

Distribution of ABO and Rhesus (Rh) blood Groups among Voluntary Blood Donors in Central Gujarat, India

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ABSTRACT

Introduction: The ABO and Rh blood group systems are the most important blood group systems in Transfusion Medicine. This study was carried out with an objective to study the distribution of ABO and Rh blood groups among voluntary blood donors in Central Gujarat, India which is essential for effective management of blood inventory.

Material and Methods: The present retrospective study was carried out at our blood centre. The data of present study is from 01/06/2009 TO 31/12/2019. Total 398803 voluntary blood donors were considered medically fit and accepted for blood donation. ABO and Rh typing was done by Manual Microplate Technique (June 2009 to August 2015) and automated blood group Immucor Galileo neo machine (September 2015 to December 2019) both forward and reverse blood grouping after validation at blood bank.

Result: Out of 398803 blood donors B blood group was most common(143408-35.96%) and the least blood group was AB Blood group (33631 – 8.43%). There were more Rh Positive blood donors (372660 – 93.45%) as compared to Rh Negative blood donors (26143 – 6.55%).

Conclusion: The most common blood group among voluntary donors was B positive and least common blood group was AB negative.

Keywords: ABO Group, Rhesus Group, Voluntary Blood Donors.

INTRODUCTION

Human blood groups are genetically inherited and exhibit varying degree of polymorphism. There is significant difference in the frequency of distribution of the various blood groups in population. Of the various blood group systems, the ABO blood group system is the most important blood group system in Health and disease.¹

To date about 700 red cell antigens have been recognized by International Society of Blood Transfusion.² These antigens are organized into 30 human blood group systems and each person has a unique spectrum of blood groups with the exception of identical twins or triplets whose blood groups are exactly the same.^{3,4} The most important human blood group systems for blood transfusion or transplantation are the ABO and Rhesus blood systems. Red blood cells contain a series of glycoproteins and glycolipids on their surface which constitutes the blood group antigens.

The distribution of ABO and Rh blood groups is important for the effective management of blood banks.⁵ The ABO blood group system was the first human blood group system

discovered by Landsteiner in 1900.⁶ The ABO blood group system is the only system in which antibodies are constantly present in the serum of human beings whose red cells lack the antigens. Depending on whether Rh antigen is present on red cells or not, Rh phenotype is classified as Rh – D positive and Rh – D negative. Although all individuals share the same blood group system, they differ in the frequencies of a specific type.⁷ ABO and Rhesus (Rh) groups vary markedly in different parts of the world. Karl Landsteiner discovered the blood groups ABO and classified it into A, B, O groups. Blood group AB was discovered by Landsteiner's associate, Von Decastello and Sturli in 1902. The Rh - D antigens have greater immunogenicity than all other red cell antigens except A and B antigens. Transfusion of ABO – incompatible blood can be associated with acute intravascular hemolysis, renal failure and death. It is of primary importance in Obstetrics, being the main cause of haemolytic disease of the newborn (HDN). Of the Rhesus antigens, D antigen is most immunogenic. Individuals in whom the D antigen is absent will produce anti- D if they are exposed to the D antigen via Pregnancy, transfusion or transplantation. So in the blood bank, every blood donation is screened for ABO and Rhesus factor. This study was conducted with the aim of determining the distribution of ABO and Rhesus blood groups among voluntary blood donors.

MATERIAL AND METODS

The present retrospective study was carried out at our blood centre. The data of present study is from 01/06/2009 to 31/12/2019 and includes In house, Mobile Vans, and Blood donation camps 100% voluntary non remunerated voluntary blood donors. The donors were first required to fill up a registration form which carried all the information like personal details, demographic details, occupation and medical history. The donors were then screened by medical officer according to blood donor selection criteria

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and guidelines from drug and cosmetic act and NACO. Individuals with good health, mentally alert, physically fit were selected as blood donors. The donors were then asked to sign the donor questionnaire and inform consent form. Total 398803 donors were considered medically fit and accepted for blood donation. After blood donation, ABO and Rh typing was done by Manual Microplate Technique (June 2009 to August 2015) and automated blood group Immucor Galileo Neo Machine (September 2015 to December 2019) both forward and reverse blood grouping after validation at blood bank. Doubtful cases were confirmed by tube technique and weak D blood group confirmed by Column Agglutination technology method (DIA MED-ID BIO RAD). All weak D groups were considered as Rh positive in blood donors.

RESULTS

ABO blood group was carried out on 100% voluntary non remunerated 398803 healthy blood donors. Distribution of blood donors according to gender shows there were more male donors (95.96%) as compared to female donors (4.04%). Out of 398803 blood donors B blood group was most common(143408-35.96%) and the least blood group was AB Blood group (33631 – 8.43%). We found that the percentage of ABO blood groups in donors in descending order as follows: B > O > A > AB. (Table 1) (Table 2) (Fig1). Rh blood group distribution of blood donors according gender shown in Table 3. There were more Rh Positive blood

donors (372660 – 93.45%) as compared to Rh Negative blood donors (26143 – 6.55%). There were no difference in rh blood group distribution in male and female blood donors ABO and Rh distribution of blood donors shown in Table 4. Most common ABO and Rh blood group was B Positive (33.75%) and the least common was AB Negative (0.54%) (Fig 2) (Table 3).

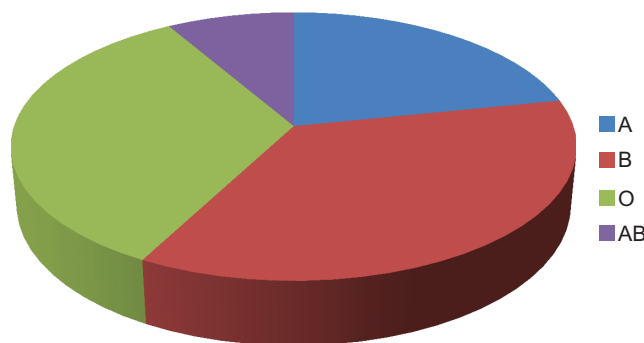


Figure-1: Pie chart showing distribution of ABO blood group distribution (Original)

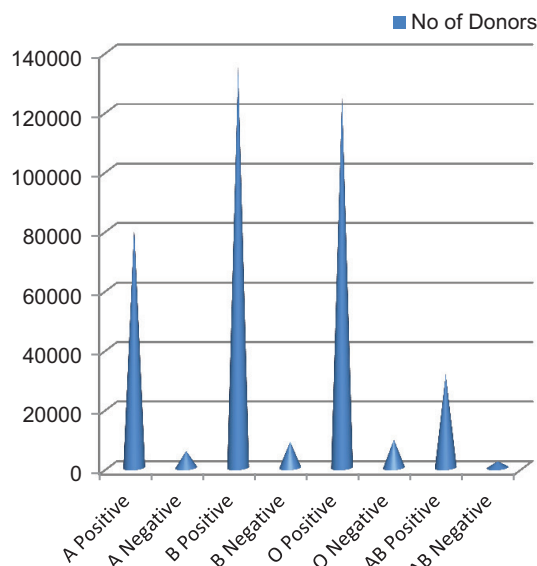


Figure-2: Graph showing ABO and Rh blood distribution among blood donors (Original)

Gender	No of Donors	Percentage%
Male	382698	95.96%
Female	16105	4.04%

Table-1: Distribution of Blood donors according Gender

Blood Group	No of Donors	Percentage%
A	86900	21.79%
B	143408	35.96%
O	134864	33.82%
AB	33631	8.43%

Table-2: Distribution of Donors according ABO blood group

Rh Group	Total No of Donors (%)	Male Donors (%)	Female Donors (%)
Rh Positive	372660(93.44%)	357604(95.96%)	15056(4.04%)
Rh Negative	26143(6.55%)	25093(95.98%)	1050(4.01%)

Table-3: Distribution of Rh blood group in blood donors according gender.

Blood Group	No of Donors	Percentage%
A Positive	81209	20.36%
A Negative	5691	1.42%
B Positive	134604	33.75%
B Negative	8804	2.20%
O Positive	125391	31.44%
O Negative	9473	2.37%
AB Positive	31456	7.88%
AB Negative	2175	0.54%

Table-4: Distribution of ABO and Rh blood group in blood donors.

DISCUSSION

The findings of this study show that the blood group B occurs most frequently among the donors and blood group AB is the least common. Knowledge of the distribution of ABO and Rhesus blood groups is an important element in determining the direction of recruitment of voluntary blood donors as required in each region and for effective management of blood banks inventory, be it at a facility of a small local transfusion services or regional or national transfusion services. In the present study males (95.96%) comprised the significant donation group as compared to female donors (4.04%) which is similar with other Indian studies.^{8,9} The lower rate of donation in females is due to fear of donation and low haemoglobin level among females. The commonest blood group was B followed by O, A, AB. This is similar with other studies from North India in which blood group B was found to be predominant.⁸ Studies from South India like Periyavan et al, Suresh et al and Soonam John et al showed a conflicts pattern of frequency where O blood group was predominant.^{9,10} In the Country like Pakistan and Nepal the predominant blood group were B and A respectively.^{11,12} Studies from West zone, Central zone, and East zone like Agrawal A et al showed a conflicts pattern of most common blood group was O positive.¹³ In the present study, 93.44% of blood donor population showed Rh positivity for D antigen while 6.55% showed Rh D negativity. The Rh D positive blood group was found in the range of 91% to 97% across the India in different studies.⁹⁻¹³ The blood group AB found also as a least common blood group in the range of 5% to 12% across the india in different studies.⁹⁻¹⁶

CONCLUSION

This present study concludes that B (35.96%) blood group is the most common and AB (8.43%) blood group is the least common blood group among voluntary blood donors in central Gujarat. Regarding Rh blood group system, there were more Rh positive blood donors (93.44%) as compared to Rh negative blood donors (6.55%). Blood donation by the females was very low (4.04%) compared to males (95.96%) and it needs to be increased by improving health status of females and awareness about blood donation.

The study helps to prepare a database for the blood banks and creates awareness as to which blood groups should be stored and given importance and maintain inventory. It is necessary to conduct similar well designed studies in other states of India to determine the blood group frequencies in the different regions. So, it is advisable to do blood grouping studies in each region for drafting proper national policies and for supplying to the needy patients during emergency.

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