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Hematology

BONE MARROW PROFILE IN HEMATOLOGICAL DISORDERS IN YEMENI PATIENS

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ABSTRACT There is paucity of information about the prevalence of hematological disorders in Yemen and neighboring countries .This is the first project to evaluate the relative spectrum of hematological diseases in Taiz and Ibb governorate Yemen ,by method of bone marrow examination which is considered an important valuable diagnostic tool, for evaluation and final diagnosis of various hematological and non-hematological disorders especially when CBC and peripheral blood film study and other investigation failed to give a diagnosis .

OBJECTIVES: The aim of this study was to evaluate the spectrum of haematological diseases diagnosed by bone marrow examination in Taiz and IBB governorates Yemen between September 2016 and October 2020 .Patients and method : A total of 1108 patients aged between (1 -100)years old were evaluated by bone marrow examination at referral hematological center in IBB city Yemen . Relevant investigations were performed when needed. After exclusion of 98 patients with normal bone marrow findings ,a total of 1010 patients had hematological disorders , and their data were analyzed. There were 527 (52.2 %) males and 483(47.8 %) females . A total of 655(64.9%) patients had benign hematological diseases and 355 (35.1%) patients had malignant hematological diseases .

RESULTS :A total of 138 patients had Iron deficiency anemia ,107 had immune thrombocytopenic purpura (ITP) , 92 had hypersplenism,84 had Acute lymphoblastic leukemia ,79 had Acute myeloid leukaemia, 71 had megaloblastic anemia 58 had myeloproliferative disorder , 53 had Chronic myeloid leukemia , 45 had hemolytic anemia ,45had visceral leishmaniasis. 44 had malaria, 38 had chronic lymphocytic leukemia 38 had anemia of chronic disease ,25 had aplastic anemia ,25 had myelodysplastic syndromes, ,21 had anemia of infection ,19 had congenital syndroms,7had multiple myeloma ,6 had mixed deficiency anemia and 5 had metastatic deposits , 4 had myeloid leukomoid reaction ,4 had lymphoma infiltration and 2 had hairy cell leukemia . Sex. and age.related distribution of the various disorders was also presented.

CONCLUSION: The anemias of all types were the most frequently encountered diagnosis followed by acute and chronic leukemias , ITP , Hypersplenism , ,myeloproliferative disorder , visceral leishmaniasis , malaria, myelodysplastic syndrome and congenital syndromes respectively. The other haematological disorders were less common. These findings are comparable with published data in previous studies done in Yemen and other developing countries .

KEYWORDS : Bone marrow aspiration ,Hematological disorders ,Yemen

INTRODUCTION

In today's era of advanced diagnostic procedures in the field of hematology, it is important to have proper diagnosis of various hematological and non-hematological disorders. Bone marrow examination is considered a valuable diagnostic tool to evaluate hematological disorders especially When routine hematological investigations failed to diagnose the patient illness . Various indications for bone marrow examination(BME) include :

1- Definitive diagnosis of anemias ,acute and chronic leukemias Myeloproliferative and lymphoproliferative disorders ,thrombocytopenia , unexplained pancytopenias and plasma cell dyscrasia like multiple myeloma . [1,2]

2-Staging and therapeutic monitoring of different hematological/non-hematological disorders like Hodgkin's and non-Hodgkin's lymphoma and other bone marrow disorders require BME (aspiration/or biopsy) [3,4].

3-Bone marrow is essential in diagnosis of non-hematological conditions like investigations of fever of unknown origin, especially in patients with AIDS, presence of microorganisms like tuberculosis, leishmaniasis,malaria , histoplasmosis and various other disseminated fungal infections.

4-Diagnosis of storage disorders like Gaucher's disease , Niemann-pick disease, assessment of metastatic carcinomas and granulomatous diseases like Tuberculosis and sarcoidosis etc .[5}

Some times, marrow aspirate may be diluted, dry tap, unsatisfactory or sometimes marrow involvement is focal eg. Granulomas, metastatic deposits, focal myeloma, Hodgkin's disease and associated fibrosis respectively. In these states, B M aspiration examination fails to demonstrate disease processes. In such areas, to arrive at a diagnosis, marrow trephine biopsy is very essential, which is carried out under local anesthesia. [6,7] Other needed examination includes CBC ,peripheral blood film (PBF) study , Buffy coat, biochemical and serological tests ,Trephine biopsy imprints and sections .Other investigation of bone marrow analysis includes flow cytometry ,PCR real time . (cytogenetics which is not available in Yemen). {8,9}

MATERIAL AND METHODS

This retrospective transactional study has been conducted in specialized referral hematological privet center in IBB city Yemen .

All patients underwent bone marrow examination between September 2016 and October 2020,were enrolled in this study.

A total number of 1010 cases were studied. Inform consent was taken from patient and their relative (In childhood cases). In each case a detailed history with general and systemic examination and routine investigations (complete blood count, blood film study ,reticulocytes count and erythrocytes sedimentation rate and biochemical tests) were carried out prior to bone marrow examination. The standard technique (10) was employed in obtaining the samples from posterior iliac crest or from sternum by using a biopsy set needle (Disposable bone marrow aspiration and biopsy needles).

About 0.5- 1 ml of marrow fluid was obtained and nearly about ten smears prepared. Two slides were stained with Prussian blue technique by well trained staff to demonstrate iron granules and ring sideroblasts when indicated .When biopsy was performed, was fixed in formalin and sent for processing in histopathology department .Touch imprint smears were usually made in cases with dry tap aspiration. {11,12,13}

For some patients with lymphoproliferative disorders and acute leukemia, marrow materials was collected and sent to Sana'a Cancer Center laboratory for flow cytometry analysis . Also some patients with chronic myeloid leukemia and myeloproliferative neoplasm in whom the diagnosis were not straight forward, specimens were sent for BCR- ABL fusion gene and JAK2 mutation respectively .(8)

The marrow was examined and interpreted and reviewed with consideration of the patient's clinical examination and laboratory results . All information about the patient were register in our records including residence, age, sex, clinical features, organomegaly, complete blood picture, other related investigations and bone marrow examination report .Data were analyzed by using the statistical package for social science (SPSS) version 19. Chi square test of association was used to compare between proportions. {8}

RESULTS

A total of 1010 cases underwent bone marrow examination from September 2016 and October 2020, were included in this study. Males were 527 (52.1 %) and females were 483 (47.8 %). The ratio of male to female was (1.1 :1). The age of patients in this project were ranged between 0.1 – 100 years with mean age of 33.5 years.

The indications for bone marrow examination were based on the clinical and or complete blood pictures. In this study, the main indications for examination of bone marrow were:

Evaluation of anemia and in some patient associated with fever which was seen in 300 (29.7 %) cases, followed by evaluation of pancytopenia which was seen in 210 (20.8 %) cases ,evaluation of bleeding tendency seen in 152 (15 %) patients, evaluation of leukocytosis was seen in 128 (12.7 %) cases, evaluation of splenomegaly was seen in 126(12.5 %) cases and evaluation of thrombocytosis was seen in 94 (9.3 %) cases . Table 1.

Various hematological disorders were encountered in this study as the result of bone marrow examination. There were 655 (64.9 %) cases with benign hematological conditions , and 355(35.1%) cases with malignant hematological conditions .Tables 2and 3 shows the benign and malignant hematological disorders distribution in relation to age and sex of the patients .

The most common diagnosis in our study was Anemias of all types which were seen in 344 (34.1 %) cases ,the relative frequencies of them were as follow :

Iron deficiency anemia was the most prevalent anemia seen in 138 (13.6%) cases and was seen in all age groups (male and females .

and represent cases, which showed unusual features necessitating bone marrow examination. The causes of iron deficiency were searched for in every patient and the most common causes where malnutrition and malabsorption , gastric adenocarcinoma, high.grade lymphoma , some patients had occult gastrointestinal bleeding due to esophageal avarices caused by chronic liver disease. Megaloblastic anemia was seen in 71(7.1 %) cases and was prevalent in all ages groups , 51 cases were due to folic acid deficiency and 20 cases due to Vit B 12 deficiency .Mal absorption ,diarrhea , malnutrition in younger age group especially in last 6 years due to civil war in Yemen which is the worst malnutrition crises in the world according to WHO agencies working in Yemen . Hemolytic anemia was seen in 45(4.5 %) cases and was most prevalent in age group (0-20 y) due to increased cases of hereditary hemolytic anemias ,and few cases of AIHA confirmed by direct Coombs test . Anemia of chronic disease seen in 38(3.8%),5- Hypoplastic /aplastic anemia was seen in 25 (2.5%) cases .In all cases of hypoplastic anemia, the marrow was hypocellular and all 3 cell lineages were suppressed. Anemia of infection was seen in 21(2.1 %) cases .-Double deficiency anemia was seen in 6(0.6%) cases .

The second most common diagnosis in our study was leukemias acute and chronic which were seen in 256 (25.3 %) cases , acute leukemias were seen in163 (16.2%) and chronic ones were seen in 93 (9.2%) cases .The relative frequencies of them were as follow :

Acute lymphoblastic leukemia ALL , was the most prevalent condition among younger age group and was seen in 84 patient (8.3 %) and was mostly seen in children and young adults and the FAB LI sub group was seen in 86.9 % followed by FAB L2 and the least was FAB L3 .Table no 4

Acute myeloblastic leukemia was the second most prevalent leukemia diagnosed in 79 (7.8 %) of our cases and the FAB M4and M1 were the most frequent subtypes of AML ,followed by FAB M2,3 and 5 (table no 4) .

Chronic myeloid leukemia (CML) was seen in 53(5.2 %) patients with M:F was 1.5 :1 and was mostly seen in old and meddle aged patients and most of them were seen in chronic phase CML ,and few cases were seen in transformation and transformation to AML or ALL.

Most cases of CML ,samples of peripheral blood were collected and sent to the Sana'a National Oncology Centre Lab for determination of BCR/ABLE fusion gene by real time PCR technique .

Chronic lymphocytic leukemia was seen in 38(3.7 %) patients , with M:F was 1 :1,and as usual the disease was mostly seen in older age patient and most of them seen in stage 0 (RAI scoring system)
Hairy cell leukemia seen in 2(0.2 %) cases.

The third most common diagnosis was idiopathic thrombocytopenic purpura (ITP) which was seen in 107 (10.6 %) of patients, the mal : female ratio is 1 : 1.5. ITP in our patients was acute and idiopathic in children and in younger females was chronic ITP . in some patients idiopathic and in others was secondary to other autoimmune disease like systemic lupus erythematosis ,HCV , and post viral .

Hypersplenism was ranked fourth and was seen in 92 (9.1 %) of patients and the male : female ratio is 1:1 . The most common cause of hypersplenism was secondary to portal hypertension which is prevalent in Yemen due to infestation with shistosoma ,the other causes of hypersplenism was due to malaria ,leishmaniasis , sickle cell ,thassemia ,and Gaucher disease etc .

Myeloproliferative disorders (table no 3) were seen in 58

(5.7%) cases with F : M was 2 :1 ;Essential thrombocythemia was the most prevalent seen in 34 (3.4 %) cases followed by myelofibrosis seen in 12 (1.2 %) cases followed by polycythemia rubra vera seen in 10 (1 %) cases.

Most cases with myeloproliferative disorders peripheral blood samples were collected and sent to the Sana'a National Oncology Centre Lab for determination of JAK -2 mutations by real time PCR technique .

Visceral leishmaniasis was seen in 45 (4.5%) cases, Malaria was seen in 44 (4.4%) cases , both conditions were mostly seen in younger age group .

Myelodysplastic syndrome was diagnosed in 25 (2.5 %) cases, with F : M was 1 :1 and was most prevalent in old age group ,and the subgroup refractory anemia (RA) and refractory anemia with excess of blasts (RAEB1-2) were the most prevalent in our cases .

There were 19 cases with hematological congenital syndromes aged 1 to 4 years diagnosed in our center ;10 cases with Gaucher disease ,4 cases with pure red cell aplasia ,2 cases with Higashi –Chediaki syndrome ,2 cases with Wiscoot –Aldrich syndrome and 1 case with malignant infantile osteopetrosis .Table no 2

Multiple myeloma was seen in 7(0.7 %) patients and was predominant in old age females.

Also there were less prevalent malignant conditions such as :
Metastasis from gastric and prostatic cancer seen in 5
(0.5%) cases followed by lymphoma (Hodgkin's and non Hodgkin's) seen in 4 (0.4%) and leukomoid reaction 4 (0.4%) cases .Table 4

DISCUSSION:

There is a very wide diversity of hematological disorders ranging from benign disorders to neoplastic ones diagnosed by bone marrow aspiration which is safe, very informative and useful tool used worldwide. With rare side effect such as infection, excessive bleeding or embolism which has been reported after bone marrow Aspiration. [14,15,16]

In this study 1108 cases were registered and 98 cases were excluded , and we analyzed the data obtained from these patients to know the relative frequency of different hematological disorders ; 65.9 % of them were benign and 34.1% were malignant (table 3 and 4).

In the present study, the age of the patients ranged from 9 months to 100 years with mean age of 33.5 years. 527 (52.2%) were males and 483 (47.8 %) were females with (M: F=1.1:1.0).

The most common indication of Bone marrow aspiration in this study is seen in table no 1 . The relative frequencies of different hematological diseases in this study is seen in Table no 2

Anemia of all types was the most common diagnosis in our study seen in 344(34.1%) of our cases accounting for one third of all patients and this results reflect limited health facilities and resources in Yemen because of low economic slandered of living ,the effect of civil war which affects all age groups of Yemeni people and causing the worse nutritional crisis according to WHO agencies working in Yemen ,wide spread of parasites ,malaria ,tuberculosis and leishmania especially in rural areas . Our results is comparable with studies done by APRAJITA et all that showed 46% cases ,and other study done by SHORSH et all that showed 32.2 % cases .{17,9} The different types of anemias were as follow :(Table no3)

Iron deficiency anemia (IDA) was seen in (13. 7 %) cases , in comparison with a study done by Al gazaly et all that showed 10.4 % of cases , and a study done by Bashawri et all that showed 2.6 % cases .{8,2 } These cases showed unusual features necessitating bone marrow examination. The causes of iron deficiency were searched for in every patient and the most common causes where malnutritional and malabsorption due to parasitic infestations , piles, menorraghia, gastric adenocarcinoma, high.grade lymphoma , and some patients had occult gastrointestinal bleeding due to oesophageal varices caused by chronic liver disease. Microcytic anemia seems to be common finding and later labeled as iron deficiency anemia after negative iron staining by Prusian blue in bone marrow slides .(19,20,21). Megaloblastic anemia was seen in (7.1%) cases , compared to other studies done by Pudasaini et all, Ahmed SQ et all and Khodke K, et all that showed (12.3%), (11.9%) and (6.5%) of their cases respectively. [22,19,23] Aprajita et al found 43.7 % of cases suffering from megaloblastic anemia ,and Al ghazali et al found 9.1 % of cases .(17,8) Megaloblastic anaemia cases were secondary to chronic diarrhea ,malabsorption and malnutrition caused by poverty and civil war , some has heridatary hemolytic anemias in aplastic crises ,and few old patients had pernicious anemia with positive anti parietal cells antibodies and atrophic gastritis seen by gastric endoscopy , others had tropical splenomegaly syndrome caused by recurrent malaria infestation causing folic acid deficiency . Most patient presented with pancytopenia necessitating bone marrow aspiration for diagnosis . B12 and folic acid assays were not performed because some times are not available due to civil war in our country .

Hemolytic anemia which showed erythroid hyperplasia in bone marrow with peripheral blood reticulocytosis and increased serum bilirubine ,some of them diagnosed finally as hereditary hemolytic anemias (24) , others had malaria infestation with splenomegaly and hemolysis ,others diagnosed as autoimmune hemolytic anemia which was seen in (4.5%) proved by Coombs test ,in comparison with Other studies that showed (19.6%) cases in a study done by Jha et al {25}, 14% in a study done by Khodke et al(23) and 1.4 % in a study done by Alghazali et al (8) . Anemia of chronic disease which was seen in(3.8 %) of our cases secondary to rheumatoid arthritis and other connective tissue inflammation ,malignancy pulmonary tuberculosis . Hypoplastic(Aplastic) anemia which was seen in (2.5 %) of our cases , in comparison with Al ghazali(8) results that showed (5.7%) ,Malempati S et al reported (29%) ,Thieml H et al reported (19% cases) and Rock WA Jr et al reported hypoplastic /aplastic anemia in (14%) cases [26,27,28] . The diagnosis was based on Bone marrow aspiration findings, and a bone marrow biopsy{25 } . Most cases were idiopathic ,some has history of drug affecting bone marrow ,and few cases secondary to hepatitis C .

Anemia of infection was seen in 2.1% cases ,followed by Double deficiency anemia due to malaria infestation or malabsorption due to Celiac disease , was seen in (0.6 %) cases in comparison with Al ghazali et all who reported (2.9 %) of his cases .(8)

The seconed most common diagnosis in our study was leukemias of all types seen in 25.3 % cases accounting for one fourth of the total cases and the male :female ratio is about 1.2:1 , compared to other studies done by ; al gazali 28.2 % cases (8) ,Aprajita 10.4 % cases (17) . Acute leukemias were seen in 16.3% cases , and chronic leukemias were seen in (9.2 %) cases . (Table no 4)

This high frequency of leukemias especially in rural areas and less in urban areas give rise to possible role of pesticides used in agriculture without regulations and without protective measures. These findings are similar to the published reports showing a high incidence of leukaemias among farmers in relation to pesticide exposure in Europe and the USA (Al gazalli) 8 .

Acute lymphoblastic leukemia(ALL) was seen in 8.3 % of our cases which was less than the number of cases seen in a study done by SHORGE(9) and ALGAZALI (8) that showed 16 .3 % and 12% cases respectively ,APRAJITA et all reported 6.6 % cases(17).

Acute Myeloblastic Leukemia (AML) was seen in 7.8 % of our cases which was less than the number of cases seen in a study done by AGAZALI (8) and SHORGE(9) that showed 25.4 % and 11.8 % cases respectively ,Aprajita et all reported 9.6 % cases (17) . Chronic Myelogenous Leukemia (CML) was seen in 5.2% cases in comparison with data reported by ALGAZALI(8) and SHORGE (9) that showed 13.9 % and 4.9 % cases respectively , and the diagnosis of CML was correlated with complete blood count (CBC) and peripheral blood film findings and BCR/ABL fusion gene study .

Chronic Lymphocytic Leukermia was seen in 3.7% cases in comparison with data reported by ALGAZALI(8) (5.7%) , Shorge (9) (13%) , while Aprajita (17)study showed 0.74 %. Natnael et all (30) study in Eriteria showed 23.1 %. Hairy Cell Leukemia (HCL) was seen in 2 (0.2 cases which was less than the number of cases seen in a study done by ALGAZALI(8) that showed (0.3 %) and these differences because of the number of patients enrolled in our study (1010 cases) and Al gazaly study 785 cases .(see TABLE NO 3)

The thirde most common diagnosis was Idiopathic thrombocytopenic purpura which was seen in 107 (10.6%) of the cases. Other studies showed :

Ahmed et all (14.5%), Al gazali 8.6 % , Shorge 8.6 %, Aprajita 8.1 % Marwah (6.8%), Kibrea (6.21%) cases of ITP in their studies.(19,8,9,17,,31, 29,]

The fourth common diagnosis was hypersplenism seen in 92 (9.1%) cases diagnosed by trilineage hyperplasia on bone marrow aspiration and peripheral blood bicytopenia or pancytopenia and enlarged spleen which needs more investigation to detect what behind this splenomegaly in Yemeni patients ,some of our cases show portal hypertension secondary to shistosomiasis ,others had chronic liver diseases and few patients showed portal vein thrombosis .

Myeloproliferative disorders were the fifth common diagnosis were seen in 58 (5.7%) of our cases in comparison with ; Shorge 8.6 % and Aprajita 2.2 %.(9,17) . The relative frequencies were as follow : (Table no 5)

Essential thrombocythemi a 34 (3.45%) cases , Myelofibrosis 12(1.25%) cases ,Polycythemia rubra vera 10(0.9%) cases ,Chronic myelomonocytic leukemia 2(0.6%) cases . polycythemia Vera that showed trilineage hyperplasia and correlate with complete blood count (CBC) and peripheral blood findings and JAK 2 (Janus kinase 2) mutation study.

Visceral Leishmaniasis(32) was the sixth most common diagnosis in the present study seen in 45 (4.5%) of the cases, other studies done by Al gazaly and Aprajita showed (1.8%) and (0.74 %) cases of visceral leishmaniasis respectively [8,17)

Malaria was seen in 44(4.4%) cases compared with study done by Nusrat Bashir(18) et all in India that showed (0.3 %) cases.

Myelodysplastic syndrome was seen in 25(2.5%) cases compared to a study done by Al ghazaly (2.1%) (8) cases , most cases showed refractory anemia subtype ,few had RAEB 1 ,and 2 had transformation

to AML ,all cases of MDS were biopsied for final diagnosis.

Congenital hematological syndromes were seen in 19 (1.9%) cases :

The relative frequencies were : Gaucher disease 10 cases , Red cell aplasia 2 cases Chediack Higashi syndrome 2 cases ,Wiscot Aldrich(saeed) syndrome 2 cases and malignant infantile Osteopetrosis 1 case .(33,34.)

We found that bone marrow examination is helpful in making the primary diagnosis of storage disease.

We encountered 7 cases (0.7%) of multiple myeloma and correlated with biochemical, radiological and clinical findings compared to Laishram et al ,Kibria et al, and Jha et al who reported an incidence of (20.5%) ,(9.04%),and (0.94%) in their studies respectively. [35,29,25] While AL GAZALI (8) reported 1.3 % of cases of multiple myeloma Five (0.5%) cases of bone marrow aspiration showed metastastatic deposits ,and the bone marrow biopsy showed adenocarcinoma deposits with primary from gastric ,prostate and breast .

CONCLUSION

Bone marrow examination is an important diagnostic tool to reach a confirmatory diagnosis of different hematological disorders, especially in a resource-limited country like YEMEN. The procedure remains a valuable tool in the diagnoses of a wide range of hematological and some non-hematological diseases.

We found benign hematological disorders in (65.9%) of cases while malignant hematological disorders in (34.1%) of cases . Most common benign hematological disorders were Anemias , I.T.P , hypersplenism , V.Leishmaniasias and malaria .

Most common hematological malignancies were acute and chronic leukemias ,myeloproliverative disorder and myelodusplastic syndrome .The commonest cause of pancytopenia in our study was hypersplenism which need further evaluation and further investigations to search about the primary disease causing it .

Although Bone marrow aspiration and biopsy are an uncomfortable procedure for the patient and should be performed only when there is a clear clinical indication.

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Table No .1	Indications For B.M aspiration				
N		M	F	Total	%
1	Evaluation of Anemia	145	155	300	29.7
2	Evaluation of Pancytopenia	116	94	210	20.8
3	Evaluation of Unexplained Thrombocytopenia	55	97	152	15
4	Evaluation of Leukocytosis	76	52	128	12.7
5	Evaluation of Splenomegaly	75	51	126	12.5
6	Evaluation of Thrombocytosis	8	86	94	9.3

Table No .2 Bone marrow aspiration diagnosis of cases			
N	Diagnosis	N	%
1	Anemias	344	34.1
2	Acute and chronic Leukemias	256	25.3
3	I.T.P	107	10.6
4	Hypersplenism	92	9.1
5	Myeloproliferative Disorder	58	5.7
6	Visceral Leishminiasis	45	4.5
7	Malaria	44	4.4
8	Myelodysplastic Syndrome	25	2.5
9	Congenital hematological Syndromes	19	1.9
10	Multiple Myeloma	7	0.7
11	Metastasis	5	0.5
12	Lymphoma	4	0.4
13	Leukomoid Reaction	4	0.4

Table No:3	Benign Hematological Condition								
N	Disease	Sex		Age groups (Years)				Total Number	%
		Male	Female	0--20	21--40	41--60	61-80		
1	I.D.A	69	69	35	47	34	22	138	13.7
2	I.T.P	43	64	56	25	17	9	107	10.6
3	Hypersplenism	54	38	23	34	28	7	92	9.1
4	Megaloblastic Anemia	42	29	19	19	13	20	71	7.0
5	Hemolytic Anemia	23	22	35	7	2	1	45	4.5
6	Visceral Leishminiasis	28	17	39	6	0	0	45	4.5
7	Malaria	26	18	28	12	3	1	44	4.4
8	Anemia Of Chronic Disease	21	17	16	7	8	7	38	3.8
9	Aplastic Anemia	15	10	13	4	5	3	25	2.5
10	Anemia Of Infection	11	10	13	2	5	1	21	2.1
11	Congenital Syndrome	9	10	19	0	0	0	19	1.9
12	Double Deficiency	4	2	2	2	1	1	6	0.6
13	Leukomoid Reaction	2	2	4	0	0	0	4	0.4
Total		347	308	302	165	116	72	655	65

Table No: 4	Malignant Hematological Conditions								
N	Disease	Sex		Age groups (Years)				Total	%
		Male	Female	0--20	21--40	41--60	61-80		
1	A.L.L	46	38	60	12	6	6	84	8.3
2	A.M.L	41	38	25	14	23	17	79	7.8
3	C.M.L	33	20	4	23	20	6	53	5.2
4	C.L.L	19	19	1	1	12	22	38	3.8
5	Essential Thrombocythemia	8	26	1	13	16	4	34	3.4
6	Myelodysplastic Syndrome	13	12	0	6	10	9	25	2.5
7	Myelofibrosis	5	7	3	3	3	3	12	1.2
8	Polycythemia Vera	7	3	0	2	5	3	10	1.0
9	Multiple Myeloma	0	7	1	1	1	4	7	0.7
10	Metastasis	3	2	0	1	2	2	5	0.5
11	Lymphoma	3	1	2	1	0	1	4	0.4
12	Hairy Cells Leukemia	1	1	0	1	1	0	2	0.2
13	Juvenile CMML	1	1	2	0	0	0	2	0.2
Total		180	175	99	78	99	77	355	35

Statistics		
Age		
N	Valid	1,010.0
	Missing	0
Mean		33.50
Median		30.00
Mode		60
Minimum		0.1
Maximum		100
Sum		33,908

Table No: 5	Distribution of Some Hematological Diesese By Subtypes and sex					
N	Disease	SubType	No	M	F	%
1	A.L.L By Morphology No 84	L1	73	40	33	86.9
		L2	9	5	4	10.7
		L3	2	1	1	2.4
2	A.M.L By Morphology No 79	M0	2	1	1	2.5
		M1	24	13	11	30.3
		M2	4	3	1	5.1

		M3	4	3	1	5.1
		M4	30	15	15	37.9
		M5	3	3	0	3.8
		M6	2	1	1	2.5
		M7	0	0	0	0
3	C.L.L By Stages No 38	0	22	9	13	57.9
		I	6	2	4	15.8
		II	3	3	0	7.9
		III	7	4	3	18.4
4	M.P.D No 58	E.T	34	8	26	58.6
		M.F	12	5	7	20.6
		P.C.R.V	10	7	3	17.2
		C.M.M.L	2	1	1	3.4
5	Congenital Syndrome Subtype No 19	Gauchar	10	4	6	52.6
		Red Cell Aplasia	4	1	3	21.1
		Chediach	2	1	1	10.5
		W.A.S	2	2	0	10.5
		Osteo Petrosis	1	1	0	5.3

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