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## Research Article

# DISTRIBUTION OF A B O AND RHESUS (RH) BLOOD GROUP SYSTEM AMONG VOLUNTARY BLOOD DONORS AT TERTIARY CARE HOSPITAL IN WESTERN MAHARASHTRA, INDIA

Dr. Amruta Khade, Dr. Pratik Chide Dr. Yasmin Momin, Dr. Abhaysinh Bhasale  
and Dr. Amruta A. Khade

Gajraj Colony, Sanglikar Mala , Miraj 416410

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### ABSTRACT

**Introduction:** The ABO system is the most important blood group system in transfusion therapy and was the first blood group system to be discovered. In modern medicine, the need for blood group frequency and prevalence study is multipurpose as besides that importance in evolution, their relation to disease and environment is being increasingly important. Knowledge of the distribution of pattern of different blood groups is very crucial for blood centre and blood transfusion services which are significantly contribute to the health system of the nation and to maintain donor registry. **Aim:** The study is aimed to know the frequency of ABO and Rh blood group in a population of western Maharashtra, India which is essential for effective management of blood inventory and to maintain blood donor registry. **Material and method:** The present study was conducted at Government Medical College and Hospital Blood Centre, Miraj. A total of 13858 blood donors were selected and accepted for blood donation as per blood Donor selection guidelines of Drug and cosmetics Act ,1940. **Result:** Out of 13858 donors, 13440 (96.98%) were males and 418 (3.02%) were females. The majority of donors belong to the age group 30 to 40 years. The commonest A B O group present was B+ 29.55% followed by O+ 28.33% followed by A + 27.48% and AB + 9.54% while 13155( 94.92% )donors were Rh Positive and 698 ( 5.03%) donors were Rh Negative. **Conclusion:** Knowledge of the distribution of pattern of different blood groups is very crucial for blood centers and blood transfusion services which are significantly contribute to the health system of the nation. Blood group distribution is important for clinical studies geographical information and forensic studies in general population. It also helps to maintain donor registry which is useful in blood crisis.

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### INTRODUCTION

At present, the International Society of Blood Transfusion recognizes 33 blood group systems, encompassing over 300 antigens.<sup>(1)</sup> Among these, the ABO system holds paramount importance in transfusion therapy and stands as the pioneering blood group system discovered by Landsteiner in 1900.<sup>(2)</sup> His groundbreaking observations highlighted the agglutinating effect of healthy human serum on both animal and human blood corpuscles, leading to the identification of major blood groups—O, A, and B types. This discovery laid the foundation for compatibility testing and subsequent transfusion practices.<sup>(1)</sup>

Following closely in significance is the Rhesus (Rh) system, crucial for preventing erythroblastosis foetalis, a condition common in Rh-negative mothers carrying Rh-positive fetuses.

<sup>(3)</sup> The distribution of ABO and Rh blood groups plays a pivotal role in effective blood bank management. <sup>(4)</sup> Comprehensive studies on the frequency of these blood groups in diverse populations underscore their importance not only in transfusion therapy but also in disease associations and genetic research. <sup>(5)</sup>

Ideally, a blood transfusion system should be capable of addressing 100% of clinical demand arising in healthcare facilities, within its catchment area. Yet, in many developing and under-developed countries, there is a widespread shortfall between demand and supply of blood due to several barriers. The major factors are increasing requirement for blood and blood products, poor implementation of voluntary donation and blood safety programs in countries, inadequate voluntary non-remunerated blood donation (VNRBD), suboptimal component separation, inadequate infrastructure, equipment and trained human resources, inappropriate use of blood and blood

\*Corresponding author: **Amruta Khade**

Gajraj Colony, Sanglikar Mala , Miraj 416410

components, poor quality management systems, poor supply chain management systems, lack of cold chain, wastages and expiry of blood <sup>(6)</sup>

Beyond their role in transfusion practice, ABO grouping and Rh typing prove valuable in clinical and genetic studies, aiding in population research and medico-legal problem-solving. <sup>(7)</sup> Understanding the distribution patterns of different blood groups is crucial for blood centers and transfusion services, contributing significantly to the overall health system. This study was conducted at a tertiary care Government medical college and hospital Blood Centre in western Maharashtra, India, to determine the frequency of ABO and Rh blood groups, furthering our understanding of the local blood landscape and to maintain blood donor registry.

**Aims and Objectives**

To know the frequency of ABO and Rh blood group in a population of Western Maharashtra which is essential for effective management of blood inventory and to maintain blood donor registry.

**MATERIAL AND METHOD**

**Study setting and duration:**

The present study was conducted at Government Medical College and Hospital blood centre, Miraj located at Western Maharashtra India.

**Study design and sample size**

It is a cross sectional retrospective study with the sample size 13858 healthy donors.

**Inclusion criteria**

All the voluntary non remunerated blood donors coming to blood bank and outside the blood bank in voluntary blood donation camps were eligible as per guidelines of Drug and cosmetics Act, 1940

**Exclusion criteria**

Donors don't qualify as per guidelines of Drug and cosmetics Act, 1940

**Data collection**

Information regarding personal details, demographic details, occupation, past medical history was elicited. Individuals with good health ,mental alert, physical fit were selected as blood donors .The donors were then asked to sign the donor

questionary as well as donor register inclusive of the inform consent.

After blood donation, A B O and Rh typing were done on each sample using tube agglutination method according to Standard Operating Procedures (SOPs). The Monoclonal type Antisera reagents anti A and anti B and anti D manufactured by Tulip Diagnostics were used. O blood group donors were tested by anti H Lectin to rule out Bombay blood group. Each new lot of Antisera were used after quality control test like Titer and avidity .Also on each day daily quality control test also performed before use of Antisera.

Reverse grouping was done by using known pooled A cells, B cells and O cells from three different known donor samples. The final blood group is confirmed only if both Forward group and Reverse group were identical. All the week D groups were considering as positive.

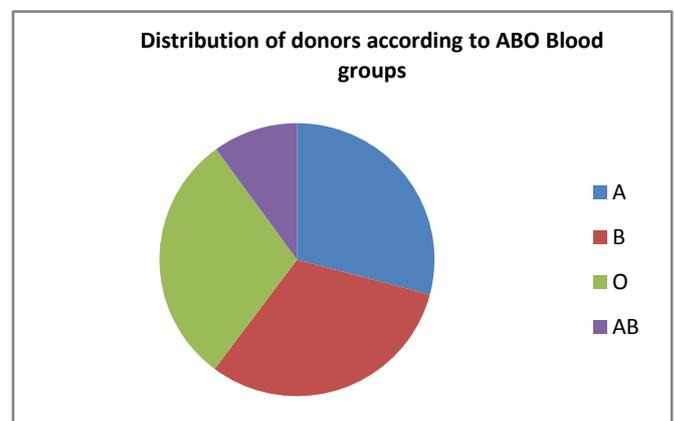
*Ethical consideration and permission institutional ethical committee approval is taken before conducting the study.*

*Frequency and percentage for each variable were calculated. Statistical analysis the recorded data was compelled and entered in a spreadsheet computer program and then it's ported to the data editor page of SPSS version 20 data on the frequency of a view and Rh blood groups were reported in simple percentage.*

**RESULT**

**Table 1** Distribution of donors according to Gender.

Gender	Number of donors	Percentage
Male	13440	96.98%
Female	418	3.02%
Total	13858	100%



**Fig 1** Distribution of donors according to ABO blood groups

**Table 2** Distribution of donors according to ABO and Rh blood group system

Types of Blood Group	Number of donors	Percentage
A Rh -Positive	3809	27.48%
A Rh -Negative	226	1.63%
B Rh -Positive	4096	29.55%
B Rh -Negative	213	1.53%
O Rh -Positive	3927	28.33%
O Rh -Negative	200	1.44%
AB Rh -Positive	1323	9.54%
AB Rh -Negative	64	0.46%
<b>Total</b>	<b>13858</b>	<b>100%</b>

**Table 3** Comparative studies from India

Study	Place	No. studied	ABO blood group				Rh blood group	
			A	B	AB	O	Rh D Positive	Rh D Negative
Studies from India								
Periyavan et al(8)	Bengaluru	36,964	23.9	29.9	6.4	39.8	94.2	5.8
Das et al(9)	Vellore	150,536	21.8	32.7	6.7	38.8	94.5	5.5
Mallikarjuna et al(10)	Devanagere	19,413	26.1	29.9	7.2	36.8	94.5	5.5
Girish et al(11)	Shimoga Malnad	ND	24.3	29.4	7.1	39.2	94.9	5.5
Chandra et al(12)	Lucknow	1,40,320	21.7	39.8	9.3	29.1	95.7	4.3
Sidhu et al(13)	Punjab	1,150	21.9	37.6	9.3	31.2	97.3	2.7
Patel et al(14)	Western Ahmedabad	5,316	21.9	39.4	7.9	30.8	95.1	4.9
Wadhwa et al(15)	eastern Ahmedabad	ND	23.3	35.5	8.8	32.5	94.2	5.8
Mehta et al(16)	Surat	ND	24.1	34.9	8.7	32.3	94.2	5.8
Gupta et al(14)	Indore	17,080	24.2	35.2	9.1	31.5	95.4	4.6
Naga et al(18)	Durgapur	3850	23.9	33.6	7.7	34.8	94.7	5.3
Present Study	Western Maharashtra	13858	21.1	40.8	7.6	30.5	91.4	8.6

**Table 4** Comparative studies from other parts of world

Anees et al(19)	Punjab Pakistan	2542	34	29	4	33	96.7	3.3
Pramanik et al (20)	KhatmanduNepal	120	26.2	22	4.4	47.5	80.3	19.7
Lycy et al (21)	Nairobi, Kenya	38898	20.0	32.2	6.1	41.7	92.8	7.2

## DISCUSSION

All human population shares the same blood group systems; although they differ in the frequency of specific types. The frequencies of ABO and Rh blood groups vary from one population to another and time to time in the same region.

Current study shows that the majority of donors were male (96.98%) Table 1, which is consistent with other studies in most regions globally. The lower rate of donation in females (3.02%) is due to fear of donation, iron deficiency anemia and post partum blood loss which leads to anemia in most of female donors.

In studies spanning diverse cultural and geographic groups the most common age range for blood donation is 18 to 44 years and our study results are consistent with this Global trend. The improved interest and ability among younger adults to donate maybe related to awareness, better Physical health and greater mobility. Older individuals may suffer from Medical conditions such as ischemic heart disease, diabetes mellitus and hypertension hence negatively impacting their ability to be well enough to donate blood.

The majority of donors in our study were voluntary non remunerated donors 100%. This is consistent with other studies and global trends. The donation of blood by voluntary non remunerated blood donors is critical for the safety and sustainability of national blood supply. National blood donation system in which replacement are typically unable to meet clinical demands for blood while paid family members contributing of a serious threats to the health and safety of the recipients. WHO recommendations are therefore to create health system based 100% on voluntary donation

Table 3 shows that Frequency of A B O blood groups of the present study was compared to the studies done at Lucknow by Chandra et al<sup>(12)</sup>, at Punjab Sidhu et al<sup>(13)</sup> at Ahmedabad by Patel PA et al<sup>(14)</sup> and Wadhwa MK et al<sup>(15)</sup>, at Surat by Mehta T et al<sup>(16)</sup> and at Indore by Gupta H et al.<sup>(17)</sup> In all these

studies predominant blood group was 'B' which was followed by O, A and AB

On the other hand studies were done at Shimoga Malnad by, at Bangalore by Periyavan A et al<sup>(8)</sup> Das et al<sup>(9)</sup>, Mallikarjuna et al<sup>(10)</sup>, Girish CJ et al<sup>(11)</sup> and at Durgapur by Nag I et al<sup>(18)</sup>, the commonest A B O blood group was 'O' which is in contrast to present study where B is the most common A B O blood group

In other countries of the world like in Pakistan by Anees et al(19), Pramanik et al(20) in Khatmandu Nepal, Lycy et al(21) Nairobi, Kenya showed the blood group O was highly frequent which is in contrast to our presence study.

Table 4 shows that ,frequency of Rhesus blood groups of present study was 94.92% and 5.08% for RH positive and RH negative donor respectively .Which is similar to all studies except in USA where it is 85% and 15% respectively . Some of the factors which can affect the overall distribution of the ABO Rh blood group depend upon the donor selection and deferral which are unique to specific location.

## CONCLUSION

Knowledge of the distribution of pattern of different blood groups is very crucial for blood centers and blood transfusion services which are significantly contribute to the health system of the nation. Blood group distribution is important for clinical studies geographical information and forensic studies in general population.

It also helps to maintain donor registry as there are very few voluntary donors in the society, of which very few are regular donors. By preparing or making a Registry of these regular Donors as per A, B, O Blood group differentiations this Registry will be valuable or of great help during blood crisis. That is why it is important to maintain A, B, O and Rh Blood group distribution.

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