

Distribution of ABO and Rh-D blood groups in Saudi Population of Makkah City– Saudia Arabia

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Abstract

Background: The antigens expressed on the red blood cell determine an individual's blood group. The two main blood groups are called ABO (with blood types A, B, AB, and O) and Rh (with Rh D-positive or Rh D-negative blood types). The discovery of the ABO blood group system over 100 years ago, caused a great excitement. Until then, all blood had been assumed to be the same, and the often tragic consequences of blood transfusions were not understood. The Rh blood group system is the most second important system which has a clinical significant in medical life, and probably the most complex of all red blood group systems. It was discovered by Landsteiner and Winer in 1940.

Objectives: This study was designed to detect the frequency of ABO, and Rh(D) blood groups in Saudi population of Makkah city-KSA in the period between 1/1/2014 till 31/12/2016.

Materials and Methods: Blood testing for ABO, and Rh (D) typing was done over two years, in 4930 unrelated individuals, from both genders. Blood grouping was conducted based on hemagglutination and hemolysis reactions.

Results: Blood group "O" was the most predominant (48.29%) in both Rh positive and negative subjects, followed by blood group A, B and AB with frequencies of 29.91%, 17.54%, and 4.23% respectively. Majority of the subjects were Rh (D) positive (98.0%), when only 2% were Rh negative.

Conclusions: The frequency of ABO blood groups in both Rh positive and negative subjects among the Saudi ethnic group in Makkah city was similar to that reported from neighboring regions.

Keywords: ABO, Rh (D), blood groups, Saudi population.

Introduction

ABO Blood Group System

The discovery of the ABO blood group system over 100 years ago, caused a great excitement. Until then, all blood had been assumed to be the same, and the often tragic consequences of blood transfusions were not understood.¹

Table 1 ABO blood group system

Blood group	Antigen(s) present on the Red Cell	Antibodies present in the Serum	Genotype(s)
A	A antigen	Anti-B	AA or AO
B	B antigen	Anti-A	BB or BO
AB	A antigen & B antigen	None	AB
O	None	Anti-A & Anti-B	O

The ABO blood group system consists of four main blood groups, A, B, AB, and O, which are determined by the presence or absence of the two antigens A, and B, on the surface of red blood cell.²

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The immune system forms antibodies against whichever ABO blood group antigens are not found on the individual's RBCs. Thus, a group A individual will have anti-B antibodies, and group B individual will have anti-A antibodies. Blood group O is common, and individuals with this blood type will have both anti-A, and anti-B in their serum.³

Rh blood group system

The rhesus blood type named after the rhesus monkey was first discovered in 1937 by Karl Landsteiner and Alexander S. Wiener.⁴ The significance of the discovery was not immediately apparent and was only realized in 1940, after subsequent findings by Philip Levine and Rufus Stetson.^[1] This serum that led to the discovery was produced by immunizing rabbits with red blood cells from a rhesus macaque. The antigen that induced this immunization was designated by them as *Rh factor* to indicate that *rhesus* blood had been used for the production of the serum.⁵

The **Rh blood group system** (including the **Rh factor**) is one of thirty-five current human blood group systems. It is the second most important blood group system,

after ABO, and it consists of 50 defined blood-group antigens, among which the five antigens D, C, c, E, and e are the most important. The commonly used terms *Rh factor*, *Rh positive* and *Rh negative* refer to the *D antigen* only. Besides its role in blood transfusion, the Rh blood group system-specifically, the D antigen-is used to determine the risk of hemolytic disease of the newborn (or erythroblastosis fetalis) as prevention is the best approach to the management of this condition.⁶

D antigen

The D antigen is a collection of conformation-dependent epitopes along the entire RhD protein. While in most D-negative Caucasians there is a deletion of *RHD*, in other populations (notably Japanese and African blacks) the D-negative phenotype is associated with a grossly normal *RHD*, and the reason for the lack of expression of the D antigen is not known (except in Africans; see later).⁷

Frequency of ABO and Rh blood group systems in KSA

Results of study had been done in Eastern region of Saudia Arabia revealed the most common blood group was O, (52%) during the the lowest blood group frequency was AB (4%). Rhesus positive blood donors comprised 93% and Rhesus-negative donors were 7%.^{8,9} Other study was done in Southwest proved that the most common blood group was O, followed by blood group A and B, and the lowest blood group was AB.^{8,9}

Table 2 Some frequencies of ABO &Rh in some other countries

ABO Spectrum	O %	A %	B %	AB %
Sudan	52.7	23.3	13.2	10.8
Egypt	36.4	33.9	20.9	8.6
Syria	37.5	46.2	13.1	3.1
Jordan	36.6	38.3	18	6.9
India	37.12	22.88	32.26	7.74

Materials and Methods

A retrospective study was carried out at a Central Blood Bank- Makkah city, from January 2014 to December 2016. The blood groups of donors and patients of either sex were studied. Total of 4,930 subjects were screened for their blood groups. The blood samples were collected by venepuncture in EDTA containing vacutainer. ABO and Rh blood grouping were done by agglutination test using anti-A, anti-B and anti-D human sera. Blood group (ABO) and Rhesus factor was done by the antigen antibody agglutination test. The antisera used for ABO blood group were monoclonal anti-A, monoclonal anti-B, monoclonal anti-D (IgM). Antisera used for Du test is monoclonal anti-D (IgG).

Results

The study showed that O was the most common blood group (48.8%) , followed by A at 29.9% ,B 17.5%, while AB

was the least prevalent group (4.2%) (Table 3). 44.7% of the donor population was Rh positive and the rest were Rh negative (Table.5.)

Table 3 Distribution of ABO blood group system

Blood group	No. of Samples	%
A	1475	29.91
B	865	17.54
AB	209	4.23
O	2381	48.29

Table 4 Distribution of Rh blood group system

Blood group	No. of Samples	%
Rh +ve	4548	92.2
Rh -ve	382	7.8

Discussion

ABO and Rh genes and phenotypes vary widely across races and geographical boundaries despite the fact that antigens involved are stable throughout the life

In the present study blood group-O was the predominant (48.7), while AB was the least common (4.2%). This findings near to the results in the study done by Bashwari LA *et al.*2001 revealed the most common blood group in Eastern area of Saudi Arabia was O, (52%) while the lowest one is AB blood group system with (4%).Also the results of this study not far from results of another study done in Southwest done by Mohammad Sarhan & *etal*, the most common blood group is O (56.8%), and the lowest one is AB (3.8%). This study when is compared with studies done throughout the world found to be near to the frequencies of ABO and Rh in USA. Also another study done in the Benin (2008), proved that the frequency of O blood group was the most frequent when the AB blood group was the least frequent. Also study done in India by Amer Agrawal *et al* (2014) receded that the O blood group system was the most frequent one. Finally the results recorded by this study were not far from other countries throughout the world.

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