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Original research article

Study on distribution of ABO and Rh blood groups among blood donors at tertiary care hospital, Karnataka

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Abstract

Background:ABO blood groups was discovered by Austrian scientist Karl Landsteiner in 1900 was the greatest achievement in the history of blood transfusion medicine. He found three different blood types and he described them as A, B, and O blood groups. Alfred Von Decastello and Adrian Sturli discovered the fourth type AB in 1902.The knowledge of distribution of ABO and Rhesus (Rh) blood group is essential for effective management of blood bank inventory at the regional and national levels.

Objectives of the study: To find out the distribution and prevalence of ABO and Rh blood groups among voluntary blood donors at our tertiary care hospital.

Methodology: Blood grouping ABO and Rhesus was done by antigen antibody micro-agglutination test using commercially available standard antisera validated at National Blood Bank. Both forward (cell grouping) and reverse grouping (serum grouping) methods were used. The final blood group was confirmed only if both forward and reverse groups were identical. Donor's age, sex, location of blood donation, dates of donation and blood groups with Rh factors were tabulated in register book.

Results: We found that out of 2524 blood donors, 574 (22.74%) belong to A blood group, 789 (31.25%) to B blood group, 1005 (39.8%) to O blood group and 156 (6.18) to AB blood group. Among blood group A, 554 (21.9%) had A positive and 20 (0.79%) had A negative, among blood group B, 742 (29.3%) had B positive and 47 (1.86) had B negative, among blood group O, 960 (38.03%) had O positive and 47 (1.86%) had O negative, finally among AB blood group, 149 (5.9%) had AB positive and 7 (0.27%) had AB negative blood group.

Discussion and Conclusion: The most common blood group was found to be O followed by B, A and AB respectively.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 service or regional or national transfusion services. It is therefore imperative to determine and have information on the distribution of ABO and Rhesus blood group systems of different ethnic groups in any population where blood transfusion services are being offered.

Keywords: Blood grouping, rhesus typing, voluntary blood donors, ABO blood groups, Rh blood groups and transfusion services

Introduction

ABO blood groups was discovered by Austrian scientist Karl Landsteiner in 1900 was the greatest achievement in the history of blood transfusion medicine. He found three different blood types and he described them as A, Band O blood groups. Alfred Von Decastello and Adrian Sturli discovered the fourth type AB in 1902[1-3]. Forty years later, both Landsteiner and Weiner discovered Rhesus (D) antigen [4, 5]. To date about 700 red cell antigens have been recognized by International Society of Blood Transfusion [6]. 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 [7, 8].

There are many blood group systems based on different blood group antigens but only ABO and Rhesus system are important in clinical practice. ABO system consists of four main groups A, AB, Band O which are determined based on presence or absence of A and B antigens. These antigens are under the control of three allelic genes, A, B and O, situated on the long arm of chromosome 9q [9]. In Rhesus (D) system, blood groups are Rh-positive or Rh-negative based on presence or absence of Rhesus D antigens on red cell surface. The Rhesus antigens are determined by three pairs of closely linked allelic genes located on chromosome one [2].All human populations share the same ABO and Rhesus blood group

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systems; although they differ in the frequencies and distributions of specific types in different races, ethnic groups, and socio-economic groups or amongst different populations [10, 11].
The knowledge of distribution of ABO and Rhesus (Rh) blood group is essential for effective management of blood bank inventory [12] at the regional and national levels. This study reports the distribution of ABO and Rhesus blood groups among voluntary blood donors at our tertiary care hospital.

Aim and Objectives of the study
To find out the distribution and prevalence of ABO and Rh blood groups among voluntary blood donors at our tertiary care hospital.

Methodology
Source of data: This study was conducted in the Dept. of pathology, The Oxford Medical College and Hospital, Bangalore, Karnataka.

Type of study: Retrospective observational study using the data from Blood Bank records.

Duration of study: 3 years from January 2018 to December 2020.

Data collection: Records of 2524 voluntary blood donors were reviewed. Prior to donating blood the donors were first assessed for physical and health wellbeing. The assessment criteria required that the donors were: body weight >45 kg; hemoglobin levels, male 13.5–17.0 g/dl and female 12.5–16 g/dl and a blood pressure of up to 160/90 mmHg were accepted. Only donors who satisfied these criteria were recruited.
Analysis: Blood grouping ABO and Rhesus was done by antigen antibody micro-agglutination test using commercially available standard antisera validated at National Blood Bank. Both forward (cell grouping) and reverse grouping (serum grouping) methods were used. The final blood group was confirmed only if both forward and reverse groups were identical. Donor's age, sex, location of blood donation, dates of donation and blood groups with Rh factors were tabulated in register book.
Results
The present study is a retrospective observational study conducted using 3 years (January 2018 to December 2020) data from our blood bank records. Out of 2524 voluntary blood donor's males were 2495 (98.8%) and females were 29 (1.14%).

Table 1: Shows age wise and gender wise distribution of blood donors

Age group	Males	Females	Total
18-20 years	212	2	214
21-30years	1510	16	1526
31-40years	600	9	609
41-50years	163	2	165
51-60years	10	-	10
Total	2495	29	2524

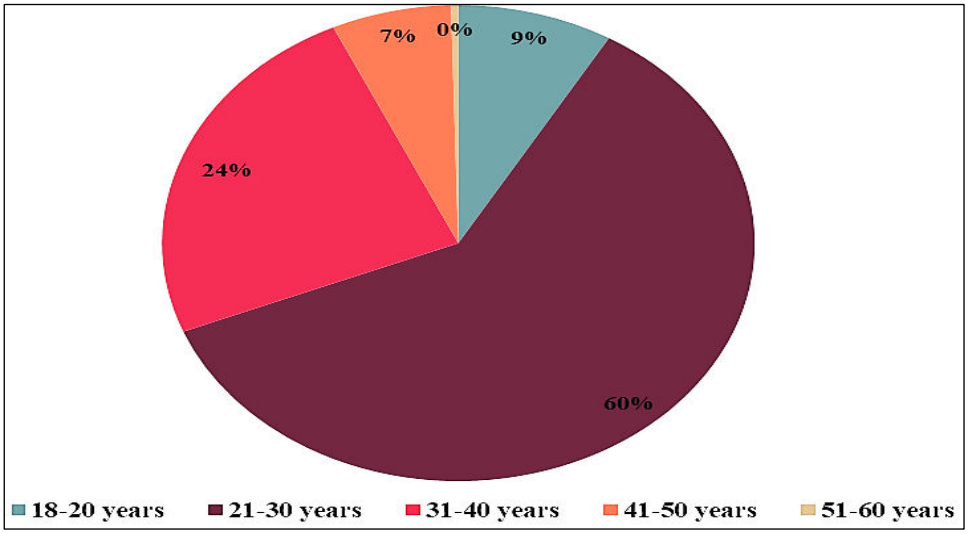

Fig 1: Shows age wise distribution of Blood Donors

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Out of 2524 blood donors, 2495 were males and 29 were females. 214(8.14%) were in the age group of 18-20 years, 1526 (60.4%) were in the age group of 21-30 years, 609 (24.1%) were in the age group of 31-40 years, 165 (6.53) were in the age group of 41-50 years and 10 (0.4) were in the age group of 51-60. Majority of the blood donors were in the age group of 21-30 years representing 60.4% of the total blood donors (table 1and figure 1).

Table 2: Shows frequency and percentage of ABO and Rh Groups among Blood Donors

Blood Group	Number	Percentage
A positive	554	21.9
A negative	20	0.79
Total A blood group	574	22.74
B positive	742	29.3
B negative	47	1.86
Total B blood group	789	31.25
O positive	960	38.03
O negative	45	1.78
Total O blood group	1005	39.8
AB positive	149	5.9
AB negative	7	0.27
Total AB blood group	156	6.18
Total blood donors	2524	100

This table represents the distribution of ABO blood groups among the blood donors. We found that out of 2524 blood donors, 574 (22.74%) belong to A blood group, 789 (31.25%) to B blood group, 1005 (39.8%) to O blood group and 156 (6.18) to AB blood group. The most common blood group was found to be O followed by B, A and AB respectively.

Among blood group A, 554 (21.9%) had A positive and 20 (0.79%) had A negative, among blood group B, 742 (29.3%) had B positive and 47 (1.86) had B negative, among blood group O, 960 (38.03%) had O positive and 47 (1.86%) had O negative, finally among AB blood group, 149 (5.9%) had AB positive and 7 (0.27%) had AB negative blood group.

The most common blood group being O positive and the least common being AB negative representing 38.03% and 0.27% respectively.

Table 3: Shows Gender wise distribution of Rh blood groups

Blood Group	Males	Females	Total
Rh positive	2378	27	2405
Rh negative	117	2	119
Total	2495	29	2524

Out of 2524 blood donors, 2405 (95.2%) had Rh positive blood group and 119 (4.71%) had Rh negative blood group. Out of 2495 males, 2378 (95.3%) had Rh positive blood group and 117 (4.65) had Rh negative blood group. Out of 29 females 27 (93.1%) had Rh positive blood group and 2 (6.89%) had Rh negative blood group.

Discussion

The present study is a retrospective observational study conducted using 3 years (January 2018 to December 2020) data from our blood bank records. Out of 2524 voluntary blood donor's males were 2495 (98.8%) and females were 29 (1.14%).

214 (8.14%) were in the age group of 18-20 years, 1526 (60.4%) were in the age group of 21-30 years, 609 (24.1%) were in the age group of 31-40 years, 165 (6.53) were in the age group of 41-50 years and 10 (0.4) were in the age group of 51-60. Majority of the blood donors were in the age group of 21-30 years representing 60.4% of the total blood donors (table 1and figure 1).

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Among blood group A, 554 (21.9%) had A positive and 20 (0.79%) had A negative, among blood group B, 742 (29.3%) had B positive and 47 (1.86) had B negative, among blood group O, 960 (38.03%) had O positive and 47 (1.86%) had O negative, finally among AB blood group, 149 (5.9%) had AB positive and 7 (0.27%) had AB negative blood group.

The most common blood group being O positive and the least common being AB negative representing 38.03% and 0.27% respectively.

Knowledge of the distribution of ABO and Rhesus blood groups is an important element in determining

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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 service or regional or national transfusion services. It is therefore imperative to determine and have information on the distribution of ABO and Rhesus blood group systems of different ethnic groups in any population where blood transfusion services are being offered.

The lower rate of donation in females is due to fear of donation and low haemoglobin level among females. This finding was in accordance with the Studies from South India like Periyavan*et al*., Suresh *et al*., and Soonam John *et al*., and Agrawal A *et al*.,[13-15]. The Rh D positive blood group was found in the range of 91% to 97% across the India in different studies.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 [13-15].

Conclusion

The most common blood group was found to be O followed by B, A and AB respectively. 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 service or regional or national transfusion services. It is therefore imperative to determine and have information on the distribution of ABO and Rhesus blood group systems of different ethnic groups in any population where blood transfusion services are being offered.

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