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ORIGINAL ARTICLE

Blood group discrepancies in leukemia children: A cross sectional study.

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ABSTRACT… Objective: To Estimate the frequency of blood group discrepancies among Leukemia Children. **Study Design:** Cross Sectional study. **Setting:** University of Child Health Sciences, The Children Hospital Lahore. **Period:** October to January 2020. **Material & Methods:** This study was conducted among patients in CH and ICH Lahore, regarding ABO blood group discrepancies in leukemic patients, in the year 2019. A total of 200 samples were processed in order to detect ABO blood group discrepancies by tube method of blood grouping, using antisera-A, antisera-B, antisera-D for forward grouping and A-cells, B-cells and O-cells for reverse grouping. Auto-control was also run by reacting patient's cell suspension with the patient's own serum. The collected data were checked for its completeness, consistency and accuracy before analysis. **Results:** In this study, a total of 200 subjects were included out of which 122 (61%) were male patients and 78 (39 %) were female. Most common age group was 6-10 years. ALL 157(78.5%) and AML 43(21.5%). Blood group discrepancy was found in 5 (2.5%) and all were of Group I. **Conclusion:** The study found that leukemia (ALL, AML) results in ABO discrepancies that must be resolved by proper serological workup. Both forward and reverse grouping should be performed to investigate the correct ABO blood group in leukemic patients and accurately matched blood must be transfused to these patients.

Key words: ABO Blood Groups, ABO Discrepancies, Leukemia.

INTRODUCTION

Blood is a complex fluid consisting of the different blood cells like RBCs (erythrocytes), WBCs (leucocytes) and platelets (thrombocytes) suspended in the yellowish liquid called plasma. Blood type is a specific form of reaction to a specific antiserum within a blood group specific system.[1] ABO blood group system is the most significant of all of the available blood group systems in the transfusion practices. The biochemistry of ABO blood group system is composed of A and B carbohydrate H core structure.[2]

Variations in the patient's blood type are one of the primary contributors to the development of a transfusion response. Through careful examination of the blood type, it is possible to prevent differences like this from occurring. ABO discrepancies are mainly divided: Group I, II, III and IV. First group discrepancies are characterized by reactions in reverse grouping due to weakly reacting or missing antibodies. One of the main reasons of this is depressed antibody production.[3] Common people with these discrepancies are: Newborns, Elderly Patients, Patients with Leukemia, Patients using immunosuppressive drugs, ABO subgroups. Group II discrepancies are discrepancies in forward grouping with unexpected reactions due to weak antigens. Rouleaux formation or pseudo agglutination leads to Group III discrepancies due to protein or plasma abnormalities. There are a variety of reasons for the disparities in Group IV, including the existence of cold-reacting antibodies or RBCs from more than one ABO group owing to RBC transfusion or marrow or stem cell transplantation.[4]

The ABO blood group discrepancies have also been frequently observed in patients with malignancies especially hematologic malignancies.[5,6]

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The acute lymphoblastic leukemia is a hematological malignant disease which occurs due to genetic mutations in B-or T-lymphoid progenitor which leads to the altered blast cell proliferation, survival and maturation.

MATERIAL & Methods

This cross sectional study was conducted in Hematology and Transfusion medicine department of University of Child health sciences, The Children hospital Lahore during a time period of six months from October to February 2020. A total of 200 blood and serum samples were collected from pediatric patients with diagnosis of leukemia. The patients suffering from leukemia show blood group discrepancies which were mainly due to the change in the B or H antigens as a result of malignancy.

Diagnosed Children (<15 years) of leukemia admitted in Children Hospital Lahore. Sample size was 200 by Consecutive sampling technique. Self-designed proforma was used to collect data. Blood and serum.1-3 ml of blood sample was drawn in EDTA vials and for serum Gel vials were used. Samples were labelled properly to avoid mislabeling. In forward grouping unknown red cells were tested against antisera. Detecting ABO antibodies in the patient serum by using known reagent RBCs was known as reverse grouping.

Ethical clearance was obtained from the ethical committee of The School of Allied Health Sciences, CH & ICH Lahore (1325/SAHS). The confidentiality was maintained in each level of the response in this study. The data was entered using IBM-SPSS v-25, the continuous variables like age are expressed in the form of mean SD and categorical variables in frequency and proportions. Graphs were used to display the data.

RESULTS

Out of 200 leukemic children, 122 (61%) were male patients and 78 (39%) were female patients. ALL was the most common type of leukaemia in our study, and most of the patients were newly diagnosed cases. B-positive was the most common blood group among all 61 cases. We found blood group discrepancies in 5 out of 10 cases (2.5%). Most patients were transfused multiple times; 143 (71.5%) cases and 57 (28.5%) didn't have transfusion history. Group I discrepancies were resolved further by increasing the incubation period, and they were resolved in four cases.

Age Groups (years)	Frequency (%)
1 to 5 years	47 (23.5%)
6 to 10 years	98 (49%)
11 to 15 years	55 (27.5%)
Total	200 (100%)

Table-I. Showing the details of the age of the patients enrolled. (n: 200)

Diagnosis	Frequency (%)
AML	43 (21.5%)
Pre-B ALL	127 (63.5%)
Pre- T ALL	30 (15%)
Total	200 (100%)

Table-II. Showing the details of the type of leukemia among the patients enrolled. (n: 200)

As shown in the tables, majority of patients enrolled were of the age group 6 to 10 years, but 4 of 5 cases with ABO discrepancies were of age group 1 to 5 years, 2 were male and 3 were female. Analyzing data of type of leukemia showed that all these cases had ALL. Data was later stratified for age, gender, blood group, transfusion history and type of leukemia, and post stratification chi square was applied. Data analysis of Age and type of blood group for frequency of patients having ABO discrepancy, showed these to be statistically significant, (p value less than 0.001).

DISCUSSION

Blood group variations are linked to a variety of cancers, including those of the hematopoietic and non-hematopoietic systems. In solid organ malignancies, blood group discrepancies are caused when the tumor produces an excessive amount of chemicals that belong to the blood group. However, such inconsistencies are quite uncommon, and the literature only contains a very small number of case reports.[7]

Variables		Discrepancy Type Group I		P-Value
		Yes	No	
Diagnosis	ALL	5(3.2%)	152(96.8%)	0.236
	AML	0	43(100%)	
Gender	Male	2(1.6%)	120(98.4%)	0.33
	Female	3(3.8%)	75(96.2%)	
Age group In years	1-5	4(8.5%)	43(91.5%)	0.01
	6-10	1(1.0%)	97(99.0%)	
	11-15	0	5%(1100%)	
Transfusion History	Yes	3(2.1%)	140(97.9%)	0.564
	No	2(3.5%)	55(96.5%)	
Blood Groups	A +ve	0	28(100%)	0.00
	A -ve	0	10(100%)	
	B +ve	2(3.3%)	59(96.7%)	
	B -ve	1(20%)	4(80%)	
	AB + ve	0	8(100%)	
	AB -ve	1(100%)	0	
	O +ve	0	44(100%)	
	O -ve	1(11.1%)	8(88.9%)	

Table-III. Stratification of data of ABO discrepencies for Age, Gender, diagnosis and blood group

The components of the ABO blood group are responsible for neutralizing the commercial antiserum and preventing red cell antigens from binding. After a thorough washing, the inhibiting ingredient is removed from the red cells, which reveals the effect.[8]

ABO discrepancies relate to the situation when results of forward grouping are not in agreement with the results of reverse grouping. In leukemic patients, there is a risk of developing such discrepancies due to leukemia (ALL, AML). In this study an attempt was made to determine that whether leukemia result in ABO discrepancies or not and if the discrepancies occur then which type of discrepancies are common in these patients, so that these discrepancies can be resolved. The ABO discrepancies can be result of problem with patient's red cells or with patient's serum (reverse grouping) or due both. The causes of ABO discrepancies are missing or weak antigens (A or B subgroups), extra antigens, mixed field, missing or weak antibodies (newborns, elderly, immune compromised), extra antibodies (presence of anti-A1).[9]

In our research work, 200 patients with diagnosis of leukemia were included. Among these patients, 122(61%) were male patients and 78(39%) were female patients. This goes in concordance with other study which mentions the same fact that ALL and AML in children is more common in males.[10] Other important thing to focus in our study is that more cases (78.5%) were diagnosed as ALL in childhood. AML cases were lesser i.e., 21.5%. This fact is also being mentioned in several studies that ALL is more common than AML in childhood 2.5 % of patients showed blood group discrepancies. All of them were type I discrepancy. ABO discrepancy in leukemic patients is reported in other studies too like reported by Ting SC, et al. These discrepancies might be due to effect of decrease in antigen expression.[11] However, these discrepancies can be resolved. Khan et al has also reported that increasing the incubation period and lowering the reaction temperature helps to resolve ABO discrepancies.[12]

In an Indian cross sectional Study, Sahu A, et al.[13] reported that 0.12 percent of blood donors had ABO group discrepancies. Approximately twelve thousand blood donors were enlisted in the trial and their information was analyzed to identify any blood group discrepancies. There were 15 ABO inconsistencies identified (0.12 percent). Disparities were classified as type I (40 percent), type II (6.7%), type III (0%), and type IV (53.3 percent). Anti-M and anti-Leb antibodies were

found in three individuals in the study population. Similalry, Kaur G, et al reported twenty-eight blood group discrepancies in around fifty thousand blood grouping tests, thus giving an overall frequency of 0.06%.[14]

To reduce the risk of a transfusion reaction, any discrepancies in the ABO typing of the blood donor must be rectified before reporting the ABO blood group. For determining an individual's ABO group, both cell and serum grouping are critical.

LIMITATIONS

Due to limitation of time and resources, the study is not conducted at broad level. Further investigations should be done to detect and minimize ABO discrepancies.

CONCLUSION

The study found that leukemia (ALL, AML) results in ABO discrepancies that must be resolved by proper serological workup. Both forward and reverse grouping should be performed to investigate the correct ABO blood group in leukemic patients and accurately matched blood must be transfused to these patients.

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