

cPrevalence of ABO and Rh Blood Groups in Saudi Arabian Population

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Abstract: ABO and rhesus (Rh) blood group antigens are the most frequently studied genetic markers in a large group of people. The knowledge of the distribution of ABO and Rh blood groups is essential for effective management of blood banks inventory, be it a facility of smaller local transfusion service or a regional or national transfusion service. Apart from the importance in blood transfusion practice, the ABO and Rh blood groups are useful in population genetic studies, researching population migration patterns as well as resolving certain medico-legal issues, particularly of disputed parentage. The present study was done to assess the prevalence of blood groups in different categories in Jeddah province and to compare our results with other studies conducted in KSA and elsewhere in the world and its multipurpose future utilities for the health planners. In our study, Determined the ABO group and Rh blood group for 800 Saudi population. The participants for this study were the blood donors coming to King Abdul Aziz hospital (KAAH) blood bank, in the period of November, December 2015, and January 2016. They were from different ages and from numerous and diverse national and cultural backgrounds, who either donate blood regularly or to cover hospital needs. The overall distribution of blood group in our sample study was 53%, 24%, 18%, 6% for groups O, A, B, and AB respectively. While the prevalence of Rh (D-antigen) blood typing was 91% Rh positive and the remaining 9% was Rh negative.

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1. Introduction:

Individual blood groups of the red cell membrane are serologically linked antigenic structures, due to their presence on the same biochemically-related lipids or proteins. Some antigens, such as those of the ABO blood group, are surface structures, while others (eg, Rh) are carried on molecules that span the width of the red cell membrane^[1].

The four common blood groups in the ABO/ABH system are O, A, B, and AB. When an individual lacks the A and/or B antigen on the red cells, the plasma will contain naturally-occurring allo-antibodies to the missing antigen(s). They generally appear in blood by fourth to sixth months of age following exposure to bacterial antigens that are similar in structure to the A and B blood group antigens^[2]. Thus, Group A individuals will have anti-B antibodies, Group B individuals will have anti-A

antibodies, Group O individuals will have both anti-A and anti-B antibodies (universal donors), Group AB individuals will have neither anti-A nor anti-B.

Individuals who have the D antigen on their red blood cells are known as Rhesus positive while those without the antigen are known as Rhesus Negative.

The clinical significance of blood groups in blood transfusion is that individuals who lack a particular blood group antigen may produce antibodies that react with that antigen. Mismatches with the ABO and Rh blood types are responsible for the most serious, sometimes life-threatening, transfusion reactions / or hemolytic disease of the new born, thus blood grouping and cross matching should be done to prevent the transfusion reactions and mortality^[3].

Besides, the need for blood group prevalence is multipurpose because of their relation to disease and environment is being increasingly sought in modern medicine^[4].

Furthermore, Generation of simple data base of blood group, not only provides data about the availability of a human blood in case of regional calamities, but also serves as forewarned of future burden of disease, such studies need to be carried out at a regional level where humanity resides^[5, 6].

Objective:

Determining the prevalence of different blood groups and Rh factors amongst Saudi population.

2. Methods:

Our aim was to determine the ABO and Rh blood groups for 800 Saudi people. The participants for this study were the blood donors coming to King Abdul Aziz Hospital (KAAH) blood bank, in the period of November-December 2015 - January 2016. And they were from different ages and from numerous and diverse national and cultural backgrounds, who either donated blood regularly or to cover hospital needs. The data was obtained from the blood bank for each donor was mainly their demographic information, nationality, medical history, ABO and Rh blood groups. For confidentiality purpose, the data was obtained from the questionnaire provided by the blood bank, and was filled by all donors before pursuing any blood donation. The nurse responsible for delivering questionnaires to donors explained to them that their blood group results will also be used in a study, verbal and written consent were obtained from them. Ethical consideration: Official approval was obtained, and ethical codes were followed strictly in all stages of the study. All data were coded using serial numbers.

Blood samples were collected by venipuncture into ethylene diamine tetraacetic acid (EDTA) bottle and used to determine ABO group and Rh factor. For ABO, a drop of serum anti-A, anti-B and anti-AB will be labeled 1,2,3 respectively. To each Anti serum we add a drop of 5-7% RBCs which was mixed well for two minutes and observed for agglutination. Similarly, for Rhesus factor, a drop of anti-D was added and was placed in a clean labeled title mixed and observed for agglutination. There were two distinct parts to ABO grouping. The Direct or Forward grouping required known anti-A and anti-B typing antisera for testing unknown cells. The Indirect, Reverse or Back grouping required a pool of known A and known group B cells. Both Forward and Reverse grouping was routinely carried out. The forward typing antigen-antibody reaction results in visible agglutination of the red blood cells determining the blood groups A and B and AB. No agglutination with anti-A, anti-B, determines the amorphous, group O. In the reverse typing reagent red blood cells agglutinate when antibodies in patient serum react with their

corresponding antigenic determinants on the red blood cell. Anti-A and B antibodies in patient serum agglutinates red blood cells possessing A and/or B blood group antigens, while group O red blood cells did not react with the patient's serum.

Tools:

Blood Bank questionnaire.
Whole blood obtained from donor.
EDTA bottles.
Anti-A, anti-B and anti-D (Rh) antiserum.
Blood typing slide.

Setting:

Blood bank, King Abdulaziz Hospital, Jeddah-Saudi Arabia.

Literature Review:

A study conducted by Mohieldin Elsayid *et al.* in 2015 to determine the Prevalence of Blood Group of Saudi Patients in King Abdulaziz Medical City-Riyadh, showed that the blood group O is highly frequent among Saudi population, while the blood group AB is the lowest. The Rh positive phenotype is mostly frequent, while the Rh negative is found less frequent. The variation in frequency of blood groups and Rh phenotypes is due to difference in racial and geographical differences as well as migration move.^[7]

A study conducted by RAJSHREE BEHRA *et al.*, 2013 to determine the distribution of blood group and Rh(D) factor in western Rajasthan found that during the study period, blood groups of 83631 donors were screened by antigen antibody agglutination method using commercially available antisera which were validated at their blood bank. The study revealed that the most common ABO blood group was B, followed by O, A and AB respectively. Rh negative were 8.25%.^[8]

A study conducted by Tulika *et al.*, 2011 on the Frequency of ABO and rhesus blood groups in blood donors. The results showed The frequency of ABO and Rh blood in northern India was group B (39.92%) followed by group O (29.27%), group A (21.38%), and group AB (9.43%).^[9]

A study conducted by Saghir Ahmad *et al.*, 2015 on the Prevalence Frequency of ABO and Rhesus Blood Groups in Human in District Rahim Yar Khan, Pakistan. The study showed that Group B is at the highest frequency level among both the genders with an overall higher to lower order B (37.41%), O (33.95%), A (20.97%) and AB (7.65%). The blood group B was also at the highest frequency in Rh+ve as well as Rh-ve male subjects. However, in female subjects the blood group O (33%) was at the highest frequency in Rh+ve and blood group A was at peak in Rh-ve.^[10]

A study conducted by Layla Bashawri *et al.*, in the period from 1985 – 1999 on Frequency of ABO blood groups in the Eastern region of Saudi Arabia, concluded that; the most frequent blood group in Saudi population was O-positive. While Blood group A was observed at a lower frequency^[11].

A study conducted by Mohamed *et al*, 2011 on the Distribution of ABO and Rhesus (RHD) Blood Groups in Al-Jouf Province of the Saudi Arabia their study shows: the present study is original in that, it is the first comprehensive study that documented the distribution of ABO and RHD blood groups among four cities of Al-Jouf Province of the Saudi Arabia. This study could have significant implications for the major blood banks of Al-Jouf where certain blood groups are needed more than others in emergency conditions.^[12]

Blood donors were asked about their demographic information, medical history questionnaire filling, medical examination, type of blood group and Rh will be done before donation.

Ethical consideration: Official approval has been obtained, and ethical codes were followed strictly in all stages of the study. All data were coded using serial numbers for confidentiality

3. Results:

A total of 800 participants were screened for ABO, and Rhesus blood groups. Of these, 665 were males (83.13%) and 135 (16.87%) were females subjects.

Table 1 and Chart 1 show the distribution of the ABO blood groups among study subjects. Blood group O was found to be the most frequent (53%) among the study population, while blood group AB was the least prevalent (6%). The gene frequencies with respect to ABO can be shown as O > A > B > AB. The frequency of blood group A showed preponderance over blood group B.

Table 2 and Chart 2 show Prevalence of blood groups Rh typing in the study population (n = 800), 91% of the subjects were Rh-ve while the remaining 9% were Rh –ve.

Table 1. Distribution of ABO blood group and number of donors

ABO blood group	A	B	AB	O
number of subjects	190	142	46	422

Table 2 Distribution of Rh blood groups amongst donors

Rh blood group	RH+	RH-
number of subjects	730	70
percentage	91%	9%

Chart 1 percentage of ABO blood groups

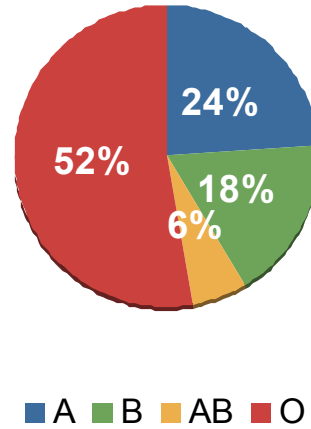
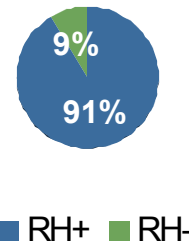
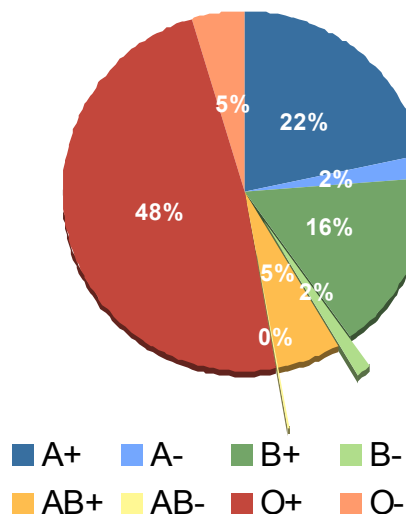


Chart 2 percentage of Rh blood groups amongst donors



With respect to both ABO and Rhesus blood grouping systems (Chart 3), the prevalence of blood group A+, A-, B+, B-, AB+, AB-, O+ and O- were 22, 2, 16, 2, 5, 0, 48, and 5%, respectively. The gene frequencies with respect to ABO and Rhesus systems can be shown as O+ > A+ > B+ > AB+ ≥ O- > A- ≥ B- > AB-.

Chart 3 percentage of ABO and Rh blood groups amongst donors



4. Discussion:

Gene frequencies with respect to ABO system for the present study can be shown with a general formula $O > A > B > AB$. The preponderance of the allele B of the ABO blood groups over allele A had been observed in the present study. Previous reports are in agreement with the present study and confirm that group O was the predominant among ABO blood groups. Previously in a study conducted by Mohieldin *et al.*, 2015 to determine the Prevalence of Blood Group of Saudi Patients in King Abdul Aziz Medical City-Riyadh, showed that The blood group O is highly frequent among Saudi population, while the blood group AB is the lowest^[7].

Rhesus D distribution also varies within any group of human population. This study showed that total percentage of RhD positive distribution was 96% and RhD negative distribution was 4%. Similar pattern of distribution is also observed in other studies^[7]. It was also revealed that blood group O RhD positive was the highest with frequency of 48%, followed by group A RhD positive 22%, blood group B RhD positive 16%, and AB RhD positive was 5%. In this study, we have observed higher prevalence of O RhD positive blood group compared to other frequencies. Similar frequencies was reported among A study conducted by RAJSHREE BEHRA *et al.*, 2013 to determine the distribution of blood group and Rh(D) factor in western Rajasthan found that during the

study period, blood groups of 83631 donors were screened by antigen antibody agglutination method using commercially available antisera which were validated at their blood bank. The study revealed that blood group O RhD positive was the highest with frequency of 35.07%, followed by group B RhD positive 33.61%, blood group A RhD positive 22.44%, and AB RhD positive was 6.58%. In this study, we have observed higher prevalence of O RhD positive blood group compared to other frequencies^[8].

Conclusion:

Knowledge of the prevalence and distribution of ABO and Rh blood groups among any population is useful in health care planning and appropriate allocation of resources. knowledge of the distribution of the various blood groups is also vital in the safe rendering of transfusion service, civic registration, forensic medicine and to reduce hemolytic disease of newborn associated with Rhesus-mismatched marriages among couples.

The overall distribution of blood group in our sample study was 53%, 24%, 18%, 6% for groups O, A, B, and AB respectively.

The blood group O was Dominant followed by A, B, while AB was Rare.

On the other hand the prevalence of Rh(D-antigen) blood typing, 91% of the subject was Rh+ while the remaining 9% was Rh-

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