ORIGINAL ARTICLE

Hematological Diagnosis in Children: Results of a 10 Year Long Cohort Based Upon Bone Marrow Examination

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ABSTRACT

Aim: To identify the spectrum of various hematological disorders in children under fifteen years of age at a tertiary care hospital of Lahore,Pakistan.
Settings: Clinical pathology laboratory at department of pediatrics,Mayo hospital/KEMU,Lahore during February 2004 to January, 2014.
Design: Retrospective study.
Methods: Clinical records of children under fifteen years of age, admitted with variable clinical features during the study period were explored retrospectively.Bone marrow aspiration was done in all the children whereas bone marrow trephine biopsy was performed in cases suspected of aplasia. Charts of the children were studied in detail in reference to history,clinical examination and diagnostic investigations.All important and relevant findings were entered in a standard proforma.
Results: Amongst the 1786 studied cases,937(52.5%) were male and 849(47.5%) female children. Eleven hundred and sixty four cases(65%) had benign or normal etiology while 622 were malignant disorders. Nutritional anemias were most common among the benign hematological disorders(586 cases i.e., 32.8%)with megaloblastic anemia as dominant etiology[370 cases(20.7%)]and iron deficiency anemia as uncommon etiology[72 cases(4%)]in this subclass. Other diagnoses in benign hematological disorders group were idiopathic thrombocytopenic purpura 234(13.1%),hypoplastic/aplastic anemia 180(10.1%),thalassemia 90(5.0%) and Gaucher disease 13 cases(0.70%).The malignant hematology group comprised of, acute lymphoblastic leukemia396(22.2%)cases followed by acute myelogenous leukemia 100(5.6%)cases, chronic myeloid leukemia 18(1.0%)cases,myelodysplastic syndrome 27(1.5%)cases,secondarymetastatic deposits 36(2%) and lymphomas 45(2.5%)cases.Out of total 1786 bone marrow examinations 36(2%) cases were declared as showing normal bone marrow morphology.
Conclusion: Acute lymphoblastic leukemia was the most common malignant hematological disorder followed by acute myelogenous leukemia. Megaloblastic anemia diagnosis was at the top of nutritional anemia subclass while iron deficiency was much less common.
Keywords: Malignant hematological disorders, anemia, leukemia, bone marrow morphology.

INTRODUCTION

Hematological disorders are frequently seen in pediatric clinical practice. These disorders usually range from iron deficiency anemia to relatively uncommon congenital hypoplastic anemia and acquired pure red cell aplasia.Pancytopenic children must be evaluated for either an acute hematologic malignancy or bone marrow failure disorder[1].Acute leukemia is diagnosed by the presence of 20% or more blasts in the bone marrow and under certain circumstances leukemia can be diagnosed with less than 20% blasts in bone marrow, (when cytogenetic or molecular genetic abnormalities are also present)[2]. It can be concluded that bone marrow examination is an essential tool in finalizing a diagnosis. It is a commonly employed safe procedure with rarely reported incidence of bleeding, infection or embolism after trephine biopsy[3].Although an invasive procedure, even mild to moderate degree of thrombocytopenia is not an absolute contraindication for bone marrow aspiration/trephine biopsy. Commonly it is performed in conditions like cytopenias,leukemias, secondary metastatic deposits in marrow and storage disorders. Trephine biopsy provides a great help in recognizing the etiology of pancytopenia and is a valuable option in the diagnosis of lymphomas, osteoporosis and granulomatous disorders[4].This study was designed to

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evaluate the spectrum of hematological disorders diagnosed on bone marrow aspirations/biopsies.

PATIENTS AND METHODS

This retrospective study was carried out in the clinical laboratory at department of pediatric medicine, Mayo hospital, Lahore, over a period of ten years. Total 1786 children who underwent bone marrow aspiration or trephine biopsy between February 2004 to January ,2014 were included in our study. All admission charts of these children were studied in detail, symptoms and signs along with relevant investigations were noted on a standard proforma. Complete data was analyzed to conclude the frequencies of all different hematological disorders in pediatric patients in this tertiary care hospital of Lahore. Complete blood counts were done on hematology analyzer, SysmexKx 21.The bone marrow aspiration was performed from posterior iliac crest in children above two years and from tibia in children less than two years of age. Bone marrow trephine biopsy was done where ever it was indicated.

RESULTS

In our study the youngest child was of 01 month, whereas the eldest was 15 years. Out of 1786 children 937(52.5%) were male and 849(47.5%) female children, with male to female ratio of 1.1:1.Average age of male children was 5.47 years and that of female children 5.71 years. Maximum number ofchildren 765(42.8%) were in age group of 01 month to 05 years, followed by 677(37.9%) in 06 to 10 years age group, while lowest number 344(19.3%)in age group of 11 to 15 years.Two distinct groups of hematological disorders were noticedin our 1786 consecutive bone marrow aspirations. Out of total 1786 children 1164(65.2%) were in benign disorders group(Table-I) and 622(34.8%) in malignant disorders group (Table-II).Among the benign hematological disorders megaloblastic anemia was the commonest 370(20.7%) followed by double deficiency anemia 144(8.1%). Iron deficiency anemia was diagnosed in 72(4.0%) children. Other common benign disorders in our study were idiopathic thrombocytopenic purpura 234(13.0%), hypoplastic / aplastic anemia in 180(10.0%) and thalassemia in 90(5.0%) cases. Disorders diagnosed with much less frequency were, Gaucher disease 18(1.0%),hypersplenism 09(0.5%) and visceral leishmaniasis in 13(0.7%) children.

Among the malignant pediatric hematological disorders group, acute lymphoblastic leukemia in 396(22.2%) cases was the commonest followed in descending order by acute myelogenous leukemia 100(5.6%), chronic myeloid leukemia27(1.5%) and lymphomas in 45(2.5%)cases. Secondary metastatic deposits were found in 36(2.0%) cases. No abnormality was detected in 36(2.0%)children and bone marrow was declared as having normal morphology.

TableI: Spectrum of Benign disorders

Disease	n	%age
Megaloblastic anemia	370	20.7
Idiopathic thrombocytopenic Purpura (ITP)	234	13.0
Hypoplastic/aplastic anemia	180	10.0
Double deficiency anemia	144	8.1
Thalassemia	90	5.0
Iron deficiency anemia	72	4.0
Gaucher disease	13	0.7
Hypersplenism	09	0.5
Visceral leishmaniasis	13	0.7
Sickle cell anemia	03	0.2
Normal morphology marrow	36	2.0
Total	1164	65.2

Table-II: Spectrum of malignant disorders

Disease	n	%age
Acute lymphoblastic leukemia	396	22.2
Acute myelogenous leukemia	100	5.6
Chronic myeloid leukemia	18	1.0
Metastatic tumors	36	2.0
Lymphomas	45	2.5
Myelodysplastic syndrome	27	1.5
Total	622	34.8

DISCUSSION

Final diagnosis in majority of pediatric hematological disorders is achieved after performing bone marrow aspiration or trephine biopsy, a safe and commonly employed tool in pediatric clinical practice. Complications like bleeding, infection and air embolism are rarely reported after these procedures[3].This study shows that megaloblastic anemia was the commonest deficiency anemia (20.7%) in our children,in comparison to many studies in different countries including Pakistan,its frequency fluctuates between 24%[5] to 68%[6].Most common finding on complete blood counts was cytopenias in our as well as in many other national studies[7,8,9,10]. Diagnosis of megaloblastic anemia depends on finding the megaloblastic maturation within the bone marrow[11]. Thrombocytopenia may bethe only finding in rare cases[12]. Microcytic anemia (iron deficiency) was the least common of micronutrient anemiasin 72(4%) cases, muchlower percentage when compared with world population 60-80 percent[13].

Idiopathic thrombocytopenia was second common disorder234(13%) in our study, whereas other studies reported the frequency between 32-48%[6,12].Our children mostly presented with cutaneous or mucosal hemorrhagic manifestations. Hypoplastic/Aplastic anemia was the third common lethal benign disorder in our children 180(10%).In majority of our children etiology was not known and only in few cases there was a positive history of drug intake and / or radiotherapy treatment. Almost same results and etiological factors were reported from Thailand[14] and China[15].Recurrent infections by bacterial or fungal invasion due to neutropenia, profuse bleeding and congestive cardiac failure are the usual contributors in death of these patients.

In our study 622(34.8%) cases were of malignant hematological disorders group. Out of these 496(27.8%) cases belonged to acute leukemias and acute lymphoblastic leukemia 396(22%),was the commonest malignant disorder followed by acute myelogenous leukemia 100(5.5%).In three other studies incidence of acute lymphoblastic leukemia was declared as 13.6%[16],16.1%[17] and 17.9%[18].Comparison of studies carried out in Pakistan,India[19]and China[20] clearly show that incidence of acute lymphoblastic leukemia is relatively lower in Pakistan.In this studychronic myeloid leukemia was diagnosed in 18(1.0%) cases, whereas it was declared as 2.4%[16]in another study carried out at Abbottabad,Pakistan. In our country due to lack of availability of research funding and data,very little is known about etiological factors, epidemiology and incidence of pediatric malignancy.

CONCLUSION

Bone marrow aspiration/biopsies remains an essential tool in the confirmatory diagnosis and management of a large variety of both hematological and non-hematological disorders.It has an important role to play in assessing prognosis and evaluation of therapeutic response by a patient. Among the benign hematological disorders megaloblastic anemia was the commonest followed by idiopathic thrombocytopenic purpura and third common was hypoplastic/aplastic anemia. Out of malignant hematological group, acute lymphoblastic leukemia was at the top followed by acute myelogenous leukemia and lymphomas. The main aim of this study was to know the pattern of hematological diseases in hospitalized pediatric patients at Mayo hospital,Lahore and secondly to provide a spectrum of disorders to pediatricians which may help them to direct their thought process in a right direction to finalize a confirmed diagnosis.

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