JK SCIENCE

ORIGINAL ARTICLE

Prevalance of Rh Antigen Subgroups Among Blood Donors in a Tertiary Care Hospital in Rural Harayana

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Absrract

Rh system in today's world is probably the most complex red cell antigen system in humans. The presence of D antigen confers Rh positivity and vice versa. Two allelic antigen pairs, E/e and C/c are also found on the Rh protein. The D antigen is the most immunogenic red cell antigen after A and B. As there is paucity of data distribution of Rh antigen subgroup from the Indian literature, the study was conducted to know the prevalence of Rh antigen subgroups in this part of the region and to determine the phenotype and most common genotype of Rh antigen among the blood donors. The observational 1 year prospective study was conducted on blood donors attending the blood bank in the Department of Pathology, MMIMSR, MMDU, Mullana.The study comprised of blood donors of various age groups which included 90%(450) males and 10%(50) females. An overall Rh D positivity was seen in 88.4% of blood donors while 11.6% lacked the D antigen. The most common Rh phenotype was ccDEE 26.6%. In conclusion, sensitization to clinically important blood group antigens can be prevented through complete blood typing. All patients should be genotyped before the first blood transfusion.

Key words

Rh D, Rh C, Rh E, Anti D

Introduction

Alloantibodies develop against some rare antigens and thus antigen typing becomes a prime focus for indigenous screening cell and panels for identification (1). Red blood cell antigens, 308 of them have been recognised by ISBT, with 270 of which divided over 30 blood group systems (2). Blood is man's complete and unchangeable identity as it is the most important body fluid responsible for circulation of nutrients and oxygen (3). Among the various factors that contribute to a person's individuality are antigens attached to the surface of red blood cells and antibodies that circulate in the serum (4). On the basis of these antigens, 30 well-defined red cell blood group system of wide distribution in most racial groups have been described. Out of these, ABO and Rh systems are of major importance in clinical practice (2).

Today the Rh system is probably the most complex red cell antigen system in humans, encompassing some 50 antigens (5). Five determinants account for this vast majority of phenotypes. The presence of D antigen confers Rh positivity, while persons who lack it are Rh negative. Two allelic antigen pairs, E/e and C/c are also found on the Rh protein. The three genes, arranged in tandem on chromosome 1 are inherited as a haplotype i.e. CDE of cde. Two haplotypes can result in the phenotypic expression of two to five Rh antigens. Exposure of Rh negative people even to small amount of Rh positive cells can result in production of anti D alloantibody (6). Anti D formation usually results from exposure through either pregnancy or transfusion of red cells possessing the D antigen to person who lacks the antigen (7).

No such study has been carried out to know the prevalence of Rh antigen subgroups in this part of the region in the recent past. As the prevalence of Rh antigen

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subgroups varies between various populations and ethnic groups this prompted us to undertake this study as this area is visited by populations of Saharanpur, Haridwar, Yamunanagar, Kaithal, Nahan and surrounding villages.

Material and Methods

The observational one year prospective study was conducted on blood donors attending the blood bank in the Department of Pathology of MMIMSR, MMDU, Mullana. The blood samples were obtained by standard procedures of venipuncture after taking proper aseptic precautions and were subjected to determination of Rh group subtypes by gel card technique. A 5.0% suspension was made in LISS and agglutinated red cells appearing as red line on gel surface or dispersed in the gel column were considered positive.

Results

The study sample comprised of 500 blood donors of various age groups which included 450 males and 50 females. 88.4% of blood donors were found out to be Rh D positive whereas only 11.6% were Rh D negative. *(Table 1)*

The most prevalent Rh phenotype among Rh D positive

Table 1: Distribution of Various Rh Antigen Subtypes Among Blood Donors

RH ANTIGEN SUBTYPES	Rh D +VE	Rh D -VE	Rh C +VE	Rh C -VE	Rh c +VE	Rh c -VE	Rh E +VE	Rh E -VE	Rh e +VE	Rh e -VE
NUMBER OF DONORS	442	58	282	218	461	39	427	73	255	245
%AGE	88.4	11.6	56.4	43.6	92.4	7.8	85.4	14.6	51.0	49.0

Table 2: Distribution of Rh Phenotypes Among Rh D Positive Blood Donors

	CCDee	CcDee	CcDEe	ccDEe	ccDee	ccDEE	CcDEE
NUMBER OF Rh D POSITIVE DONORS	17	20	90	75	05	133	102
PERCENTAGE	3.85	4.53	20.36	16.97	1.13	30.09	23.08

Table 3: ***Distribution of Rh Phenotypes Among Rh D Negative Blood Donors***

	CCdee	Ccdee	CcdEe	ccdEe	Ccdee
NUMBER OF RH D NEGETIVE DONORS	05	22	04	10	17
PERCENTAGE	8.62	37.93	6.89	17.24	29.31

Table 4: Distribution of Rh Phenotypes Among Blood Donors

PHENOTYPES	NO. OF DONORS	PERCENT DISTRIBUTION
ccDEE	133	26.6
CcDEE	102	20.4

donors came out to be ccDEE (30.09%), while the least being ccDee (1.13%). *(Table 2)* The most prevalent Rh phenotype among Rh D negative blood donors came out to be Ccdee (37.93%), while the least being CcdEe (6.89%). *(Table 3)*

The most prevalent Rh phenotype in the study was found to be ccDEE (26.6%) and the least being Ccdee (0.8%). *(Table 4)*

Discussion

Knowledge of distribution of Rh blood group is essential for effective management of blood banks inventory, be it a facility of a smaller local transfusion service or a regional or national transfusion service.

The present study was undertaken to determine the prevalence of Rh antigen subgroups among blood donors in the blood bank of MMIMSR, MMDU, Mullana. The total number of donors screened for Rh antigen subgroups, for a period of one year was 500.

In practice most of the blood banks in our country, particularly in rural regions, do not determine the Rh types routinely and no consideration is given to Rh and the similar incomplete antibodies in their cross-matching procedures (8). As there is paucity of data distribution of Rh antigen subgroups from the Indian literature, the study was undertaken to know the prevalence of these subgroups among blood donors presenting at blood bank, MMIMSR, MMDU, Mullana.

Mild to severe cases of fetal hemolytic disease have been reported when anti-c, C, e, E, or Kell, Kidd, Duffy, MNS, Lutheran, Diego, Xg, P antibodies, as well as other private and public blood group systems found in the sera of mothers (1). For this, we need to know Rh phenotype of the donors and recipients.

In the present study the overall prevalence of Rh D positive was 88.4% and that of Rh D negative was 11.6% which is comparable to a study done by Shivaraman *et a*l. (9) in various population groups in Punjab and U.P. according to which the prevalence of Rh D negative was 8.7%.

To determine whether the person has genes that encode C, c, E, e, the red cells are tested with antibody to each of these antigens. The trait is passed on by autosomal dominant pattern (10). The study found the prevalence of C antigen to be 80.0% contrasting to 56.4% in Indian study by Vyas *et al*. and Nigerian study by Jeremiah and Buseri 17.7%. Similarly, c antigen in our study was prevalent in 92.4% of donors whereas in studies by Vyas *et al*. and Jeremiah and Buseri it was 70.0% and 99.8% respectively (11,12).

A high prevalence of E antigen was found in the present study 85.4% in contrast to Vyas *et al.*, 15.0%; and Jeremiah and Buseri, 20.5% respectively. Similar findings predominated the spectrum for e antigen too where it was 51.0% in present study with respect to 99.0% and 98.7% in studies conducted by Vyas *et al.* and Jeremiah and Buseri respectively (11,12).

In the present study the commonest phenotype came out ccDEE 26.6% which was in contrast to Sarkar *et al*. 0.70% and Thakral *et al.* 1.45%. Similarly, the least common phenotype observed was Ccdee 0.80% in present study which correlated with findings of Sarkar *et al.*, 2.50% and Thakral *et al.*, 0.56% (13,14).

The reason for the disparity can be attributed to the fact that ethnic origin influences phenotype and genotype because the incidence of Rh genes differ from one geographic group to another (15,16).

Thus, knowledge of these phenotypes will help in preventing transfusion reactions in patients who require multiple transfusions as the phenotypes of blood donor and recipient can be matched before transfusion (17,18). This will also prevent hemolytic disease of new born, as the pregnant women would receive prophylactic immunoglobulin thereby preventing alloimmunization (19,20).

In conclusion, sensitization to clinically important blood group antigens can be prevented through complete blood typing and all patients should be genotyped before the first blood transfusion. The study will help in developing a panel of blood donors with known Rh phenotypes, especially for patients requiring multiple blood transfusions and during pregnancy, who have been immunized with C, c, E and e antigens.

This study can also be helpful in reducing the maternal mortality rates, as access to safe and sufficient supply of blood will help significantly in reducing the preventable deaths.

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