

ABO and Rh blood groups frequency in men, women and neonates in Diyarbakir province

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Abstract

Aim: In this study, our objective was to determine the distribution of the blood groups among females, males, and neonates along with the overall analysis of Rh and ABO blood group systems in Diyarbakir region and contribute particularly to the blood group database for neonates, as there is no other study focused on the blood groups in neonates in particular.

Material and Methods: The data of 127,091 patients, who had applied for the determination of their blood groups or were hospitalized and needed the determination of their blood groups between January 2016 and July 2019, were analyzed in this retrospective study.

Results: In our study, the distribution of subgroups of the ABO system without considering the Rh system was as follows: 39.69% A, 33.62% O, 18.63% B, and 8.06% AB. The same rates were 36.79% A, 34.6% O, 20.77% B, and 7.84% AB among neonates. The comparison of the general population (females and males) with the neonates showed that group A was 3 percent lower and group B was 2 percent higher among neonates. We believe our study is important, as it is the only single-center study focused on three groups (females, males, and neonates) and conducted in the Research and Training Hospital in Diyarbakir.

Conclusion: We believe that the differentiation in the distribution of ABO blood subgroups among neonates will also contribute to the literature as an important finding, which may depend on the social events like the increased number of Syrian refugees and domestic migrations.

Keywords: ABO and Rh (D) blood groups; Diyarbakir; Frequency; Neonates

INTRODUCTION

The research on blood groups was initiated by Landois in 1875 (1). In 1937, Wiener and Landsteiner immunized rabbits with the erythrocytes of *Macacus Rhesus* monkeys and they identified the Rh factor in the serum of the immunized rabbits, which agglutinated 85% of human erythrocytes (1). Until today, about 36 blood group systems (ABO, MNS, P1PK, Rhesus, Lutheran, Kell, Lewis, Duffy, Kidd being in the first place) were defined by the International Society of Blood Transfusion (2). However, Rh and ABO are the most important blood group systems used in current clinical practice. In the ABO blood group system, blood groups are divided into 4 subgroups as A, B, AB and O. As D antigen is the most potent antigen in the Rh system, erythrocytes that do not agglutinate with anti-D are called "Rh-negative" and erythrocytes that agglutinate with anti-D are called "Rh-positive". The rate of Rh D-positivity is changing between 85% and 90% (3). The compatibility tests performed before the transfusion

are related to the success of the transfusion during the clinical practice. The most important compatibility tests carried out before the transfusions are the cross-matching test and the determination of the Rh and ABO groups of donor and recipient erythrocytes. Besides certain exceptions, the general rule in the transfusion of blood and blood derivatives is the compatibility between the Rh and ABO groups of the donors and the recipients.

The distribution of the blood groups may vary in different geographic regions (4). The determination of these differences among the population is important because of their role in patient care and blood transfusions. Therefore, in this study, our objective was to determine the distribution of the blood groups among females, males, and neonates along with the overall analysis of Rh and ABO blood group systems in Diyarbakir region and contribute particularly to the blood group database for neonates, as there is no other study focused on the blood groups in neonates in particular.

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MATERIAL and METHODS

The data of 127,091 patients, who had applied for the determination of their blood groups or were hospitalized and needed the determination of their blood groups between January 2016 and July 2019, were analyzed in this retrospective study. The Rh and ABO blood groups of the subjects were determined with slide agglutination, tube agglutination, or gel centrifugation methods.

Our study was approved by the Ethics Committee of Clinical Trials at the Gazi Yaşargil Training and Research Hospital (04.07.2019; No: 321).

Statistical analysis

The distribution analysis of the blood groups was done with descriptive statistical methods. Bar graphics and proportions were used for the demonstration.

RESULTS

We investigated a total of 127,091 patients and found out that 44,870 of them (35.30%) were A Rh(+), 37,712 (29.68%) were O Rh(+), 20,819 (16.38%) were B Rh(+), 8,989 (7.07%) were AB Rh(+), 5,579 (4.39%) were A Rh(-), 5,016 (3.95%) were O Rh(-), 2,859 (2.25%) were B Rh(-) and 1247 (0.98%) were AB Rh(-) (Figure 1).

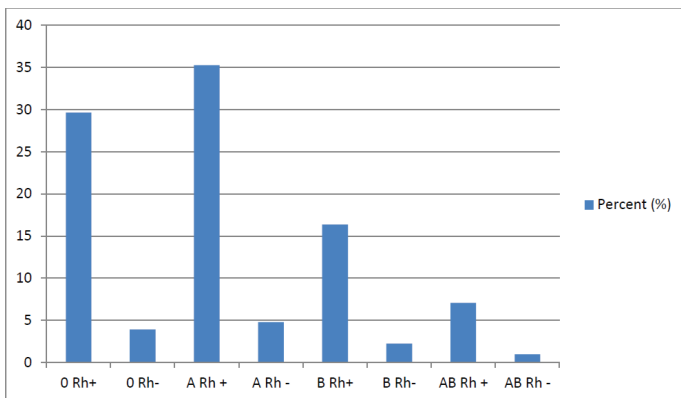


Figure 1. The distribution of the ABO and Rh blood groups in all applicants

112,390 of the applicants were Rh-positive (88.44%) and 1,471 were Rh-negative (11.56%) (Figure 2).

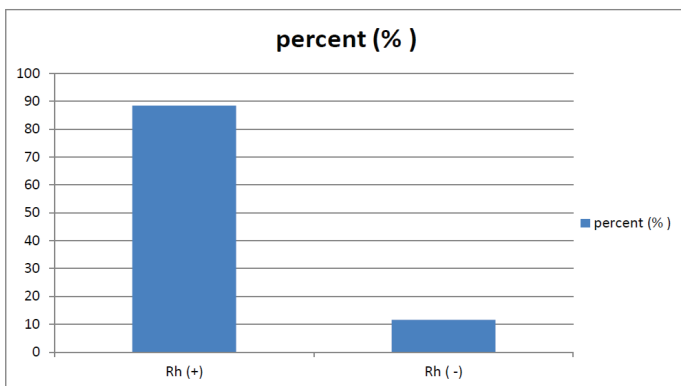


Figure 2. The distribution of Rh positivity and negativity in all applicants

16.98% of applicants were males and 83.02% were females.

Regarding the male applicants; 35.85% were A Rh(+), 29.37% were O Rh(+), 16.30% were B Rh(+), 7.02% were AB Rh(+), 4.31% were A Rh(-), 3.58% were O Rh(-), 2.15% were B Rh(-), and 0.95% were AB Rh(-). 88.58% and 11.42% of males were Rh-positive and Rh-negative respectively (Table 1).

Regarding the female applicants; 35.19% were A Rh(+), 29.73% were O Rh(+), 16.39% were B Rh(+), 7.08% were AB Rh(+), 4.74% were A Rh(-), 4.02% were O Rh(-), 2.26% B Rh(-), and 0.98% AB Rh(-). 88% and 12% of females were Rh-positive and Rh-negative respectively (Table 1).

Regarding the neonates; 32.42% were A Rh(+), 31.51% O Rh(+), 17.85% were B Rh(+), 6.55% were AB Rh(+), 4.37% were A Rh(-), 3.09% were O Rh(-), 2.91% were B Rh(-), and 1.27% AB Rh(-). 88.34% and 11.65% of the neonates were Rh-positive and Rh-negative respectively (Table 1).

Blood Group Rates	Males	Females	Neonates
A Rh (+)	35.85%	35.19%	32.42%
B Rh (+)	16.30%	16.39%	17.85%
O Rh (+)	29.37%	29.73%	31.51%
AB Rh(+)	7.02%	7.08%	6.55%
A Rh(-)	4.31%	4.74%	4.37%
B Rh(-)	2.15%	2.26%	2.91%
O Rh(-)	3.58%	4.02%	3.09%
AB Rh(-)	0.95%	0.98%	1.27%
Rh (+)	88.58%	88%	88.34%
Rh (-)	11.42%	12%	11.66%

DISCUSSION

The determination of the blood groups can be done with different serological tests like hemagglutination, Polymerase chain reaction (PCR), Enzyme Immunoassay (EIA), and Radioimmunoassay (RIA). However, almost all health centers are preferring hemagglutination, as it is easy-to-use and provides relatively more rapid results. In our hospital, we determined the blood groups with hemagglutination (tube method).

16.98% and 83.02% of the participants were males and females respectively. The high rate of females (83.02%) might depend on the requirement of the blood group determination in pregnant women before the delivery in our city, which has a very high birth rate.

In our study, the most common blood group was A Rh (+) and the least common blood group was AB Rh (-). Although the blood group distribution was similar among females and males, it exhibited some differences among neonates.

In our study, the distribution of subgroups of the ABO system without considering the Rh system was as follows: 39.68% A, 33.61% O, 18.62% B, and 8.05% AB. The same rates were 36.79% A, 34.6% O, 20.76% B, and 7.82% AB among neonates.

The comparison of the general population (females and males) with the neonates showed that group A was 3 percent lower and group B was 2 percent higher among neonates. We believe that these differences depend on the Syrian refugees and domestic migration.

In the report published by Kızılay (Turkish Red Crescent) about the distribution of blood groups among the blood donors between 2005 and 2012, the rates of the blood groups were as follows: A (42%), O (34%), B (16%), and AB (8.0%) (5). The results of this study, which comprises the general population in Turkey, were consistent with our results except for the minor differences in the blood groups A and B. In our study, the rate of blood group A was 2 percent lower and the rate of blood group B was 2 percent higher than the average of Turkey.

In our city, a similar study was conducted in 1991 and the distribution of the blood groups A, O, B and AB was as follows: 41.51%, 33.36%, 17.69%, 7.44% , and 87.77% respectively(6). The rate of Rh positivity was 87.77% (6). In 2006, another study was conducted in our city and the incidences of blood groups A, O, B and AB were 40.81%, 33.66%, 18.53%, and 6.98% respectively (7) . These two studies demonstrated that the incidence of blood group A has a downward tendency, while group B has on the contrary an upward tendency. The comparison of the results of the study conducted in 2006 and our study, which was conducted 13 years later, showed that group A had decreased by 1% and AB has increased by 1% during this period. We believe that these differences depend on the changes in the gene pool as a result of migrations and the decrease in consanguineous marriages. Our results related to the difference between the neonates and general population seemed to confirm this suggestion.

We also determined that the rate of Rh-positivity in our study was comparable with the same rate across Turkey (88%).

The investigation of the blood group profiles throughout Turkey revealed that the highest and lowest rates of group A were in Edirne and Şanlıurfa respectively. The rate of group O was highest in Rize and lowest in Van (Table II). The rate of group A in Şanlıurfa is lower than the average rate of Turkey, while the rate of group B is much higher than the average rate of Turkey (8). The rate of group A is higher in the western cities of our country, while it is lower in the cities of the Southeastern Anatolia (9). We believe that these differences between the geographical regions depend on the migrations and the ethnic structures of these regions. The blood group studies conducted in the last 20 years in different cities and regions of our country were summarized in Table II.

Table 2. The distribution of blood groups in certain cities in our country

Name of Cities	Reference	A (%)	O (%)	B (%)	AB(%)	Rh+(%)	Rh-(%)
Istanbul	(10)	43.82	33.79	15.21	7.16	87.31	12.69
Istanbul	(11)	43.44	33.02	15.00	8.54	85.95	14.05
Sakarya	(12)	44.3	35.7	12.5	7.5	84.9	15.1
Diyarbakir	(7)	40.81	33.66	18.53	6.98	89.17	10.82
Cukurova	(13)	38.9	37.10	17.00	6.90	89.90	10.10
Sanliurfa	(8)	36.38	34.69	21.25	7.68	90.79	9.21
Rize	(14)	44.07	44.07	9.26	2.60	83.70	16.30
Van	(15)	43.80	30.80	16.20	9.20	86.80	13.20
Denizli	(16)	42.60	33.30	16.80	7.40	89.90	10.10
Kayseri	(17)	44.00	33.30	16.20	6.50	88.20	11.80
Yozgat	(18)	44.30	31.70	15.90	8.10	88.00	12.00
Edirne	(19)	30.93	46.55	15.99	6.53	87.79	12.21

The distribution of the ABO blood subgroups may vary due to the ethnical identities (20,21). However, migrations occurring for centuries and other social movements worldwide led to a partially homogeneous distribution of ABO subgroups.

Although there are minor differences between the regions of our country, the blood group distribution in other countries exhibits significant differences as a result of the ethnical characteristics. For example, group B is more common in India, while group O is more common in America and Europe (Table III).

The rate of the Rh-positivity among the Caucasian population is approximately 85%, which is consistent with our results, while the same rate is almost 100% among African Blacks (20,31). The results of the studies on blood groups conducted in some other countries were also summarized in Table III.

Table 3. The results of the studies on blood groups in some other countries

Country	Reference	O	A	B	AB	Rh+(%)	Rh-(%)
USA-White	(4)	45.0	36.90	13,0	5.1		
USA-Black	(4)	49.30	37.2	20.0	3.5		
Germany	(22)	41	41	11	5	85	15
India	(23)	32.37	21.91	36.51	9.19	94	
Britain	(24)	46.63	41.78	8.56	3.04	83	17
Iranian	(25)	34.49	32.09	23.68	7.74	90.71	9.29
Lao	(26)	37.72	19.83	35.56	6.9		
Nigeria	(27)	53.3	25.3	16.7	2.7	94	
Burkina Faso	(28)	43.30	22.54	28.56	5.60	92.24	7.76
Tanzania	(29)	52.3	25.7	18.72	3.18	98	2
Ethiopia	(30)	38.09	25.39	23.80	12.69		

CONCLUSION

We believe our study is important, as it is the only single-center study focused on three groups (females, males, and neonates) and conducted in the Research and Training Hospital in Diyarbakır. Our results showed that the rates of group A and group O were higher than group AB and group B, which were consistent with the results of other studies conducted in our country. We believe that the differentiation in the distribution of ABO blood subgroups among neonates will also contribute to the literature as an important finding, which may depend on the social events like the increased number of Syrian refugees and domestic migrations.

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