PATTERN OF HEMATOLOGICAL DISEASES IN HOSPITALIZED PAEDITRIC PATIENTS BASED ON BONE MARROW EXAMINATION

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ABSTRACT

Objective: *The objective of this study was to look into various diagnoses of hematological lesions on bone marrow examination in our paediatric age group of patients.*

Material and Methods: *This study was conducted in the Pediatric A Unit and Department of Hematology Postgraduate Medical Institute (PGMI) Lady Reading Hospital, Peshawar from 01st Jan 2007 to 31st Dec 2007. Children admitted with pallor, bleeding, lymphadenopathy or visceromegaly having abnormal smear results were included in this study. The data was statistically analyzed by SPSS version 10.*

Results: *One hundred and ninety-eight cases were included in the study. The age range was from 06 months to 14 years with a mean age of 5.35 years and standard deviation of ± 3.69. Majority (47.5%) of these children were in the age range of 1 to 5 years with male to female ratio of 1.53. The commonest disorder was aplastic anemia present in 40 (20.2%) of the cases followed by idiopathic thrombocytopenic purpura (ITP) (15.7%), megaloblastic anemia (14.6%) and iron deficiency anemia (7.6 %). Acute leukemia was the predominant malignant disorder present in 11.6% of the cases. There were also few cases of histiocytosis and bone marrow secondaries. Visceral leishmaniasis, anemia of chronic disorders, haemolytic anemia, myeloid hyperplasia, hypersplenism, congenital dyserythropoietic anemia, malaria and Gaucher disease were the other non-malignant hematological disorders found in this study.*

Conclusion: *Aplastic anemia, idiopathic thrombocytopenic purpura, megaloblastic anemia and leukemia are the commonest hematological disorders in our set up.*

Key Words: *Bone Marrow Examination, Aplastic Anemia, Megaloblastic Anemia, Leukemia*

INTRODUCTION

Hematological disorders are quite common in children. These vary from simple conditions like iron deficiency anemia to congenital hypoplastic anemia and physiological anemia of infancy to acquired red cell aplasia. Pancytopenia is a frequently occurring condition in this age group. It may be a transient event secondary to viral infection like parvovirus B19 or something grave like congenital bone marrow aplasia1. This can also result from either a failure of production of hematopoietic progenitor cells, called aplastic anemia or peripheral destruction of cellular elements either due to infection, immune mediated damage or hypersplenism.2 Even simple drugs like albendazole can lead to pancytopenia.3 Bone marrow replacement by storage cells like Gaucher or malignant cells can also lead to this problem.4 The same is true with visceral leishmaniasis.5,6 Bacterial infection like Brucellosis can lead to pancytopenia in this age group.7,8 Clinically a child presenting with pancytopenia should be evaluated for possibility of either a bone marrow failure syndrome or acute malignancy, particularly when associated with lymphadenopathy or visceromegaly.

Megaloblastic anemia secondary to vitamin B12 and Folate deficiency can lead to peripheral cytopenia. These children present with anemia, bleeding from the skin and mucosa and vulnerability to infections. Myelodysplastic syndrome is another acquired disorder in which the bone marrow fails to produce and release sufficient blood cells.9 Leukemia is the most frequently occurring malignancy in children and requires bone marrow examination for diagnosis.

Bone marrow aspiration and examination is one of the important diagnostic procedures for many hematological disorders.10 This procedure is increasingly useful in documenting metastatic involvement of tumors like neuroblastoma.11 There is wide variety of disorders in paediatric patients where bone marrow examination provides diagnostically important informations.[12]

Statistics	Age of the patients in years
Mean (years)	5.35
Std. Error	0.2625
Std Deviation	± 3.69
Minimum	0.50
Maximum	14.00
Median	5.00
Mode	2.00

Table 1

Liquid bone marrow is aspirated from the tibia or posterior iliac crest under local anesthesia with little discomfort to the patient. Trephine biopsy is usually performed when there is hypoplasia or aplasia on aspiration.[13]

There is a long list of diseases which reveal bone marrow changes. A large number of these disorders present with vague clinical symptoms and create a diagnostic problem which cannot be solved without resorting to bone marrow aspiration and examination. Furthermore the spectrum of hematological disorders is relatively different in the developing world than the developed countries.[14]

Therefore, this study was conducted with the view to know the etiological spectrum of disorders diagnosed on bone marrow examination

MATERIAL AND METHODS

This study was conducted at the Pediatric A Unit and Department of Hematology, Postgraduate Medical Institute, Lady Reading Hospital, Peshawar over a period of one year. All the patients above one month of age and below fifteen years admitted with pallor, bleeding, lymphadenopathy or hepatosplenomegaly, having abnormalities on peripheral blood smear were included the study.

Detailed clinical history was recorded especially relating to age, sex, presenting complaints (fever, pallor, bleeding from skin or mucus membrane, or jaundice etc). These patients were then examined for anemia, jaundice, purpura, lymphadenopathy and hepatosplenomegaly. Bone marrow aspiration was done under local anesthesia from the upper end of the tibia in children less than 02 years of age and from posterior iliac crest in those above the age of 02 years. Bone marrow trephine biopsy was performed in selected cases in the department of hematology, Lady Reading Hospital, Peshawar. Slides were made and then processed by hematologist. The data was analyzed using SPSS version 10, for variables.

AGE GROUP

Age in Years	Frequency	Percent
< 1	11	5.6
1-5	94	47.5
5-10	71	35.9
>10	22	11.1
Total	198	100

Table 2

RESULTS

One hundred and ninety-eight cases were included in the study. The age range was from 06 months to 14 years with a mean age of 5.35 ± 3.7 years (table 1). Majority of these children were in between the ages of 1 to 5 years (47.5%) followed by age range 5 to 10 years (35.9%) {Table 2}. Males were 120 (60.6%) while females were 78 (39.4%) with a male to female ratio of 1.53 (table 3).

Aplastic anemia was the most common disorder present in 40 (20.2%) cases followed by idiopathic thrombocytopenic purpura [ITP] (15.7%), megaloblastic anemia (14.6%) and iron deficiency anemia (7.6 %). Other non malignant disorders like visceral leishmaniasis, anemia of chronic disorder, haemolytic anemia, myeloid hyperplasia, hypersplenism, congenital dyserythropoietic anemia, malaria and Gaucher disease were also diagnosed in this study. Acute leukemia was the predominant malignant disorder present in 11.6% of the cases. There were also few cases of histiocytosis and bone marrow secondaries (table 4). Majority of theses patients presented with anemia, bleeding from mucus membrane or into the skin. Patients with malignancy had various degrees of splenomegaly (79.2%), hepatomegaly (60.9%) and lymphadenopathy (39.1%) as well.

DISCUSSION

Hematological diseases are frequently encountered in paediatric practice. Bone marrow examination is one of the important investigations to clinch the final diagnosis. In our study three non malignant disorders i.e. hypoplastic or aplastic anemia, ITP, megaloblastic anemia; and leukemia (one of the malignant condition) emerged the most common entities, present in 62.1% of the total cases. Similar results have been reported in a recent study from Peshawar.13

Aplastic anemia was the most common disorder present in 20.2 % of these patients. It is more common in developing countries as compared to the industrialized world.14, 15 Its exact incidence is unknown in our country due to lack of realistic community based studies, however, various studies in selected groups have shown incidence of pancytopenia in children from 14.15 % to

GENDER

Sex	Frequency	Percent
Male	120	60.6
Female	78	39.4
Total	198	100

Table 3

38.3%.16,17,18 Studies from Europe and Israel have shown its incidence of 2 new cases per million populations.19 These patients usually present with unexplained pallor, prolonged fever and tendency to bleed. Its exact etiology is still unknown but autoimmune mechanism has been implicated. World wide studies have confirmed different pharmaceutical agents as risk factors for development of bone marrow failure.20, 21 Infections such as enteric fever, malaria, visceral leishmaniasis and other bacterial infections can result in pancytopenia in the developing countries.22

Idiopathic thrombocytopenic purpura was the 2nd most common hematological problem encountered in our study. It is one of the commonest causes of purpura. There may be epistaxis, hematuria and very rarely intracranial bleed which is then fatal.23 Various studies have shown 32% to 48% frequency24, 25 while we found it in 15.7% of the cases. This might be due to variable population group and comparatively small sample size.

In this study megaloblastic anemia was present in 29 (14.6%) of the cases. Similar results have been published in other national studies.13, 26 The second common deficiency anemia was that of iron deficiency present in 7.6% of the cases. The same result was present in a study from Islamabad.26 This is the most common cause of anemia through out the world.15, 27 Majority of the patients are in the developing countries where it reflects the poor socio-economic and nutritional status of the society. People here consume diet grossly deficient in iron. This has remained a global health problem despite of the efforts to reduce its prevalence.28 Iron deficiency has an impact on the intellectual development of the children.29 Therefore growing children should be provided with balanced diet. Nutritional megaloblastic anemia is also one of the leading causes of pancytopenia in younger children.30

Megaloblastic anemia usually presents with pancytopenia but rarely may present with thrombocytopenia only.25

In our country, green leafy vegetables are abundant which are rich sources of folic acid and vitamin B 12. However, other factors like chronic diarrhea, worm's infestations, malabsorption and protein caloric malnutrition may be responsible for micronutrient deficiency.31

Leukemia was the most common malignant

BONE MARROW RESULTS

Disease	Frequency (n=198)	Percentage
Aplastic anemia	40	20.2
Idiopathic Thrombocytopenic Purpura	31	15.7
Megaloblastic Anemia	29	14.6
Leukemia	23	11.6
Iron Deficiency Anemia	15	7.6
Visceral Leishmaniasis	13	6.6
Anemia of chronic disorder	9	4.5
Hemolytic Anemia	9	4.5
Myeloid hyperplasia	8	4.0
Hypersplenism	6	3.0
Myelodysplastic Syndrome	4	2.0
Congenital Dyserythropoietic Anemia	4	2.0
Malaria	2	1.0
Hystiocytosis X	2	1.0
Gaucher Disease	1	.5
Hemophagocytic Syndrome	1	.5
Bone Marrow secondaries	1	0.5
Total	198	100.0

Table 4

hematological disorder present in 11.3% of the cases. Similar results have been reported in a study from Islamabad 26. Worldwide this is the most common malignancy of childhood 32 accounting for about 41% of all malignancies that occur in children less than 15 years of age. In USA the annual incidence of 4.5 cases per 100000 children.33 The exact situation in our country is unknown due to lack of large scale studies; however, this is the commonest malignant condition in this part of the world as well.26 However the overall incidence in our country is lower as compared to the developed countries, as is the case in India and China.34 The exact etiology of ALL is not known however exposure to herbicides, pesticides, chemical solvents and chemical contamination of ground water, viral infection and radiation are thought to be associated with leukemia. Recently there has been much insight into the presence of chromosomal abnormalities found in most patients with leukemia. Over the past decade also there has been substantial improvement in the survival rate of children with leukemia i.e. 80% at five years from diagnosis.35

Visceral leishmaniasis was reported in 13 (6.6%) of the cases. Majority of these patients were from the hilly areas of district Dir, Buner, Bajauar and Chitral. The same observations have been made in another local study.26 Most of them presented with pallor, prolonged fever and visceromegaly. Interestingly they had a very good response to meglumine antimoniate (glocantime).

CONCLUSION

Bone marrow aplasia/hypoplasia along with

idiopathic thrombocytopenic purpura and deficiency anemia (megaloblastic and iron deficiency) were the commonest non malignant hematological disorders while acute lymphoblastic leukemia was the most common malignant condition.

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