

Blood group distribution of donors and patients admitted to the Blood and Transfusion Center of Cumhuriyet University Hospital

Cumhuriyet Üniversitesi Sağlık Hizmetleri Uygulama ve Araştırma Hastanesi Kan/Tranfüzyon Merkezi'ne başvuran donörlerin/hastaların kan grubu dağılımı

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SUMMARY

Objective: Blood group is a classification of human blood based on the antigenic types on the surface of red blood cells (erythrocytes). ABO and Rh blood group systems are widely used in our country and in the world. We aim to determine distribution of the ABO and Rh blood groups in our region using the results of blood group tests studied by the blood/transfusion center of Cumhuriyet University Hospital in our study.

Method: The blood groups of 99.207 subjects were examined based on data obtained blood/transfusion center admitted to the in our hospital between January 2009 and December 2013 in a five-year period as retrospectively. The blood groups was determined using tube agglutination method, microcolon method and microplate automatic blood group method in EDTA-containing blood samples and the weak D was studied in subjects with Rh factor negative. Subjects are evaluated only once for blood group during the study period. Repeated examples belong to the same individuals were excluded from the study.

Results: The rates of the blood groups were determined as 43.8% A, 31.8% O, 16.4% B and 8.0% AB according to the results of our region in the study period. In addition, 87% of subjects was Rh positive and 13% was Rh negative. Most common blood group was A Rh positive (37.9%) while the least common type was AB Rh negative (1%) in our region.

Conclusion: Blood is vital for the human body. Blood groups may vary between regions. Therefore, regional data must be determined and to be updated with specific time intervals. Distribution of blood groups in our blood/transfusion center is compatible with distribution of blood groups in Turkey. In addition, statistics of blood group distribution should be reviewed and critical level of blood group stock should be determined by the authorities of blood/transfusion center.

Keywords: ABO blood group system, Rh factor, Sivas.

ÖZET

Amaç: Kan grupları, kanda bulunan kırmızı kan hücrelerinin (eritrositlerin) üzerinde bulunan antijen çeşitlerine göre yapılan bir sınıflama sistemidir. Ülkemizde ve dünyada yaygın olarak kullanılmakta olan kan grubu sistemleri, ABO ve Rh sistemleridir. Çalışmamızda Cumhuriyet Üniversitesi Sağlık Hizmetleri Uygulama ve Araştırma Hastanesi Kan merkezi/transfüzyon merkezinde çalışılan kan grubu testlerinin sonuçlarından faydalanılarak bölgemizdeki ABO ve Rh

kan gruplarının dağılımını belirlemeyi amaçladık.

Yöntem: Çalışmamızda Ocak 2009 ile Aralık 2013 tarihleri arasındaki beş yıllık dönemde merkezimize başvuran 99207 kişinin kan grupları Kan merkezi/transfüzyon merkezi verilerinden geriye dönük olarak incelenmiştir. Kan grubu tayini EDTA'lı kan örneklerinde tüp aglütinasyon yöntemi, mikrokolon yöntemi ve mikropak otomatik kan grubu cihazıyla yapılmış ve Rh faktörü negatif olanlara zayıf D çalışılmıştır. Çalışma süresi içerisinde merkezimizde kan grupları tespit edilen kişiler bir defa değerlendirilmiş olup, aynı bireylere ait tekrarlanan örnekler çalışma dışı tutulmuştur.

Bulgular: Araştırılan süre içinde bölgemizde elde ettiğimiz sonuçlara göre kan gruplarının; %43,8'inin A, %31,8'inin O, %16,4'ünün B ve %8,0'ünün AB olduğu belirlenmiştir. Ayrıca kişilerin %87'sinin Rh pozitif, %13'ünün ise Rh negatif olduğu tespit edilmiştir. Çalışmamızdan elde edilen verilerde bölgemizde en sık bulunan kan grubunun A Rh pozitif (%37,9), en az bulunan kan grubunun ise AB Rh negatif (%1) olduğu tespit edilmiştir.

Sonuç: Kan insan için hayati öneme sahip olan bir sıvıdır. Kan grupları bölgeler arasında farklılıklar gösterebilmektedir. Yapılacak çalışmalar ile bölgesel verilerin ortaya konulması ve belirli zaman aralıkları ile güncellenmesi gerekmektedir. Merkezimizde saptanan kan grubu dağılımı Türkiye ortalamalarıyla paralellik göstermektedir. Ayrıca kan merkezlerinin buldukları illerdeki kan grubu dağılımlarını gözden geçirerek kritik stok kan seviyeleri belirlemelerinin faydalı olacağını düşünmekteyiz.

Anahtar sözcükler: AB0 kan grubu sistemi, Rh faktörü, Sivas

INTRODUCTION

Blood has been mysterious and mesmerizing for humans since ancient times¹⁻⁴. According to the Roman and Greek sources, it was used for the treatment of epilepsy for the first time in 160-200 A.D. Ibn al-Nafis defined the microcirculation in 1260, the blood circulation was discovered and the earliest known blood transfusion trials were begun by the English Doctor William Harvey in 1628, and the first transfusion between people was carried out by James Bundell in 1818^{3,5-7}. As of 1900, firstly the blood groups (AB0) then the Rh factor were discovered by the Austrian doctor Karl Landsteiner⁸⁻¹⁵.

Blood is a biological material, which circulates in the vessel system, consists of erythrocyte, leucocyte, thrombocyte cells and plasma, perfuses the organs, can't be obtained artificially and the source of which is the human^{1,2,10,11,15-17}.

Blood groups are the classification systems that are formed considering the antibodies within the blood^{1,2,18-20}. The blood group systems widely used in our country and the world are AB0 and Rh systems. According to the AB0 group system, the blood groups are classified as A, B, AB and O groups and to the Rh system, as Rh D Positive (+) and Rh D Negative (-). Blood groups are determined as per the antigens on the surface of erythrocytes and the antibodies

in the plasma. There are many antigens on the surface of the erythrocytes. A and B antigens are stronger. The A group has type A antigen, the B group has type B antigen and the AB group has both type A and B antigens. And there are no antigens on the surface of the erythrocytes in the O group^{1,2,5,9,12,13,18-21}.

The Rh factor is an antigen in the outer cell membrane of the erythrocytes. It was seen that the anti-serum, which had been obtained by the transfusion of the blood taken from Macacus Rhesus monkeys into rabbits, agglutinated the human serums. This antigen was named as the Rh antigen as dedicated to Rhesus monkeys. The existence of type D antigen of the Rh factor in blood is named as Rh positive (+) and the nonexistence as Rh negative (-) blood^{5,10,18}.

Blood can be life-saving for the individuals who lose blood after accidents, injuries and operations, patients who receive treatment for diseases such as hemophilia, leucemia and aplastic anemia and cancer, and pregnant women²²⁻²⁴. Blood transfusion is an indispensable part of medical treatments¹⁶. Determination of the blood groups is the first stage of the blood transfusion. Again, determination of the blood groups is very important in situations such as genetic and anthropological studies, judicial cases and Rh incompatibilities. Distribution of the blood groups may differ with regard to

different geographical regions²⁵. In our study, we aimed at determining the distributions of ABO and Rh blood groups and making contributions to the literature in this sense.

MATERIAL AND METHODS

The blood groups of 99207 people, who applied to the blood/transfusion center of Cumhuriyet University, Health Services Application and Research Hospital between January 01, 2009 and December 31, 2013, were examined retrospectively by using the data of our center. People, whose blood groups were determined in our center within the study period, were evaluated once and the repeated samples of the same individuals were excluded from the study. Blood group assignments were carried out with the tube agglutination, microcolumn and microplate methods and the weak D test was applied to the Rh negative ones. The tube agglutination method in blood samples with EDTA.

The blood samples were put into the tubes with anticoagulants. One drop from each of anti-A, anti-B and anti-D was dripped into three clean and labeled glass tubes. One drop was added into each test tube from the erythrocyte suspension in 2-5% physiological saline. The tubes were gently mixed and centrifuged. The agglutination existence was assessed as positive.

In this method, 5% erythrocyte suspension was prepared and 10 µl was added into the board wells (Ortho Clinical Diagnostic, USA). The evaluations were made through the implementation of the test as per the study procedures of the manufacturer.

Cellbind (the Netherlands) test kits were used in the Emotype (Italy) device for this study. The examinations were carried out as per the study procedures of the manufacturer.

The Weak D Test

Some erythrocytes carry a D antigen, which is too weak to be directly agglutinated by many anti-Ds. This weakness of the D antigen can be defined most clearly with the indirect antiglobulin test (IAT)

after the incubation of the test erythrocyte with the anti-D. This test is based on the principle of the incubation of test erythrocytes with the anti-D at the indirect antiglobulin phase²⁶. One drop of anti-D was dripped into a clean tube marked for this process. One drop of 2-5% erythrocyte suspension was added on it. The tubes were slightly mixed and incubated at 37 °C for 15-30 minutes. The tubes were centrifuged and checked for whether agglutination occurred. The tests were assessed with a control tube. Agglutination was evaluated as positive in the test tube, negative in the control tube and the test result as Rh (D) positive. The samples with negative test results were washed 3-4 times with physiological saline. The tubes were slightly mixed and centrifuged after the addition of antiglobulin into the test tube as per the suggestion of the manufacturer. At the end of the process, the test was reported as positive in case of the agglutination existence in the tube and negative if not so²⁶. This study was conducted by the decision of the Ethics Committee, Cumhuriyet University.

RESULTS

In our study, the blood groups of 99207 people, who applied to our center, were separately examined as per the years between the dates stated, and no important difference was observed between the years in terms of blood groups distribution. According to the five-year average results that we assessed during our study, A Rh (+) was determined as 37.9%, A Rh (-) as 5.9%, B Rh (+) as 14.4%, B Rh (-) as 2.0%, AB Rh (+) as 7.0%, AB Rh (-) as 1.0%, O Rh (+) as 27.7% and O Rh (-) as 4.1%. The distribution of the blood groups within years is given in Table 1.

Table 1: Distribution of blood groups by year.

Blood group		2009	2010	2011	2012	2013	Total
A Rh (+)	n	6893	8531	8580	8544	4967	37.515
	%	38.0	38.2	38.3	37.5	36.4	37.9
A Rh (-) %	n	1064	1258	1352	1322	814	5.810
	%	5.9	5.7	6.0	5.8	6.0	5.9
B Rh (+) %	n	2583	3131	3079	3377	2118	14.288
	%	14.3	14.1	13.8	14.8	15.6	14.4
B Rh (-) %	n	369	457	423	507	267	2.023
	%	2.0	2.1	1.9	2.2	2.0	2.0
AB Rh (+)	n	1157	1529	1622	1546	1100	6.954
	%	6.3	6.9	7.2	6.8	8.0	7.0
AB Rh (-) %	n	173	263	217	211	166	1.030
	%	0.9	1.2	1.0	0.9	1.2	1.0
O Rh (+) %	n	5160	6292	6223	6289	3582	27.546
	%	28.4	28.2	27.8	27.6	26.3	27.7
O Rh (-) %	n	720	833	907	978	603	4.041
	%	4.0	3.7	4.0	4.3	4.4	4.1
Total	n	18.119	22.294	22.403	22.774	13.617	99.207

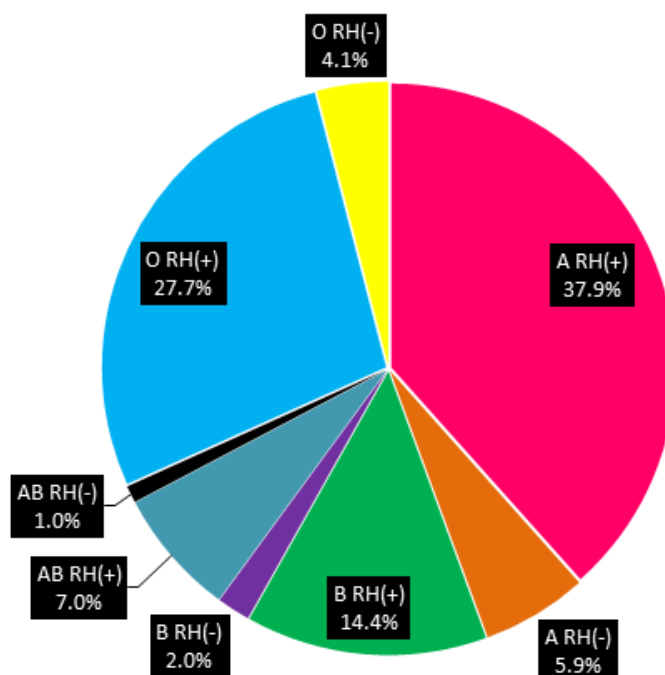


Figure 1: Distribution of blood groups in our region between the years 2009-2013.

When the blood groups of 99207 individuals, who were included in our study, were percentally assessed including all the years, it was seen that the A blood group had the highest proportion. The distribution of the blood groups that we obtained in our region is given in Figure 1. While the Rh factor was found positive in 87% of the individuals we examined in our study, it

was detected as negative in 13% of them.

DISCUSSION

Blood transfusion was included in the medical application area after the determination of the blood group antigens and the invention of blood group compatibility tests between the receiver and donor^{18,27}. There are over 600 blood group antigens

that have been serologically identified^{18,27}. Blood is a vital liquid in many application areas like medicine, judiciary and anthropology. The rate of benefitting from the blood and its products has increased in all over the world especially together with the extension of life spans²². It has been proved with studies that the blood group distributions can differ from each other in various countries. It is assumed that the certain blood group ratios are decreasing due to the difference in the blood group distribution, genetic drift, intersocietal gene flow and the infection observed only in specific regions^{10,28}.

The A blood group takes place on the top with 43.8% in our study. According to the data of the General Directorate of Red Crescent Blood Services, the blood group A is placed on the top with 42% considering the blood group distribution throughout Turkey²⁹. The A blood group results were specified between 36-46% in the studies conducted in our country^{25,30-35}. It is noted that the A blood group and gene A frequency decreases slowly from the west towards the east of our country⁹. Considering all this information, it is clear that the results we obtained comply with our country data. Different ratios are reported for the blood groups in different regions of the world as well. It was noted that the A blood group ratio decreased down to 28.5% in Nepal, a South Asian country, while it was 37% in the United States of America^{36,37}. The "O" blood group ranks as the second group with 31.8% in our study. Zerin et al.²⁵, Balçı et al.³⁰, Dilek et al.³¹, Gül et al.³², Kuku et al.³³, Temiz et al.³⁴ and Özkasap et al.³⁵ provided the following results for the O blood group, respectively: 34.69%, 33.3%, 30.8%, 30.80%, 37.23%, 33.65% and 44.07%. The "O" blood group ratio is 34% throughout Turkey²⁹. The "O" blood group ratio that we found in our region complies with the other studies conducted in our country. The "O" blood group distribution differs between the regions in Turkey and it is seen that the "O" blood group distribution increases towards the west of the country. While the "O" blood group ratio took place on the top with 47% in the United States of America³⁶, this ratio was stated as 41.16%

in the neighboring country Iran³⁹ and as 35.5% in the South Asian country Nepal³⁷.

The incidence rate of the B blood group was found as 16.4% in our study. Balçı et al.³⁰, Dilek et al.³¹, Gül et al.³², Kuku et al.³³ and Temiz et al.³⁴ stated the following results for the incidence rate of the B blood group, respectively: 16.8%, 16.2%, 8.90%, 14.9% and 18.53%. It is seen that the data obtained for the B blood group in our study are parallel to our Country data. The B blood group results were noted as 12% in the United States of America and 9-17% in Europe³⁶. It is observed that these results are close to the results we obtained in our study.

The lowest blood group ratio was detected as AB in our region. The incidence rate of the AB blood group was found as 8.0% in our study. Blood group AB results were specified between 2.60-9.20% in different studies conducted in our country^{25, 30-35}. This result, which we obtained in our region, seems similar to the results of the other studies. The results noted for the studies abroad are similar to our study³⁶⁻³⁸. The Rh blood group positivity was determined as 87% in our study. Balçı et al.³⁰, Gül et al.³² and Kuku et al.³³ stated the following Rh positivity ratios, respectively: 89.9%, 87.20% and 89.3%. Similar Rh positivities were reported in different studies conducted in our country as well^{25,31,34,35}. Similar Rh positivities are also specified in the studies conducted in different parts of the world^{25,31,34,35}. Marzban et al.³⁹ stated the Rh positive blood group ratio of the Iranian public as 90% in their study. An Rh positivity by around 99% was mentioned in the study conducted by Pramanik and Adhikari³⁷. The Rh positivity was seen as 96.66% in the study results of Pramanik and Pramanik S.³⁸. It is observed that the Rh positivities we obtained in our study are similar to the data in our country and the world.

The increase in the human mobility leads to a rapid population differentiation in all over the world today. We therefore think that the regional blood group data must continuously be updated. We assume that knowing the ABO and Rh blood group

profiles of each region may be a facilitating factor for the blood and blood product supply and motivate the individuals with rare blood groups for blood donation. We also find it important to share the obtained statistical data with the society in order to increase the number of voluntary donors. For all these reasons, we are of the opinion that our study will make contribution to the literature related to the blood group distribution.

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