İstanbul Med J 2015; 16: 98-100
DOI: 10.5152/imj.2015.14890

ABO and Rh Blood Group Distribution in İstanbul Province (Turkey)

Türkiye'nin İstanbul İlinde Saptanan ABO ve Rh Kan Grupları Dağılımı

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Abstract / Özet

Objective: An understanding of the distribution of blood groups in a city is useful for individuals in need. In this study, we aimed to determine the distribution rates of ABO and Rh blood groups in İstanbul Province.

Methods: This retrospective study was conducted by investigating the records of 6041 healthy blood donors who visited the Bezmialem Vakif University Faculty of Medicine, Blood Bank, between 1st January, 2011 and 31st December, 2013. ABO and Rh blood groups were examined by lam agglutination, micro plate agglutination, or gel centrifugation methods.

Results: In this study, the frequency of the blood groups A, O, B, and AB were found to be 43.44%, 33.02%, 15%, and 8.54%, respectively. Rh (+) positivity was determined in 5192 cases (85.95%) and Rh (-) negativity was determined in 849 cases (14.05%). The frequency of intra-group Rh was found to be 87.84% of Rh (+) and 12.16% of Rh (-) in blood group A, 87.52% of Rh (+) and 14.48% of Rh (-) in blood group O, 82.12% of Rh (+) and 17.88% of Rh (-) in blood group B, and 76.94% of Rh (+) and 23.06% of Rh (-) in blood group AB. A majority of the blood donors were males (92.42%), and 69.28% were in the age group of 25–44 years.

Conclusion: ABO and Rh blood group distribution rates in our region were similar to the general rates in Turkey. There was a positive correlation between the frequency of ABO blood group type and Rh positivity rate in each group. We believe that the present study will contribute to the literature with respect to the database of blood groups.

Keywords: Blood groups, ABO, Rh, İstanbul

Amaç: Bir şehirde kan grupları dağılımını bilmek gereksinim halindeki bireyler için faydalıdır. Bu çalışmada İstanbul ilindeki kan gruplarının oranını bulmayı amaçladık.

Yöntemler: Bu retrospektif çalışma 1 Ocak 2011 - 31 Aralık 2013 tarihleri arasında Bezmialem Vakıf Üniversitesi Tıp Fakültesi, Kan Bankasına başvuran 6041 sağlıklı kan bağışçısının verileri incelenerek yapıldı. Kan gruplarına lam aglütinasyon, mikro plak aglütinasyon veya jel santrifügasyon yöntemi ile bakıldı.

Bulgular: Çalışmada, A, O, B, AB kan gruplarının sıklığı sırasıyla 43,44%, 33,02%, 15%, 8,54% bulundu. 5192 (85,95%) vakada Rh pozitifliği, 849 (14,05%) vakada Rh negatifliği belirlendi. Grup içi Rh sıklığı A kan grubunda 87,84% Rh (+) ve 12,16% Rh (-), O kan grubunda 87,52% Rh (+) ve 14,48% Rh (-), B kan grubunda 82,12% Rh (+) ve 17,88% Rh (-), AB kan grubunda 76,94% Rh (+) ve 23,06% Rh (-) bulundu. Kan bağışçılarının çoğunluğu erkek cinsiyette (92,42%) ve 25-44 yaş aralığındaydı (69,28%).

Sonuç: Bölgemizdeki ABO ve Rh kan grubu dağılımı Türkiye genel oranları ile benzerdi. ABO kan grubu sıklığı ve her grubun Rh pozitiflik oranı arasında pozitif korelasyon mevcuttu. Çalışmamızın kan grupları veri tabanı açısından literatüre katkıda bulunacağını düşünüyoruz.

Anahtar Kelimeler: Kan grupları, ABO, Rh, İstanbul

Introduction

Blood groups are classified into different groups according to the antigens on the surface of erythrocytes (1). The International Society for Blood Transfusion (ISBT) Working Committee catalogue currently lists 339 blood group antigens, of which 297 are clustered within 33 blood group systems (2). The milestone in the modern medical practice of blood transfusion is the identification of blood groups as A, B, and O by Karl Landsteiner in 1901. One year later, the fourth group AB, in which both antigens are present on red blood cells and neither anti-A nor anti-B antibodies are present in serum, was described by Sturli and von Decastelo (3). The histo-blood group ABO that is the major human alloantigen system involves three carbohydrate antigens (4). Antigens of this system are present on the surface of erythrocytes, platelets, and various human tissues including vascular, intestinal, cervical, and glandular mammary epithelial cells; these antigens are also soluble in plasma, saliva, milk, urine, and feces. Additionally, serum contains antibodies to antigens that are not on the surface of erythrocytes. Therefore, ABO system plays the most important role in transfusion and transplantation (5).

Rh blood group system, another important system, is the most polymorphic of all human blood groups and is composed of at least 45 antigens. The discovery of the Rh factor by Landsteiner and Alexander Wiener in 1940 provided the pathophysiological basis for erythroblastosis.

The Rh system is clinically important because of its role in the hemolytic diseases of newborns and in transfusion incompatibility (3).

An understanding of the distribution of blood groups in a city would be helpful for blood bank employees and individuals in need. There are many studies in Turkey on blood group distribution. In this study, we aimed to determine the distribution rates of ABO and Rh blood groups in Istanbul Province and provide new data to the literature.

Methods

This retrospective study was conducted by investigating the records of 6041 healthy blood donors who applied to the Bezmialem Vakif University Faculty of Medicine, Blood Bank, between

This study was presented at the 6th National Congress of Blood Bank and Transfusion Medicine, 27 November-1 December 2013, Antalya

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Received/Geliş Tarihi:
29.12.2014

Accepted/Kabul Tarihi:
21.04.2015

Table 1. Distribution of ABO and Rh blood groups

	A		O		B		AB	
	Rh+	Rh-	Rh +	Rh-	Rh +	Rh-	Rh +	Rh-
Intra-group Rh (%)	87.84	12.16	87.52	14.48	82.12	17.88	76.94	23.06
Rh (%)	38.16	5.28	28.90	4.12	12.32	2.68	6.57	1.97
ABO (%)	43.44		33.02		15		8.54	
Rh +/- Ratio	7.22		6.04		4.59		3.33	

1st January, 2011 and 31st December, 2013 after obtaining ethical approval from the ethics committee of the Bezmialem Vakif University (05.02.2014/25). Written informed consent as "Blood donor questionnaire and consent forms" was obtained from the blood donors. ABO and Rh blood groups were determined by the lam agglutination method using Blood Grouping Reagent (Dia-Gast, Loos, France), microplate agglutination method using Galileo System (Stratec, Frankfurt, Germany), or gel centrifugation method using IH-1000 Fully Automated System (Diamed, Cressier, Switzerland).

Statistical analysis

Statistical analyses were performed with descriptive statistics methods and Pearson's correlation test using Statistical Package for Social Sciences (SPSS) 20.0 (IBM, Armonk New York, USA). A probability value of less than 0.05 was considered to be statistically significant.

Results

A total of 6041 blood donors were included in our study. As shown in Table 1, the frequencies of blood groups A, O, B, and AB were found to be 43.44% (2624), 33.02% (1995), 15% (906), and 8.54% (516), respectively. In total, 5192 (85.95%) blood donors were found to be Rh (+) positive and 849 (14.05%) were found to be Rh (-) negative. The frequency of intra-group Rh was found to be 87.84% (2305) of Rh (+) and 12.16% (319) of Rh (-) in blood group A, 87.52% (1746) of Rh (+) and 14.48% (249) of Rh (-) in blood group O, 82.12% (744) of Rh (+) and 17.88% (162) of Rh (-) in blood group B, and 76.94% (397) of Rh (+) and 23.06% (119) of Rh (-) in blood group AB. There was a positive correlation between the frequency of ABO blood group type and Rh positivity rate in each group (p=0.011). In table 2, the age of the blood donors are categorized into four groups; the number of individuals in each group was as follows: 1071 (17.73%) blood donors were in the age group of 18–24 years, 4185 (69.28%) blood donors were in the age group of 25–44 years, 783 (12.96) blood donors were in the age group of 45–64 years, and 2 (0.03%) blood donors were in the age group of over 65 years. A total of 5583 (92.42%) blood donors were males and 458 (7.58%) blood donors were females.

Discussion

The inheritance of ABO and Rh blood groups follows the Mendelian rules. ABO blood group genes are located on the ninth chromosome and the Rh gene is located on the first chromosome (6). The frequency of ABO and Rh blood groups vary according to ethnic groups (7). The worldwide distribution rates of A, O, B, and AB blood group were reported to be 41%, 47%, 9%, and 3%, respectively; in the USA, the distribution rates were 37.10%, 46.70%, 12.10%, and 4.10%; in the UK, 41.78%, 46.63%, 8.56%, and 3.04%; in Greece, 48.19%, 34.21%, 12.04%, and 5.56%; and in Bulgaria, 39.96%, 35.80%, 16.84%, and 7.60%, respectively, (Table 3) (7-9).

In table 4, we gave the distribution of ABO and Rh blood groups in some regions of Turkey (9-22). When we look at the distribution of blood groups in Istanbul Province, it is seen that the frequencies of A, O, B, and AB blood groups were 44.80%, 30.80%, 15.90%, and 8.10%, respectively, by Gül et al. (11) in 2005. The frequencies obtained in our study were lower than those in the study by Gül et al. in terms of blood group A and were higher than that study in terms of blood group O. The differences between these two studies could be related with the recent increase in the emigration rate in Istanbul Province. When we look at the other cities of Turkey, the frequency of blood group A was reported between 36.38% in Şanliurfa and 45.06% in Konya (12, 13). The distribution rate of blood group A in Eskişehir was found to be 43.52%, which was the rate closest to that found in our results (9). The frequency of blood group O in Turkey was reported between 30.80% in Istanbul and Van and 44.07% in Rize (11, 14, 15). The rate closest to that of our study for blood group O was 33.30% in Denizli and Kayseri (16, 17). The highest rate of blood group B in Turkey was found to be 21.25% in Şanliurfa and the lowest rate was found to be 9.26% in Rize (12, 15). In this study, the frequency of blood group B was up to 15.00%, which is closest to the frequency of 15.45% in Ankara (18). The AB blood group rate was shown as 9.20% in Van and as 2.60% in Rize, which are the highest and lowest rates in the literature of Turkey (14, 15). In a recent study, the frequency of blood group AB was found to be 8.54% in Istanbul. For blood group AB, Eskişehir had the closest rate to of our city with 8.50% (9). The results of our study are similar to the general rates in Turkey (10).

The rate of Rh positivity was reported to be 85% in Caucasian population (7). In our study, the percentage of Rh positivity and negativity were 85.95% and 14.05%, respectively. In terms of Rh positivity, it was revealed that Eskişehir (86.65%) and Van (86.80%) had a percentage rate closest to that found in our study (9, 14). In addition, there was a positive correlation between the frequency of ABO blood group type and Rh positivity rate in each group (p=0.011). The frequencies of Rh positivity were the lowest in the AB blood group (76.94%) and the highest in the A blood group (87.84%) (Table 1).

In our study, a majority of the blood donors were males (92.42%), and 69.28% were in the age group of 25–44 years (Table 2). The reason for this could be that the female individuals in this age group were not accepted as blood donors because of anemia. It was also shown that anemia prevalence was higher, particularly during the fertile period of females depending on the number of parity and gravity increases (23).

Our limitation is that the study was conducted with a relatively small number of volunteers. However, we can say that we included a considerably good number of volunteers in the study by considering the limitation of the study period and that the study was conducted at one center.

Conclusion

ABO and Rh blood group distribution rates in Istanbul are similar to the general rates in Turkey. An understanding of the frequency of blood groups and high Rh positivity rate in common blood groups will be helpful to provide suitable blood storage for individuals in need. We think that the present study will be a valuable contribution to the literature.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Bezmialem Vakıf Unıversity.

Table 2. Distribution of the blood donors according to age and gender

Age groups (%)	Male (%)	Female (%)	M/F Ratio
18–24 (17.73)	15.88	1.85	8.58
25–44 (69.28)	64.74	4.54	14.26
45–64 (12.96)	11.77	1.19	9.83
>65 (0.03)	0.03	-	-
Total	92.42	7.58	12.19

Table 3. Distribution of the ABO blood group in some countries of the world

Region	Reference	A (%)	O (%)	B (%)	AB (%)
Worldwide	7	41	47	9	3
USA	8	37.10	46.70	12.10	4.10
UK	9	41.78	46.63	8.56	3.04
Greece	9	48.19	34.21	12.04	5.56
Bulgaria	9	39.96	35.80	16.84	7.60

Table 4. Distribution of the ABO and Rh blood groups in some regions of Turkey

Region	Reference	A (%)	O (%)	B (%)	AB (%)	Rh+ (%)	Rh- (%)
Turkey (Total)	10	42.84	32.67	16.46	8.03	88.54	11.46
İstanbul	11	44.80	30.80	15.90	8.10	87.20	12.80
İstanbul	Our Study	43.44	33.02	15.00	8.54	85.95	14.05
Şanlıurfa	12	36.38	34.69	21.25	7.68	90.79	9.21
Konya	13	45.06	32.21	15.63	7.12	87.40	12.60
Eskişehir	9	43.52	31.10	16.84	8.50	86.65	13.35
Van	14	43.80	30.80	16.20	9.20	86.80	13.20
Rize	15	44.07	44.07	9.26	2.60	83.70	16.30
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
Ankara	18	44.62	32.24	15.45	7.69	88.13	11.87
Yozgat	19	44.30	31.70	15.90	8.10	88.00	12.00
Gaziantep	20	40.01	35.09	18.10	6.80	90.83	9.17
Malatya	21	39.32	41.28	13.36	6.04	89.00	11.00
Diyarbakır	22	40.81	33.66	18.53	6.98	89.17	10.82

Informed Consent: Written informed consent was obtained from patient who participated in this study.

Peer-review: Externallypeer-reviewed.

Author Contributions: Concept - Z.İ.Y.S.; Design - Z.İ.Y.S.; Supervision - G.Ç., C.K., A.Ö.; Funding - Z.İ.Y.S., G.Ç.; Materials - M.B., İ.G., Ö.G.; Data Collection and/or Processing - Z.İ.Y.S., Ö.G.; Analysis and/or Interpretation -G.Ç., C.K., A.Ö.; Literature Review - Z.İ.Y.B., M.B, İ.G..; Writer - Z.İ.Y.S.; Critical Review - G.Ç., C.K., A.Ö.; Other -M.B., İ.G., Ö.G.

Acknowledgements: The authors thank to all blood bank employees for their contributions to this study.

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

Financial Disclosure: The authors declared that this study has received no financial support.

Etik Kurul Onayı: Bu çalışma için etik komite onayı Bezmialem Vakıf Üniversitesi'nden alınmıştır.

Hasta Onamı: Yazılı hasta onamı bu çalışmaya katılan hastalardan alınmıştır.

Hakem Değerlendirmesi: Dış bağımsız.

Yazar Katkıları: Fikir - Z.İ.Y.S.; Tasarım - Z.İ.Y.S.; Denetleme - G.Ç., C.K., A.Ö.; Kaynaklar - Z.İ.Y.S., G.Ç.; Malzemeler - M.B., İ.G., Ö.G.; Veri toplanması ve/veya işlemesi - Z.İ.Y.S., Ö.G.; Analiz ve/veya yorum - G.Ç., C.K., A.Ö.; Literatür taraması - Z.İ.Y.S., M.B., İ.G.; Yazıyı yazan - Z.İ.Y.S.; Eleştirel İnceleme - G.Ç., C.K., A.Ö.; Diğer - M.B., İ.G., Ö.G.

Teşekkür: Yazarlar bütün kan bankası çalışanlarına bu çalışamaya katkılarından dolayı teşekkür ederler.

Çıkar Çatışması: Yazarlar çıkar çatışması bildirmemişlerdir.

Finansal Destek: Yazarlar bu olgu için finansal destek almadıklarını beyan etmişlerdir.

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