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Prevalence Of ABO And RH Blood Group Types In Government Medical College, Baramulla, Jammu And Kashmir, India - A Retrospective Study.

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Abstract
Background: *Since it was discovered by Karl Landsteiner, the ABO blood group system is the most important blood group system in Transfusion Medicine. The blood group systems are also very important in population genetic studies, researching population migration patterns as well as resolving certain medico-legal issues, particularly disputed parentage. This study was carried out with an objective to provide data regarding prevalence of ABO and Rh blood groups among blood donors in District Baramulla, Jammu and Kashmir, India.*
Methods: *Data of 1730 blood donors were retrospectively collected and analyzed regarding ABO and Rh blood groups from Jan-2021 to Oct-2021 and reported in simple numbers and percentage. Blood group of the blood donors was determined by forward and reverse methods with the help of commercially available standard monoclonal antisera by test tube method*
Results: *The most common blood group among donors was O (33.69%) followed by B (31.61%), A (24.50%), while the least prevalent blood group was AB (10.17%). Rh positivity among donors was (88.772%). Rests were Rh Negative (11.27%).*
Conclusions: *The most common blood group in donors was O positive and least common was AB negative.*
Keywords: *ABO & Rh blood group, Blood donor, Rh, Prevalence.*

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I. Introduction

In 1900, Karl Landsteiner of the University of Vienna identified that red blood cells contain antigens on their surfaces, and that blood plasma contains antibodies targeted to antigens [1–3]. This discovery is the basis of modern-day blood grouping and transfusion medicine. He suggested the letters O, A, B and AB to express blood groups which were universally followed by the early 1950s. Multiple alleles of ABO blood groups are located on a single locus of long arm of ninth chromosome (9q34) that exhibit Mendelian inheritance pattern [4]. ABO gene has mainly three types of alleles: ***i*** expresses no antigen hence type O, I^A expresses type A antigen, and I^B expresses type B antigen where *i* is a designation for iso-agglutinogen [5]. Both I^A and I^B are dominant over *i*, and only *ii* people have type O blood group. I^AI^B individual has both phenotypes due to codominance and is typed as AB blood group. Rh is the second major blood group system which comprises of more than 50 blood group antigens. Out of them, RHD and RHCE are the most clinically important Rh antigens. RHD and RHCE are closely linked genes on chromosome 1 that controls expression of Rh proteins [6]. A person with Rhesus antigen is referred to as Rhesus positive while individuals lacking the antigen are Rhesus negative. When a Rhesus negative person is exposed to Rhesus positive blood, antibodies will be produced, which cause potentially fatal haemolytic reactions.

Blood group selection of any region can be influenced by race, ethnicity, geographical conditions, genetic drift and migration frequency of population. Environment factors and natural selection for survival of population in that region also affect the blood group distribution. The study of distribution of blood groups is of great importance for inventory management, safe blood transfusion, disease association with blood group in specific area and preparation of donor data for organ transplantation [7-8]. Blood banks require timely information concerning the distribution and frequency of blood groups to ensure adequate supply of the most medically useful blood types.

Antigen expression can influence the development of particular infections as well as certain malignancies. The Multinational Pancreatic Cancer Consortium successfully identified susceptibility loci in the ABO gene for pancreatic cancer pathogenesis [9]. Other studies have showed an association between gastric cancer and blood group A related to a higher susceptibility of Helicobacter pylori infection. Different hypothetical models such as inflammation, immune system surveillance and cell membrane signalling have been developed to explain the mechanism of cancer susceptibility among people with varying blood groups [10–15].

The knowledge of the distribution of Rhesus antigen in a population is critical in managing a transfusion service in areas such as antenatal serology, paternity testing as well as selecting compatible blood and blood products. Even after Karl Landsteiner's discovery in 1900, transfusion reactions were still prevalent [1]. It was not until 1940 when Landsteiner and Weiner discovered the Rh factor that transfusion medicine involved less risk. Immunogenicity of the Rh factor along with A, B antigens made it mandatory for pre-transfusion testing [1, 16].

This study aims to determine the distribution of ABO and Rh blood groups and the demographic background of blood donors in GMC Baramulla.

II. Material And Methods

A retrospective study was conducted at Government Medical College Baramulla in the Department of Pathology and Blood Bank during a period of 10 months from Jan 2021 to Oct 2021. District Baramulla is one of the biggest districts of the state and has outreach to entire northern area of Kashmir valley. It is located approximately 60 kms from capital Srinagar city. Samples were analyzed from both voluntary and replacement donors at Blood Bank, GMC Baramulla.

Voluntary blood donation involves a donor giving blood, plasma or cellular components of his or her own free will while replacement or family donors are those who give blood when required by a family or community member.

The inclusion criteria for this study were donors between the ages of 18–70, with a personal weight above 45 kg, and who met the haemoglobin cut off criteria. All donors were required to have a haemoglobin level of at least 12.5 g/dL. A total of 1730 blood donations were collected during the period which met the inclusion criteria.

During blood donation approximately 4 mL of blood from each donor was collected in EDTA tubes for analysis. ABO and Rh status were analyzed by tube method using commercially prepared anti-A, anti-B, anti-AB and anti-D antisera blood types. To do so correctly, we followed the specific procedures outlined in the manufacturer's manual. Prepared 5% suspensions of red blood cells in normal saline were used. Four different tubes labelled with donor unit numbers were added with one drop of antisera A, B, AB and D. To every tube with specific antisera one drop of 5% cell suspension was added and each sample was macroscopically observed for agglutination.

Interpretation of results

Positive: Agglutination indicates positive reactions to respective group or Rhesus factor.

Negative: No Agglutination indicates negative reactions to respective group or Rhesus factor.

III. Results

As shown in Table 1, there were more male participants (99.13%, n = 1715) as compared with female participants (0.86%, n = 15). The age distribution of the participants was 54.85% (n = 949), 34.33% (n = 594), and 187% (n = 187) for the age groups of 18–29, 30–39 and 40–65 respectively. The most common blood type among the participants was blood group O (33.69%, n = 583), followed by blood group B (31.61%, n = 547), blood group A (24.50%, n = 424) and blood group AB (10.17%, n = 176). As shown in Table 2, 88.8% (n = 1535) of participants were Rhesus positive while 11.2% (n = 195) were Rh negative.

Table 1. Gender and age distribution of the participants(N = 1730)

Characteristic	Frequency (n)	Percentage (%)
Sex		
Female	15	0.86
Male	1715	99.13
Age (years)		
18–29	949	54.85
30–39	594	34.33
40–65	187	10.80

There was no difference between the blood type and the sex ($\chi 2 = 3.7021$, *P value* 0.895). Except for blood group AB, all the other blood groups had Rh-negative antigens in the donated blood. The prevalence of Rh-negative antigens was 2.25% (n = 39), 3.64% (n = 63), 4.10% (n = 71) and 1.27% (n=22) for blood group A, B, O and AB respectively. There were no differences in RH between different blood groups ($\chi 2 = 1.923$, *P value* 0.712).

Figure 1. Distribution of blood groups in males.

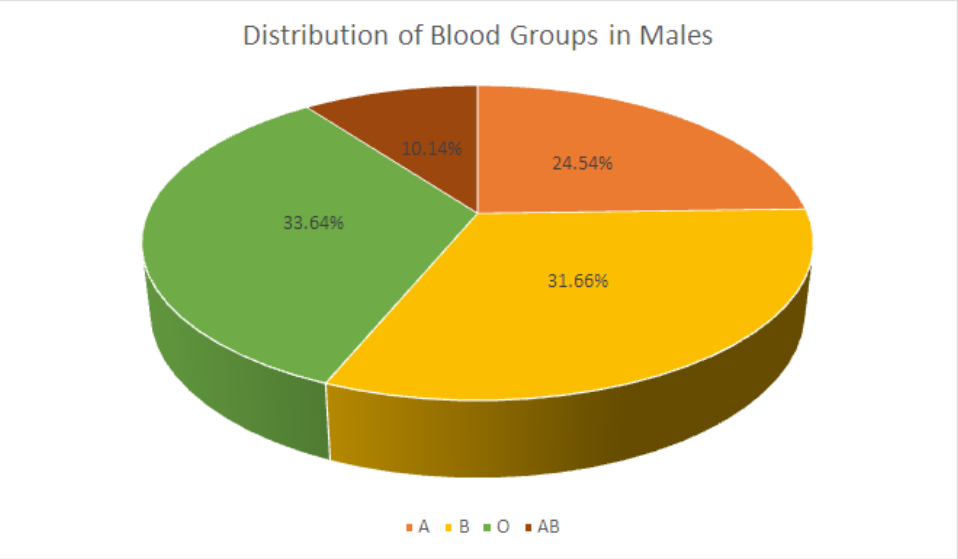
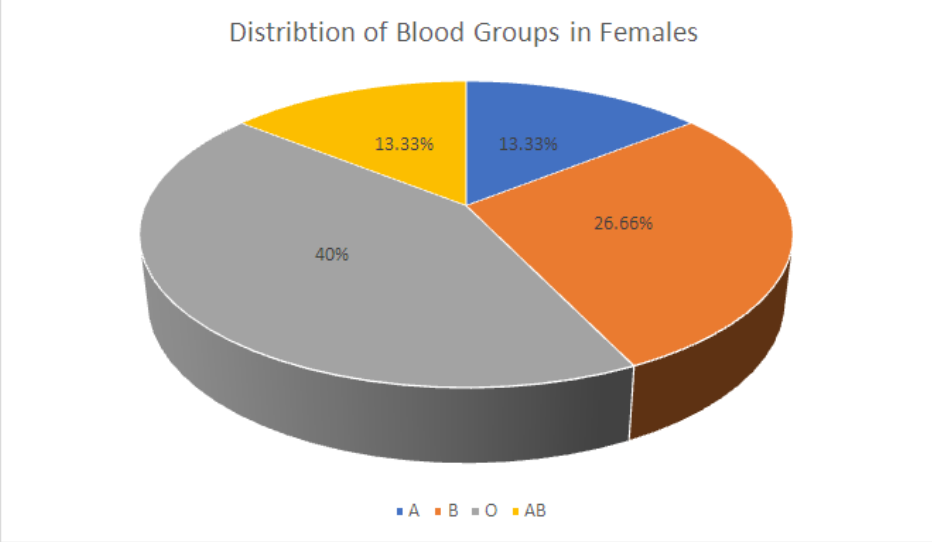


Figure 2. Distribution of blood groups in females.



IV. Discussion

India is a huge country with 29 states and more than 1 billion population. No large-scale data are available on the distribution of ABO and Rh (D) blood groups and their allelic frequency in the Indian population, but many regional studies are available which depicted distribution in their region or state. One recent multicentric study by Agrawal et al. [17] tried to cover four major regions of the India with 10,000 donor population, which was very low according to total Indian population.

Table 2. Blood type and Rh antigens of the participants(N = 1730)

	Frequency%
Blood type	
A	24.50
B	31.61
O	33.69
AB	10.17
Rh antigens	
Rh negative	11.27
Rh positive	88.72

The present study shows blood group O (33.69%) to be the most common blood group followed by B (31.61%), A (24.50%) and AB (10.17%). This prevalence is in concordance with the studies done in rest of the India except for the northern region where blood group B was found to be the most common.

In present study, we found similar lower contribution of female donors. Distribution pattern of blood groups of the present study was compared with the recent studies done across India at Andhra Pradesh,[18] Jharkhand,[19] Delhi and Uttarakhand,[20] Madhya Pradesh,[21] Karnataka,[22] and Assam.[23].(Table 3) It was found the prevalence was similar to Andra Pradesh, Assam and Karnataka while others were having mostly B blood as most prevalent group. Rh status was also similar and in concordance with most of the studies.

Table 3: ABO and Rh phenotype comparison between present study and national studies for the year 2016 onwards.

Studies	Author	Sample size	Blood group (%)					
			A	B	O	AB	RH+	RH-
Baramulla, J&K	Present Study	1730	24.50	31.61	33.69	10.17	88.72	11.27
Andra Pradesh [18]	Bhavani *et al.*	6942	20.00	35.80	36.90	7.30	96.28	3.72
Jharkhand [9]	Singh *et al.*	2055	22.09	35.15	34.73	8.03	96.46	3.54
Delhi[20]	Kaur *et al.*	15446	22.60	37.80	29.50	10.10	94.47	5.53
Madhya Pradesh [21]	Mehta and Mehta	800	25.63	39.25	28.63	6.50	94.88	5.12
Uttarakhand[20]	Kaur *et al.*	6350	23.40	35.60	29.50	11.40	94.55	5.45
Karnataka [22]	Anushree *et al.*	1959	21.40	34.80	38.80	5.00	97.10	2.90
Aasam[23]	Islam Barbhuiya *et al.*	334	21.60	29.30	44.30	4.80	98.50	1.50

Determination of Rh status is crucial in clinical contexts to ensure patient safety. Rh factor is of interest because of its marked immunogenicity. In the case of the D antigen, patients who do not produce the D antigen will produce anti-D if they encounter the D antigen on transfused red blood cells. This process may result in a haemolytic transfusion reaction or, in the case of new-born red blood cells, haemolytic disease of the new-born [24]. For this reason, it is important to determine the Rh status in clinical settings and for research purposes. Our present study had 88.72% of donors to be Rh D positive and 11.27% to be Rh D negative. The Rh D negative population was higher as compared to the other parts of India. This comparison suggests that the heterogeneity in blood groups observed in the different populations may be due to genetic and environmental factors.

There are large number of male donors compared to female donors; this has been observed in most of the studies in India being a developing nation. The main reasons behind it were lack of education, social taboo, cultural habits, lack of motivation, and fear of blood donation.[25] In our study also we observed 99.13% of males and 0.86% of females. This may be due to lack of motivation, fear of blood donation and nutritional health status of female donors.

A large section of female from the menstruating age groups were occasionally found anaemic with low body weight, so they are considered unfit for donating blood and usually eliminated during the predonation screening and counselling. In this regard, the general health status of the female needs to be improved by providing proper nutritional diet and iron supplements. The fear regarding blood donation among Indian females needs to be driven out by educating them with the advantages of blood donations. Most of the older people suffer from hypertension, diabetes mellitus, low haemoglobin, and ischemic heart diseases and found unfit during predonation counselling.[26]

V. Conclusion

The present study concludes that the most common blood group is "O" and "AB" is the least common among the donors in the region of Baramulla, Jammu and Kashmir, India. Rh positive were 88.72% and Rh negative were 11.27%. Awareness about donation of blood must be created to increase the number of female donors and benefits to society. The data obtained in our present study when read in context of several other studies of different regions of India and abroad may be useful in policy making and policy implementation to face the future health challenges.

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