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Hematological Parameters in Childhood Acute Lymphoblastic Leukemia among Sudanese

May Mohammed Ali[1*], Abu Elgasim Abass Awad Elkareem[2], Mugtaba Ahmed Abdelrazig[3], Elshazali Widaa Ali [4], Hisham N. Altayb[5], Kawthar Abdelgaleil MohammedSalih[6], Osama Ali[7], Eman Abass[8], Babiker Ahmed Mohammed[9]

[1]Head Department of Hematology and immunehematology,
[1,2,3,5,6] College of medical laboratory science, Sudan University of Science and Technology, Khartoum, Sudan
[4]Faculty of medical laboratory sciences, Al Neelain University, Khartoum, Sudan
[7,8]Flowcytometery center**,** Khartoum, Sudan
[9]Faculty of medicine, Karary University, Khartoum, Sudan
Email: Mayhussen1976@gmail.com[1] , Gassomy2@gmail.com[2], Abuhamzah66@gmail.com[3], elshazaliwidaa@gmail.com[4], hishamaltayb@gmail.com[5], Kawthargaleil@yahoo.com[6], Babikjuba54@gmail.com[9]

Abstract: *Acute lymphocytic leukemia (ALL) is white blood cells disorders of lymphoid precursor cells in bone marrow, blood and extramedullary sites; it has two peaks, the childhood peak and the peak above age of forty. The study aimed to determine hematological parameters among Sudanese child patients with ALL. Fifty patients attended flowcytometry laboratory (Khartoum-Sudan), during the period from July 2016 to January 2017 recruited in this study. Venous blood samples were collected from each patient in EDTA blood container and then analyzed by automated hematology analyzer for measurement of hematological parameters and flowcytometer to identify ALL types and subtypes. Data were analyzed by statistical package for social science (SPSS) computer software program. The sex of patients revealed that 36 (72%) males and 14(28%) females (male female ratio was 2.6:1). The patient age ranged from 1 to 11 years, with mean age (5.16). B-ALL represent 45 (90%) of cases while T- ALL represents 5 (10%) of cases. The B- ALL subtypes identified were early pre B- ALL 31cases, pre B- ALL 10 cases, common B- ALL 3cases and Burkitt's type one case; while T- ALL subtype identified was cortical T-cell ALL 5cases. The complete blood count of patients as follows (Mean±SD): TWBCs (69.92±141.206X10^9/L), RBCs (2.80±0.8817X10^{12}/L), PLTs (58.62±62.8171X10^9/L.), Hb (8.08±2.415 g/dl), and blast (73.56 % ±18.11%). This study concluded that ALL was common in males than females. B- ALL was more frequent than T- ALL; among B- ALL subtypes; early B-ALL was the most prevalent, while T- ALL subtype was cortical. Total white blood cells count was significantly higher in patients with T-ALL than B-ALL. Hyperleucocytosis was observed in 14% of patients, 80% of patients were anemic and 88% of patients were thrombocytopenic.*

Keywords — acute lymphoblastic leukemia; immunophenotyping; hematological parameters; Sudanese patients**.**

1. Introduction:

Acute lymphoblastic leukemia (ALL) is the most common cancer diagnosed in children, three quarters of leukemia cases in children being the acute lymphoblastic type [1]. and represents approximately 25% of cancer diagnosed among children younger than 15 years. A sharp peak in ALL incidence is observed among children aged 2 to 3 years (>90 cases per 1 million per year), with rates decreasing to fewer than 30 cases per 1 million by age 8 years. The incidence of ALL among children aged 2 to 3 years is approximately four fold greater than that for infants and is likewise fourfold to five fold greater than that for children aged 10 years and older [2,3].

Flowcytometry has great value in identification and diagnosis of different types and subtypes of leukemia; it becomes the standard goal procedure for ALL diagnosis and sub-classification, it used to differentiate ALL from AML and to classify ALL into types; T-ALL, B-ALL and subtypes, also have prognostic and therapeutic monitoring roles [4]. Complete blood count is initial evaluation and follow-up monitoring tool. Predominantly patients with ALL occur with hematological abnormalities, about 80% of patients are normocytic normochromic anemia, 50% of ALL patients have leukocytosis; despite that some patients have severe neutropenia <500 cell/µl, so they at high risk for serious infections. Thrombocytopenia is very common, affecting 75% of patients [5,6].

2. Material and Methods:

2.1 Study design:

This is cross sectional study

2.2 Study area and study period:

The study was conducted at flowcytometry centre(Khartoum-Sudan) during the period from June 2016 to January 2017.

2.3 Study sample:

Venous blood samples collected in EDTA blood container.

2.4 Sample size:

A total of 50 blood sample from children with ALL**.**

3. Methods:

3.1 Sample analysis:

Venous blood samples were analyzed for complete blood count by automated hematology analyzer (Sysmex KX-21N, Japan) and flowcytometer (EPICS XL-MCL Beckman Coulter flowcytometry, Miami, FL, USA) for phenotyping of ALL. Monoclonal antibodies for B-cell and T –cell markers used (Immunostep-SL, Spain).

3.2 Statistical analysis:

Data were analyzed using statistical package for social science (SPSS), version 21. Qualitative variables were presented as frequency, percentage, and quantitative variables as mean ± SD.

3.3 Ethical considerations:

This study approved by Sudan University of Science and Technology – College of Medical Laboratory Science Research Board. Ethical clearance obtained from the research ethics committee. Informed consent obtained from child parents. Data kept confidentially and only used for the purpose of the study.

4. Results:

Fifty ALL patients were enrolled in this study, the age of patients ranged from one to 11years (5.160±2.673), the predominant age group was 1-5years, which represent 31(62%) of cases while 6 -11years represents 19(38%). The study included 36 (72%) males and 14 (28%) females (male to female ratio 2.6:1). B- ALL type represents 45 (90%) while T- ALL type represents 5 (10%). The B- ALL subtypes were early pre B- ALL 31 (62%), pre B-ALL cell 10 (20%), common B- ALL 3 (6%) and Burkitt's type 1 (2%); while T-ALL subtypes were only cortical T- ALL 5 (10%). (Table 1).

The hematological parameters of ALL patients as follow: TWBCs (69.92 ± 141.206X109/L), RBCs (2.80 ± 0.881X10¹²/L), PLTs (58.62 ± 62.817 X109/L), Hb (8.08 ± 2.415g/dl), and blasts (73.56 ± 18.112%) (Table 2).

Table (1): Age groups, gender, and ALL subtypes among 50 children with acute lymphoblastic leukemia (B-ALL and T-ALL)

Variables		***Frequency***	***Percentage (%)***
Age groups	1___5 years	31	62
	6___11 years	19	38
Gender	Male	36	72
	Female	14	28
B- ALL	Early pre B- ALL	31	62
	Pre B - ALL	10	20
	Common B-ALL	3	6
	Burkitt's type ALL	1	2
T- ALL	Cortical T-ALL	5	10

Table (2): Laboratory characteristics of 50 children with acute lymphoblastic leukemia (B-ALL and T-ALL)

Hematological par	***Over all (n=50)***	***B-ALL (n=45)***	***T-ALL (n=5)***
TWBCsX10^9/L	69.92 ± 141.206	41.11 ± 70.93	329.18 ± 309.12
RBCsX10^{12}/L	2.80 ± 0.881	2.82 ± 0.92	2.67 ± 0.52
PLTsX10^9/L	58.62 ± 62.817	56.07 ± 57.58	81.60 ± 105.54
Hb (g/dl)	8.08 ± 2.415	8.03 ± 2.52	8.60 ± 1.08
Blast (%)	73.56 ± 18.112	72.82 ± 18.13	80.20 ± 18.54

5. Discussion:

This study aimed to determine the immunophenotypic and hematological characteristics of ALL among Sudanese children patients. The age of patients showed that most of them were in the age group between 1 - 5 year (58%), indicating that this age group are more susceptible to disease, this result was agree with other studies that showed peak between 1 and 5 years[7,8,9]. In the present study ratio between males and females was found (2.6:1), this finding was similar to Shahab and Raziq, 2014; Hayakawa et al., 2014; Azevedo et al., 2014[10,11,12].

In the current study, B- ALL was more common (90%) than T-ALL, this finding is agree with Sousa et al 2015 they found that B- ALL was more common (89.5%) than T- ALL [13].

B-ALL subtype early pre B-cell ALL is predominant subtype among Sudanese children, this finding is in consistent with a previous study done in Sudan by Abdulla et al 2016 in B-cell ALL, they found that early pre B-ALL was the most common types, also similar to the finding of Abdelaziz and Alqatary, in Saudia Arabia 2013 , they found the most common subtype was pre-B-cell ALL and for T-cell ALL, cortical T-cell ALL was the most predominant [14], this agree with study done in Sudan by Jadalla et al (2017) who found that the most predominant subtype among the Sudanese patients was cortical T-cell ALL [15].

Regarding hematological parameter of the patients, the total white blood cells showed increased count (hyperleucocytosis) in 14% of patients, this findings consistence Kong et al 2014, they reported that twenty (19.2%) of the children with ALL had initial leukocyte counts of >100×109/L [16].

Also our study revealed that T-ALL had increased TWBCs than B-ALL, and this result is agree with study done in Brazil by Sousa et al (2015), they found that patients with T-cell ALL presented with high total white blood cells count at diagnosis than patients with B-ALL [17].

The Hb of patient showed that 80% of them were less than 10 g/dl, this result is agree with Sultan et al 2016, they reported that Anemia (Hb<10gm/dl) was noted in 33 (64.7%) of patients.

The platelets of patient showed that 88% of them were thrombocytopenic patients (less than 100X109/L), this result is agree with Sultan et al 2016, they reported that Thrombocytopenia (platelets count <100x109/l) was detected in 80.3% of patients[18].

6. Conclusion:

This study concluded that, B- cell ALL is common than T-ALL and males were predominant than females. Early B-ALL was the most predominant subtype among the Sudanese children patients; on the other hand, cortical T-cell was the most frequent of T- ALL subtypes. Total white blood cells count was significantly higher in patients with T- ALL, while hemoglobin concentration was significantly lower in patients with B- ALL. Hyperleucocytosis was found in 14% of patients 80% of patients were anemic and 88% of patients thrombocytopenic.

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