Journal of Cardiovascular Disease Research

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

ORIGINAL RESEARCH

Distribution of ABO and Rh Blood group phenotypes among blood donors in a Tertiary care hospital at Rajouri, J&K, India: A retrospective study

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Received: 12-10-2022 **Revised: 22-11-2022** **Accepted: 26-11-2022**

ABSTRACT

Aim: To determine the ABO and Rh phenotype blood group distribution among blood donors in Government Medical College, Rajouri, J&K India.

Material and Methods: A total of one thousand people were evaluated and found to be physically and mentally capable of giving blood. Everyone in this group is older than 18 years old. All of the blood was collected either from willing donors at donation camps or from replacement donors in the hospital blood bank. None of the blood was taken from animals. Venepuncture was used as the technique for collecting the blood samples, which were then placed in a vacutainer that contained ethylene diamine tetra acetic acid. The antigen-antibody agglutination test served as the only basis for these examinations. The anti-globulin approach was used to verify blood groups that were Rh-negative, and after that, any weak D groups that remained were believed to be Rh positive.

Results: According to the data shown in Tables 1 and 2, out of a total of one thousand blood donors, the vast majority were men (910, or 91%), while just 90 of the donors were females (9%). There were a maximum of sixty percent of blood donors who were discovered to be under the age of thirty-five, and forty percent of blood donors were found to be above the age of thirty-five. Blood type B was shown to have the highest prevalence (32%), followed by blood group A (30%), blood group O (26%), and blood group AB (12%), in that order; hence, B is more common than A, O, and AB. It was discovered that the positive Rhesus factor was present in 94% of cases, whereas the negative Rhesus factor was only identified in 6% of cases. The distribution of blood donors according to their rhesus phenotype.

Conclusion: The current research comes to the conclusion that blood group "B" is the most frequent among donors in Rajouri, India, whereas blood type "AB" is the least common among donors in this region. The Rh positive percentage was 94%, while the Rh negative percentage was 6%. In order to increase the number of female blood donors, it is necessary to raise awareness about the process of donating blood.

Keywords: ABO, Rh phenotype, blood group, blood donors

Introduction

Different blood groups are inherited and defined by the presence of surface antigens on red blood cells (RBC). Blood groups play an important part in the process of blood transfusion because of the hereditary nature of blood groups. In the year 1900, Karl Landsteiner made the discovery that would go on to become a significant turning point in the annals of the history of blood transfusion. This was immediately followed by the discovery of the Rh (D) antigen. [1] There is significant variation across populations and races in the distribution of the blood types ABO and Rh (D). The study of blood groups is an important parameter in a wide variety of genetic studies for the purpose of obtaining reliable geographical information. Additionally, the study of blood groups is important in the blood

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

transfusion process with diseases associated with it, which will eventually contribute to a reduction in the overall morbidity and mortality rate. A knowledge of blood grouping is also necessary for the efficient administration of blood bank inventory.[1,2] Based on the degree to which red cells respond with human anti-A and anti-A1 antibodies, subgroups of A have been further divided into the following categories: A1, A2, Aint, A3, Ax, Am, Aend, Ael, and Abantu. A1 red blood cells are those that belong to Group A and respond with both anti-A and anti-A1 antibodies. Group A cells that respond with anti-A but are not agglutinated by anti-A1 are labelled as A2, and they make up the remaining 20% of the overall A blood group population. A1 cells made up roughly 80% of the entire A blood group population.[3] The members of the B subgroup—B3, Bx, Bm, and Bh—are very uncommon and appear in the population much less often than those of the A subgroup.[4]

In the year 1940, Levine and Stetson established a connection between the Hemolytic Disease of the Fetus and Newborn and the Rh blood group system as the root cause of the condition.[3] The major Rh antigens are denoted by the letter D, whereas related antigens are denoted by the letters C and E, and antigens that are antithetically linked are denoted by the letters c and e. [5] Although roughly 29 blood group systems and over 700 distinct kinds of blood group antigens have been found so far, the most important blood group systems are ABO and Rhesus.[6] This technique aids in addressing some medicolegal concerns, mostly paternity disputes, and is valuable in a variety of genetic research, including those relating to particular illnesses, various migratory patterns of population, and different patterns of disease transmission. [7]

Material and methods

The current retrospective research was conducted at the blood bank of Government Medical College Rajouri. A total of one thousand people were evaluated and found to be physically and mentally capable of giving blood. Everyone in this group is older than 18 years old. All of the blood was collected either from willing donors at donation camps or from replacement donors in the hospital blood bank. None of the blood was taken from animals. Venepuncture was used as the technique for collecting the blood samples, which were then placed in a vacutainer that contained ethylene diamine tetra acetic acid. The antigen-antibody agglutination test served as the only basis for these examinations. Monoclonal anti A, anti-A1, anti B, anti AB, and anti H antisera were used. In addition to A, B, and O pooled cells, were used in both the forward and reverse ABO blood grouping processes. Antisera against Rh (R0 and R1, anti IgM, and a mixture of anti IgM and anti IgG) were used in the process of Rh typing. In conclusion, the selection of blood groups was limited to situations in which both the forward and backward groups were similar. The anti-globulin approach was used to verify blood groups that were Rh-negative, and after that, any weak D groups that remained were believed to be Rh positive.

Statistical analysis

The data that were collected were then imported into Microsoft Excel and evaluated using the demo version of Excel. In order to determine whether or not there was a correlation between the variables, descriptive statistical methods such as percentage and confidence interval were used.

Results

According to the data shown in Tables 1 and 2, out of a total of one thousand blood donors, the vast majority were men (910, or 91%), while just 90 of the donors were females (9%). There were a maximum of sixty percent of blood donors who were discovered to be under the age of thirty-five, and forty percent of blood donors were found to be above the age of thirty-five. Blood type B was shown to have the highest prevalence (32%), followed by blood group A (30%), blood group O (26%), and blood group AB (12%), in that order; hence, B is more common than A, O, and AB. It was discovered that the positive Rhesus factor was present in 94% of cases, whereas the negative Rhesus factor was only identified in 6% of cases. The distribution of blood donors according to their rhesus phenotype is shown in Table 3. The Rhesus-positive male pattern was discovered to be exhibited as B > A > O > AB, which is comparable to the general ABO blood group pattern. On the other hand, the Rhesus-positive female pattern was shown to be B > O > A > AB. The prevalence of Rhesus negative patterns was found to be B > A = O > AB in males and A > O > B > AB in females, respectively. This

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

was true for both sexes. It was discovered that the frequency patterns of both the observed and anticipated phenotypes were essentially the same. Table 4.

Table 1 Age and Gender distribution of the participants.

Gender	Number	Percentage
Male	910	91
Female	90	9
Age		
below 35	600	60
Above 35	400	40

Table 1 Blood groups distribution of the participants.

Blood group	Number	Percentage
A	300	30
B	320	32
AB	120	12
O	260	26
Total		
Rhesus (D) blood group		
Rh positive	940	94
Rh negative	60	6

Table 3: Distribution of ABO blood group with Rhesus factors with respect to gender

	Male	Female	Number	%	**95% CI**
A positive	255	35	290	29	26.8-30.58
B positive	290	20	310	31	29.85-31.55
AB positive	100	5	105	10.5	11.74-18.63
O positive	225	10	235	23.5	25.88-27.85
A negative	5	5	10	1.0	2.5-5.55
B negative	5	5	10	1.0	2.55-4.63
AB negative	10	5	15	1.5	0.75-1.85
O negative	20	5	25	2.5	0.11-2.39

Table 4: Comparison of observed and expected phenotype frequency among blood donors

Blood groups	**Phenotype**	**Observed frequency**	**Genotype**	**Expected frequency**
ABO	A	0.32	AA AO	0.31
	B	0.33	BB	0.32
			BO	
	O	0.27	OO	0.26
	AB	0.12	AB	0.11
Rh	D+	0.10	DD	0.11
			Dd	
	D−	0.07	dd	0.06

The calculated allele frequency was found to be 0.25 for IA, 0.25 for IB, and 0.52 for IO. In present study, Rhesus group allele frequencies for ID = 0.75 and for Id = 0.26 were found.

Discussion

The majority of the studies done in India, which is considered to be a developing country, have shown that the number of male donors significantly outnumbers the number of female donors. The lack of knowledge, the social taboo, the cultural habits, the lack of motivation, and the fear of blood donation

ISSN: 0975-3583,0976-2833 VOL13, ISSUE 08, 2022

were the primary contributors to this problem.[8] A significant proportion of women of menstrual age have sometimes been discovered to be anaemic and to have a low body weight; hence, these individuals are regarded as unsuitable for donating blood and are often excluded during the pre-donation screening and counselling process. In this respect, the overall health state of females has to be enhanced via the provision of a diet that is appropriately nutritious and iron supplements. The anxiety that some Indian women have about donating blood has to be alleviated as quickly as possible by exposing them to the many positive aspects of doing so. The majority of elderly patients are diagnosed as unsuitable for donation due to conditions such as hypertension, diabetes mellitus, low haemoglobin levels, and ischemic heart disease during the pre-donation counselling process.[9]

There is a significant amount of variation in both the phenotypic and genotype frequencies of ABO and Rh groups among the many races and geographical regions of the globe. There have only been a few research conducted throughout India to determine the variance. Following the Hardy–Weinberg equation, the current research also computed the gene frequency of ABO and Rh blood groups. The results of this calculation are provided in Table 4, along with the frequencies. The gene frequencies of the ABO and Rh blood groups that were discovered in the other four investigations carried out by Raja et al., Suresh et al., Agrawal et al., and Sidhu et al.[10-13] The predicted gene frequencies in Table 4 were not substantially different from the actual distribution of ABO blood groups, as shown in Table 4.

The current research shows that blood kinds A, AB, and Rh negative have the greatest prevalence, with respective figures of 30%, 12%, and 6%. These figures are much higher than those found in prior studies that were qualitatively comparable. When compared among Indian studies, the prevalence of blood type B was found to be the second lowest (32%), but when compared among foreign research, it was shown to be the second highest prevalence percentage. When looking at research conducted in India, blood type O and the Rhesus negative factor have the lowest prevalence, coming in at 26% and 6%, respectively. However, when compared to studies conducted in other countries, these two factors have the lowest and second highest prevalence, respectively.

The pattern of blood group distribution in the current study was compared to that of recent studies conducted in various parts of India, including Andhra Pradesh[14], Jharkhand[15], Delhi and Uttarakhand[16], Madhya Pradesh[17], Karnataka[18], and Assam. [14] Jharkhand[15] Delhi and Uttarakhand[16] and Assam[1819] The results of the current research showed that blood group "B" was the most frequent, while blood group "AB" was the least common. These findings are comparable to those discovered in Jharkhand, Delhi, Uttarakhand, and Madhya Pradesh, but they vary from the findings of the other studies. In comparison to recent international studies from countries in Africa such as Ethiopia[20], Uganda[21], and Libiya[22], from western Asian countries such as Iran[23] and Iraq[24], and from the south Asian country Bangladesh[25], the result of the present study is comparable to the study of Bangladesh specifying blood group "B" as the most common and "AB" as the least prevailing blood group; however, in the remaining countries, the frequency of blood group O is highest, which differs from the previous findings The Rh negative status was found to be 6.49 percent, which is considerably higher when compared to the most recent other research carried out all across India but lowest when compared to all other countries, with the exception of Uganda.

Conclusion

The current research comes to the conclusion that blood group "B" is the most frequent among donors in Rajouri, India, whereas blood type "AB" is the least common among donors in this region. The Rh positive percentage was 94%, while the Rh negative percentage was 6%. In order to increase the number of female blood donors, it is necessary to raise awareness about the process of donating blood.

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