



A STUDY OF DISTRIBUTION AND FREQUENCY OF ABO BLOOD GROUP AND RHESUS (RH) FACTORS AMONG DONORS VISITING BLOOD BANK AT MMIMSR, MULLANA, AMBALA

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ABSTRACT

Background: Blood transfusion is an important concern for the society, as it is life saving for patients with bleeding disorders, accidents, surgeries, acquired haematological diseases and malignancies. The frequency of four main blood groups systems varies throughout the country. **Aim & Objective:** The objective of the study was to identify distribution of ABO and Rh blood group system **Methods and Material:** Cross-sectional, hospital based study was conducted over a period of one year which included participants who came to the department of Blood Bank at MMIMSR. Self-designed, semi-structured, pre-tested questionnaire was used. Statistical analysis used: The data collected was analyzed by using appropriate statistical technique. The data collected during the survey was converted to electronic format and was entered in Microsoft excel, the data was analyzed using SPSS (Statistical Package for Social Sciences) version 21 for percentages and means were calculated for the data. **Results:** 747 donors participated in the present study. Majority (54.6%) of study subjects belonged to age group 21-30 years, while 90.6% of the study subjects were males and 9.4% were females. The frequency of blood group B was found to be highest 31.1%, and the frequency of blood group AB was found to be the lowest 9.8%. Majority 76.1% were Rhesus positive. **Conclusions:** It was seen that the most frequent blood group positions in the descending order are 'B', 'O', 'A' and 'AB' respectively. It is hoped that the data generated in this study would assist in the planning and establishment of a functional blood service that would meet the ever-increasing demand for safe blood and blood products.

KEYWORDS : ABO, Blood group, Blood donors, Rhesus factor

Introduction:

Blood transfusion is an important concern for the community, as it is life saving for patients with bleeding disorders, accidents, surgeries, inherited/acquired haematological diseases and malignancies.¹ An essential element of human life is 'blood' and there are no substitutes to it. A crucial component in the management of patients presenting with accident injuries, surgical conditions, malignancies, pregnancy complications, and other medical conditions is blood transfusion². A critical component in improving health care and in preventing the spread of infectious diseases globally is safe blood. All the activities related to blood collection, testing, processing, storage and distribution should be coordinated at the national level through effective organization and integrated blood supply networks, according to the WHO. National Blood Policy (NBP) should be managing the national blood system and legislative framework should promote uniform implementation of standards and consistency in the quality and safety of blood and blood products. There are components can be derived from donated blood. This approach to treatment, referred to as blood component therapy, allows several patients to benefit from one pint of donated whole blood³.

The discovery of the ABO blood group system by mixing the red cells and serum of each of his staff was done by Dr. Karl Landsteiner in Vienna. These early experiments lead to identification of three groups called A, B, C (C was later re-named O). The fourth much rarer blood group 'AB' was discovered years later. He was awarded Nobel Prize in Physiology and Medicine in 1930 for his achievements. In addition, together with American physician, Karl Landsteiner and Alexander S. Wener were also the first to identify Rhesus factor in 1937⁴.

Red blood cells antigens are the basis of blood grouping, they consist of proteins and carbohydrates attached to lipids or proteins. There are more than 100 blood group systems involving over 500 antigens in which ABO is the most studied group in the human population. These antigens have various functions, such as membrane structural integrity and transportation of molecules through membranes. ABO antigens are highly expressed on human tissues and most epithelial and endothelial cells^{5,6}. Currently there are more than 50 antigens in the Rh blood group system but the principal Rh antigens of medical interest are D, C, E, c and e. A person with Rhesus antigen is referred to as Rhesus positive while individuals lacking the antigen are Rhesus negative. When a Rhesus negative person is exposed to Rhesus positive blood, antibodies will be produced, which cause potentially fatal hemolytic reactions.^{7,8,9} The Blood banks requires timely information concerning the distribution and frequency of blood in order to ensure adequate supply of all the useful blood types.

Aim & Objective(s): The objective of the study was to identify distribution of ABO and Rh blood group system.

MATERIALS AND METHODS:

A hospital based cross-sectional design was adopted and study was conducted in methodology its hospital based cross sectional in the department of community medicine with collaboration of department of pathology in the blood bank of Maharishi Markandeswar Institute of Medical Sciences and Research, Mullana district Ambala, Haryana. The study was conducted among the participants coming to the department of Blood Bank. These participants were both voluntary and replacement donors. Inclusion criteria included participants who were willing to give consent for the study and whose Hemoglobin ≥ 12 gm%. Exclusion criteria included participants whose age < 18 years and > 65 years, Weight < 45 kgs, Suffering from any disease or on medication and Professional / Commercial / Paid donors. The study was carried out over a period of one year i.e. from January 2015 to December 2015. During this period, finalization of study tool, field survey, data collection, data analysis and interpretation was done. Stratified random sampling technique was used for sample collection. The sample size for the study came out 743 and the sample size was round off to 800 donors. It was found that approximately 2000 donors attend the Blood Bank in a year. Considering sample size of 800, sampling fraction was calculated, therefore, in the current study every 3rd donor was included for the study, and till the sample size was completed. A total 747 donor respondent well and fulfilled the inclusion and exclusion criteria for study. Non response rate was found to be 6.6%.

DATA ANALYSIS:

The data collected was analyzed by using appropriate statistical technique. The data collected during the survey was converted to electronic format and was entered in Microsoft excel, the data was analyzed using SPSS (Statistical Package for Social Sciences) version 21 for percentages and means were calculated for the data.

RESULTS:

Table 1 shows demographic distribution of blood donors, where majority of age group seen was between 21-30 years (54.6%), who were male (90.6%), and belonged to Hindu community (64.8%). Figure 1 shows distribution of ABO blood groups, where blood group B was found to be highest 37.9%, and the frequency of blood group AB was found to be the lowest 9.7%. Table 2 shows frequency of distribution of Rh blood groups, where majority were Rhesus positive 76.1%.

DISCUSSION:

The ABO and Rh D blood group should be known to every individual, so that they could donate blood whenever emergency requirement arises. This knowledge is even more important in areas which are more prone to accidents and militancy related incidents. Youngsters must know their ABO and Rh D blood group so that they could donate blood easily whenever there is demand of their particular blood group. Those with rare blood groups should specially get their name enrolled as

voluntary blood donors in rare blood group donor's records maintained by Regional Transfusion Centres¹⁰.

In our present study, majority (54.6%) of study subjects belonged to age group 21-30 years, while 90.6% of the study subjects were males, which was similar to the studies done by Gonzalez et al (2008) at Brazil, Ahuja et al (2009) at Chandigarh, Sareen et al (2012) at Rajasthan, Ekwere et al (2014) at south Nigeria, Shidam et al (2015) at Puducherry, Kurian et al (2016) at New Delhi,¹¹⁻¹⁶ this can be due to the fact that in the developing countries, one of the main reasons being taboo, cultural habits, lack of motivation and most importantly fear of blood donation. Large number of females belong to the menstruating group and are anemic, therefore unfit for blood donation. So, general health needs to be improved by good diet and iron supplements.

The frequency of blood group B was found to be highest 31.1%, and the frequency of blood group AB was found to be the lowest 9.8%, and, in our present study which was found similar to the studies done by Patel et al (2012) at Ahmedabad, Rajshree et al (2013) at Rajasthan, Garg et al (2014) at Uttarakhhand, Singh et al (2015) at Haryana, Rehman et al (2015) at Pakistan¹⁷⁻²¹. This was followed by group O which was 31.2% which was similar to studies done at Ahmedabad¹⁷.

The donation of blood by voluntary non-remunerated blood donors is critical for the safety and sustainability of national blood supplies. National blood donation systems in which replacement donors dominate are typically unable to meet clinical demands for blood while paid family members contributing often poses serious threats to the health and safety of the recipients and the donors. WHO recommendations are therefore to create health systems based 100% on voluntary donation. Majority of donors were which was similar to the other studies and global trends. However, there is regional variability, in Britain the most predominant blood group is O and the least is AB²²⁻²⁴. These regional differences may be explained by genetic mapping and the varying origins of diverse ethnic groups

All human populations share the same blood group systems; although they differ in the frequencies of specific types. The incidence of ABO & Rh groups varies markedly in different races, ethnic groups, and socio-economic groups in different part of the world. The frequencies of ABO and Rh blood groups vary from one population to another and time to time in the same region. The knowledge of distribution of ABO& Rh blood groups at local and regional levels is helpful in effective management of blood banks & safe blood transfusion services. Identification of Rh system is important to prevent the erythroblastosis fetalis; which commonly arises when an Rh negative mother carries Rh positive fetus²⁵. Determination of Rh status is crucial in clinical contexts in order to ensure patient safety. Rh factor is of interest because of its marked immunogenicity. In the case of the D antigen, patients who do not produce the D antigen will produce anti-D if they encounter the D antigen on transfused red blood cells. This process may result in a hemolytic transfusion reaction or, in the case of newborn red blood cells, hemolytic disease of the newborn. For this reason, it is important to determine the Rh status in clinical settings and for research purposes. In our present study, majority were Rhesus positive 76.1% which was found similar to studies done in African continent and global trends²⁶⁻²⁸.

Globally we share the same blood group types however clearly there are some geographic, regional, and ethnic differences. Ensuring adequate Rh positive blood supply is important in the context of patient safety. As well, the growing literature investigating the association of blood groups with the pathogenesis of cancer requires locally specific information on Rh distribution among other factors²⁹. There is known genetic association of specific blood groups to certain diseases in certain population. Studies concerned about possible association between ABO blood group and cardiovascular diseases have confirmed that persons of group A are affected more frequently with coronary heart disease, ischemic heart disease, venous thrombosis and atherosclerosis, while it is low in people with blood group 'O' which stated to have protective effect against these diseases. 'O' group individuals are known to have a 14 % reduced risk of squamous cell carcinoma and 4 % reduced risk of basal cell carcinoma when compared to non-O group. It is also associated with a reduced risk of pancreatic cancer. The 'B' antigen links with increased risk of ovarian cancer. Gastric cancer has reported to be more common in blood group 'A' and least in group 'O'. So, it is advisable to do blood grouping studies in each region for drafting proper national transfusion policies and supplying blood to needy patients during emergency. In short,

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 enables insight into possibilities of future burden of diseases.³⁰

Conclusion: The demand for blood products steadily increases. If the youngsters are made aware about their importance and role in supplying safe blood the volunteer donor can be found. VBD behaviour is culturally based and occurs at different rates in different religion, age, sex, attitude of person, family support, and geographical locations. Up-to-date knowledge of the distribution of blood types in a local setting is critical to the functioning of any national health service. Similar studies are needed across the country and further research and mobilization are required to meet WHO recommendations on voluntary blood donation. Groups of individual indicated on national identity cards, driving licenses and school/office identity cards will be of great use in case of acute hemorrhage or anaemia in children when urgent transfusion of yet to be cross marched blood is required.

Limitation of the study: This study has been done in one medical college and the results cannot be applied to the whole state.

Relevance of the study: Such studies have not been done and are required to encourage such studies more.

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Table 1. DEMOGRAPHIC DISTRIBUTION OF BLOOD DONORS

Age group (in years)	n=747	%
<20	118	15.8
21-30	408	54.6
31-40	165	22.1
41-50	48	6.4
>50	8	1.1
Gender		
Male	677	90.6
Female	70	9.4
Religion		
Hindu	484	64.8
Sikh	139	18.6
Muslim	54	7.2
Others	70	9.4

Figure 1 Distribution of donors according to ABO blood group

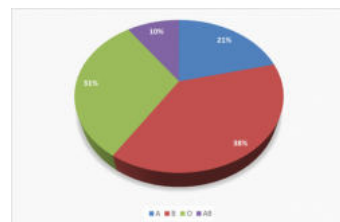


Table 2 Distribution of Rh phenotype

Rhesus phenotype	n=747	%
Rh positive	569	76.1
Rh negative	178	23.8

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