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ORIGINAL ARTICLE

Frequency of Common Hematological Diseases in Paediatric Patients Presenting with Clinical Features Indicative of Bone Marrow Examination

SUMIRA ABBAS[1], SABA KHAN[2], MIAN MUFARIH SHAH[3], SIDRA BASIR[4], SHAH TAJ KHAN[5]
[1]*MBBS, FCPS, Postgraduate Trainee Hematology Department, Hayatabad Medical Complex Peshawar*
[2]*Postgraduate Trainee Hematology Department, Hayatabad Medical Complex Peshawar*
[3]*(MBBS, FCPS), Specialist Registrar Department of Medicine, Hayatabad Medical Complex Peshawar*
[4]*Postgraduate Trainee Hematology Department, Hayatabad Medical Complex Peshawar*
[5]*Head of Department of Hematology, Hayatabad Medical Complex Peshawar*
Corresponding author: Saba Khan, Email: roghanis2012@gmail.com

ABSTRACT

Background: Haematological disorders are quite common in children. Bone marrow examination is a very important investigation for the diagnosis of many haematological and non haematological diseases.

Objective: To determine the frequency of common hematological diseases in paediatric patients presenting with clinical features underling on biopsy.

Material and Methods: This is a descriptive cross sectional study carried out at Hematology Department Hayatabad Medical Complex Peshawar from 19th Feb to 19th Aug 2018. A thorough relevant history was collected, and a clinical examination was performed. All haematological parameters were documented. Blood counts were carried out using an automated haematology analyzer. May – Grunwald Geimsa and Sudan Black B were used to stain peripheral blood and bone marrow smears, while haematoxylin and eosin was used to stain trephine biopsies. Exclusion criteria were used to compensate for confounding variables and bias.

Results: A total of 290 patients were enrolled in this study. The range of age was between 2 months -15 years, with an average age of 8 years. Among 290 patients 211 (72.75%) male and 79 (27.24%) were female. 154 (53.10%) patients were in 2-8 years age group whereas 136 (46.89%) patients in 9-15 years age group. As per common hematological diseases, 72 (24.82%) patients were having megaloblatic anemia, 42 (14.48%) patients were having aplastic anemia, and 74 (25.51%) patients were having leukemia. Stratification of common hematological diseases with respect to age, gender and duration of disease are recorded.

Conclusions: Leukemia is the commonest haematological disorder followed by megaloblastic anemia and aplastic anemia.

Keywords: Bone marrow Examination, Leukemia, Megaloblastic anemia, Aplastic Anemia

INTRODUCTION

Haematological problems are quite prevalent in children. These range from basic disorders like as iron deficiency anaemia through congenital hypoplastic anaemia and infancy physiological anaemia to acquired red cell aplasia.(1) Also, bone marrow examination is a critical step in the diagnosis of many haematological and non-haematological diseases. The existence of bone marrow failure, shown as pancytopenia, is an essential signal for bone marrow investigation.(2) This might be a transitory reaction to a viral infection or something more serious, such as congenital bone marrow aplasia. This can also be caused by a failure to produce haemopoitic progenitor cells, known as aplastic anaemia, or by peripheral death of cellular components caused by infection, immune-mediated injury, or hypersplenism.(3)

Pancytopenia is a prevalent condition in paediatric children. The pathogenesis of bicytopenia/pancytopenias in children varies greatly, ranging from transitory marrow viral suppression to deadly malignant infiltration. The clinical presentation might include fever, pallor or infection, depending on the cause. Knowing the precise aetiology is critical for targeted therapy and prognosis.(4) Cytopenias, such as bicytopenia and pancytopenia, are typical findings in children megaloblastic anaemia. Megaloblastic anaemia is frequent in developing-country paediatric populations. It is a kind of macrocytic anaemia caused by a lack of folic acid, vitamin B12, or both.

Aplastic anaemia is a haematological condition characterised by pancytopenias due to deficiency of early stem cells. The etiological factors are chemical exposure, medications, viral infections, and immunodeficiency.(5) A kid with pancytopenias should be investigated clinically for the potential of a bone marrow failure syndrome or acute malignancy, especially if associated with lymphadenopathy or visceromegaly.6-7

In paediatric patients, bone marrow examination gives diagnostically essential information for a wide range of disorders.(8) Liquid bone marrow is taken from the posterior iliac crest or tibia under local anesthesia with minimum pain to the patient. When there is hypoplasia or aplasia on aspiration, a trephine biopsy is routinely done.(9) There is a vast variety of disorders that cause changes in the bone marrow. Majority of these significant illnesses have confusing clinical symptoms, making diagnosis difficult to achieve without bone marrow examination. Additionally, the range of haematological disorders in underdeveloped nations differs from that in prosperous countries.10-11 In a 2005 research at Khyber Teaching Hospital, 24% patients had Megaloblastic anaemia, 14% had Aplastic anaemia, 26 % had Leukemias, and 9 % had ITP. 12 This study is designed to know the etiological pattern of disorders diagnosed on bone marrow in the pediatric population of a tertiary care hospital.

MATERIALS AND METHODS

This is a descriptive cross sectional study carried out at Hematology Department Hayatabad Medical Complex Peshawar from 19th Feb to 19th Aug 2018. The study approval was taken from the ethical and research committee of the hospital. For sampling, consecutive (non-probability) sampling technique was used. Total sample size in the current study was 290 based on WHO sample size calculator. The inclusion criteria in our study was all patients with less than 15 years with signs and symptoms having Pallor, Bleeding, Lymphadenopathy, Peripheral Cytopenias, Pyrexia of unknown origin, Hepatosplenomegaly whereas the criteria for exclusion was all patients having Hemorrhagic problems like congenital coagulation factor deficiencies (Hemophilia, Disseminated intravascular coagulation), patients on anticoagulant drug therapy, infections of skin or current radiation therapy at the site of sampling and patients with bone problems like osteomyelitis or osteogesis imperfect. A thorough relevant history was collected, and a clinical examination was performed. All hematological parameters were documented. Blood counts were carried out using an automated haematology analyzer. May – Grunwald Geimsa and Sudan Black B were used to stain peripheral blood and bone marrow smears, while haematoxylin and eosin was used to stain trephine biopsies. Exclusion criteria were used to compensate for confounding variables and bias. All the Data analysis was done by using IBM SPSS version 24. Continuous variables were computed as mean and standard deviation whereas categorical variables were counted as frequency and percentages.

RESULTS

This study has been carried out at the Department of Hematology, MTI-Hayatabad Medical Complex Peshawar. As per our sample size, 290 patients were included in study. Mean and standard deviation SD for age was 8 Years + 4.1 whereas for duration of disease was recorded as 3 years + 1.05. Among 290 patients 211 (72.75%) male whereas only 79 (27.24%) were female. Age range was 2 months -15 years, 154 (53.10%) patients were in 2-8 years age group whereas 136 (46.89%) patients in 9-15 years age group. (Table 1).

As per common hematological diseases, 72 (24.82%) patients were having megaloblatic anemia, 42 (14.48%) patients were having aplastic anemia, and 74 (25.51%) patients were having leukemia

Stratification of common hematological diseases with respect to age, gender and duration of disease are recorded. (Table 2&3).

Table 1: Age and gender wise distribution (n=290)

		Frequency	Percentage
Age	2-8 Years	154	53.10%
	9-15 Years	136	46.89%
Gender	Male	211	72.75%
	Female	79	27.24%

Table2: Stratification of common Hematological disease with Age & Gender (n=290)

Common Hematological Disease		Age		P-Value	Gender		P-Value
		2-8 Years	9-15 Years		Female	Male	
Megaloblastic Anemia	Yes	40 (13.79%)	32 (11.03%)	0.630	53 (18.27%)	19 (6.55%)	0.851
	No	114 (39.31%)	104 (35.86%)		158 (54.48%)	60 (20.68%)	
Aplastic Anemia	Yes	22 (7.58%)	20 (10%)	0.919	33 (11.37%)	09 (3.10%)	0.360
	No	132 (45.51%)	116 (40%)		178 (61.37%)	70 (24.13%)	
Leukemia	Yes	36 (12.41%)	38 (13.10%)	0.373	53 (18.27%)	21 (7.24%)	0.799
	No	118 (40.68%)	98 (33.79%)		158 (54.48%)	58 (20%)	

Table 3: Stratification of common Hematological disease with duration of disease (n=290)

Common Hematological Disease		Duration of Disease		P- Value
		< 3 Years	> 3 Years	
Megaloblastic Anemia	Yes	53 (18.27%)	19 (6.55%)	0.793
	No	157 (54.13%)	61 (21.03%)	
Aplastic Anemia	Yes	31 (10.68%)	11 (3.79%)	0.826
	No	179 (61.72%)	69 (23.79%)	
Leukemia	Yes	55 (18.96%)	19 (6.55%)	0.670
	No	155 (53.44%)	61 (21.03%)	

DISCUSSION

Haematological problems are relatively common in general paediatric practise, and bone marrow testing has been shown to be an important investigation in reaching a definite diagnosis in such patients. The frequencies of three prevalent haematological disorders, namely megaloblastic anaemia, aplastic anaemia, and leukaemia, were examined in a paediatric population ranging from 2 months to 15 years.

Megaloblastosis is a term used to represent a diverse set of illnesses that all have the same morphologic features ("large cells with an arrest in nuclear maturation"). In contrast to cytoplasmic maturation, nuclear maturation is not mature. As a result, megaloblasts are the cells that may be observed in aspirates of bone marrow and peripheral smears that have been identified. Impaired synthesis of DNA, RNA is the cause of these disorders. Rapidly proliferating cells, such as those in the blood and the gastrointestinal tract, are particularly prone to megaloblastic alterations.

Aplastic anemia is a hematological condition marked by pancytopenias caused by a lack of early stem cells. The etiological factors include chemical exposure, medications, viral infections, and immunodeficiency.

Acute lymphoblastic leukemia (ALL) is a bone marrow cancer in which early lymphoid progenitor cells multiply and overtake the marrow's normal hematopoietic cells. Worldwide, leukaemia is the commonest type of malignancy in children, accounting for approximately 41% of all types of malignant disorders that affect children under the age of 15 years and their incidence is 4.5cases/100,000 annually in the United States of which acute lymphoblastic leukemia is the most common type of malignancy and leukaemia. The precise prevalence is not known in our country because to a lack of large-scale investigations, but this is the most prevalent malignancy in this part of the world as well. While the actual cause of ALL is unknown, it is believed that exposure to radiation, viral infections, and hazardous chemical compounds such as herbicides, pesticides, chemical solvents, and ground water chemical pollution all have a part in etiology of acute leukemia. Fortunately over the last few decades, there has been a great improvement in the survival rate of children with leukemia.[15]

In pediatric patients, bone marrow examination gives diagnostically essential information for a wide range of disorders.[8] Liquid bone marrow is taken from the posterior iliac crest or tibia under local anesthesia with minimum pain to the patient. When there is hypoplasia or aplasia on aspiration, a trephine biopsy is routinely done.[9] A research done in Peshawar and another study from Islamabad, aplastic anaemia was the most often reported condition, accounting for roughly 20.2 % of total cases, followed by ITP, accounting for 15.7% of total cases.[13-14]

In our study 72 (24.82%) patients were having megaloblatic anemia, 42(14.48%) patients were having aplastic anemia, and 74(25.51%) patients were having leukemia. The second most common haematological disorder in this study was megaloblastic anemia found to be in 15.3% of all the cases[16]. Similar results have been published in a few other national studies.

In a research done in DI Khan in 2006, the prevalence of megaloblastic anaemia was found to be exceptionally high, accounting for 57.7 % of all cases.[17] This is regarded as one of the leading causes of nutritional deficiency anaemia in the developing countries, where it reflects the society's low socioeconomic position. In children one of the most common causes of pancytopenia under the age of five is nutritional megaloblastic anemia.[18] Although our country is rich in green leafy vegetables, which are a good source of folic acid, conditions such as chronic diarrhea, worm infestation, malabsorption, and poor eating habits may contribute to the micronutrient deficiency.

Idiopathic Thrombocytopenic Purpura (ITP) was the third most frequent haematological condition observed in our study, accounting for 11% of all patients. While ITP was described as the least common disorder, studies in Peshawar showed it to be 9 %[19] of the entire patients. Afzal S, et al found it to be 15%[17] of the total cases in DI Khan, it is one of the most frequent causes of purpura.[20] Epistaxis, haematuria, and, in extremely rare cases, fatal intracranial bleed are the most prevalent presenting features. Aplastic anaemia was the least frequent hematological disorder in our analysis, accounting for 6.7% of all patients. Aplastic anaemia was found to be the most frequent haematological condition in children in a comparable local survey done in 2007, accounting for 20.2 % of all cases.[21]

There is no good prospective data on the global incidence of aplastic anaemia. In Asia, Aplastic anemia is quite common as compared to Western world. The majority of the patients arrive with inexplicable pallor, persistent pyrexia, and bleeding trends. Their specific etiology is unknown; however autoimmune mechanisms

are thought to play a key part in Pathophysiology. International studies have established the involvement of harmful chemical compounds and radiation exposure in inducing bone marrow failure.

CONCLUSION

Leukemia was the most frequent haematological disorder, followed by megaloblastic anaemia and ITP, with aplastic anaemia being the least common. The most prevalent age group impacted was children aged 0 to 5 years, with men being more affected than females.

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