



ABO and Rh- D Blood Groups Distribution among Blood Donors at a Tertiary Level Hospital in North Assam (Research Paper)

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Abstract

Background: ABO and Rhesus (Rh)-D blood group antigens are genetically determined integrated parts of the red blood cell membrane. They are hereditary characters and are useful in compatibility test in blood transfusion and organ transplant practices. They show a wide geographical and racial variation. The knowledge of ABO and Rh-D blood groups distribution among different population is essential in health care and transfusion practices.

Materials and Methods: ABO and Rh-D grouping were done in 10,200 blood donors in the Blood Bank, Tezpur Medical College and Hospital, Tezpur, Assam. Data on the frequency of ABO and Rh-D blood groups were reported in simple numbers and percentages.

Results and observations: The study revealed blood group O to be the commonest at 37.65% followed by blood group B at 32.0%, blood group A at 24.80% and blood group AB at 5.55%. The Rh-D positive phenotype was 96.86% and remaining 3.14% was Rh- D negative.

Conclusion: The present study provides information about the distribution of the ABO and Rh-D blood groups in North Assam, which may be helpful in effective management of regional blood transfusion service of the area.

Keywords: Blood group, ABO and Rhesus-D, Blood transfusion, Antigen, Health care

Introduction

ABO and Rh-D blood group antigens are genetically determined integrated parts of the red blood cell membrane ^[1]. They are hereditary characters and hold a respectable position in view of safety of blood/blood products transfusion more importantly in compatibility test in blood transfusion and organ transplant to date ^[2].

Today, it is a well-established fact that ABO and Rh-D blood group phenotypes vary widely across geographical boundaries despite the fact that the antigens involved are stable throughout the life ^[3]. So, the ABO and Rh -D blood groups distribution in different population groups is of importance in health care and transfusion practices ^[4]. Apart from this, ABO and Rh-D blood groups are also

of importance in population genetic studies, researching population migration patterns, resolving certain medico-legal issues particularly those of parental dispute and also for effective management of blood bank inventory^[5,6].

The Tezpur Medical College and Hospital is a tertiary level hospital situated in the North Assam. It receives most of the patients from the North Assam. The blood bank of this hospital occupies an important place in the health sector of this area. The blood donors who donate blood in this blood bank are mostly from the North Assam. If we study the ABO and Rh-D blood groups distribution among these blood donors, it will provide a fair data on the distribution of ABO and Rh-D groups among the population of North Assam and will be helpful in effective management of blood transfusion service in the area. Hence, the present study was undertaken with the aim of studying the frequency of distribution of ABO and Rh-D blood groups among the blood donors in this blood bank.

Material and Methods

A total of 10,200 blood donors, both voluntary and replacement, were recruited retrospectively into the present study at the Tezpur Medical College and Hospital Blood Bank, Tezpur, Assam during the period of two years from June 1, 2014 to May 31, 2016. Most of the blood donors were from North Assam and hence represented the population of North Assam. After phlebotomy, two millilitres of venous blood was collected in plain and anti-coagulant vacutainers. The vials were clearly marked with the unique donor identification number. The red blood cells and serum were separated from the respective vials. ABO and Rh- D blood group phenotypes were determined by tube test, both cell grouping and serum grouping methods (Cite Table 1 and Table 2), using monoclonal anti-A, anti-B, anti-AB and monoclonal anti-D (Ig M) (Tulip Diagnostics Pvt. Ltd) respectively, according to the test procedure described in standard text book and manufacturer's instruction^[2,3,4]. The principle was

based on the fact that human red blood cells possessing A and/or B antigen will agglutinate in the presence of antibody directed towards the antigen. Agglutination of red blood cells with anti A, anti-B, anti-AB and anti-D (Rh) IgM reagent is a positive test result and indicates the presence of the corresponding antigen. Absence of agglutination of red blood cells with anti-A, anti-B, anti-AB and anti-D (Rh) IgM reagent is a negative test and indicates absence of the corresponding antigen. Appropriate controls of known blood groups were used concurrently with each batch of tests. Data on the frequency of ABO and Rh -D blood groups were reported in simple numbers and percentages. A care was exercised to eliminate any repeated entry and all checked by the author.

Table 1- Interpretation of results of ABO and Rh-D blood grouping by cell grouping method

Anti-A	Anti-B	Anti-AB	Saline	ABO group
P	A	P	A	Group A
A	P	P	A	Group B
P	P	P	A	Group AB
A	A	A	A	Group O
Anti-D		Saline		Rh-D typing
P		A		Rh-D Positive
A		A		Rh-D Negative

P= Agglutination Present.

A= Agglutination Absent.

Table 2- Interpretation of results of ABO blood grouping by serum grouping method.

A cells	B cells	O cells	Blood group
A	P	A	Group A
P	A	A	Group B
A	A	A	Group AB
P	P	A	Group O

P= Agglutination/Haemolysis Present.

A= Agglutination/Haemolysis Absent.

Results and observation

During the period of 2 years from June 1, 2014 to May 31, 2016; a total of 10,200 blood donors donated blood in our blood bank. Table 3 shows that out of 10,200 blood donors 8,120 (79.61%) were male donors and 2080 (20.39%) were female donors with a male female ratio of 3.90:1(Cite Figure 1). A total of 3210 (31.47%) were voluntary donors and 6990 (68.53%) were family replacement donors with a voluntary donor and replacement donor ratio of 1:2.18 (Cite Figure 2)

Table-3: Sex distribution and type of donation of the blood donors.

Sex	Voluntary donors	Replacement donors	Total donor
Male	2405 (23.58%)	5715 (56.03%)	8120 (79.61%)
Female	805 (7.89%)	1275 (12.50%)	2080 (20.39%)
Total	3210 (31.47%)	6990 (68.53%)	10200 (100%)

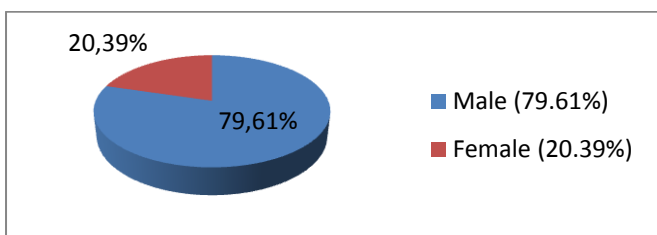


Fig-1: Diagram showing percentage of male and female donors.

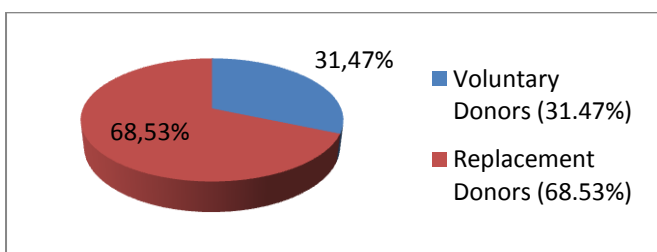


Fig-2: Diagram showing percentage of voluntary and replacement donors.

Table 4 shows the frequency of group O phenotype was the most prevalent at 37.65% (3840), followed by B at 32.00% (3264), A at 24.80% (2530) and AB at 5.55% (566) (Cite

Figure 3). Rh-D antigens were detected in 9,880 samples. So, the Rh-D positive phenotype was 96.86% and Rh-D negative phenotype was 3.14%. (Cite Figure 4)

Table- 4: The frequency of blood groups ABO and Rh-D phenotypes in sample studied

Blood group	Number	Percentage
ABO group	Group-A	2530 24.80%
	Group-B	3264 32.00%
	Group-AB	566 5.55%
	Group-O	3840 37.65%
Rh-D typing	Positive	9880 96.86%
	Negative	320 3.14%

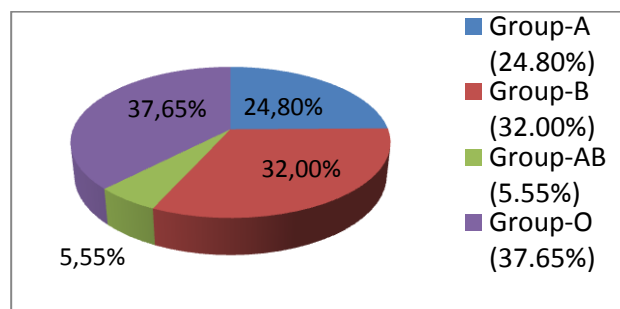


Fig-3: Diagram showing percentage of different ABO blood group in the study samples.

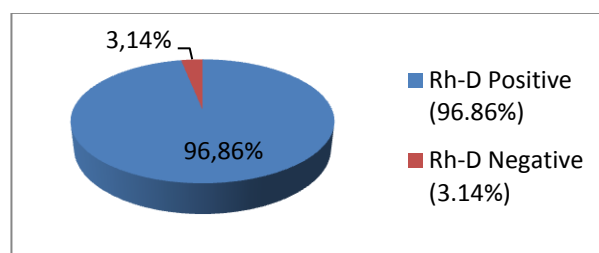


Fig-4: Diagram showing percentage of different Rh-D grouping in the study samples.

The frequency of Rh-D Phenotypes among the samples studied with respect to ABO blood groups is shown in Table 5. Rh-D positivity to blood group O, A, B, AB were found in the study as 3656 (35.85%), 2480 (24.31%), 3194 (31.31%) and 550 (5.39%) respectively. Rh-D negativity to blood group O, A, B, AB were found in the study as 184 (1.80%), 50 (0.49%), 70 (0.69%) and 16(0.16%) respectively (Cite Figure 5).

Table-5: The frequency of Rh-D phenotypes in the various ABO blood groups of the study samples.

Blood group	Number	Percentage
A Positive	2480	24.31%
A Negative	50	0.49%
B Positive	3194	31.31%
B Negative	70	0.69%
AB Positive	550	5.39%
AB Negative	16	0.16%
O Positive	3656	35.85%
O Negative	184	1.80%
Total	10,200	100%

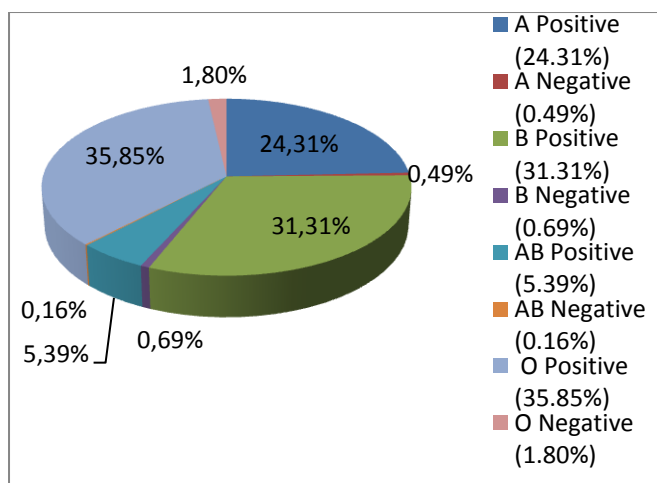


Fig-5: Showing the frequency of Rh-D phenotypes in various ABO blood groups of the study samples.

Discussion

ABO and Rh phenotypes vary widely across races and geographical boundaries despite the facts that the antigens involved are stable throughout the life. A racial difference in the distribution of blood group have been noted by some researchers [7,8,9]. Few studies on the prevalence of ABO and Rh blood group have been carried out in the Indian population, and majority of these studies are limited to individual communities or to a particular region of the country. No such study has yet been reported from North Assam.

The present study revealed that blood group O was the most prevalent at 37.65%, followed by B

at 32.0%, A at 24.80% and AB at 5.55%. This observation is in accordance with previous study from other parts of India. The findings of studies conducted in the National Institute of Mental Health and Neuroscience, Bengaluru and on the population of some parts of Andhra Pradesh reveal similar trends. However, studies in the North Indian population by Nanu & Thapliyal, Chandra & Gupta and Agarwal et al reported blood group B to be the most prevalent blood groups in blood donors [6,7,8]. Similar results with predominance of blood group B have also been noted in a study conducted in Gujarat. Some other studies from different parts of Europe, America and South-east Asia have reported blood group O to be the commonest blood group and comparison with our study is shown in Table 6. [11, 12].

Table-6: Comparison of ABO phenotypes frequencies amongst different world population and present study.

Population	Group-O	Group-A	Group-B	Group-AB
Caucasoid	47%	41%	09%	03%
Whites	45%	41%	10%	04%
Blacks	49%	28%	19%	04%
Mexicans	56%	28%	13%	03%
British	46.7%	41.7%	8.6%	03%
Asians	43%	27%	25%	05%
Indians	37.5%	24.7%	32.5%	5.3%
Our Study	37.65%	24.80%	32.00%	5.55%

The Rhesus blood group is the most polymorphic and its clinical significance in transfusion medicine is only next to the ABO blood group system [2,10]. The present study showed that the prevalence of Rhesus ‘D’ antigen is 96.86%. This finding is in agreement with the results of other studies by Periyavan et al and Falusi et al [5, 13]. There was no association between Rh-D status and ABO grouping.

Mordant *et al* [14] have earlier shown that the frequency of ABO/Rh blood group is valid only for the specific region or the specific population

group from where the data were derived ^[14]. The Tezpur Medical College and Hospital, Tezpur is a tertiary level referral hospital of North Assam. As the blood donors that donate blood in this tertiary level hospital belong mostly to North Assam, so they represent the population of North Assam. Hence the data revealed in the present study fairly reflects the frequency of distribution of the ABO and Rh-D blood group antigens among the population of the North Assam and it will help in effective management blood transfusion service of the area.

Conclusion

With a large sample, we established that among the various ABO and Rh-D blood group in the study, group O is the commonest with Rh-D antigen, the occurrence of blood group A and B with Rh-D antigen is nearly equal and frequency of AB is least. The frequency of Rh-D negative is, although slightly lower in present series than the data of the country. The present study is therefore, useful in providing information on the status of ABO and Rh-D blood group distribution of North Assam and the knowledge of it will help in effective management of regional blood transfusion service of the area. However, studies of other minor blood group antigens are also needed in order to effective management for repeated transfusion dependant transfusions.

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