

Evaluation of the distribution of ABO and Rh blood groups in Sivas province

Sivas ilinde ABO ve Rh kan gruplarının dağılımının değerlendirilmesi

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SUMMARY

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Objective: To determine the A, B, O, AB blood group distribution and Rhesus (Rh) positivity rate of Sivas province, and thus to know the distribution of blood groups in our region and to use it in a practical and scientific manner when necessary.

Method: The blood group results of a total of 50,441 individuals over the age of 18 who applied to Sivas Cumhuriyet University Health Services Application and Research Hospital for various reasons between 2018 and 2020 were analyzed retrospectively. ABO and Rh blood groups were determined according to the data obtained from the Hitachi ElecSys 2010 Rack device. Various groupings were made according to blood type, gender and age, and the results were evaluated by percentage calculation.

Results: 19.387 (38.4%) people A Rh (+), 14.045 (27.8%) people O Rh (+), 7.202 (14.2%) people B Rh (+), 3445 (6.8%) person AB Rh (+), 2781 (5.5%) person A Rh (-), 2060 (4.08%) person O Rh (-), 1027 (2.03%) person B Rh (-), 500 (0.9%) persons were identified as AB Rh (-). In terms of Rh blood group, it was seen that 44.076 (87.3%) people were Rh (+) and 6365 (12.6%) people were Rh (-).

Conclusions: In summary Sivas province of Turkey reflects the demographic. Blood type distribution rates of Sivas province are similar to other provinces in our region and the general population of our country. However, we saw differences with some other regions. It is very important to know the blood type for blood supply and storage in our region. We hope that these up-to-date data on blood group distribution in Sivas will be useful for the practice and literature in terms of blood groups database.

Keywords: Blood groups, ABO, Rh, Sivas

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ÖZET

Amaç: Sivas ilinin A, B, O, AB kan grubu dağılımını ve Rhesus (Rh) pozitiflik oranını belirlemek ve bu sayede bölgemizdeki kan grubu dağılımını bilmek ve gereksinim halinde bunu pratik ve bilimsel anlamda kullanabilmek.

Yöntem: 2018-2020 yılları arasında Sivas Cumhuriyet Üniversitesi Sağlık Hizmetleri Uygulama ve Araştırma Hastanesi'ne çeşitli nedenlerle başvuran ve kan grubu testi yapılan 18 yaş üstü toplam 50.441 bireyin kan grubu sonuçları retrospektif olarak analiz edildi. ABO ve Rh kan grupları, Hitachi ElecSys 2010 Rack cihazından elde edilen verilere göre belirlendi. Kan grubu, cinsiyet ve yaşa göre çeşitli gruplamalar yapıldı ve sonuçlar yüzde hesaplamasıyla değerlendirildi.

Bulgular: 19.387 (%38,4) kişi A Rh (+), 14.045 (%27,8) kişi O Rh (+), 7.202 (%14,2) kişi B Rh (+), 3445 (%6,8) kişi AB Rh (+), 2781 (%5,5) kişi A Rh (-), 2060 (%4,08) kişi O Rh (-), 1027 (%2,03) kişi B Rh (-), 500 (%0,9) kişi AB Rh

(-) olarak saptanmıştır. Rh kan grubu açısından bakıldığında 44.076 (%87,3) kişinin Rh (+) olduğu, 6365 (%12,6) kişinin de Rh (-) olduğu görülmüştür.

Sonuç: Sivas ili demografik olarak Türkiye'nin özetini yansıtmaktadır. Sivas ilinin kan grubu dağılımı oranları bölgemizdeki diğer iller ve ülkemizin genel nüfusu ile benzer çıkmıştır. Bununla birlikte diğer bazı bölgelerle farklılıkların da olduğunu gördük. Bölgemizde kan temini ve depolanması konusunda kan grubunu bilmek oldukça önemlidir. Sivas ili kan grubu dağılımı ile ilgili elde edilen bu güncel verilerin kan grupları veri tabanı açısından pratiğe ve literatüre faydalı olmasını ummaktayız.

Anahtar sözcükler: Kan grupları, ABO, Rh, Sivas

INTRODUCTION

The first identification of ABO blood group antigens by Austrian scientist Karl Landsteiner in 1900 is one of the most important steps taken for safe blood transfusion. Since that day, it has been shown that many structures related to the cell membrane in the blood cell have antigenic properties and can generate antibody response. Today, the number of serologically defined blood group antigens is over 600. Most of these antigens are interrelated and make up the blood group system¹. Today, there are 41 blood group systems approved by the International Blood Transfusion Association (ISBT) and 45 genes responsible for these systems have been identified². Undoubtedly, the most important point clinically is the identification of antigens in the ABO blood group system. The ABO blood group system consists of four antigens (A, B, O, and AB). These antigens are known as oligosaccharide antigens and are widely expressed in the membranes of saliva and body fluid as well as red cell and tissue cells (in vascular epithelial cells, intestinal / cervical / mammary gland epithelial cells)³. Antibodies against antigens that are not on the reactive erythrocyte surface constitute another feature of this system. These two characters make the ABO system the most important antigen in transfusion and transplantation. In addition, it is the only blood group system that allows reverse grouping of antibodies based on the plasma principle⁴. The ABO blood group system consists of three major alleles (co-dominant A and B and a recessive O) and is controlled by a single gene located in the terminal part of the long arm of chromosome 9 (9q34.2)⁵.

Rhesus (Rh) system is also very important for transfusion medicine. Rh blood group antigens are associated with non-glycosylated red blood cell membrane proteins encoded by two closely related genes, RHD and RHCE⁶. 85% of humans agglutinated antiserum obtained from rabbits due to the donation of the erythrocytes of Macacus Rhesus monkeys, and this antigen was named Rh antigen. After that, it was understood that the D

antigen had the highest antigenicity after A and B antigens. The strongest antigen in the Rh system is the D antigen, therefore erythrocytes agglutinated with anti-D are called Rh positive, and non-agglutinated with anti-D are called Rh negative⁷.

Recent studies show that the ABO system can extend its clinical significance beyond immunohematology, transfusion and transplantation medicine, and thus play a role in the pathogenesis of cardiovascular, neoplastic and other diseases^{8,9}.

Knowing the blood group distribution of a city is very important in ensuring blood supply for blood bank employees and people who need blood. In addition, the fact that it is now known that blood group systems have an effect on the pathogenesis of some diseases is expected to provide us with useful information in determining the distribution of diseases. We have reviewed similar studies, which we have seen in our city and different cities before, in the light of current data. In this study, we aimed to determine the distribution of ABO and Rh groups of those living in Sivas and to obtain comparative results with other provinces in the light of current data. Our primary goal is to contribute to the literature and assist transfusion applications with the data we will obtain regarding blood group distribution in Sivas.

MATERIAL AND METHODS

Our study was carried out as a single center, retrospective and archive scan. A total of 50,441 patients over the age of 18 who applied to Sivas Cumhuriyet University Health Services Application and Research Hospital between January 2018 and December 2020 for various reasons were included in this retrospective study. Except for routine tests, blood and tests were not taken from the patients. ABO and Rh blood groups were determined according to the data obtained from the Hitachi ElecSys 2010 Rack device. Afterwards, various groupings were made according to blood type, gender and age, and the obtained data were evaluated by percentage calculation.

RESULTS

A total of 50,441 people over the age of 18, 26,320 women and 24,121 men, were included in our study. We divided the study group into seven subgroups according to age. 2526 people were under 20 years old, 10,833 people were in the 20-29 age range, 7,660 people were 30-39, 6597 people were 40-49, 6802 people were 50-59, 7127 people were 60-69, 8895 people were over 70 years old.

According to the blood group analysis results of 50,441 individuals; 19.387 (38.4%) people A Rh (+), 14.045 (27.8%) people O Rh (+), 7.202 (14.2%) people B Rh (+), 3445 (6.8%) people AB Rh (+), 2781 (5.5%) person A Rh (-), 2060 (4.08%) person O Rh (-), 1027 (2.03%) person B Rh (-), 500 (0.9%) person AB Rh (-). In terms of Rh blood group, it was seen that 44.076 (87.3%) people were

Rh (+) and 6365 (12.6%) people were Rh (-). When ABO blood groups are examined without Rh factor; A blood group constitutes the highest blood group with 22,168 (43.9%) people, followed by O blood group with 16,105 (31.9%) people. After that, 8,229 (16.3%) people with B blood type and 3,945 (7.8%) people with AB blood type come [Figure 1].

When ABO blood groups are examined, A group constitutes the highest number in Rh (-) group (43.6%), while the group with the least Rh negativity is AB blood group (7.8%). Within the Rh (+) group, the highest positivity was 43.90% in group A, and the least in AB group with 7.8%

The blood group distribution of our study group by gender is given in Figure 2. Its distribution according to gender and Rh is given in Figure 3. Detailed blood group distribution according to age and Rh is given in Table 1.

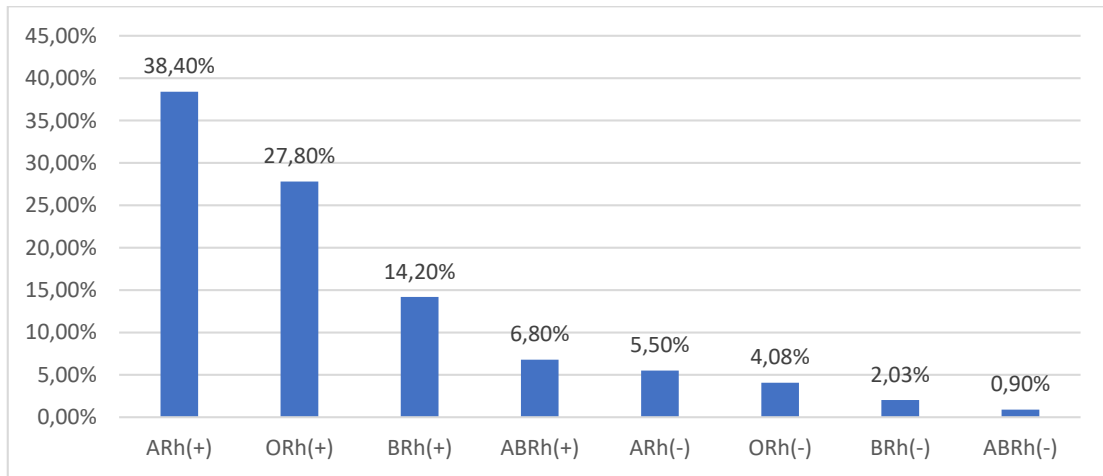


Figure 1: % blood group distribution of our study group

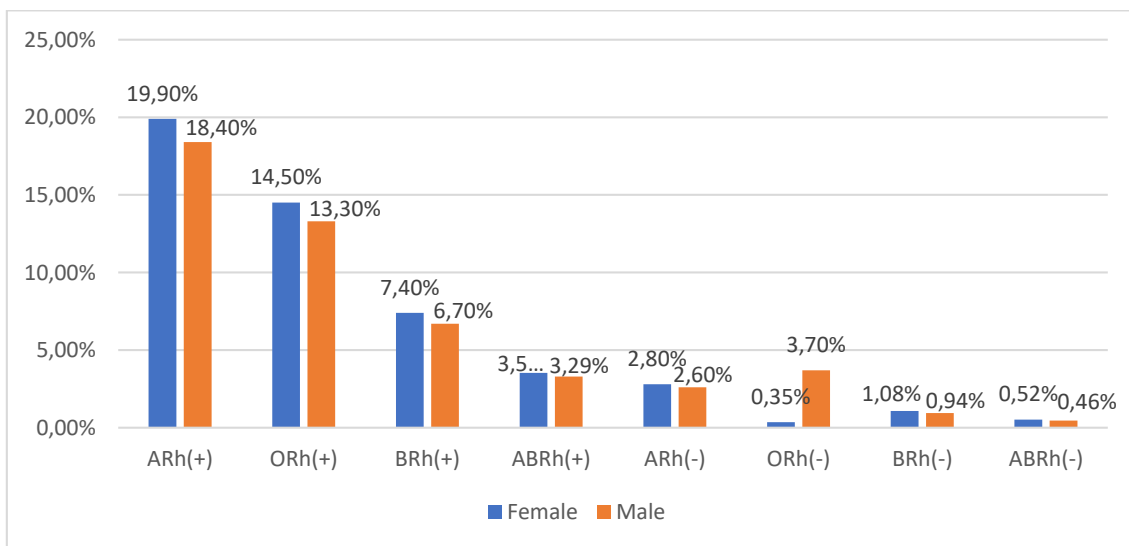


Figure 2: Blood group distribution of our study group by gender

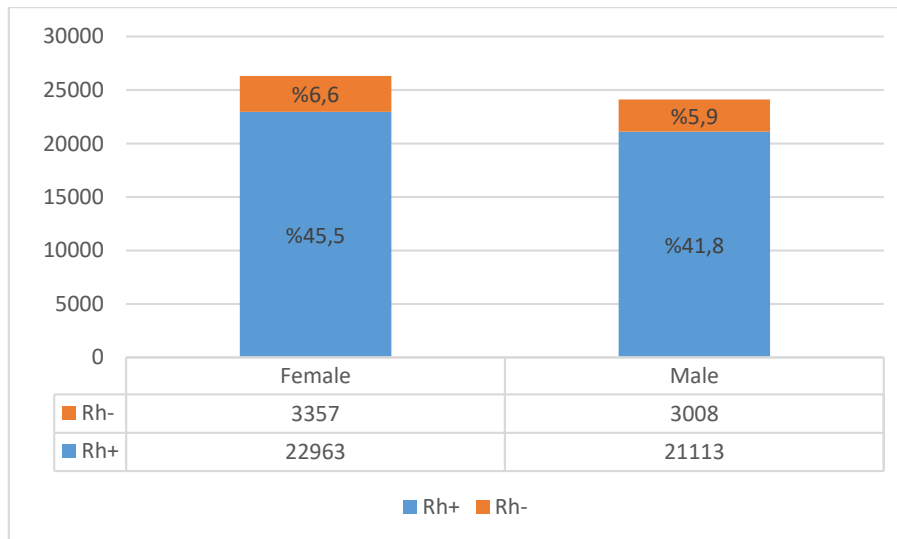


Figure 3: Distribution of our study group according to gender and Rh

Table 1: Detailed blood group distribution of our study group according to age and Rh [n (%)]

Age group	O Rh+	O Rh-	A Rh+	A Rh-	B Rh+	B Rh-	AB Rh+	AB Rh-	Total
18-19	737 (29,1)	135 (5,3)	937 (37,0)	128 (5,06)	368 (14,5)	41 (1,6)	163 (6,45)	17 (0,6)	2526 (100)
20-29	3024(27,9)	453 (4,1)	4152(38,3)	602 (5,5)	1552(14,3)	211 (1,9)	736 (6,7)	103 (0,9)	10833(100)
30-39	2163(28,2)	317 (4,1)	2911(38,0)	380 (4,9)	1156(15,0)	145 (1,8)	516 (6,7)	72 (0,9)	7660(100)
40-49	1807(27,3)	245 (3,7)	2602(39,4)	373 (5,6)	916 (13,8)	158 (2,39)	443 (6,7)	53 (0,8)	6597(100)
50-59	1882(27,6)	261 (3,8)	2614(38,4)	379 (5,5)	999(14,6)	128 (1,8)	460 (6,7)	79 (1,1)	6802(100)
60-69	1960(27,5)	285 (3,9)	2764(38,7)	391 (5,4)	1015(14,2)	137 (1,9)	493 (6,9)	82 (1,1)	7127(100)
>70	2471(27,7)	364 (4,0)	3407(38,3)	527 (5,9)	1195(13,4)	206 (2,3)	632 (7,1)	93 (1,0)	8895(100)
Total	14045(27,8)	2060(4,08)	19387(38,4)	2781(5,5)	7202(14,2)	1027(2,03)	3445(6,8)	500(0,9)	50441(100)

DISCUSSION

ABO and Rh blood groups may differ depending on the ethnic origin and geography¹⁰⁻¹⁴. Worldwide, the distribution rates for A, B, O and AB blood groups are 41%, 9%, 47% and 3%, respectively⁷. In the United States of America, the A, B, O and AB blood group distribution rates are 37.1%, 12.2%, 47.7%, 4.1% and Rh positivity rate is 85.4%. In the United Kingdom, the rates are 41.78%, 8.56%, 46.63% and 3.04%¹³. In Iran, the rates are 33.8%, 20.7%, 34.7% and 8.4%, according to the same order¹⁴. Turkey A in the general population, B, O, AB blood distribution of 42.84%, 16.46%, 32.67%, 8.03% and 88.54% Rh-positive rate was reported¹⁵. Our ABO blood group results differ from those in western countries. The observed that most of the blood group in Turkey

seen most western countries. In our border neighbor Iran, the distribution rate of A and O blood groups is approximately equal.

Rh-positive rate in the general population in Turkey was reported to be 88.54%¹⁵. While the Rh (+) rate in white race is around 85% worldwide, this rate is around 95% in American blacks and almost 100% in African blacks⁷.

ABO and Rh blood group distribution ratios of some cities in Turkey comparing the results of our studies on the Sivas are given in Table 2. According to Table 2, Kayseri, Yozgat, Van and Eskişehir are the closest provinces to Sivas according to their blood group distribution rate. According to Rh positivity, Istanbul and Konya are the closest provinces to Sivas¹⁶⁻²⁸.

Table 2: Distribution of ABO and Rh blood groups in some cities in Turkey

City	A Group (%)	B Group (%)	O Group (%)	AB Group (%)	Rh(+) (%)	Rh(-) (%)
Rize ¹⁶	44,07	9,26	44,07	2,6	83,7	16,3
Denizli ¹⁷	42,6	16,8	33,3	7,4	89,9	10,1
Van ¹⁸	43,8	16,2	30,8	9,2	86,8	13,2
Diyarbakır ¹⁹	40,81	18,53	33,66	6,98	89,17	10,82
Malatya ²⁰	39,32	13,36	41,28	6,04	89	11
Gaziantep ²¹	40,01	18,1	35,09	6,8	90,83	9,17
Konya ²²	45,06	15,63	32,21	7,12	87,4	12,6
Ankara ²³	44,62	15,45	32,24	7,69	88,13	11,87
İstanbul ²⁴	43,82	15,2	33,7	7,1	87,3	12,6
Eskişehir ²⁵	43,52	16,84	31,1	8,5	86,65	13,35
Sakarya ²⁶	44,3	12,5	35,7	7,5	84,9	15,1
Edirne ²⁷	46,55	15,99	30,93	6,53	87,79	12,21
Şanlıurfa ²⁸	36,38	21,25	34,69	7,68	90,79	9,21
Çukurova ²⁹	38,9	17	37,1	6,9	89,9	10,1
Yozgat ³⁰	44,3	15,9	31,7	8,1	88	12
Kayseri ³¹	44	16,2	33,3	6,5	88,2	11,8
Sivas*	43,9	16,3	31,9	7,8	87,3	12,6

CONCLUSION

As a result, Turkey's Sivas province reflects the demographic summary. Blood type distribution rates of Sivas province are similar to other provinces in our region and the general population of our country. However, we saw differences with some other regions. It is very important to know the blood type for blood supply and storage in our region. We hope that these up-to-date data on blood group distribution in Sivas will be useful for the practice and literature in terms of blood groups database.

Ethic committie approval: The ethics committee and work permits from Cumhuriyet University Ethic Committie were taken with the number 10.02.2021 date and number 2021-02/60.

Conflict of Interest Statement: No conflict of interest was declared by the authors.

Contributions of the authors to the article

A.A set up the main idea and hypothesis of the study. A.A and G.U developed the theory and edited the material method section. A.A made the evaluation of the data in the results section. The discussion part of the article was written by A.A and G.U, reviewed and made the necessary

corrections and approved. In addition, all authors discussed the entire study and approved its final version.

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