

# The Prevalence of ABO, Rh and Bombay Blood Group among Donors at a Tertiary Care Hospital in Mangalore, India

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## ABSTRACT

**Introduction:** Blood types were first discovered by an Austrian physician, Karl Landsteiner. He found that blood sera from different persons would clump together (agglutinate) when mixed in test tubes, and some human blood also agglutinated with animal blood. The study of different blood groups is important as it has major role in blood transfusion, certain medico-legal cases especially disputed paternity etc.

**Aim:** This study was carried out to find the prevalence of ABO, Rhesus (Rh) and Bombay blood group among donors at a tertiary care hospital.

**Materials and Methods:** The present retrospective study was done at a tertiary care hospital of Mangalore, Dakshina Kannada district, Karnataka, India from June 2018 to May 2019 with data analysis done in November 2019. Data of 8,254 blood donors were collected and analysed regarding ABO, Rhesus and Bombay

group from June 2018 to May 2019. Blood grouping was done by automated method using agglutination technique. The data collected was analysed by frequency and percentage.

**Results:** The total donors studied were 8,254 with mean age of 48 years. The most common blood group was O (n=3178, 38.5%) followed by B (n=2343, 28.38%), A (n=2102, 25.47%), AB (n=629, 7.62%) and Bombay (n=2, 0.02%), respectively. Rh positivity among donors were 94% (n=7762). Rest were Rh negative and were found to be approx. 6% (n=490).

**Conclusion:** The most common blood group among donors was O Rh positive and the least common was Bombay blood group. Every blood bank should have a record of frequency of ABO and Rh grouping as it is important for its effective management. Safe transfusion reduces the risk of transfusion transmitted illnesses and thus promotes patient safety.

**Keywords:** Agglutination technique, Blood donors, Major blood groups, Rhesus factor

## INTRODUCTION

The ABO blood group system was first discovered by the Austrian scientist Karl Landsteiner, who found three different blood types in 1900. He described A, B and O blood groups for which he was awarded the Nobel prize in 1930. Landsteiner found that there are substances in the blood, antigens and antibodies that induce clumping of red cells when red cells of one type are added to those of a second type. Blood groups are genetically determined [1]. The knowledge of distribution of ABO and Rh blood groups is important for the effective functioning of blood banks. Transfusion of ABO incompatible blood can be associated with acute intravascular haemolysis, renal failure and death [2].

Blood groups are known to be associated with various diseases like diabetes mellitus, duodenal ulcer, Urinary Tract Infections (UTI) and Rhesus incompatibility and ABO incompatibility of newborn. The knowledge of distribution of ABO, Rh and Bombay blood groups ensures safe blood transfusion services [3] and thus will help a lot in reducing the morbidity and mortality rate [4]. The D antigen, after A and B, is the most important red cell antigen in transfusion practice [5]. This study will document distribution of different blood groups as well as create social awareness among them, allowing safe blood transfusion by knowing ABO and Rh typing. The objective of this study was to know the distribution of ABO, Rh and Bombay blood group among donors in a tertiary care centre in Mangalore.

## MATERIALS AND METHODS

The present study was retrospective study of one year carried out in a tertiary care hospital in Father Muller Medical College, Mangalore, Karnataka, India, from June 2018 to May 2019. The collected data was analysed in November 2019. Research work was started after applying for ethical clearance from Institutional Ethical Committee

(Reference No. FMIEC/CCM/691/2020). The total blood donors studied were 8,254. This was a retrospective time bound study. Hence sample size cannot be characterised.

**Inclusion criteria:** Donors (both voluntary and replacement donors) between the age of 18-65 years of age, weight more than 50 kg, haemoglobin more than 12.5 gm%, free from medications and diseases were included in the study.

**Exclusion criteria:** Those donors less than 18 years of age or more than 65 years of age, with weight  $\leq$  50 kgs or those with haemoglobin less than 12.5 gm% and those taking any medications for past illnesses were excluded from the study.

Blood grouping was done by automated method using Ortho Vision equipment. Ortho Vision Analyser is an instrument designed to automate in vitro immune-haematology testing of human blood utilising ID-Microtyping system (ID-MTS)<sup>TM</sup> gel card technology. Forty two samples were tested at a time. The cassette was loaded into the automated machine. Antigen Typing for the predicate device was executed using pre-filled cards, where the active antibodies of particular specificity are pre-filled in card columns, requiring only the addition of red blood cells (sample) for the reaction. Principle of this method is based on column agglutination technology. The donor blood group data was recorded and analysed.

## STATISTICAL ANALYSIS

Frequency and percentage were calculated using Microsoft excel. Descriptive statistical analysis was used.

## RESULTS

The total donors studied were 8,254 with mean age of 48 years. It was revealed that the commonest blood group was O (n=3178,

38.50%) followed by B (n=2343, 28.38%), A (n=2102, 25.47%), AB (n=629, 7.62%) and Bombay blood group (n=2, 0.02%), respectively. Among females, the most common blood group was O, followed by B, A, AB and Bombay blood group, respectively. Among males, the most common blood group was O, followed by B, A, AB and Bombay blood group, respectively [Table/Fig-1].

Blood group	A (%)	B (%)	AB (%)	O (%)	Bombay blood group (%)
Females	74 (0.89)	115 (1.39)	67 (0.81)	186 (2.25)	0
Males	2028 (24.56)	2228 (26.99)	562 (6.80)	2992 (37.14)	2 (0.02)
Total	2102 (25.47)	2343 (28.38)	629 (7.62)	3178 (38.50)	2 (0.02)

[Table/Fig-1]: Gender wise distribution of blood donors.

The distribution of Rhesus (Rh) D factor was as follows, 94.06% were Rh D positive (n=7762) and 5.93% were Rh D negative 5.93% (n=490) blood donors [Table/Fig-2].

Rh D Positive		Rh D Negative	
Number	%	No.	%
7762	94.06	490	5.93

[Table/Fig-2]: Distribution of Rh D allele.

## DISCUSSION

India carries a lot of diversity in the distribution of blood groups. Knowledge of frequency and distribution of blood groups is essential in determining the direction of recruitment of voluntary and replacement donors as required for different zones of the country [6]. The total blood donors studied from June 2018 to May 2019 were 8254. The distribution of blood group was as follows, blood group O (38.5%), B (28.39%), A (25.47%), AB (7.62%) and Bombay blood group (0.02%), respectively. In our study, O was the commonest blood group among donors followed by B, A, AB and Bombay blood group. In Southern part of India, studies done by Das PK et al., Periyavan S et al., Mallikarjuna S et al., and Reddy MK et al., showed that the most common blood group was found to be group O followed by B, A, AB and Bombay blood group which is similar to that of our study [4,7-9]. In the study done in Central India by Badge SA et al., blood Group O was found to be the commonest followed by B, A and AB. The same incidence was found in our study i.e., O was more frequent followed by B, A, AB and Bombay blood group [1]. In studies done in Western India by Patel PA et al., and by Raja KA it was observed that blood group B was common followed by B, A and AB [3,10] which is in contrast to our study. In studies done in Eastern India by Ipsita N et al., it was observed that blood group O common followed by B, A and AB [11] which is comparable with our study. In the study conducted by Chandra T et al., and Mohroo RN in Northern India it was that observed blood group was B was the commonest followed by O, A and AB respectively which is in contrast to this study [Table/Fig-3] [1,3-5,7,8,10-12].

Region	Author	A (%)	B (%)	O (%)	AB (%)	Bombay blood group (%)	Rh positive (%)	Rh negative (%)
<b>South India</b>								
Mangalore, Karnataka	Present study	25.47	28.39	38.05	7.62	0.02	94	6
Mumbai, Maharashtra	Das PK et al., [4] 2001	18.85	32.69	38.75	5.27	0	94.53	4.47
Bangalore	Periyavan S et al., [7] 2010	23.85	29.95	39.81	6.37	0	94.20	5.7

Davangere	Mallikarjuna S [8] 2012	26.15	29.85	36.76	7.24	0	94.48	5.52
<b>North India</b>								
Lucknow	Chandra T and Gupta A [5] 2012	21.38	39.92	29.27	9.43	0	95.71	4.29
Delhi	Mohroo RN et al., [12] 2020	23.98	35.40	30.96	9.65	0	95.63	4.37
<b>Central India</b>								
Chattisgarh	Badge SA et al., [1] 2017	24.95	30.44	31.09	13.52	0	99.43	0.57
<b>Western India</b>								
South Gujarat	Raja KA et al., [3] 2016	24.35	34.43	32.26	8.94	0	95.12	4.87
Ahmedabad	Patel PA et al., [10] 2012	21.94	39.40	30.79	7.86	0	95.05	4.95
<b>Eastern India</b>								
Durgapur	Ipsita N and Sekhar S	23.9	33.6	34.8	7.7	0	94.7	5.3

[Table/Fig-3]: Comparison of frequency percentages of ABO and Rh groups at different geographical areas [1,3-5,7,8,10-12].

Geographical distribution of blood group revealed that in Northern India and Western India, blood group B was common whereas in Southern, Eastern and Central India, O is the most frequently occurring blood group. The incidence of Rh D positivity in most parts of India varies between 94-95% and Rh D negativity varies between 4-6% which is in concordance with our study.

## Limitation(s)

This study was conducted in a tertiary care hospital in Mangalore, Karnataka. The distribution of blood group varies from one hospital to another and cannot be generalised.

## CONCLUSION(S)

The knowledge of distribution of blood group is very important for blood bank and transfusion performing healthcare facilities and access to safe blood will significantly reduce preventable deaths.

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