

Relationship between ABO and Rh Blood Groups with Childhood Acute Lymphoblastic Leukemia

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Abstract

Background: Despite their obvious clinical importance, the physiological functions of ABO blood group antigens remain a mystery. An association between blood type and cancer was initially suggested through the observation that stomach cancer patients were more likely to have blood type A than control subjects. A variety of other cancers have since been linked to ABO blood group but the associations generally have been inconsistent.

Aims of the study: To identify any association between blood grouping and Rh type with Childhood Acute Lymphoblastic Leukemia (ALL) and the outcome of disease.

Patients and methods: This is a hospital based retrospective study conducted between August 15th and November 8th, 2016; in which 340 patients' records, whom were below the age of 14 years with newly diagnosed ALL were treated and followed at the oncology unit of Children Welfare Teaching Hospital (CWTH), were reviewed. A chart review was performed to determine age, gender, residence, date of diagnosis and Blood group type. The patients were followed till the end of 2015 to find any association between blood grouping and the outcome of treatment.

Results: In this study, 338 patients were 14 years or younger. The median age was 4.9 years (range 29 days to 14 years), 184 (54.4%) males & 154 (45.5%) females forming Male: Female ratio of 1.2:1. The total number of cases diagnosed were 117 (34.6%) during 2011, followed by 116 (34.3%) during followed by 105 (31.0%) during 2012. The distribution of blood grouping type for those patients showed that "O" positive blood group was the most common detected group in 125 (36.9%) patients, followed by "B" positive in 83 (24.5%), "A" positive in 79 (23.3%) and "AB" positive in 31 (9.1%). Analysis of the distribution of blood groups according to the fate of those patients showed no statistical significance.

Conclusion: There is no statistically significant association between ABO blood group type and different independent variables with Childhood acute lymphoblastic leukemia.

Recommendation: ABO blood groups are still fruitful research strategy in understanding the etiology of hematological malignancies, especially if they are evaluated in the ground of recent molecular typing of such genetic polymorphism.

Keywords: Childhood Acute Lymphoblastic Leukemia, ABO and Rh blood groups.

I. Introduction

Acute Lymphoblastic Leukemia (ALL) is the most common childhood malignancy in most parts of the world (1). The etiology of childhood leukemia is unknown and is probably multifactorial. Genetics and environmental factors play roles (2). The relationship between the epidemiological determinants such as gender, race, geographic location and various hematological malignancies are well known. However, the association between blood groups and these malignancies are not well established. If the risk of these malignancies is known, for the different ABO blood groups, then it could be used as an epidemiological marker to identify the high-risk population.

Several well-known association exist between ABO blood groups and certain diseases. For example; gastric carcinoma is found to occur in mostly persons with A blood group whereas duodenal ulcers are found to occur more commonly among persons with O blood group. (3,4)

The studies also suggested that ABO blood groups could be served as an epidemiological marker or a primary screening aid to identify populations at high-risk for certain hematological malignancies. (5) Subjects with blood groups A, B, or AB have a higher risk of venous thromboembolic disease than those of blood group O, probably related to the effect of the ABO system on levels of von Willebrand factor and factor VIII. (6,7)

II. Aims Of The Study

The aim of this study was to identify any association between blood grouping and Rh type with Childhood Acute Lymphoblastic Leukemia and its outcome.

III. Patients And Methods

This is a hospital based retrospective study conducted between August 15th and November 8th, 2016; in which 340 patients' records, whom were below the age of 14 years with newly diagnosed ALL treated and followed at the oncology unit of Children Welfare Teaching Hospital (CWTH) during the period from January 1st, 2010 to December 31st, 2012 were reviewed. For these patients, a chart review was performed to determine age, gender, residence, date of diagnosis and Blood group type. Another source of information was the medical recording system that was kept in the archives of the consultation clinic. The total duration of observation extended to December 31st 2015 (a minimum of 3 years post starting treatment). In all patients, the diagnosis of ALL was established by bone marrow aspirate (when it contained at least 25% lymphoblasts). Two patients were excluded from the analysis as their blood groups were not documented in the archives of the oncology unit. Patient data were tabulated and processed using SPSS (Statistical package for the social sciences) V.20 for mac. Qualitative data are expressed as frequency and percentage, quantitative data as median. Chi-square test was used to identify the associations between the blood group and the studied independent variables. P-values equal or less than 0.05 were considered significant (8).

IV. Results

The retrospective analysis identified 340 patients that met the diagnosis of ALL who were 14 years or younger. The analysis of results was limited to 338 patients after excluding 2 patients to fulfill the aim of the study. The median age was 4.9 years (range 29 days to 14 years), 184 (54.4%) males & 154 (45.5%) females forming Male: Female ratio of 1.2:1. The total number of cases diagnosed was 117 during 2011, followed by 116 during 2010 followed by 105 during 2012. (Table 1) Most of the patients in the study were from Baghdad 133 (39.3%) patients, followed by Babil 40 (11.8%), Diala 28 (8.3%), Karbala 28 (8.3%) and Qadisiya 23 (6.8%) as shown in (Table 2). Table (3) describes the distribution of blood groups including Rh type among those patients, it had shown that 'O' positive group was the main blood group in studied patients in 125 (36.9%), followed by 'B' positive, 'A' positive and 'AB' positive in 83 (24.5%), 79 (23.3%), and 31 (9.1%) respectively.

Applying Chi-square test to find any possible significant association between blood groups and gender or the survival status by the end of December 2015 had not shown any statistical significance, all P-values for the above mentioned independent variables were more than 0.05. (Table 4). Analysis of the distribution of blood groups according to the fate of those patients showed no statistical significance. Eleven patients were excluded from this analysis because they were either lost during follow up or their parents chose to be treated in another center. (Table 5)

Table 1: Demographic & Clinical Data of 338 ALL patients at the CWTH from 2010-2012:

Datum	Frequency	Percent
Overall	338	100
Age (years)		
1-4.9	172	51
5-9.9	112	33
10-14	54	16
Sex		
Males	184	54
Females	154	46
Year of diagnosis		
2010	116	34
2011	117	35
2012	105	31

Table 2: Referral Pattern of 338 children (Age 0 to 14 years) treated at the CWTH from 2010-2012:

Governorate	Frequency	Percent
Baghdad	133	39.3
Babil	40	11.8
Diala	28	8.3
Karbala	28	8.3
Qadisiya	23	6.8
Najaf	22	6.5
Wasit	20	5.9
Anbar	17	5.0
Thi Qar	11	3.3
Muthanna	6	1.8
Salah Aldeen	5	1.5
Meesan	3	0.9
Kirkuk	2	0.6
Total	338	100.0

Table 3: Distribution of blood groups with Rh type in 338 ALL patients at CWTH from 2010-2012:

Blood group	Frequency	Percent
O positive	125	36.9
B positive	83	24.5
A positive	79	23.3
AB positive	31	9.1
O negative	12	3.5
A negative	4	1.1
B negative	4	1.1
AB negative	0	0
Total	338	100.0

Table 4: Distribution of blood groups in 338 ALL patients at the CWTH from 2010-2012 according to gender:

Gender	A	B	AB	O	Total
Female	3925.3%	4831.2%	138.4%	5435.1%	154100%
Male	4423.9%	3921.2%	189.8%	8345.1%	184100%
Total	8324.6%	8725.7%	319.2%	13740.5%	338 100%

P value: 0.1

Table 5: Distribution of blood groups in 338 ALL patients at the CWTH from 2010-2012 according to survival:

Blood group	Alive	Died	Total
A	47 58.03%	3441.97%	81100%
B	49 58.3%	3541.7%	84 100%
AB	22 71 %	929 %	31100%
O	79 60.3%	52 39.7%	131 100%
Total	19760.2%	130 39.8%	327*100%

P value: 0.3

*** 11 were excluded because of either being lost or treated in other centers**

V. Discussion

The purpose of this study was to show any significant association between blood grouping and the other independent variables for children with acute lymphoblastic leukemia treated in Children Welfare Teaching Hospital. Male to Female ratio was almost equal which is comparable to the previous study in the same center and other developed nations. (9) This probably reflects the same care of the female child in our society rather than sex bias. In the Indian study by Kulkarni (10) in North India, parents often seek medical advice and treatment preferentially for male siblings, they observed a definite bias towards males with a ratio of 3.2:1. Literatures mentioned that the peak incidence of ALL occurs between two and five years of age (11,12), and this goes in agreement with the current study which showed that (50.8%) of patients were below 5 years of age. The total number of new cases per year was convergent for the three studied years. The main bulk of cases were from Baghdad and other nearby governorates, the patients from distant governorates were treated in other centers.

The antigens of the ABO system were the first human genetic markers known (13,14). Many other studies have published inconsistent results on the distribution of blood types in different disease (15). There are some reports mentioned probable association between ABO blood groups and ALL, yet many of them showed non-conclusive results. One study was conducted in Iran, showed although there was not any association between ABO and Rh blood groups and acute leukemia but probably females with "B" blood group are more susceptible toward ALL. (16)

In the current study, blood group "O" stands firstly among the most common blood groups in the studied patients and this was slightly higher than the recorded frequency in the general population (17), but still it was the major blood group among the study sample. Both frequencies (in patients and general population) were comparable for other blood groups (A, B and AB).

A previous study carried out in Iraq for the Distribution of ABO blood groups in Iraqi samples of leukemia patients where "O" type of blood group was the main blood group followed by "A", "B" and "AB". This figure was slightly different from the current study where type "B" group stood second to type "O" in frequency but still comparable to "A" in both studies (29.5% for "A" followed by 26.3% for "B" in Ali study while 24.5% for "A" and 25.7% for "B" in the current analysis). (18)

The same results came out for the distribution of blood groups along with Rh type; "O" positive type was the main recorded type among ALL patients and also among the general population and "AB" negative was the least recorded type. (17)

Another study was done by MelihaSakić to indicate the distribution of ABO groups in children with leukemia in the Federation of Bosnia and Herzegovina. The result however, showed an equal percentage of distribution of both A and O blood groups among the children with ALL. (19)

Further analysis of blood groups in relation to the referral pattern showed predominance of the type “O” among all governorates except for Džepčar were both “A” and “O” groups were found in the same number (7 patients), though statistically not significant (P value 0.6). Analysis of blood groups in correlation with the year of diagnosis, gender and fate of patients showed no statistical significance (P values were more than 0.05).

VI. Conclusions

There is no statically significant association between ABO blood group type and different independent variables with Pediatric ALL. No relationship was found between ABO blood group and the survival of children with ALL.

VII. Recommendation

ABO blood groups are still fruitful research strategy in understanding the etiology of hematological malignancies, especially if they are evaluated in the ground of recent molecular typing of such genetic polymorphism.

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