

## ABO AND RH D PHENOTYPE DISTRIBUTION AMONG BLOOD DONORS- A RETROSPECTIVE STUDY

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### Abstract

**Background:** Human Blood Groups are genetically inherited and play a vital role in transfusion safety, understanding genetics, inheritance pattern and disease susceptibility and exhibit varying degrees of pleomorphism. Blood group antigens are integral parts of the red cell membrane and have different biochemical compositions. As per recent updates, International Society of Blood Transfusion (ISBT) has described about 45 blood group systems. Among them, ABO and Rhesus (Rh) blood group systems are most important in clinical practice. There is significant difference in the frequency of distribution of the various blood groups in the population. **Material and Methods:** This is a retrospective descriptive study among blood donors in the Transfusion Medicine Department, Medical College, Kottayam. Data of 15000 donors with full details were collected. ABO and Rh D typing was done using ABO grouping and Rh typing antisera. The procedure was in accordance with the manufacturer's instructions. All healthy donors of age group 18-60 years attending the department of Transfusion Medicine, Government Medical College Kottayam, Kerala were included and all donors whose details like age, sex etc was not recorded were excluded. **Results:** ABO and RhD blood group determination of 15000 healthy young adults from 18 to 60 years of age was carried out. Out of the 15000 donors, 10951 (73%) were voluntary and 4049 (27%) were replacement donors. We found that the percentage of ABO blood groups in donors in descending order was as follows: O>B>A>AB. Out of 15000 blood donors, 6072 (40.48%) were of blood group O, 4166 (27.77%) of B, 3968 (26.45%) of A and 794 (5.29%) were of blood group AB. **Conclusion:** To conclude, the commonest blood group was O in both males and females in Kottayam, Kerala. Regarding Rhesus group, Rh D negativity was found in only 7.24 % population. Based on the findings of the present study and other reference studies, it can be concluded that O blood group has highest frequency in South India while B blood group has highest frequency in the North India.

## INTRODUCTION

Human Blood Groups are genetically inherited and play a vital role in transfusion safety, understanding genetics, inheritance pattern and disease susceptibility and exhibit varying degrees of pleomorphism. Blood group antigens are integral parts of the red cell membrane and have different

biochemical compositions.<sup>[1]</sup> As per recent updates, International Society of Blood Transfusion (ISBT) has described about 45 blood group systems.<sup>[2]</sup> Among them, ABO and Rhesus (Rh) blood group systems are most important in clinical practice. There is significant difference in the frequency of distribution of the various blood groups in the population.<sup>[3]</sup>

The ABO system is a blood group system that is responsible for most of the blood transfusion reactions, transplant rejections and determining some forensic cases. The ABO and Rh blood group systems have shown variations in different part of world and different races.<sup>[4]</sup> Distribution pattern of ABO and Rh blood group systems show variations in different populations, knowledge of which is essential for effective management of blood bank inventory.<sup>[6]</sup>

Red blood cells contain a series of glycoproteins and glycolipids on their surface which constitute the blood group antigens, the production of which is genetically controlled. The ABO system consists of four main groups A, B, AB, O which are determined on the basis of the presence of antigens A and B, which are under control of three allelic genes A, B and O situated on the long arm of chromosome 9. There are 56 antigens in the Rh blood group system of which D, C, E, c, and e are most important. Presence of D antigen is termed as Rh-positive, while Rh- negative refers to the absence of the D antigen.<sup>[5]</sup> There is significant difference in the frequency of distribution of the various blood groups in different parts of the world. There is some correlation between ABO groups and various diseases like duodenal ulcer, Diabetes Mellitus, ovarian cancer and coronary artery disease as documented in literature till date. ABO incompatibility between mother and baby can cause hemolytic disease of the newborn.<sup>[6]</sup>

**Objective:** This study was carried out to determine the distribution pattern of blood groups among blood donors attending Government. Medical College, Kottayam.

## MATERIALS AND METHODS

**Type of study:** Retrospective descriptive study

**Period of study:** 1 year

**Location and study setting:** Department of Transfusion Medicine, Government Medical College, Kottayam..Kerala

**Sample Size:** 15000 donors

**Study Population:** Donors attending the Transfusion Medicine Department, Medical College, Kottayam.

**Inclusion Criteria:** All healthy donors of age group 18-60 years attending the department of Transfusion Medicine, Govt Medical College Kottayam

**Exclusion Criteria:** All donors whose details like age, sex etc was not recorded.

**Study Tool:** Donor Records in the transfusion Medicine Department

**Study Procedure:** This is a retrospective descriptive study among blood donors who had attended the Transfusion Medicine Department, Medical College, Kottayam in the year 2020. Data of 15000 donors with full details were collected.

**Ethical Considerations:** Study was started after obtaining ethical clearance from the Institutional ethics committee.

**Study Procedure:** This is a retrospective descriptive study among blood donors in the Transfusion Medicine Department, Medical College, Kottayam. Data of 15000 donors with full details were collected.

### Procedure

ABO and Rh D typing was done using ABO grouping and Rh D typing antisera (Monoclonal Ig M type of antisera of each antigen by Tulip). The procedure was in accordance with the manufacturer's instructions.

Blood grouping was done by finger prick and confirmed by taking two ml of blood from the collected blood unit. Cells were washed and 40% cell suspension in normal saline was used for slide method and 5% for tube method. Both cell grouping and reverse grouping were done. For cell grouping cell: serum ratio was 1: 1. Cell suspension and anti-serum were mixed and incubated and watched for agglutination. ABO and Rh blood grouping were done by agglutination test using commercially available Anti A, Anti B and Anti D anti sera. For reverse grouping. washed pooled A cells, B cells and O cells were used. Donor serum was mixed with these cells and observed for agglutination,

Personnel Responsible for data collection; The principal investigator was responsible for Data Collection.

## RESULTS

ABO and Rh D blood group phenotyping of 15000 healthy young adults from 18 to 60 years of age was carried out. Out of the 15000 donors, 10951 (73%) were voluntary and 4049 (27%) were replacement donors. We found that the percentage of ABO blood groups in donors in descending order was as follows: O>B>A>AB. Out of 15000 blood donors, 6072 (40.48%) were of blood group O, 4166 (27.77%) of B, 3968 (26.45%) of A and 794 (5.29%) were of blood group AB. [Table 1]

**Table 1: ABO Blood Group distribution**

RhD status	Age distribution (in years)	A	B	O	AB
Positive	18 to 30	2427	2626	3897	506
	31 to 40	842	894	1161	162
	41 to 50	388	340	506	78
	51 to 60	18	25	42	2
Negative	18 to 30	191	176	269	25
	31 to 40	70	85	143	12
	41 to 50	27	18	49	9

	51 to 60	5	2	5	0
Total		3968 (26.45%)	4166 (27.77%)	6072 (40.48%)	794 (5.29%)

**Table 2: Rh D distribution in ABO groups**

Blood group	Age distribution (in years)	Rh D Positives (n)	Rh D Negatives (n)
A	18 to 30	2427	191
	31 to 40	842	70
	41 to 50	388	27
	51 to 60	18	5
B	18 to 30	2626	176
	31 to 40	894	85
	41 to 50	340	18
	51 to 60	25	2
O	18 to 30	3897	269
	31 to 40	1161	143
	41 to 50	506	49
	51 to 60	42	5
AB	18 to 30	506	25
	31 to 40	162	12
	41 to 50	78	9
	51 to 60	2	0
Total		13914 (92.76%)	1086 (7.24%)

**Table 3: ABO & Rh D allele distribution in different studies**

Author	Calculated ABO & Rh D allele frequencies				
	I <sup>A</sup>	I <sup>B</sup>	I <sup>O</sup>	I <sup>D</sup>	I <sup>d</sup>
Amit Agrawal et al	0.1653	0.2254	0.6093	0.7679	0.2321
Sindhu S et al	0.171	0.27	0.559	0.839	0.164

## DISCUSSION

The present study was done to determine the distribution and frequency of ABO and Rhesus blood group among selected donors attending blood bank of Government Medical College Kottayam over a period of one year. We observed that maximum donors belonged to age group of 18 -30 years. This finding finds consonance with other studies as well.<sup>[7]</sup> This may be due to the fact that this age group fulfils maximum inclusion criteria set by National Blood Transfusion Council for blood donation.

We have also observed that voluntary blood donation is more common among donors of this age group. Minimum number of donors belonged to age group 50 to 60 and above as mostly they are considered unfit for blood donation as per guidelines of NACO. The current study showed that majority of donors are males as compared to females which is comparable with other studies. This may be due to the reason that in a developing country like India, majority of females in the reproductive age group i.e. 15-49 years are anaemic. Hence even if they volunteer for blood donation or wish to be a replacement donor they are deferred because of haemoglobin levels which are below the cut off range.<sup>[8]</sup>

Among women belonging to age group besides the reproductive age group, there may be lack of motivation or preconceived notion that they may be unfit for blood donation. Voluntary donors in present study were 73% which is in contrast to study where voluntary donations were 37.30%. Blood can be provided to patients in emergency without waiting for the replacement donors. Moreover, there

is less risk of transmitting transfusion transmitted infections with voluntary donations. The frequency of ABO and Rh blood group observed in our study was O>B>A>AB which is in contrast to the study findings from various parts of North India like Amritsar, Lucknow and parts of western and central India.<sup>[9]</sup>

The gene frequencies of ABO and Rh blood group found in two studies done by Agrawal A et al and Sindhu S et al are also shown in table 3. The actual distribution of ABO blood group did not differ significantly from the calculated gene frequencies.<sup>[10]</sup>

## CONCLUSION

To conclude, the commonest blood group was O in both males and females in Kottayam, Kerala. Regarding Rhesus group, Rh D negativity was found in only 7.24 % population. Based on the findings of the present study and other reference studies, it can be concluded that O blood group has highest frequencies in the South India while B blood group has highest frequency in the North India.

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