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# Childhood Leukemias in Khyber Pakhtunkhwa and Afghan Children Visiting to Hayatabad Medical Complex Hospital

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## Abstract

**Background:** Khyber Pakhtunkhwa and Afghanistan located in South Central Asia which is most prevalent area for childhood leukemia. In this region, no previous data or study was available on estimated cases per year of different types of childhood leukemia. The aim of the present study is to evaluate the frequency of different types of childhood leukemia in the children from different districts of Khyber Pakhtunkhwa (KP) and Afghanistan presenting to Hayat Abad Medical Complex Hospital, Peshawar.

**Methods:** This descriptive cross-sectional study was conducted in pathology department Hayat Abad Medical Complex hospital, Peshawar, Pakistan. Duration of the present study was, from January 2014 to December 2016. A total number of 605 children were enrolled up to 15 years of age, who were suspected to have leukemia, went through bone marrow examination. 3 ml blood was collected in EDTA tube (purple top) and complete blood count was prepared by hematology analyzer (Ruby cell dyne, Abbott, USA). By aseptic techniques bone marrow aspiration and bone marrow trephine biopsy samples were collected from all patients. Slides were papered from Bone marrow aspirates, fixed with methanol and stained with Giemsa, myeloperoxidase and periodic acid Schiff stain. Trephine biopsy slides were stained by Hematoxyline and Eosin and Reticulin stain. Immunohistochemistry was done after initially examining bone marrow aspirate slides. All data was documented and statistical analysis was performed by SPSS-20 software.

**Findings:** Among 605 children suspected to have leukemia, 281 (46.5%) children were diagnosed with different types of childhood leukemia. Out of 281 diagnosed patients, 231(82.2%) were Pakistani children

and rest of the 50 (17.8%) were Afghani children. The studied population consist of 173(61.6%) males and 108(38.4) females. Their age ranged from 3 months to 15 years with median age of 9.8 years. Out of 281 cases, 210 (74.73%) were diagnosed to have acute lymphoblastic leukemia and rest of the children were 62 (22.06%) acute myeloid leukemia, 7 (2.44%) chronic myeloid leukemia, 2 (0.71%) had Juvenile Chronic Myelomonocytic Leukemia (JMML) and 1 (0.35%) child was report with Chronic Myelomonocytic leukemia (CMML). There was no significant differences seen in prevalence among Afghan children and Pakistani children except ALL, which is more frequent in Afghan children compared to Pakistani children and no single case of CMML, were diagnosed in Afghan children.

**Conclusion:** In the present study, acute lymphoblastic leukemia is most frequent leukemia in the children of Khyber Pakhtunkhwa and Afghanistan. Juvenile chronic Myelomonocytic leukemia is found the less common leukemia in the present study.

**Keywords** Childhood leukemia; Bone marrow examination; Immunohistochemistry

## Introduction

Globally, childhood cancer is a major cause of deaths in children and more than 90,000 children die each year. Worldwide it is estimated that 1,60,000 new cases are diagnosed every year [1]. Statistically, the most common childhood malignancies are childhood leukemia, CNS tumor and lymphomas, while childhood leukemia is one of frequent malignancy (4-40/100000 children) of childhood in world as well in Pakistan [2]. The actual incidence of childhood leukemia per year is not known because nonexistence of national malignancy registry in Pakistan and Afghanistan [3].

Acute lymphoblastic leukemia (ALL) is a heterogeneous group of lymphoid cells malignancy results from multi steps genetic alteration in a single progenitor cell. It is further classified on the bases of immunophenotyping into B-lymphoblastic leukemia and T-lymphoblastic leukemia [4]. Acute Myeloid Leukemia (AML) is a diverse colonel hematological malignancy characterized by lack of differentiation and overgrowth of myeloid blasts lead to bone marrow failure. AML is further classified by French, American and British (FAB) into M0 to M7 subtypes [5]. Chronic myeloid leukemia (CML) is less common childhood leukemia, and rarely few cases of chronic Myelomonocytic leukemia (CMML) and juvenile chronic Myelomonocytic leukemia (JMML) were also reported in children [6,7].

Laboratory diagnosis of childhood leukemia was determined by bone marrow aspiration with trephine biopsy [8]. The exact diagnosis of childhood leukemia was diagnosed through cytogenetic studies, immunohistochemistry, flowcytometry and polymerase chain reaction for responsible gene mutation [9]. These services are commonly not available and high cost effect it makes difficult to patients to do such investigations. This makes bone marrow examination reliable and cheap technique used as standard diagnostic tool for diagnosis of childhood leukemia in poor income countries and middle-income countries [10].

Mehmood T carried out a study on pattern of leukemia patients in Ayub Teaching hospital Abbottabad. Study result revealed that 81% had acute lymphoblastic leukemia, 15% had acute myeloid leukemia and 7% had chronic myeloid leukemia in less than 15 years age group. Mushtaq et al. study result revealed that 87% children had B cell leukemia and 13% had T cell leukemia. Prevalence of different types of childhood leukemia is not yet known in Khyber Paktoonkhwa population as well in Afghanistan population [11].

The aim and designed of the present study is to evaluate the prevalence of different types of childhood leukemia in children from different districts of Khyber Pakhtunkhwa (Pakistan) and Afghanistan presenting to a tertiary care hospital, Hayat Abad Medical complex Peshawar.

## Materials and Methods

The present descriptive cross-sectional study was conducted in the pathology department Hayat Abad Medical Complex, a tertiary care hospital, in Khyber Pakhtunkhwa Peshawar. Duration of the study was, from January 2014 to December 2016. A total number of 605 children were enrolled up to 15 years of age, suspected to have childhood malignancy, went through bone marrow examination. 3 ml of blood was collected in EDTA vacutainer tube (purple top) and peripheral blood smear was prepared, air dried, fixed with methanol and stained with Giemsa's stain. Complete blood count was performed by hematology analyzer (Ruby cell dyne, Abbott, USA). By aseptic techniques in bone marrow room, bone marrow aspiration and bone marrow trephine biopsy samples were collected from all childhood malignancy suspected patients. Bone marrow smear was prepared from bone marrow

aspirates, touch imprint from biopsy. All Bone marrow slides were fixed with methanol and stained with Giemsa's, Myeloperoxidase (MPO) and Periodic acid Schiff stain. Trephine biopsy was sent to histopathology section and after tissue processing, slides were stain with Hematoxyline and Eosin and Reticuline stain. Immune histochemical stains were applied after initially seeing of bone marrow aspirate slides. All data was documented and statistical analysis was performed by SPSS-20 software.

## Results

Among 605 suspected children 281 (46.5%) children were diagnosed with different types of childhood leukemia. Out of 281 diagnosed patients 231 were Pakistanis and rest of the 50 children were Afghani. The studied population consist of 173 (61.6%) males and 108 (38.4) females and with age range from 3 months to 15 years with median age of 9.8 years. The prevalence of childhood leukemia in male children was greater than female children and male to female ratio was 1.6:1. Out of 281 cases, 210 (74.73%) were diagnosed to have acute lymphoblastic leukemia and rest of the children were 62 (22.06%) acute myeloid leukemia, 7 (2.44%) chronic myeloid leukemia, 2 (0.71%) had juvenile chronic Myelomonocytic leukemia (JMML) and 1 (0.35%) child was diagnosed with Chronic Myelomonocytic leukemia (CMML) as shown in **Table 1**.

**Table 1** Prevalence of different types of childhood leukemia in studied population.

Childhood leukemia Types	Diagnosis		Sub Types of leukemia	Diagnosis	
	N	% Age		n	Within % age
ALL	210	74.73	Pre-B ALL	161	76.92
			T-cell ALL	49	23.08
AML	62	22.06	M-0	3	4.83
			M-1	-	-
			M-2	31	50
			M-3	12	19.3
			M-4	5	8.06
			M-5	8	12.9
			M-6	3	4.83
M-7	-	-			
CML	7	2.44			
JCMML	2	0.71			
CMML	1	0.35			
Total	281	100			

Note: ALL: Acute Lymphoblastic Leukemia; AML: Acute Myeloid Leukemia; CML: Chronic Myeloid Leukemia; JCMML: Juvenile Chronic Myelomonocytic Leukemia; CMML: Chronic Myelomonocytic Leukemia, N: Number of Cases

There were no significant differences were seen in prevalence among Afghan children and Khyber Pakhtunkhwa (Pakistan) children except ALL is more frequent in Afghan children comparatively Pakistani children and no single case of CMML were diagnosed in Afghan children.

## Discussion

The present study was conducted to determine the frequency of different types of childhood leukemia in Khyber Pakhtunkhwa and Afghan population. This region located in south central Asia which is most prevalent one area for childhood leukemia in the world. In this region, no previous data or study was available on estimated cases per year of different types of childhood leukemia. In present study, acute lymphoblastic leukemia was found predominant childhood leukemia about 74.3% children suffer from ALL, followed by 22.0% AML, 2.44% CML. Current study result slightly different from the study of Metayer et al. in 2013 that revealed 80% were acute lymphoblastic leukemia, 17% were acute myeloid leukemia and 2% were chronic myeloid leukemia [12].

Sub types of acute lymphoblastic leukemia in current study were 76.92% Pre-B ALL and 23.08% were T-Lymphoblastic leukemia. Present study result was different from Mushtaq et al. study which revealed in 87% children had B cell leukemia and 13% had T cell leukemia. In present study M-2 (50%), M-3 (19.30%) and M-5 (12.9%) were more frequent leukemia were diagnosed in FAB sub types of acute myeloid leukemia and no M-1 and M-7 case reported. Present study result was similar to. Shahab F et al. (2014) study that revealed M-2 and M-3 were more prevalent among AML subtypes. M-4 was most frequent childhood leukemia in Asif et al. study and M-1 was more frequent one in Kakepoto et al. research [10,13,14].

Estimated cases of childhood leukemia in globe were dissimilar in different countries and ethnicity. Central south Asia is most prevalent region where contribute about 21.1% childhood leukemia cases in total world diagnosed childhood leukemia cases, followed by eastern Asia 12.1% and eastern Africa 10.1% of total world cases. This ratio of childhood leukemia is least found in southern Africa (0.5%), Caribbean (0.5%) and Oceania (0.6%) in total world cases. Frequencies of childhood leukemia in another region of globe were in Europe 9.9%, Central America 2.9%, South America 7.3%, Northern western Africa 5.1%, south eastern Asia 9.6% and western Asia [15]. Al-Mutlaq et al. in 2015 study result revealed that 8% childhood cancer accounted in total malignancy cases. Childhood leukemia contribute about 34.1% in childhood malignancy followed by 15.2% lymphoma, 12.4% CNS and 5.2% were renal malignancies [16].

## Conclusion

The present study reveals that all most all types of leukemias are seen in children. Acute lymphoblastic leukemia

is most prevalent leukemia in the children of Khyber Pakhtunkhwa and Afghanistan. Juvenile Chronic Myelomonocytic leukemia and Chronic Myelomonocytic leukemia is the least common type of leukemia in childhood.

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