

**A STUDY OF DISTRIBUTION OF ABO AND RH BLOOD GROUPS SYSTEM AMONG BLOOD DONORS AT A TERTIARY CARE HOSPITAL**

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**ABSTRACT:** Up till now about 400 red cells antigen have been identified. The majority are inherited by Mendelian fashion. The ABO and Rh blood group system was first to be identified and is most important for blood transfusion purposes. **OBJECTIVE:** This study was conducted to determine the frequency of ABO and Rhesus (Rh) blood groups in a tertiary care teaching hospital in India. **MATERIALS AND METHODS:** A retrospective data based study was conducted at blood bank, Chirayu Medical College and Hospital, Bhopal, Madhya Pradesh, India over a period of four years. **RESULTS:** Study includes a record of 3188 (28.54%) voluntary and 7982 (71.46%) replacement donors attending blood bank from February 2011 to January 2015. Out of 11170, 10723 (95.998%) were male and 447 (4.002%) female donors. The most common blood group was found to be B in 4013 (35.927%) donors followed by O in 3462 (30.994%) donors, an in 2516 (22.524%) donors and AB in 1179 (10.555%) donors. Out of these, 10659 (95.425%) donors were Rh-positive while 511 (4.575%) were Rh-negative.

**KEYWORDS:** ABO blood group, Rhesus blood group.

**INTRODUCTION:** Karl Landsteiner at the University of Vienna discovered that some blood transfusions were successful while others could be deadly. He demonstrated that the serum of some people agglutinated the red cells of other. From his early experiments, he identified three types, called A, B and C (C was later to be re-named O for the German "Ohne", meaning "without", or "Zero", "null" in English). A year later, the fourth less frequent blood group AB was also discovered. The Nobel Prize in physiology and medicine was awarded to Landsteiner in 1930 for this work.<sup>(1)</sup> After this, the Rh blood group was also defined by Landsteiner and Wiener in 1941.<sup>(2,3)</sup>

More than 20 distinct blood group systems have been identified since then but the ABO and Rhesus (Rh) blood groups remain clinically most important. Furthermore, they are also the well-defined genetic markers employed in population genetic and anthropological studies.<sup>(4,5)</sup>

The frequency of ABO and Rh-D phenotypes in different populations has been extensively studied. Different blood groups have been shown to be particularly associated with different diseases as well. Rh system emerged as second most important blood group system due to hemolytic disease of newborn and its importance in Rh D-negative individuals in subsequent transfusions once they develop Rh antibodies.<sup>(6)</sup> In modern medicine, the need for blood group frequency and prevalence studies is multipurpose, as besides their importance in evolution, their relation to disease and environment is being increasingly important.<sup>(7,8)</sup> Blood group antigens can also be utilized in genetic research, forensic pathology, anthropology and in tracing the ancestral relation of human beings.<sup>(9)</sup>

Hence this study was conducted to determine the frequency of ABO and Rhesus (Rh) blood groups in a tertiary care teaching hospital in India.

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**MATERIAL AND METHODS:** A retrospective study was carried out at Blood bank, Chirayu Medical College and Hospital, Bhopal, Madhya Pradesh, India. The data based on blood groups of donors of either sex presenting over a period of four years from February 2011 to January 2015 was studied. The donors with more than one entry in the record were included once for the study. The ABO and Rh blood grouping was done by agglutination test using anti-A, anti-B and anti-D human sera.

A total of 11170 donors were studied for their blood groups and percentage of each blood group was calculated.

**RESULTS:** Out of 11170 donors, 10723 (95.998%) were males and 447 (4.002%) were females which shows a predominance of male donors.

The frequency of ABO blood groups in 11170 donors shows that most prevalent blood group was B followed by O, A and AB as the least common group. (Table 1)

Blood Group	Donors	Prevalence (%)
A	2516	22.524%
B	4013	35.927%
AB	1179	10.555%
O	3462	30.994%
<b>Total</b>	<b>11170</b>	<b>(100%)</b>

Table 1: ABO Blood Grouping

Distribution of both ABO and Rh blood groups in the donors is as depicted in Table 2 which shows that out of 11170 donors, 511 (4.575%) were Rh negative.

Blood Group	A	B	AB	O	Total	Percentage
Rh Positive	2404	3826	1131	3298	10659	(95.425%)
Rh Negative	112	187	48	164	511	(04.575%)
<b>Total</b>	<b>2516</b> <b>(22.524%)</b>	<b>4013</b> <b>(35.927%)</b>	<b>1179</b> <b>(10.555%)</b>	<b>3462</b> <b>(30.994%)</b>	<b>11170</b>	<b>(100%)</b>

Table 2: Distribution of ABO and Rhesus blood group among study population (n=11170)

Among Rh-negative donors, blood group B was the commonest (36.594%) followed by group O (32.093%), group A (21.917%) and group AB (9.393%)

We compared our result with other studies carried out in different countries of the world like Britain, USA, Nepal, Nigeria, Pakistan, Guinea, Saudi Arabia etc. (Table 3). Except Nepal, Pakistan and India (Present study), O blood group is commonest in Britain (47.0%), USA (46.0%), Nigeria (54.2%), Guinea (48.9%) and Saudi Arabia (52.0%) and there is no marked difference in incidence of O blood group in these countries.

The incidence of Rh negative blood groups is highest in Britain (17%) followed by USA (15%). In India, highest incidence of Rh negative blood group was in Pondicherry (6.50%).

Population	A%	B %	O %	AB %	Rh +ve%	Rh -ve%
Britain <sup>(10)</sup>	42.00	8.00	47.00	3.00	83.00	17.00
USA <sup>(11)</sup>	41.00	9.00	46.00	4.00	85.00	15.00
Nigeria <sup>(12)</sup>	21.60	21.40	54.20	2.80	95.20	04.80
Guinea <sup>(13)</sup>	22.50	23.70	48.90	4.90	95.90	04.10
Saudi Arabia <sup>(14)</sup>	24.00	17.00	52.00	7.00	93.00	07.00
Nepal <sup>(15)</sup>	34.00	29.50	32.50	4.00	96.70	03.30
Pakistan <sup>(3)</sup>	28.70	32.40	30.50	08.40	93.00	07.00
INDIA						
South India <sup>(16)</sup>	18.66	32.69	38.75	9.90	94.45	05.55
Maharashtra <sup>(17)</sup>	27.57	33.06	31.04	8.33	95.73	04.27
Jaipur <sup>(18)</sup>	23.50	42.10	30.40	4.00	97	03.00
Pondicherry <sup>(19)</sup>	39.50	20.50	34.00	6.00	93.50	06.50
Present study (Bhopal MP)	22.524	35.927	30.994	10.555	95.425	04.575

Table 3: Comparison of Frequency percentage of ABO and Rhesus blood group in different countries of the world and in different areas of India

**DISCUSSION:** Blood groups and Rh antigen are hereditary. Gene for ABO antigens is on the 9th chromosome and Rh antigen gene is on the 1st chromosome.<sup>[20]</sup> The distribution of ABO blood group varies regionally, ethnically and from one population to another. India is a country with a lot of diversity in race, religion, and creed. Hence, diversity has been observed in the distribution of blood groups in population within the country. In the present study, the ABO blood group typing in the total sample showed the same trend of prevalence as in the general Indian subcontinent (B ≥ O > A > AB). Our study shows the highest frequency of blood group B (35.927%), followed by O (30.994%), A (22.524%) and AB (10.555%). Similar studies carried out in different part of India by Warghat et al [17] and Rai et al [18] revealed that the frequency of blood group B (33.06%), followed by O (31.04%), A (27.02%) and AB (8.33%); and blood group B (42.0%), followed by O (30.04%), A (23.5%) and AB (4.0%) respectively.

Internationally, a study by Rahman et al.<sup>[3]</sup> showed that the frequency of blood group B (32.04%), followed by O (30.5%), A (22.4%) and AB (8.4%); while other studies.<sup>[10,11,12,13,14]</sup> showed O blood group to be the most prevalent. In Rhesus system, our study shows frequency of Rh-positive was 95.425%, while only 4.575% was Rh-negative. These figures are similar to the other studies carried out in different part of India.<sup>[16,17,18,19]</sup> Rh-positive groups are predominant group and the frequency is more or less the same. Internationally, the distribution and frequency of the Rh-positive group in the Nigeria population is 95.20%.<sup>[12]</sup> In the Guinea and Nepal, 95.90% and 96.70% belong to the Rh-positive respectively.<sup>[13,15]</sup> while in Pakistan and Saudi Arabia, 93% of blood donors were found to be Rh-positive.<sup>[3,14]</sup> which were also similar to our present study. The frequency to Rh-negative group in the Nigeria population is 4.8%.<sup>[12]</sup> In the Guinea and Nepal, 4.1% and 3.3% belong to the Rh-negative respectively.<sup>[13,15]</sup> while in Pakistan and Saudi Arabia, 7% of blood donors were found to be Rh-negative.<sup>[3,14]</sup>

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**CONCLUSION:** The study has a significant implication regarding the management of blood bank and transfusion services in this area. Knowledge of blood group distribution is also important for clinical studies, for reliable geographical information and for forensic studies in the population. Besides, these studies will help a lot in reducing the maternal mortality rate, as access to safe and sufficient supply of blood will help significantly in reducing the preventable deaths.

So the data generated can be helpful to health planners to face the health challenges of the region. In conclusion these studies generate a simple database of blood groups at regional level which can be helpful in case of calamities as well as prediction of future disease burden.

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