil immersion)

Table 4: Distribution of non- malignant hematological disorders according to the age and sex

Disease	1-14 yrs	15-20 yrs	21-30 yrs	31-40 Yrs	41-50 yrs	51-60 yrs	61-70 yrs	71-83 yrs	M:F	Totalcases
Erythroid hyperplasia	4	3	6	5	4	5	3	2	1.1:1	32
Megaloblastic anemia		2	2	2	1	1	1	1	1.2:1	10
Dimorphic Anemia			1	1					1:8	2
Anemia of Chronic Disease	1								M	1
Hypoplastic marrow		1	-	-	1	-	-	1	2:1	3
ITP	1	1	2	-	-	-	-	-	1:4.7	4
Infective pathology						1	1		M	1
Total										53

Table 5: Distribution of hematological malignancies according to the age and sex

Hematologic Malignancy	1-14 yrs	15-19 yrs	20-30 yrs	31-40 yrs	41-50 yrs	51-60 yrs	61-70 yrs	71-83 Yrs	M:F	Total cases
CML	1	1	1	1	1	1	1		1:1.5	7
AML			1		1	1	1		1.1:1	4
MM					1	2	1		1:1.4	4
MF			2	4	1	2	1		1.5:1	3
CLL					1			1	1.7:1	2
NHL				1		1			1:1.3	2
ALL		1							M	1
Mets				1					M	1
PLL						1			M	1
Total No. of cases										25

The results of the bone marrow biopsy performed in the nine cases of normal marrow study, the two cases of acute leukemia that were in remission, and the one case with insufficient yield in the current investigation are presented in table 6.

Table 6: Distribution of other hematological conditions

Other conditions	No. of cases	M:F
Normal marrow study	9	22:17
Inadequate samples	1	All are females only
Hematological malignancies under remission	2	6:4
Un involved by lymphomatous process	3	10:2
No metastatic deposit seen	01	M
Total	16	

Discussion

The safest invasive method that can be used to make a final diagnosis for some hematological illnesses is a bone marrow examination.

In the current study, there were 49 males (52.13%) and 45 females (47.87%) out of the 94 cases examined. There were 1:1.1 more men than women. The individuals who had a bone marrow analysis ranged in age from 13 months to 83 years. The most prevalent age range was between 31 and 40 years, while the mean age was 39.1 years. This result was comparable to that of the Pudasani S et al.[3] study, in which the majority of the patients were between the ages of 30-45. The age range in the study conducted by Gayathri et al.[4] was from 2 years to 80 years, and the M:F ratio was 1.2:1, which was similar to the results of the present study.

The most frequent bone marrow examination finding in the current investigation was erythroid hyperplasia, which was observed in 32 instances (34.04%), with a common age range of 21 to 30 years and a M:F ratio of 1.1:1. In studies conducted by Pudasani S et al [3] and Jha et al [5], erythroid hyperplasia was seen in 21% and 19.6% of patients, respectively. The 2nd common diagnosis in the present study was Megaloblastic anemia in the age group between 21-30 years and M:F ratio was 1.4:1 and was similar to the studies done by Pudasani S et al,[3] Niazi et al [6] and Jha et al. [5]

TP was detected in 4 instances (4.26%) in the current investigation, with the majority of cases occurring in the age range of 21 to 30 years and a M:F ratio of 1:4.7, indicating a significant female preponderance. ITP was observed in 6 patients (or 10.5%) in the Pudasani et al.[3] study, and it has also been recorded in 6.21%, 14.5%, 6.8%, and 5% of cases in other investigations. [2,7,8]

The diagnosis of hypoplastic marrow was made in 3 cases (3.19%), predominantly in the age range of 21 to 30 years with a M:F ratio of 2:1, and was based on both BMA results and a bone marrow biopsy. In comparison to our study, 5.3%, 19%, 29%, and 14% of cases of hypoplastic anemia were reported in other investigations.[3-5,8]

Dimorphic anemia was found in 2 cases (2.13%), most of which were in the 31-40 age range and had a M:F ratio of 1:8. Dimorphic anemia was not rec-

orded by Pudasani S et al [3] and Anita et al., but it was noted in 16.72% of the study conducted by Rajendra Kumar Nigam et al.[9], 4.7% of Fazlur Raheem et al.[10], and 2.87% of AL-Ghazaly J et al.[11,12]

In the current investigation, there was also 1 instance of infectious pathology and 1 instance of chronic anemia.

Hematologic malignancy was found in 25 cases out of 88 cases and constituted to 28.41% of overall hematologic disorders. According to the studies done by Rajendra Kumar Nigam et al,[9] Fazlur Rahman et al,[10] Al -Ghazaly J[11] and Anita Tahlan et al,[12] the hematologic malignancies constituted to 20.28%, 27.12%, 47.48% and 18% respectively.

Chronic leukemia's were the commonest malignant hematological disorder in the present study constituting to 9.57% of overall cases and 38% of malignancies. Among the chronic leukemia's, chronic myeloid leukemia (CML) was most common comprising to 7 cases (8% of overall malignancies and 30% of malignancies). The common age group among CML was 31-40 years with M:F ratio of 1:1.5 and most of the cases were diagnosed in chronic phase.

The average age was 41 to 50 years, and the M:F ratio was 1.7:1. There were 2 cases of chronic lymphocytic leukemia (2.13% total; 8% of malignancies). Acute leukemia, which made up 6 cases (6.38% of all cases and 23% of hematologic malignancies) in this study, was the next most prevalent cancer. There were 4 cases of AML and 1 case of ALL. AML patients typically ranged in age from 51 to 60, with a M:F ratio of 1.1:1. ALL of them were male and ranged in age from 1 to 14 years old. In the Pudasani et al.[3] investigation, 7.3% of cases involved acute leukemia. Four (16%) of these patients were AML, and one (1.06%) was ALL. AML M3 was the most prevalent type, accounting for 1 of the 4 AML cases. AML is more prevalent than ALL, according to other series, and acute leukemia is the most common hematological cancer.[1,2]

In total, we found 4 cases of multiple myeloma (5.06% overall; 19% malignancies), with a M:F ratio of 1:1.4 and a common age range of 51 to 60 years. Multiple myeloma instances were recorded

in 5.06% of the Pudasani et al.[3] study, compared to 9.04%, 20.5%, and 0.94% in the investigations of Kibria et al.[2], Laishram et al.[13], and Jha et al.[5].

Other hematologic malignancies found in the current study included 10 cases of myelofibrosis (2.66% overall; 10% of malignancies), 7 cases of lymphomatous involvement of the marrow (1.86% overall and 7% of malignancies), and 2 cases of metastatic secondary deposits (0.53% overall; 2% of malignancies), one of which was from a mucin-secreting stomach adenocarcinoma [Fig. 2]. Additionally, one case of polymphocytic leukemia was included in the study.

In our investigation, we found 3.19% cases of myelofibrosis, 5.32% cases of multiple myeloma, 9.57% cases of chronic leukemias, and 6.38% cases of acute leukemia. According to several research, the range of hematological malignancies was as follows: In comparison to Pudasaini S et al [3], Rajendra Kumar Nigam et al [9] reported 58.27% cases of acute leukemia (12.3% AML, 3.5% MDS, and 3.5% ALL), 8.57% cases of myeloproliferative disorders, 8.57% cases of multiple myeloma, and 1.42% cases of non-Hodgkin lymphoma. Acute leukemia was observed in 24.28% of patients in the study by Fazlur Rahim et al.[10] (AML 6.36% & ALL 17.92%), 1.17% of cases of lymphoma, and 0.47% of cases of CML & Neuroblastoma. In the Anita et al. study[12], 41% of cases were acute leukemia, 30% were CMPD, 14.2% were lymphomas, 7.5% were CLL, and 7% were multiple myeloma patients. In the study conducted by Al-Ghazaly J et al., there were 37.31% instances of acute leukemia (AML 25.35%, ALL 11.96%), 5.74% cases of CLL, and 1.27% cases of multiple myeloma.[11]

Conclusion

In order to diagnose a wide range of hematologic illnesses, a bone marrow examination is crucial. The spectrum of these hematologic diseases in our analysis revealed that nonmalignant illnesses were more prevalent than hematologic malignancies. The most prevalent condition among these non-malignant hematologic illnesses was erythroid hyperplasia, which was followed by megaloblastic anemia, ITP, hypoplastic marrow, dimorphic anemia, infectious pathology, and chronic anemia of disorder. Among hematological malignancies, chronic leukemias were most prevalent, followed by acute leukemias and multiple myeloma.

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