

Frequency of ABO and Rh blood groups in the Jazan region of Saudi Arabia

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ABSTRACT

Objectives: Among 30 blood group systems ABO & Rh blood groups are clinically significant. So they are called major blood groups. Frequencies of ABO blood groups and Rh types show geographic variations. The objective of this study was to estimate frequencies of ABO and Rh blood groups in native Saudi blood donors in Jazan region.

Methodology: A total of 30481 healthy donors, donating blood for various reasons at Blood Bank Department of King Fahd Central Hospital in Jazan from January 2002 to December 2008 were evaluated for the ABO and Rh blood groups. Only Saudi nationals were included in this study.

Results: Out of 30481 donors, 18909 (62%) were group O, 8411(27.6%) were group A, 2662 (8.7%) were group B and 499 (1.7%) were group AB. Rh+ were 28988 (95%) and 1493 (5%) were Rh-. The results of this study were compared with results of the Southwest and the Eastern regions of Saudi Arabia.

Conclusion: This study confirmed that blood group O was the most common of the ABO blood group system in the Jazan region. AB blood group was quite rare and Rh positive was more common than Rh negative phenotype. Significant differences were observed between the results of this study and the results of the Southwest and the Eastern regions of Saudi Arabia in the distribution of both ABO groups and the Rh phenotypes.

KEY WORDS: ABO, Rh, Blood Group, Blood Donor, Jazan.

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INTRODUCTION

Currently, 30 different blood group systems are known, nine of which are considered to be the major blood group systems.¹ The ABO and Rh blood groups are among the most important blood groups.²

The ABO system is the most important blood group system in transfusion therapy and was the first blood group system to be discovered. The ABO blood group system was discovered in 1900 by Landsteiner. The ABO blood group system consists of four major groups (A, B, AB and O).³

The Rh blood group system was discovered in 1939 when Levine and Stetson found an antibody in the serum of a mother who had suffered a severe hemolytic reaction after receiving ABO compatible blood. In 1940 Landsteiner and Wiener discovered anti-Rh. This antibody was renamed anti-D in 1963. The common Rh antigens D, C, c, E, e are the major Rh specificities.⁴

All human populations share the same blood group systems, although they differ in the frequencies of specific types. The incidence of ABO and Rh groups varies very markedly in different parts of the world

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Table-I: Percentage frequencies of the ABO and Rh blood groups phenotypes in the Saudi blood donors in the Jazan region.

Phenotype	O	A	B	AB	Total	Rh +	Rh -
No of Blood Donors (%)	18909 (62%)	8411 (27.6%)	2662 (8.7%)	499 (1.7%)	30481 100%	28988 95%	1493 5%

and in different races.⁵The frequency of the four ABO groups varies in different populations; American Indians are almost exclusively group O, while Asians have a higher incidence of group B. In Caucasians the proportions of the four main blood groups are as follows: O group 44%, A group 43%, B group 9% and AB group 4%. In Blacks the frequencies of the O, A, B and AB blood groups are 49, 27, 20 and 4% respectively. In Asians the frequencies of the O, A, B and AB blood groups are 43, 27, 25 and 5% respectively.^{6,3}

Rh-(Absence of D antigen) is much more prevalent in Caucasian persons of European descent (15%-17%), less likely in individuals of African background (3%-5%), and rare in Asian populations (<0.1%).⁷ In 2001 Bashawri et al published their finding of the ABO and Rh blood groups frequencies among 57396 blood donors in the Eastern region of Saudi Arabia.⁸ Sarhan et al in 2009 determined the distribution of the ABO and Rh blood groups in 944 Saudi students from the King Khalid University, Abha (Southwest), Saudi Arabia.⁹ There are significant differences in the ABO distribution between Eastern and Southwest regions. This data is tabulated in Table-II. The sample of Sarhan et al was of small size and including 156 subjects from Jazan area. Therefore, a large sample is desirable. Thus, this study was carried out with a specific aim to provide a valuable database of the historical, serological frequencies of ABO and Rh blood groups phenotype in the Jazan area for native Saudi donors.

METHODOLOGY

All ABO and Rh serological results obtained in the Blood Bank Department of King Fahd Central Hospital in Jazan from January 2002 to December 2008 were retrospectively reviewed and analyzed.

During this period, a total of 30481 healthy donors, donating blood for various reasons, were evaluated for the ABO and Rh blood groups. Only Saudi nationals were included in this study. For the ABO and Rh tests, ABO and Rh blood groups were determined by combined slide and tube method using standard antisera. Chi square test was used as a test of homogeneity. A value of < 0.05 was considered significant.

RESULTS

The frequencies of distribution of ABO blood group phenotypes in the 30481 Saudi blood donors were determined in this study. The results of ABO phenotyping revealed that the most common blood group was O (62%); the lowest blood group frequency was 1.7% for AB. The A and B blood groups represented 27.6% and 8.7% respectively of the total blood groups investigated. The frequency of the Rh for the Saudi blood donors was as follows: Rh positive represented 95% and absence of D antigen (Rh negative) was represented 5% (Table-I). Table-II compares the results of Eastern region with the results of the Southwest region of Saudi Arabia. Tables III and IV compare the results of this study with the results of each of the Eastern region and Southwest region studies separately. Table-V shows the percentage deviations of all ABO and Rh blood group phenotypes in the three studies (the present study, the Eastern region study and the Southwest region study) from the expected percentages.

DISCUSSION

Knowledge of the frequencies of the different blood groups in the Saudi population is very important for blood banks and transfusion service policies. In transfusion medicine, the major implications of ABO and Rh blood group systems relate to the occurrence of

Table-II: Percentage frequencies of the ABO & Rh blood group phenotypes studied in Saudi blood donors in the Eastern & Southwest regions.

Phenotype	O	A	B	AB	Total	Rh +	Rh -
Eastern region Study	29311(51.1%)	15167(26.4%)	10583(18.4%)	2335(4.1%)	57396(100%)	52861(92.1%)	4535(7.9%)
Southwest region Study	536(56.8%)	315(33.4%)	57(6%)	36(3.8%)	944(100%)	876(92.8%)	68(7.2%)
Comparison	Chi-square = 101.25 degree of freedom = 3 P-value: < 0.0001					Chi-square = 0.53 degree of freedom = 1 P-value = 0.467	

Table-III: Frequencies of the ABO & Rh blood group phenotypes studied in Saudi blood donors in Jazan (present) & Southwest regions

Phenotype	O	A	B	AB	Total	Rh +	Rh -
Present Study	18909(62%)	8411(27.6%)	2662(8.7%)	499(1.7%)	30481(100%)	28988(95%)	1493(5%)
Southwest region Study	536(56.8%)	315(33.4%)	57(6%)	36(3.8%)	944(100%)	876(92.8%)	68(7.2%)
Comparison	Chi-square = 48.25 degree of freedom = 3 P-value: < 0.0001					Chi-square = 9.83 degree of freedom = 1 P-value = 0.002	

serious hemolytic transfusion reactions (HTRs) in patients receiving incompatible red cells.¹⁰ The anti-D antibodies can cause HTRs and can cross the placenta causing hemolytic disease of the fetus and newborn (HDFN) when present in a D-negative female carrying a D-positive fetus.¹¹

The present study was the first to document the frequencies of the ABO and Rh blood groups in Jazan region. Distribution of the ABO and Rh blood groups phenotype frequencies were studied in 30481 native Saudi blood donors. Blood group O was found to be the most prevalent (62%), followed by group A (27.6%), group B (8.7%) and group AB (1.7%).

Rh distribution also varies within any group of human population. In this study, it was observed that Rh positive was 95% and Rh negative was found to be 5%.

There are two different studies describing the frequency and distribution of ABO and Rh blood groups in the Eastern and Southwest regions of Saudi Arabia.⁸⁻⁹ The results of this study were compared with the results of the Southwest region study and the Eastern region study separately. The difference between the results of this study and each one of the previous studies was not only significant in the frequency of the ABO blood groups but also in the frequency of the Rh phenotypes. The result of this study was not homogenous with the results of each previous study. There were significant differences between the results of this study and the results of the Southwest region study in the distribution of both ABO groups and the Rh phenotypes (P < 0.0001 & 0.002 respectively) (Table-III). Also, there were

significant differences between the results of this study and the results of the East region study in the distribution of both ABO groups and the Rh phenotypes (P < 0.0001 for each) (Table-IV).

Table-V shows to which extent the frequency of each blood group is deviated from the expected frequency if we accept the null hypothesis (the hypothesis that assumes there is no difference between the results). The deviations are expressed in percentages. The positive sign (+) of the figure means that the frequency of the corresponding blood group is above the expected frequency and the negative sign (-) of the figure means that the frequency of the corresponding blood group is lower than the expected frequency.

The biggest frequency shortage of the ABO blood groups was in group B in both the Southwest and Jazan samples (-59.7% and -41.7% respectively) and group AB in Jazan samples (-41.3%). The biggest frequency shortage of the Rh phenotypes was in Rh- in Jazan samples (-28.6%). Group B, group AB and Rh- phenotype have the lowest frequency in the three study samples. Jazan sample has the lowest frequency on two of these rare groups. Study of the distribution of blood groups in different regions of Saudi Arabia would provide a valuable database of the historical and serological frequencies for the native donor population and direct donor typing policies and programs to enable subsequent targeted transfusion provisions. It will also determine if regional differences occur within the overall donor population.

Table-IV: Frequencies of the ABO & Rh blood group phenotypes studied in Saudi blood donors in Jazan (present) & Eastern regions.

Phenotype	O	A	B	AB	Total	Rh +	Rh -
Present Study	18909 (62%)	8411 (27.6%)	2662 (8.7%)	499 (1.7%)	30481(100%)	28988 (95%)	1493 (5%)
Eastern region Study	29311 (51.1%)	15167 (26.4%)	10583 (18.4%)	2335(4.1%)	57396(100%)	52861(92.1%)	4535 (7.9%)
Comparison	Chi-square = 2055.56 degree of freedom = 3 P-value: < 0.0001					Chi-square = 280.55 degree of freedom = 1 P-value = < 0.0001	

Table-V: Percentage Deviations of the ABO & Rh phenotypes in the three different regional studies

<i>Phenotype</i>	<i>O</i>	<i>A</i>	<i>B</i>	<i>AB</i>	<i>Rh +</i>	<i>Rh -</i>
Present Study	+ 13%	+ 2.6%	- 41.7%	- 49.3%	+ 2.1%	- 28.6%
Eastern region Study	- 7%	- 1.8%	+ 23.1%	+ 25.9%	- 1.1%	+ 15.1%
Southwest region Study	+ 3.4%	+ 24.1%	- 59.7%	+ 18%	- 0.4%	+ 4.9%

CONCLUSION

The study results show that the most frequent blood group in the Jazan region is group O and the rarest is group AB. This study has a significant implication regarding the management of blood banks and transfusion services in this area. Knowledge of blood group phenotype distribution is also important for clinical studies (for example disease association), as well as for population studies. It is necessary to conduct similar studies in other regions of Saudi Arabia in order to determine the blood group frequencies in them.

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