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Research Article

**A THREE YEARS DETAILED RESEARCH STUDY ON THE  
HEMATOLOGICAL DISORDERS SPECTRUM ON ASPIRATE  
ASSESSMENT OF BONE MARROW IN THE SETTING OF  
SERVICES HOSPITAL, LAHORE**<sup>1</sup>Dr. Shub Noor Saeed, <sup>2</sup>Dr. Azeem Ahmed, <sup>3</sup>Dr. Tayyaba Ali Qureshi<sup>1</sup>WMO, BHU Joura, Jalalpur, Gujrat<sup>2</sup>Ex House Officer, Aziz Bhatti Shaheed Teaching Hospital Gujrat<sup>3</sup>THQ Kot Addu**Abstract:**

**Background:** Anemias and hematological malignancies are common blood disorders. Significant study for hematological disorders is bone marrow aspiration in this regard. The main aim of the study at hand is to identify age distribution, the sex and disorders related to hematology on bone marrow aspirate examination.

**Material & Methods:** At Services Hospital, Lahore, an in-depth study was carried out from Jan 2015 - Dec 2017. Total 168 patients were selected for sample. Eligibility was ensured for bone marrow aspiration of all the patients directed to the laboratory. Patients who were affected with bleeding disorders i.e. hemophilia, were not included. Questionable reports of patients were also non-considered. Age grouping and sex were demographic variables. Pattern of the disorder on bone marrow aspirate examination was research variable. Obtained data was analyzed manually by percentage and frequency.

**Results:** Twelve patients i.e. 07 percent of selected 168 were dropped. Twenty-six cases i.e. 16.67 percent were having non-hematological disorders. Seventy-eight cases i.e. 50 percent had non-malignant hematological disorders. Thirteen cases i.e. 8.33 percent were having normal marrow. However, thirty-nine i.e. 25 percent, had hematological malignancies. Thirty-one patients i.e. 39.74 percent suffered from most common disease 'megaloblastic anemia' (non-malignant hematological disorders). Four cases (10.25 percent) cases of chronic myeloid leukemia were reported. Twenty-three cases i.e. 58.97 percent, were sufferers of acute leukemia, pertaining to hematological malignancies. Five cases i.e. 12.82 percent cases of multiple myeloma were observed too.

**Conclusion:** The most widespread disease amongst non-malignant hematological disorders was found to be Megaloblastic anemia. It was followed by iron deficiency anemia. Acute leukemias were widespread amongst malignant hematological disorders. In ascertaining the cause of disease and accurate diagnosis bone marrow aspiration is extremely useful.

**Key Words:** Anemia, Multiple myeloma, acute myeloid leukemia, Acute lymphocytic leukemia, lymphoma, megaloblastic anemia, Chronic myeloid leukemia, Leukemia, Bone marrow aspiration, Hematological malignancies.

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**INTRODUCTION:**

Nowadays, different age groups are commonly affected by Blood disorders. They encompass advanced hematological malignancies, anemias etc. Megaloblastic anemia which is a general reason of nutritional deficiency anemias is caused by folate deficiency or B12. Acute myeloid leukemia which is very common in adults is from the category of 'hematological malignancies'. Proliferation of myeloid cells in bone marrow with their maturation arrest is its characteristic. It is pertinent to mention that the pattern of such disorders is not similar in both developed and developing countries. Diagnosis can be commonly ascertained by basic blood tests, physical examination and detailed history. For authenticity of diagnosis in some cases, bone marrow examination is inevitable

Nowadays, Bone marrow examination is a quite significant test to determine the diagnosis of hematological disorders. Authentic details about bone marrow cellularity, bone marrow architecture and the stage of maturation of different blood cells are collected through Bone marrow aspiration. Test usefulness lies in its diagnostic abilities and staging of hematological malignancies i.e. leukemias etc. Details about the presence of infiltrates, the presence hemiparasites in bone marrow and storage diseases can be adjudged through this reliable test.

Being an invasive procedure is the hallmark of Bone marrow aspiration only 0.08 risk percentage is noted in its adverse events. Infection, pain at the biopsy site and bleeding are some of its common procedural complications.

The main aim of this study at hand was to identify age distribution, the sex and disorders related to hematology on bone marrow aspirate examination.

**MATERIAL AND METHODS:**

At Services Hospital, Lahore, an in-depth study was carried out from Jan 2015 - Dec 2017. Total 168 patients were selected for sample. Eligibility was ensured for bone marrow aspiration of all the patients directed to the laboratory. Patients who were affected with bleeding disorders I.e. hemophilia, were not included. Questionable reports owing to inadequate sample and improper technique were not considered.

Physical examination and comprehensive history was ensured to check the presence of anemia, hepatosplenomegaly and lymphadenopathy. Automated hematology analyzer (Erma Ink, PLC 210, Manchester) was used in blood count. A comprehensive blood count entails total and differential leucocyte count, hemoglobin, blood

indices and platelet count. After Leishman and retic stain, Peripheral blood smear examination was performed.

Standard protocol was followed in performing Bone marrow aspiration. Aseptic technique was adopted in the procedure. Iliac crest was the most commonly used site in the process. Sternum was the site selected for aspiration in obese patients. In order to ensure stability of the vitals (temperature, blood pressure and pulse), patients were kept under observation after the whole procedure. Biopsy site was monitored too for any bleeding and infection.

Collection of bone marrow aspirate was done in a sterile test tube which was having anticoagulant (Ethylenediaminetetraacetic acid, EDTA). It was stained with Leishman stain. Prussian blue stain was used for the examination of presence of cellularity, immature cells, megakaryocytes, hemiparasites, absence or presence of iron stores.

Age grouping and sex were demographic variables. Pattern of the disorder on bone marrow aspirate examination was its research variable. Group ages were classified as 0 – 10, 11 – 20, 21 – 30, 31 – 40, 41 – 50, 50 – 60, 61 – 70, 71 – 80, 81 – 90 and 90 – 100 years. Obtained data was analyzed manually by percentage and frequency.

**RESULTS:**

In the beginning of study, total 168 patients were the participants. The gender of 92 participants was male whereas rest of the 76 participants were of female gender. The ratio for male to female was 1.2:1. Distribution of patients into various age groups was also studied. Maximum thirty-five patients (20.83 percent) were in age group from 21-30 years (as shown in Table 1). Twelve cases (7percent) were not included owing to their Non-conclusive reports. Thirteen cases (8.33percent) were taken as normal.

Non-hematological disorders related cases were twenty-six (16.67 percent). Non-malignant hematological disorders related cases were seventy-eight (50 percent). Thirty-nine cases (25 percent) were victims of malignant hematological disorders. 26 cases from non-hematological disorders were having various disorders. For instance, four cases (15.38percent) were affected by visceral leishmaniasis, reactive marrow was observed in 07 cases (26.92 percent), contaminated marrow was reported in 01 case (3.85 percent), Affectees of hypoplastic marrow were 02 cases (7.69 percent), hemolysis was seen in 02 cases (7.69 percent), 04 cases were dry tap (15.38 percent), 02 cases were

related to hemolytic anemia(7.69 percent) , diluted marrow cases were 01 (3.85 percent) and three cases (11.54 percent) were infected with pancytopenia.

Seventy-eight cases were related to non-malignant hematological disorders. Out of these, thirty one cases (39.74 percent)were of megaloblastic anemia ,iron deficiency anemia were noted in twenty cases

(25.65 percent),mixed deficiency was observed in 08 cases (10.26 percent), aplastic anemia related cases were 06 (7.70 percent),05 cases were of hemolytic anemia, 02 cases (2.56percent )were related to both depressed erythropoiesis and ITP .01 case (1.28percent )was related to lipid storage disease, myeloid hyperplastic marrow, hemochromatosis and Gaucher's disease each as demonstrated in Figure 1.

**Table 1: Age distribution of patients with hematological disorders based on bone marrow aspirate examination.**

S No	Age group in years	Frequency	Percentage
1	00 – 10	27	16.07
2	11 – 20	17	10.12
3	21 – 30	35	20.83
4	31 – 40	8	4.77
5	41 – 50	17	10.12
6	51 – 60	20	11.9
7	61 – 70	13	7.74
8	71 – 80	12	7.14
9	81 – 90	12	7.14
10	91 – 100	7	4.17
Total		<b>168</b>	<b>100</b>

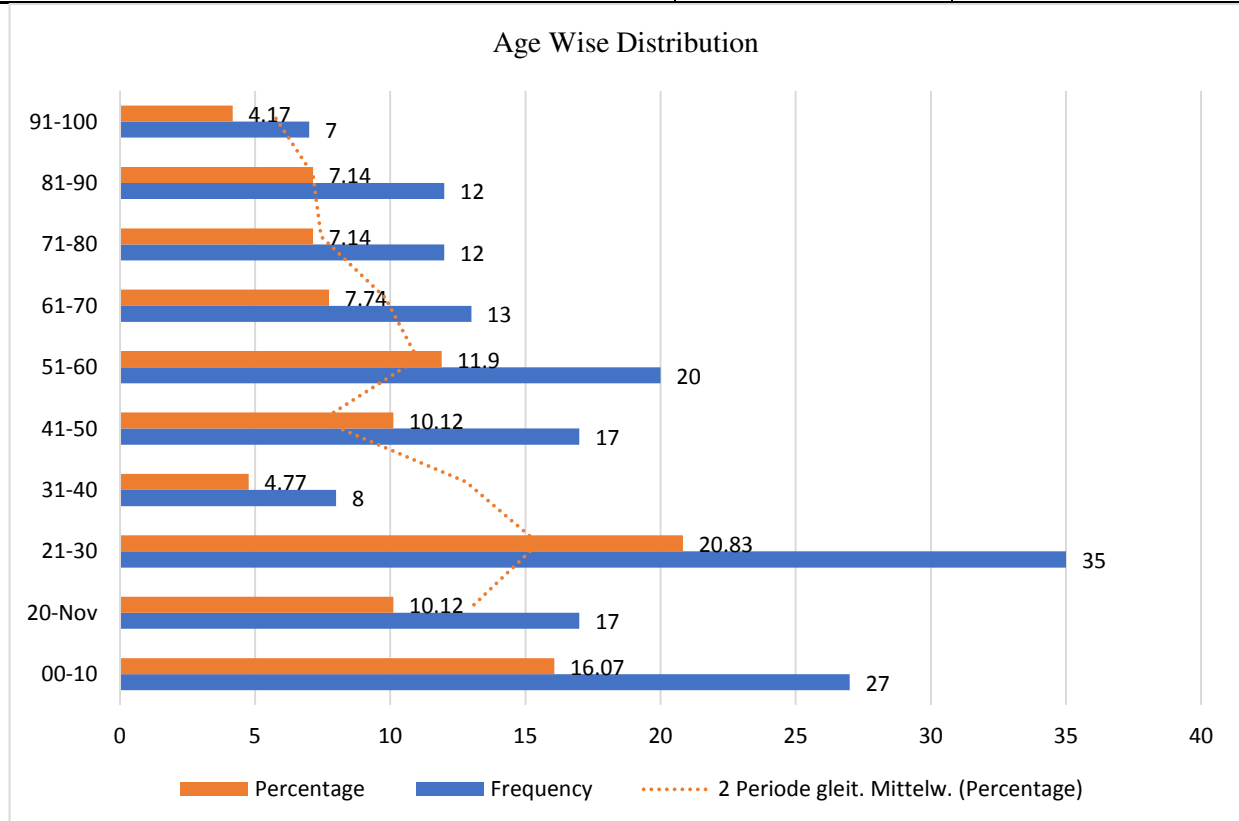
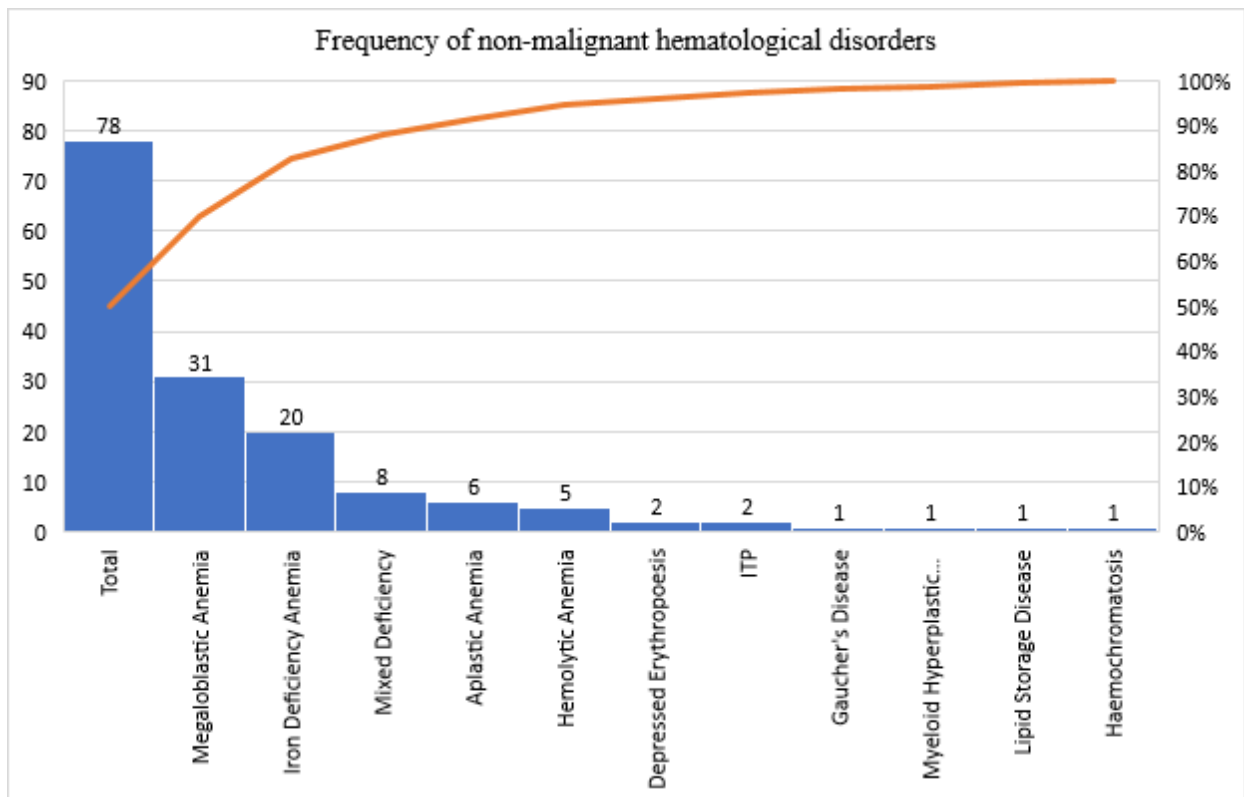


Table – II: Frequency of non-malignant hematological disorders based on bone marrow aspirate examination. (n=78)

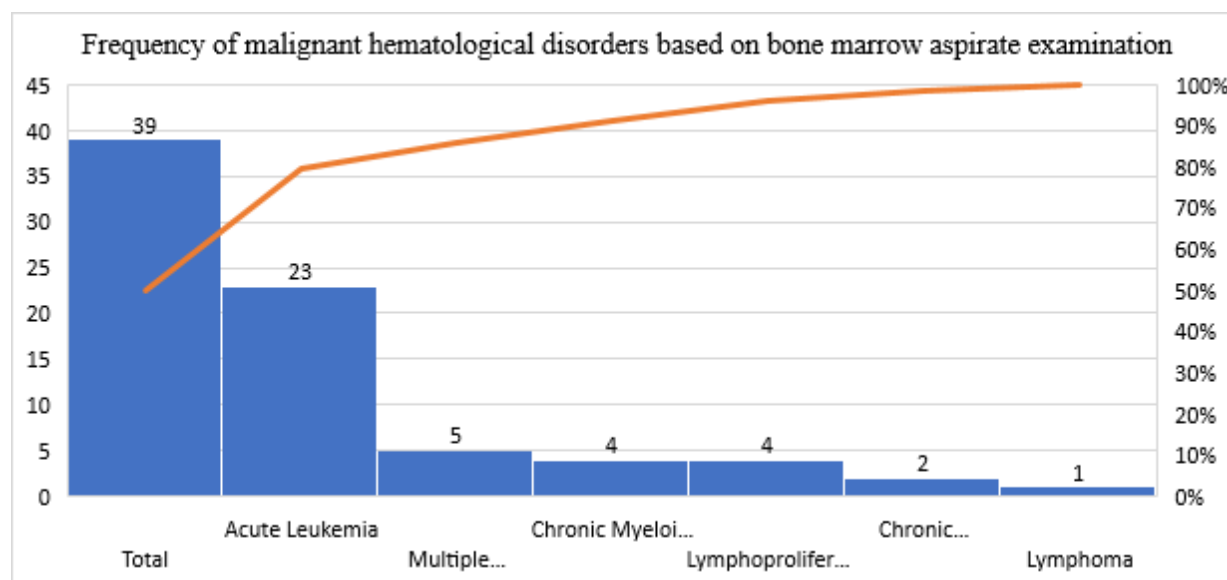
Disease	Number
Gaucher's Disease	1
Myeloid Hyperplastic Marrow	1
Lipid Storage Disease	1
Haemochromatosis	1
Depressed Erythropoiesis	2
ITP	2
Hemolytic Anemia	5
Aplastic Anemia	6
Mixed Deficiency	8
Iron Deficiency Anemia	20
Megaloblastic Anemia	31
Total	78



From total thirty-nine hematological malignancies, twenty-three (58.97 percent) were related to acute leukemia. It includes acute lymphocytic leukemia and acute myeloid. 05 cases (12.82 percent) of multiple myeloma followed them. lymphoproliferative disorder and chronic myeloid leukemia have 04 cases (10.25 percent) each. One case (2.56 percent) of lymphoma and 02 cases (5.13percent) of chronic lymphocytic leukemia were also noted as demonstrated in Fig-2.

**Table – III:** Frequency of malignant hematological disorders based on bone marrow aspirate examination. (n=39)

Detail	Number
Acute Leukemia	23
Multiple Myeloma	5
Chronic Myeloid Leukemia	4
Lymphoproliferative Disorder	4
Chronic Lymphocytic Leukemia	2
Lymphoma	1
Total	39

**DISCUSSION:**

Hematological disorders are of various kinds. They range from hematological malignancies to nutritional anemias. Bone marrow aspiration plays a pivotal role in diagnosis of a disease after its apparent cause. Because of its safety, it can be carried out on outpatient basis.

Nutritional deficiency anemias which are a non-malignant hematological disorder are widespread. Megaloblastic anemia was found to be with the highest frequency amongst these disorders. Rahim et al observed that in Pakistan megaloblastic anemia is very common. According to them, the disorder which is of the least frequency is iron deficiency anemia. However, our study indicates that it stands at second position after mixed deficiency anemia. It may be because of the reality that iron deficiency anemia commonly cured on outpatient basis, where bone marrow examination is not conducted for its diagnosis on routine basis. Moreover, Geographical distribution could be another cause of this non-

compatible pattern as this study was completed in a Pakistani city i.e. Lahore.

As far as our study is concerned, hematological malignancies related cases were 39(25 percent) in which 23 cases (58.97 percent) were related to acute leukemia. Resultantly, acute leukemia is found the most widespread hematological malignancy in our cases. Acute lymphoblastic leukemia affected cases were 08(34.78percent) whereas 06 cases (26.08 percent) were related to acute myeloid leukemia.09 cases (39.13 percent) were victims of acute leukemia, however difficulty lies in their further characterization as they demand in depth and exhaustive investigations.

04 cases (15.38 percent) were of visceral leishmaniasis. It can be presented as pancytopenia, myelofibrosis and anemia. Hemiparasites can be a source of hematological disorders although their incidence is not high. A keen observation is required

regarding such disorders when examination of bone marrow aspirate is in progress.

Twelve cases (07percent) were not included in the study as their reports were deficient because of improper techniques and inadequate sampling procedures. Procedure of Bone marrow aspiration is carried out on routine basis in a hematology laboratory. In case of the absence of skillful and professional approach, it may lead to inadequate sample, failure of procedure and other such complications. Consequently, the authenticity of diagnosis for this category of patients necessitates trephine biopsy and other investigations.

Study found one case (01.28percent) of hemochromatosis and Gaucher's disease each. In storage disorders, Bone marrow involvement is very frequent. Hematological abnormalities can be presented by them and the diagnosis is confirmed by bone marrow aspiration.

To determine the diagnosis of hematological disorders, Bone marrow aspiration is the key factor. However, results are supposed to be construed in a meaningful way along with blood tests i.e. complete blood count, peripheral film and patient's clinical history. A qualified hematologist should carry out such tests. The patients should be observed too, afterwards, for the safety purpose.

### CONCLUSION:

The most widespread disease amongst non-malignant hematological disorders was found to be Megaloblastic anemia. It was followed by iron deficiency anemia. Acute leukemias were widespread amongst malignant hematological disorders. In ascertaining the cause of disease and accurate diagnosis bone marrow aspiration is extremely useful.

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