

Investigation of ABO and Rh Blood Group Frequencies in Southern Kazakhstan and North Eastern Anatolian Populations

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ABSTRACT: This study was carried out to compare the phenotypic distributions of ABO and Rh blood groups of individuals living in North East Anatolia versus in Southern Kazakhstan. A total of 232 samples from individuals living in North East Anatolia and a total of 324 samples from Southern Kazakhstan were collected. Antisera of collected samples were analyzed using an ELISA technique. Our findings, the A blood group was the highest (42.4%), followed by the B blood group (28%). The O blood group (24.2%) and the AB blood group (5.4%) were for North East Anatolia population. As for Rh phenotypic frequency, 85.6% of the population was Rh (+) and 14.4% of them were Rh (-) for the same population. As for the population living in Southern Kazakhstan, 38.5% of the population had the A blood group, 22.2% the B group, 33.9% the O blood group, and 5.4% of the population had the AB group. For the same population, the rate of Rh (+) was 93% and Rh (-) was 7%. We summarize that the A type and B were higher in North East Anatolia population than the Southern Kazakhstan population. On the other hand, the phenotypic distribution of the O type was higher in Southern Kazakhstan than in North East Anatolia. The AB blood group was similar in both populations. The phenotypic frequency of the Rh (+) in North East Anatolia was lower than that of Southern Kazakhstan, and Rh (-) distribution in the North East Anatolia was found to be higher than in Southern Kazakhstan.

Keywords: Blood Groups (ABO), Rh Factor, North East Anatolia, Southern Kazakhstan Populations

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INTRODUCTION

ABO blood group system was discovered in the early 1900s, followed by the discovery of Rh (D) antigen in the mid-1900s. The ABO locus has the A, the B, and the O alleles. The genes associated with the A and B antigens are located on chromosome 9 while Rhesus D antigens are located on the erythrocyte cell membrane and coded by genes located on chromosome 1 (Flegel , 2007). Rh system is highly polymorphic and includes more than 40 antigens, however, in clinical standpoint, the presence of the Rh (D) antigen on red blood cells is the most important (Yang et al., 2007).

Studies on the ABO and the Rh systems were frequently conducted to determine genetic relationships among different populations in Asia (Curtis et al., 2000; Donbak et al., 2002). It has been known that the frequencies of the ABO and Rh blood groups vary from one population to other populations and in different geographical regions (Liu et al.,2017). The ABO blood type is the key system, especially for blood transfusion practices. In the first years of human life, anti-A and anti-B antibodies are produced depending on the ecological factor (Wu et al., 2008; Anstee, 2010). The ABO blood group system plays an important role in blood transfusions. Generally, in the first years of life, anti-A and anti-B antibodies become sensitized by being affected by environmental factors such as food, bacteria, and viruses. The O blood groups antigens can be found in some other creatures bacteria (Davis et al.,2017). The cell types investigated in humans have the A, B or O antigen on the cell membrane. These antigens include receptors of certain cells, tissues, organs, lymphatic system, and nervous system (Anstee, 2010).

It is crucial to know the general distribution pattern of blood groups for population genetics, anthropologic and population migration studies as well as for clinical practices. Furthermore, knowledge of distribution of blood antigens is important for establishing the effective blood bank inventory, blood transfusions and organ transplants (Nazli et al., 2015; Liu,2017). As our genetic knowledge of the ABO group system improves, blood transfusions will become much safer. Scientists will know more about blood group genetics. In this sense, doctors will use different methods in the treatment of blood diseases. An individual's ABO blood type can be used by the legal system in paternity suits. It will also be used in law enforcement and forensic medicine. It can be used by scientists for different ecological research. (Engin et al. 2012).

The role of ethnicity has been poorly studied among different Turkish populations and neighbour countries in the Central Asia and Middle East (Liu, 2017). The present study, we compared the phenotypic frequencies of genomics in the ABO and Rh blood groups of two populations of South Kazakhstan and North East Anatolia.

MATERIALS AND METHODS

Population

This study was carried out by taking blood samples from healthy and volunteer individuals aged 18-65 years who came to the outpatient clinic in both regions between October 2013 and September 2017. Files were created by applying a blood group questionnaire to each individual. Blood samples were taken by finger pricks from 556 unrelated individuals of both sexes of South Kazakhstan (324 samples) and Eastern Anatolia populations (232 samples).

Experimental procedure

Informing the participants was carried out through face-to-face interviews. A brief questionnaire was applied for each subject, including name, age, sex, etc. were collected using. Informed consent was taken from each subject exceed the country's average. Samples were collected from Family's

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doctor population of South Kazakhstan and Eastern Anatolia populations positive and negative refers to the Rh level in the blood. Open slide method of ABO blood groups testing was applied, as previously reported. It was used ELISA methods for defining the antigen-antibody agglutination for determination of ABO and Rh blood groups. IgM and IgG monoclonal reagents were used in antigen-antibody agglutination reactions. (Kuhne et al., 2019).

Statistical procedure

For the statistical evaluation of our findings, SPSS 22.0 package program was used for the statistical evaluation of the results obtained. Descriptive statistics for variables were given as mean and standard deviation, and descriptive statistics for data were given as frequency and percentage. We also conducted Chi-Square test to compare the relative frequency of each blood type and Rh factor between the two populations ($P < 0.05$).

RESULTS AND DISCUSSION

Our results, which are important in terms of genomics and regions, are as follows: A total of 232 samples were collected from North Eastern Anatolia. (Table 1). The A blood group was 42.4%, the B blood group was 28%, the AB blood group was 5.4% and the O blood group was 24.2%. Rh (+) ratio 85.6% was and Rh (-) ratio was 14.4% for the population in Eastern Anatolia (Table 2). In Kazakhstan, 324 samples were collected from individuals. The phenotype distributions are as follows: The A blood type were 38.5%, type B, 22.2%, type AB 5.4%, and type O was 33.9% (Table 3). For Southern Kazakhstan population, Rh (+) was 93% while Rh (-) rate was 7% (Table 4).

In summary, the frequencies of ABO blood type were the A, B, O and AB in North Eastern Anatolia Region while it was type A, type O, type B and type AB Southern Kazakhstan population. Rh (+) frequencies were higher than Rh (-) distribution for both populations.

Table 1. ABO blood groups percentages and allele frequencies of North Eastern Anatolian population

Phenotype	Observed Number	Percentage observed	Allele frequency
A	98	42.2%	0.3234
B	65	28.0%	0.1853
AB	13	5.4%	-
O	56	24.2%	0.4913
Total	232	100%	1.0000

Table 2. Rh phenotypes, percentage and allele frequency of North Eastern Anatolian population

Phenotypes	Number allele	Percentage observed	Observed frequencies
Rh (+)	199	85.6%	0.8503
Rh (-)	33	14.4%	0.1410
Total	232	100%	1.0000

Table 3. ABO blood groups percentages and allele frequencies of Southern Kazakhstan population

Phenotypes	Observed Number	Percentage observed	Allele frequency
A	125	38.5%	0.2690
B	72	22.2%	0.1483
AB	17	5.4%	-
O	110	33.9%	0.5827
Total	324	100%	1.0000

Table 4. Rh phenotypes, percentage and allele frequency of Southern Kazakhstan population

Phenotypes	Number Allele	Percentage Observed	Observed Frequencies
Rh (+)	301	93%	0.9233
Rh (-)	23	7%	0.0767
Total	324	100%	1.0000

The Chi-square test was conducted to test if the ABO blood type distribution was different between the North Eastern Anatolian population and Southern Kazakhstan population. The results

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revealed that the ABO blood types do not differ between the two population significantly ($p=0.08$). We also conducted the same analyses for Rh factor. The results indicated that the two population differ significantly in the ratio of Rh (+) and Rh(-) ($p=0.006$) (Table 5). The Southern Kazakhstan population had a significantly higher proportion of Rh (+) population than North Eastern Anatolian population.

Table 5. Chi-square test for differences in the distribution of blood types between North Eastern Anatolian population and Southern Kazakhstan population.

Test	Chi-square test value	df	P-value
ABO blood groups	6.6864	3	0.08
Rh Factor	7.5782	1	0.006

Blood grouping information may be crucial for blood banks for timely availability of correct blood groups during an emergency. Furthermore, knowing general distribution of ABO blood groups increase the knowledge of genetics of Turkish and Kazakh people. Various studies proposed that the higher incidence of different diseases, such as rheumatic diseases, cancer and cardiovascular diseases in different blood types (Çildağ et al., 2017; Shahkar et al., 2010).

In a study conducted on 7000 people in Turkey, the A blood group was 39.9%, the B blood group was 17%, the AB blood group was 14.6%, and the O blood group was 28.2% Rh (+) ratio was reported as 89.4% and 10.5% for Rh (-) (Galip and Dostbil, 2017). In our study, 132 samples were taken from the population living in Turkey. The A blood type 42.4%, the B blood type 28%, the AB blood type 5.4%, and the O blood type 24.2%. Rh (+) ratio was 85.6% while Rh (-) ratio was 14.4%. We believe that the difference between these two studies stems from smaller population size in this study.

Numerous studies have been conducted to determine the blood groups and genetic structure of various populations. Blood group frequencies vary among different Asian communities (Uçar et al., 2004; Galip and Dostbil 2017). In the present study, we observed a series of O type, A type, B type and AB, with the highest allele frequency of Rh(D) positive for the population living in Southern Kazakhstan. The ABO blood types are not found in equal numbers. In Caucasians in the United States, the distribution of type O is 47%, type A is 41%, type B is 9%, and type AB is 3%. Among African American, the distribution of type O is 46%, type A 27%, type B 20%, and type AB is 7%. Among Western Europeans, 42% people are group A, 9% are B, 3% are AB and the remaining 46% group are O.

CONCLUSION

In this study, we have compared the population of South Kazakhstan with the population of Eastern Anatolia. The phenotypic ratio of Rh (+) blood group system in Southern Kazakhstan is 7.5% higher than the Eastern Anatolian population. Similarly, phenotypic ratio of Rh (-) blood group system is 7.4% lower than Eastern Anatolian population. Results show us that the Rh blood groups system is dissimilar in terms of both countries. Phenotypic difference in the ABO system between these two regions was higher in O blood group by 8%, by 6% in B blood group, by 5% in B blood group and 2% in A blood group. The phenotypic rate in the AB blood group was the similar in both regions. In order to get more accurate information, we think that studies should be done in larger populations in order to compare these populations of gene pools.

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Conflict of Interest

The article author declares that there is no conflict of interest.

Author's Contributions

Author has contributed in experimental study and writing of the manuscript himself.

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