

Blood group and Rhesus antigens among Blood donors attending the Central Blood Bank, Sudan

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Abstract

Background: It is well known that the Rhesus system remains the second most clinically important blood group system after the ABO. There is no published work regarding the frequency of various Rhesus antigens among Sudanese population.

Objectives: In order to minimize Rhesus allo-immunization among blood recipients a cross sectional study was conducted to determine the frequency of various Rhesus antigens among the blood donors attending the Central Blood Bank in Khartoum.

Methods: Two hundred male blood donors were enrolled in the study. ABO and Rhesus typing were performed using the classical slide method and gel micro typing system.

Results: The frequency percentage of ABO blood phenotypes in the total samples were as follows: O(51.5%), A (29.5%), B (16%), and AB (6%); whereas the frequency percentage of Rh antigens were D (93%), e (79.5%), c (68.5%), C, (27%), E (18.5%).

Conclusion: We concluded that the frequency of the Rh antigens can be shown in this order $D > e > c > C > E$. Special precautions need to be undertaken to minimize any possible allo-immunization by such antigens.

Keywords: Frequency, Rhesus antigens, phenotyping, Blood group.

Thirty blood group systems consisting of approximately 700 erythrocyte antigens are described by the International Society of Blood Transfusion¹. The ABO and Rh are the most common important blood group systems than the others. The ABO was discovered firstly by Landsteiner in 1900^{2,3}. The Rh system was identified later by Landsteiner and Weiner in 1940³.

Blood group antigens play a vital role in transfusion medicine, genetics understanding, inheritance pattern, and disease susceptibility⁴. The benefit of knowledge of the blood group pattern in transfusion services is the reducing of maternal mortality rate and useful in clinical practice, because in certain conditions an antigen may react with its

corresponding antibody and cause serious clinical effects like haemolytic disease of the newborn and haemolytic transfusion reaction⁵. Therefore, it is fundamental to have information on the distribution of these blood groups in any population group.

The Rh blood group has been reported to be the most complex and highly polymorphic of all the blood group systems⁶. To the present, the Rh system is composed of over 50 antigens⁷, but only five are commonly identified (C, D, E, c, e). The Rh antigens are highly immunogenic, and most of the rhesus antibodies should be considered potentially capable of causing haemolytic transfusion reactions and haemolytic disease of the fetus and newborn^{8,9}. Anti-D causes the most severe form of HDN and it used to be a major cause of fetal death. However, all cases cannot be prevented, and RhD alloimmunization remains a major cause of disease¹⁰. Anti-c Rh alloantibodies are also capable of causing severe HDN¹¹, which is considered the most important Rh antigen after the D antigen. Rh allo-antibodies that are

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associated with mild HDN include anti-C¹², anti-E¹³, and anti-e¹⁴. Anti-D, anti-C, anti-E, and anti-e have all been involved in delayed hemolytic transfusion reactions¹⁵. Routine Rh D phenotyping in both blood donors and recipients has reduced the incidence of transfusion reactions caused by anti-D. But

sensitization to other Rh antigens can be a problem in transfusion medicine, particularly in patient with sickle cell anemia who needs multiple blood transfusions. Those patients are not few in our region; they may develop allo-antibodies in case of receiving blood possessing certain Rh antigen which they lack. To find compatible blood for such

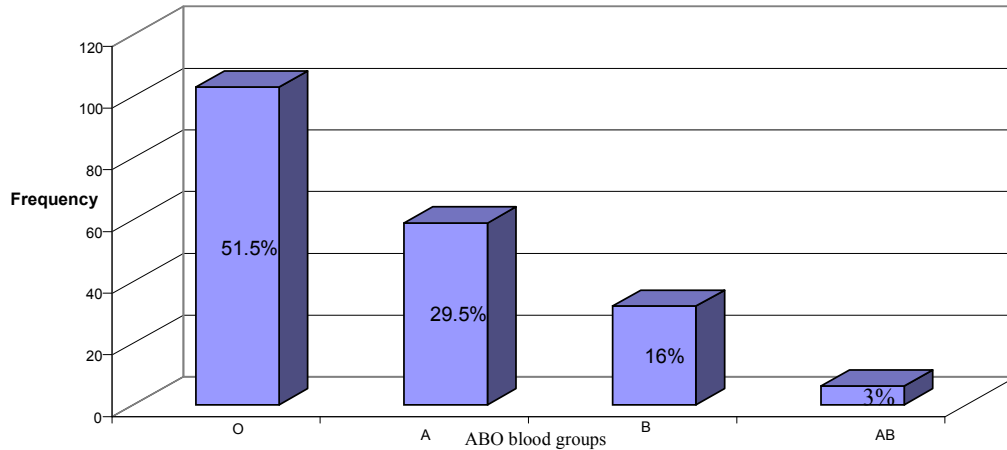


Figure 1: The Frequency of ABO blood groups among the studied blood donors (N/200)

the donors and recipients. Thus, the present study was carried out to determine the frequencies of various Rh antigens among the blood donors attending the Central Blood Bank in order to minimize the possible allo-immunization against various Rh antigens among the blood recipients.

Methods:

Study area and population: A total of 200 male blood donors from different Sudanese tribes were included in this study when they attended for the donation process in the Central Blood Bank in Khartoum.

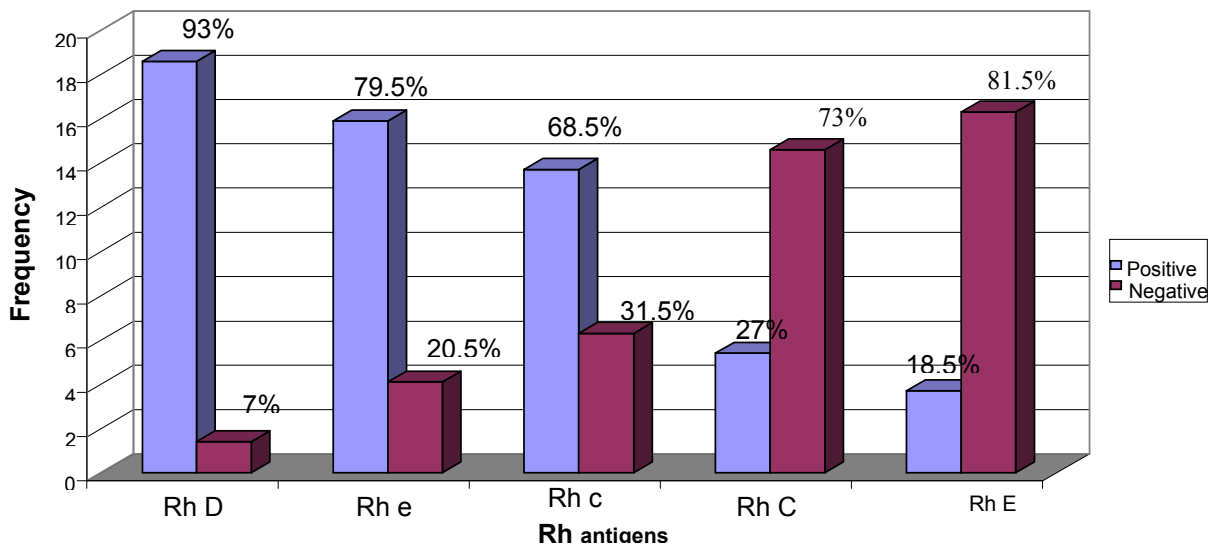


Figure2: The frequency of various Rh antigens among the studied blood donors (N/200)

Study design and period: A cross sectional study was conducted during June to October 2012.

The practical protocols were performed in Faculty of Medical Laboratory Sciences, Alneelain University- Khartoum.

Table 1: The frequency of ABO and Rh antigens among the studied blood donors in relation to their tribes (in percentage).

ABO& Rhantigen	O	A	B	AB	D	e	C	C	E
Afro-asiatic	51.3%	28.7%	15.7%	4.1%	92%	78%	67.8%	27.3%	19.1%
Nilo-sahara	51.0%	32.6%	16.3%	0%	93.8%	83.6%	67.3%	26.5%	16.3%
Niger-congo	60%	20%	20%	0%	100%	80%	100%	20%	20%

Ethical consideration and sample processing:

collected from each donor For each sample ABO and Rhesus D, E, e, C and c phenotyping was performed using monoclonal anti-A , anti-B and monoclonal / polyclonal anti-D (Labkit ,Barcelona, Spain), the procedure performed by the classical slide and tube agglutination method according to the manufacturer's instructions. Confirmation of Rh D negative was done by the dextran acrylamide gel technique (DiaMED-ID Micro Typing System)^{16,17}.

Statistical analysis: Results data were

analyzed by SPSS, then presented in tables and figures using Microsoft office word and excel.

Results:In this study, included blood donors were categorized according to their tribes into three ethnic groups: Afro-asiatic, Nilo-sahara and Niger-congo and were represented in this percentage 73%, 24.5 % and 2.5% respectively. Moreover the frequency percentages of the ABO blood group were O (51.5%), A (29.5%), B (16%) and AB (6%), figure 1.

Table 2: Comparison of frequency of Rh phenotypes at different geographical areas (in Percentage)

Rh antigen	Sudanese	Blacks	Asians	Palestinians	North Indians
D	93 %	92%	99%	92%	93%
E	79.5 %	98%	96%	97%	98.3%
C	68%	96%	47%	81%	52.8%
C	27%	27%	93%	69%	84.7%
E	18.5%	22%	39%	38%	17.9%

Whereas the frequency percentages of Rh D positive and Rh D negative donors were 93.0 % and 7.0 % respectively. Furthermore the frequency percentages of the other various Rhantigens were e (79.5%), c (68.5%), C (27%), and E (18.5%), figure 2.

Discussion:

To the best of the author's knowledge there is no published work in the literature regarding the frequencies of various Rh antigens among Sudanese. Therefore, this study was performed to document the frequencies of the

various Rh antigens among the blood donors in the Central Blood Bank- Khartoum. The frequency of the Rh antigens in the total samples can be shown as in this order D > e > c > C > E. In our study the Rh D, C, E antigens have almost identical frequencies compared to black populations, whereas Rh c and e have remarked lower frequencies. In Asians, Rh antigens are found to have higher frequencies except for Rh c¹⁸. With the exception of Rh D, higher Rhesus frequencies were reported in a study done in Palestinians by Skaik et al¹⁹. In north Indian,

almost identical frequencies of Rh E and D are found by Karan and his co-workers²⁰.

The five most important Rhesus antigens are the cause of most allo-immunizations following blood transfusion. Whenever we transfuse blood, it's crucial to provide Rh compatible blood especially in transfusion - dependant patients and women of reproductive age.

In the present study, our results revealed that Rh E antigen has the least frequency among other various Rh antigens in studied blood donors. Because of its immunogenicity, in certain circumstances as in case of transfusion-dependant patients this antigen may be a source for allo-immunization. Some precaution needs to be undertaken in frequent transfusion processes in order to prevent the consequent harmful effect of allo-immunization.

Conclusion: We Reached to conclude that the frequencies percentages of the Rh antigens were $D > e > c > C > E$. Rh E antigen has least frequency among the other Rh antigens in Sudanese blood donors. Some of these antigens have high immunogenicity; for this need to be checked before every blood transfusion to minimize any possible allo-immunization.

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