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Distribution of ABO & Rh Blood Group Among Healthy Blood Donors Attending Blood Bank of Gauhati Medical College & Hospital, Guwahati



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ABSTRACT

Background: Blood transfusion is an essential part of a modern health system. If blood with correct group is transfused it can save precious life. So, blood grouping plays an essential part of blood transfusion service. The knowledge of Red Blood Cell (RBC) antigen phenotype frequencies in a population is helpful in terms of their ethnic distribution in creating a donor data bank for the preparation of indigenous cell panels and for blood to patients with multiple alloantibodies. **Methodology:** It is a retrospective study, including 10,000 healthy donors in the State of Art Model Blood Bank, Gauhati Medical College & Hospital, Guwahati. **Results:** The study shows the distribution of ABO blood groups as A+ (2411), A- (37), B+ (2939), B- (83), O+ (3548), O- (141), AB+ (812) and AB- (29). While looking at ABO grouping it is noticed that the grouping is comparable to a study done in Bangalore in Karnataka and another study done in Kanchipuram district, Tamil Nadu. These studies usually follow the asiatic trend of O>B>A>AB. It shows Rh distribution as 9710 (97%) donors to be Rh positive and 290 (3%) donors to be Rh negative. **Conclusion:** Generation of a simple database of blood groups, not only provides data about the availability of human blood in case of regional calamities, but also serves to enable insight into possibilities of future burden of diseases.

INTRODUCTION

Red blood cells contain a series of glycoproteins and glycolipids on their surface which constitute the blood group antigens. Production of these antigens is genetically controlled. There are many blood group systems on the basis of different blood group antigens - only ABO and Rh systems are important in clinical practice. The ABO system consists of four main groups. AB, A, B, and O which are determined on the basis of presence of antigens A and B. These antigens are under control of three allelic genes A, B, and O, situated on the long arm of chromosome 9. In Rh system blood groups are RH positive or Rh negative on the basis of presence or absence or Rh- antigens on red cell surface. Rh antigens are determined by three pairs of closely linked allelic genes located on chromosome 1. In clinical practice blood grouping is important because an antigen may, in certain circumstances, react with its corresponding antibody and cause harmful clinical effects like hemolytic transfusion reactions and hemolytic disease of newborn.

Knowledge of blood group distribution is also important for clinical studies, for reliable geographic information and it will help a lot in reducing the maternal mortality rate, as access to safe and sufficient supply of blood will help significantly in reducing the preventable deaths.

REVIEW OF LITERATURE

In 1900, Karl Landsteiner has discovered ABO blood group system and later in 1940 Landsteiner and Weiner defined Rh blood Group System of human RBC.

Since, the discovery of ABO blood group by Landsteiner, different blood typing system have been devised. Blood group antigens are integrated part of red blood cell (RBC) membrane and have many essential functions (membrane transporters and protein channels, ligand receptor adhesion molecules, enzymes and structural proteins.

Several studies were performed worldwide. ABO & Rh (D) phenotype frequencies of different racial / ethnic groups in United States performed in 2004. Distribution of ABO and Rhesus (RHD) blood groups in Saudi Arabia was studied in 2011 where highest percentage was found in O group followed A, B & AB and Rh (D) positive was greater than Rh (D) negative. Another study conducted in Morocco in 2013 where distribution of ABO & Rhesus (D) blood antigen were studied^{1,2,3}.

In Northern India prevalence of ABO & Rhesus blood group were studied in 2012 among 23320 people in one year where a percentage of B group was highest, followed by O, A, & AB group & Rh positive is more than the Rh negative⁴.

A study conducted in a tertiary care Hospital in North India, where blood group phenotype frequency in blood donors was studied in 2013 and here frequency of D antigen was highest⁵.

Although blood transfusions can be life saving for a number of patients they are not without risks. In addition to risks such as transfusion – transmissible diseases (TTD) caused by donors viruses, parasites or bacterial contaminants of blood products, there is also risk to donor-recipient antigen phenotype disparity. Still RBC's for blood transfusion are most only matched for major antigens, ABO and D an approach that is considered as safe and cost effective, except chronic transfusion recipients (e.g. thalassemia) who additionally require extended matching for minor antigens.

So, preparation of antigenic profile data bank with a population help blood transfusion service to select appropriate antigen negative donor unit for prevention of alloimmunization in the recipient.

Aim and Objectives:

Antigenic frequencies in Indian donors differ from widely available data of European and American countries. Till date, there is no data available / reported about the frequency of different blood group antigens in the donor population in North Eastern region except in Manipur in 2010, where the study was conducted on ABO & an Rh blood group among four population⁶. So doing a survey of the frequency of clinically significant blood group antigen in donor population is necessary for:

- i) To facilitate quality blood transfusion service.
- ii) Preparation of antigenic profile data.
- iii) Comparison of the data of this donor population group with other region.
- iv) Future genetic research.

MATERIALS AND METHODS

A retrospective study was carried out at the State of art model blood bank, Gauhati Medical College & Hospital, Guwahati. The blood groups of donors of either sex, presenting over a period of approximately six months from January 2015 to June 2015 were studied.

Subjects: Out of 10,000 subjects, 9,610 were male and 390 were female subjects screened for their blood groups.

Collection of blood samples: The blood samples were collected by finger prick in most cases but occasionally by venepuncture in a disposable syringe, and transferred immediately to a tube containing Ethylene Diamine Tetra Acetic acid (EDTA). The ABO and Rh blood grouping were done by agglutination test using anti-A, anti-B and anti-D human sera. The donors with more than once entered in the record were included once in the study.

Determination of blood group: Blood grouping (ABO) and Rhesus factors (Rh) was done by the antigen antibody agglutination test by tube method. Commercially available antisera were used.

Statistical Analysis:

Percentage and proportions for each variable are calculated and 95% confidence intervals were taken to define normal range.

RESULTS

ABO blood groups of 10000 healthy from State of art model blood bank, GMCH were found out by agglutination method. We found that the percentage of blood groups with people in descending order were as follows: O>B>A>AB.

Table 1. Distribution according to type of donors

TYPE OF DONOR	NO.
FIRST TIME DONOR	3370
REPEAT DONOR	4450
VOLUNTEER DONOR	2180
TOTAL	10000

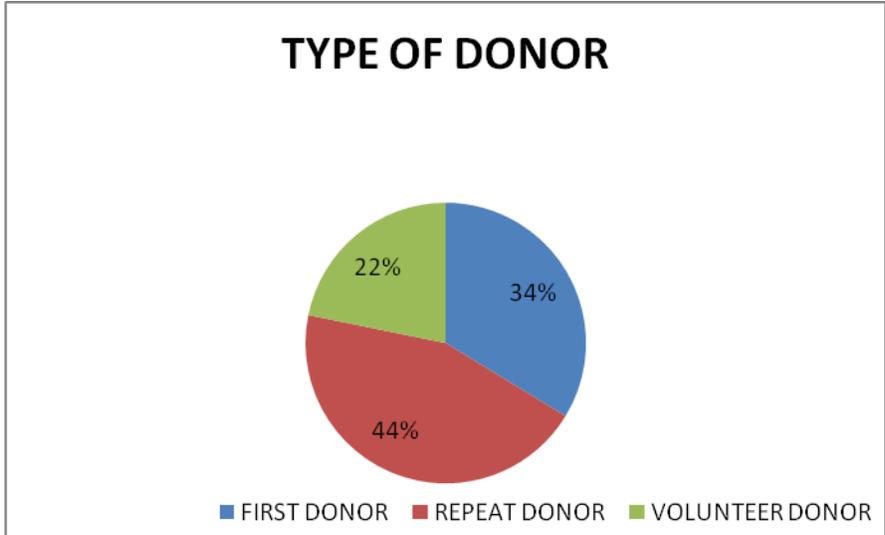


Figure 1. Distribution according to type of donors:

Table 2. Distribution showing the gender of donors

GENDER	NO.
MALE	9610
FEMALE	390
TOTAL	10000

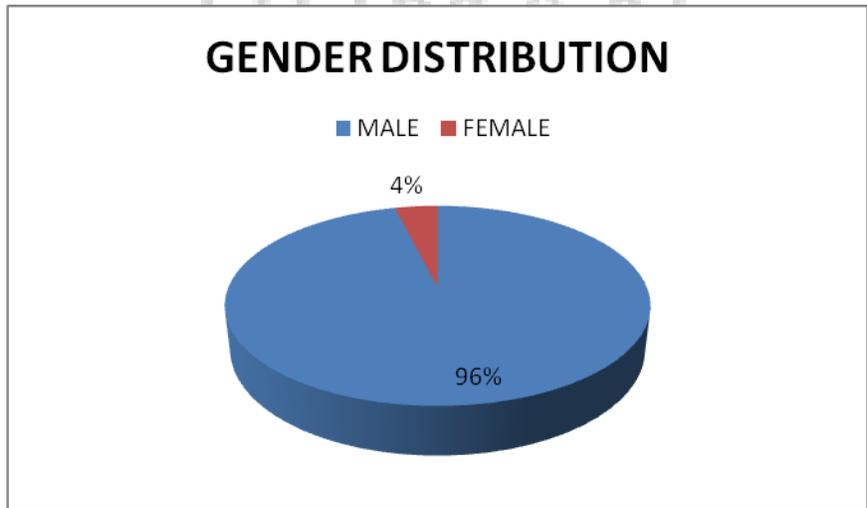


Figure 2. Distribution showing the gender of donors

Table 3. Distribution showing religion of donors

RELIGION	NO.
HINDU	8280
MUSLIM	1720
	10000

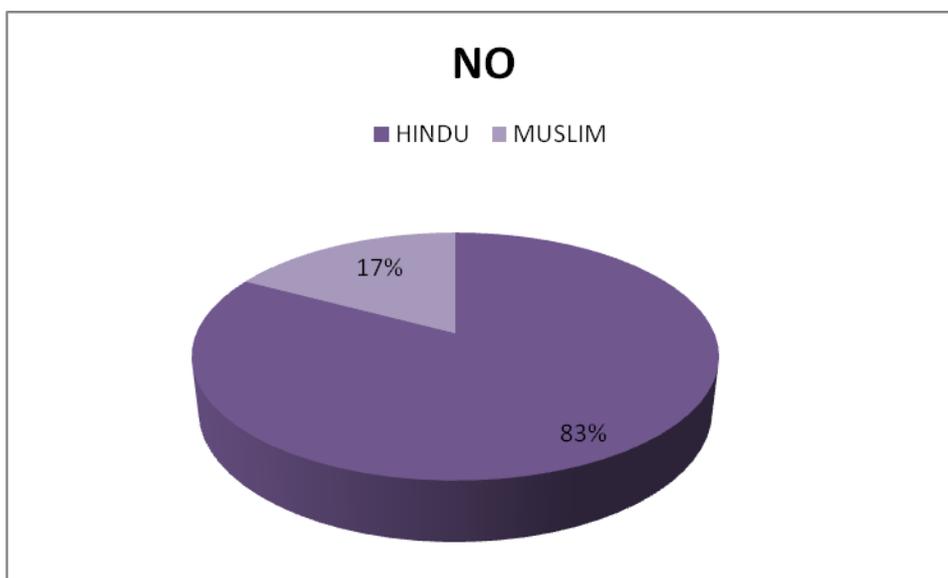


Figure 3. Distribution showing religion of donors

Table 4: Distribution according to ABO

	POSITIVE	NEGATIVE	TOTAL
A	2411	37	2448
B	2939	83	3022
O	3548	141	3689
AB	812	29	841
TOTAL	9710	290	10000

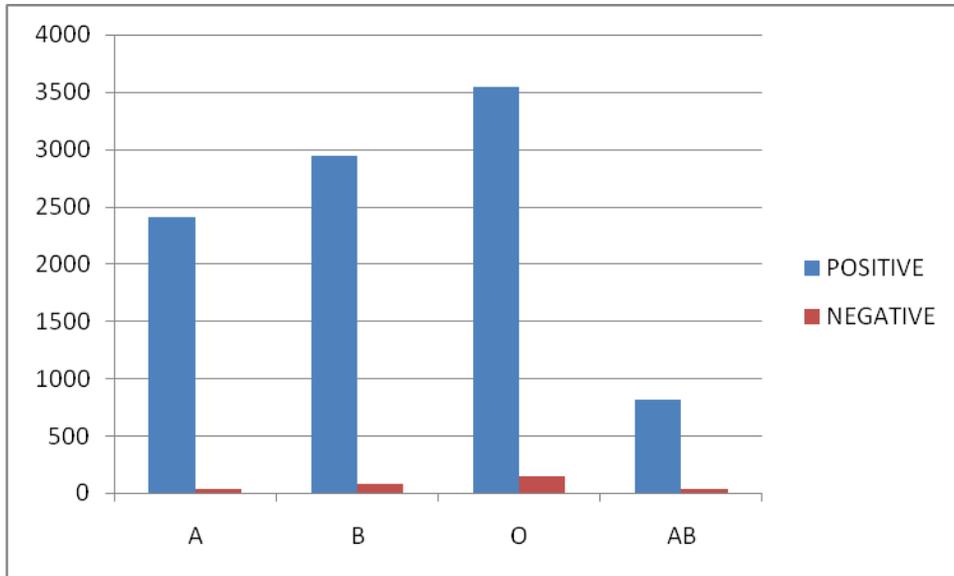


Figure 4: Distribution according to ABO

Table 5: Distribution according to Rh positive and Rh Negative

Rh	TOTAL
POSITIVE	9710
NEGATIVE	290

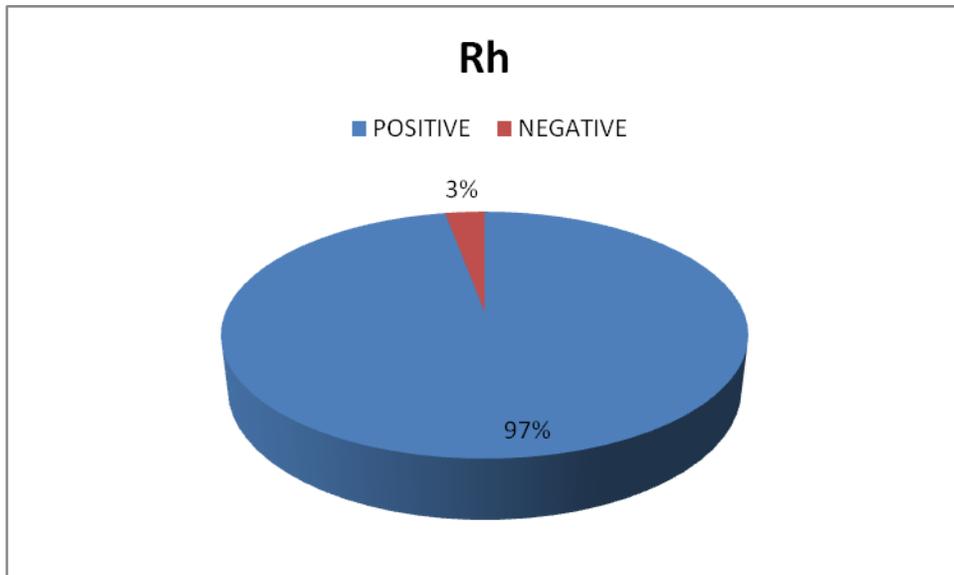


Figure 5: Distribution according to Rh positive and Rh Negative

DISCUSSION

Knowledge of ABO blood groups is an important tool to determine the direction of recruitment of voluntary donors as required for zone across the country. The distribution of ABO blood group varies regionally, ethnically and from population to another.

Table 1 shows distribution of types of donor. It shows 3370 (34%) First Donors, 4450 (44%) Repeat Donors and 2180 (22%) Volunteer donors.

Table 2 shows gender distribution among the donors. 9160 (96%) male donors and 390 (4%) female donors.

Table 3 shows religion distribution among the donors. 8280 (83%) are Hindu and 1720 (17%) are Muslim donors.

Table 4 shows the distribution of ABO blood groups as A+ (2411), A- (37), B+ (2939), B- (83), O+ (3548), O- (141), AB+ (812) and AB- (29). While looking at ABO grouping it is noticed that the grouping is comparable to a study done in Banglore in Karnataka and another study done in Kanchipuram district, Tamil Nadu. These studies usually follow the asiatic trend of O>B>A>AB⁷. Studies done in Durgapur, Bangalore, Devanagere and Shimoga-Malnad found that the commonest blood group was 'O' ^{8,9,10}.

Table 5 shows Rh distribution as 9710 (97%) donors to be Rh positive and 290 (3%) donors to be Rh negative.

CONCLUSION

The study results show that the most frequent blood group of the donors of State of art model Blood Bank of Gauhati Medical College is group O and the rarest is group AB and Rh-negative frequency is 3%. Blood donation by the females are very low (4%) and it needs to be increased by improving health status and awareness about blood donation.

This study has a significant implication regarding the management of blood banks and transfusion services in this area. Knowledge of blood group phenotype distribution is also important for clinical studies (for example disease association), as well as for population studies. It is necessary to conduct similar well designed studies in other states of India in order to

determine the blood group frequencies in them. The data generated in the present study and several other studies of different geographical regions of India may be useful for health planners, while making efforts to face the future health challenges in the region. In short, the generation of a simple database of blood groups, not only provides data about the availability of human blood in case of regional calamities, but also serves to enable insight into possibilities of future burden of diseases.

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