

Original article:

Frequency and distribution of ABO and Rh blood groups among blood donors in a tertiary care hospital in Unnao district, Uttar Pradesh

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ABSTRACT

Background: The ABO and Rh blood group system is the most important system in transfusion and organ transplants. The ABO system derives its importance from the fact that A and B are strongly antigenic and anti A and anti B occur naturally in the plasma of persons lacking the corresponding antigen. These antibodies are capable of producing hemolysis in vivo. From the point of view of transfusion, rhesus blood group system is the second most important blood group. Since it was discovered by Karl Landsteiner, the ABO blood group system is the most important blood group system in Transfusion Medicine. **Aim:** The objective of this study was to determine the distribution of blood groups and the demographic background of blood donors in a tertiary care hospital in Unnao district.

Materials and Methods: A retrospective study of one year was carried out at our blood bank in Saraswati Medical College, Unnao in Uttar Pradesh, India. Data pertaining to the blood groups of donors was collected from the Blood Bank donor register from January 2019 to December 2019. **Results:** Total 1114 donors were included in the study. ABO blood groups of 1114 healthy young adults from 18 to 65 years of age were carried out. Out of these 1114 subjects, 1108 (99.46%) were male donors and 6 (0.54%) were female. We found that the percentage of ABO blood groups in donors were maximum in O blood group (39.50%) followed by A blood group (32.76%), B blood group (23.25%) and AB blood group (4.49%).

Conclusion: Our study has noteworthy ramifications of age of a straightforward database of blood groups here. It gives logical information as well as serves to empower understanding into potential outcomes of future weight of blood group related diseases.

Keyword: ABO blood group, Rh (D) factor, Blood Bank, distribution.

INTRODUCTION

A blood group system consists of one or more antigens controlled at a single gene locus, or by two or more very closely linked homologous genes with little or no observable recombination between them.[1,2] Of the 35 blood group systems currently recognized by the International Society of Blood Transfusion, the ABO and Rhesus (Rh) are considered as the most clinically significant.[1-4]

ABO blood group antigens play an important role during organ transplantation and blood transfusion. A small error in matching the donor and recipients blood type can be fatal for the recipients. Therefore, it is important to know our blood group before blood transfusion, surgery or an organ transplant. Karl Landsteiner a pathologist

and a 1930, Nobel Prize winner for Physiology and Medicine discovered the ABO blood groups at university of Vienna in 1900s.[5]

Blood group antigens play vital role in transfusion safety, understanding genetic inheritance pattern and disease susceptibility. [6,7] ABO and Rh are most important from the transfusion and transplantation perspective. The incidence of ABO and Rh varies markedly in different races, ethnic groups in different parts of the world [7].

Blood group antigens are known to have some association with diseases. Group-A associated with gastric cancer [7]. Group-B has increased incidence of ovarian cancer [8] and Group-O has increased risk of infections like cholera, UTI, ABO incompatibility and Rh incompatibility [6]. Knowledge of blood group distribution is also important for clinical studies, for reliable geographical information, genetic studies ,resolving medico legal issues particularly of disputed paternity cases [6].

Genes for ABO antigen are located on chromosome 9 and have three different alleles (A, B and O) that encode different glycosyl-transferases enzymes with specificities to different substrates thus determining our blood types [9], and the Rhesus antigen (D) gene is located on human chromosome 1. According to earlier studies [10] frequencies and the distribution of ABO blood groups tend to vary among individuals of different countries and there are major differences in the distribution of ABO and Rh (D) antigens between individuals living in different countries. Even. [5]

Nearly 700 erythrocyte antigens are described and organized into 30 blood group systems by the International Society of Blood Transfusion of which ABO and Rh blood group systems are important [10,11]. According to the presence of antigens and agglutinins patterns, ABO blood group individuals are divided into four major blood groups namely, A, B, AB and O [12,13].

Group O blood has neither A nor B antigens, group A blood has type A antigens and group B blood has type B antigens. Also plasma from blood O has both A and B antibodies, plasma from blood group A contain Anti-B antibodies which act against type B antigens, whereas plasma from type B blood contains Anti-A antibodies, which act against type A antigens and type AB has neither type of antibody [14,15].

The second most important blood group system is rhesus (Rh). In this blood group system the Rhesus antigen (named because a related antigen was first discovered in Rhesus monkeys) is found on the surface of red blood cells [16-17]. Individuals who have RhD antigen on the surface of their red cells are positive for Rh and those who do not have this antigen on the surface of their red cells are negative Rh [18]. It is in this manner essential to have a data on the appropriation of these blood groups in the number of inhabitants in this examination locale and consequently this investigation has been completed to decide the quality recurrence and dispersion of ABO and Rhesus blood groups in blood donors of tertiary care hospital of Unnao district, Uttar Pradesh and to contrast it and different studies.

MATERIALS AND METHODS

This prospective study was conducted at Blood Bank in Department of Pathology, Saraswati Medical College, Unnao, Uttar Pradesh, India. Data pertaining to the blood groups of donors was collected from the transfusion centre from January 2019 to December 2019. A total of 1114 people volunteered for donation were included in the study.

Each donor, at the time of donation, was interviewed before screening for his/her particulars such as address, age and sex. Information regarding medical history including a history of previous transfusion was also

obtained. After blood donation, blood group was determined by forward and reverse grouping by conventional tube method from the pilot samples of the donors following standard operative procedures of the blood bank.

Blood samples were collected by standard procedure of venepuncture. Both forward and reverse grouping were carried out for confirmation of blood group. Commercially available antisera anti A, anti B and anti D were used for agglutination reactions after validation. Reverse grouping was performed using daily prepared pooled A, B and O cells. Data was recorded on a specially prepared proforma and analyzed.

The study was approved by the institutional ethical committee. Informed consent was obtained from all patients who were participating in the study.

RESULTS

This present study was conducted from January 2019 to December 2019; during this period total 1114 donors were included in the study. ABO blood groups of 1114 healthy young adults from 18 to 65 years of age were carried out. Out of these 1114 subjects, 1108 (99.46%) were male donors and 6 (0.54%) were female.

We found that the percentage of ABO blood groups in donors were maximum in O blood group (39.50%) followed by A blood group (32.76%), B blood group (23.25%) and AB blood group (4.49%). Combining ABO and Rh blood groups, frequencies of different blood groups were in the following order: O positive (39.32%)>A positive (31.96%)>B positive (23.07%)>AB positive (4.40%)>A negative (0.81%)>B negative and O negative (0.18%) each>AB negative (0.09%). In Rh group, frequency of Rh D positive was 98.74% and Rh D negative was 1.26%. In both Rh D positive and Rh D negative person's blood group O was the commonest followed by blood group B. Blood group AB was the least common. [Table-1]

Comparison of our study with other studies within India, Periyavan S et al. [25] from Bangalore, India reported O blood group was having highest prevalence (39.82%) followed by B (29.95%), A (23.85%) and AB (6.37%) blood group. Reddy KSN, Sudha G [26] from Chittor, India also reported O blood group was having highest prevalence (47.37%) followed by B (25.79%), A (18.95%) and AB (7.89%) blood group. Das PK et al. [27] from Vellore, India also reported O blood group was having highest prevalence (38.75%) followed by B (32.69%), A (21.86%) and AB (6.70%) blood group. However Garg P et al. [17] from North India reported B blood group was having highest prevalence (39.80%) followed by O (29.10%), A (21.70%) and AB (9.33%) blood group. [Table 2]

Comparison of our study with other countries, similar study reported by Mollison PL et al. [28], from USA, in their study O blood group was having highest prevalence (46%) followed by A (41%), B (9%) and AB (4%) blood group. Frances TF [29], Britain, in their study O blood group was having highest prevalence (46.70%) followed by A (41.70%), B (8.6%) and AB (3%) blood group. However Hamed A et al. [30], from Pakistan reported B blood group was having highest prevalence (32.40%) followed by O (30.50%), A and AB blood group. Pramanik T, Pramanik S [31], from Nepal reported on distribution of blood groups, in their study A blood group was having highest prevalence (34%) followed by O (33%), B (29%) and AB (4%) blood group. [Table 2]

Table 1: Frequency distribution of ABO and Rh blood groups

ABO Blood group	Rh Positive		Rh Negative		Total No.	%
	No.	%	No.	%		
A	356	31.96	9	0.81	365	32.76
B	257	23.07	2	0.18	259	23.25
AB	49	4.40	1	0.09	50	4.49
O	438	39.32	2	0.18	440	39.50
Total	1100	98.74	14	1.26	1114	100

Table 2: Our study compare with other studies.

Authors	Place	Blood groups frequency (%)					
		A	B	AB	O	Rh Positive	Rh Negative
Within India							
Present study	Unnao, Uttar Pradesh	32.76%	23.25%	4.49%	39.50%	98.74%	1.26%
Periyavan S et al. [25]	Bangalore	23.85%	29.95%	6.37%	39.82%	94.2%	5.8%
Reddy KSN, Sudha G [26]	Chittoor	18.95%	25.79%	7.89%	47.37%	90.6%	8.42%
Das PK et al. [27]	Vellore	21.86%	32.69%	6.7%	38.75%	94.5%	5.5%
Garg P et al. [17]	North India	21.7%	39.8%	9.33%	29.1%	95.71%	4.29%
Outside India							
Mollison PL et al. [28]	USA	41%	9%	4%	46%	85%	15%
Frances TF [29]	Britain	41.7%	8.6%	3%	46.7%	83%	17%
Hammed A et al. [30]	Pakistan	22.4%	32.4%	8.4%	30.5%	93%	7%
Pramanik T, Pramanik S [31]	Nepal	34%	29%	4%	33%	96.7%	3.33%

DISCUSSION

The frequencies of ABO and Rh blood groups vary from one population to another and time to time in the same region [16,18]. For the effective management of blood banks and safe blood transfusion services, understanding ABO and Rh blood groups distribution at local and regional levels is very essential [15,17]. To prevent erythroblastosis fetalis that commonly occurs when an Rh negative (Rh-ve) mother carries an Rh positive (Rh +ve) fetus, it is very important to identify Rh blood group system [18,19].

For the effective blood banks inventory management whether it is a smaller local transfusion service facility, a regional or national transfusion service it is important to have the knowledge of ABO and Rh blood group distribution [20,21].

To know the distribution of blood group is also important for clinical studies, for reliable geographical information and as reducing maternal and premature mortality rate [22,23]. It is also important to use ABO and Rh blood group studies for genetic studies, for doing research in population migration patterns in addition to resolving certain medico-legal issues particularly in case of disputed paternity [23,24]. Blood group relation to disease and environment is also progressively more important in modern medicine [19,23].

Information on frequency of ABO and Rh blood groups is a significant device in the compelling administration of blood donation center [6,32]. The dispersion of blood groups differs locally, morally and starting with one populace then onto the next. [6]

In India, on account of changed social propensities, social restrictions, absence of inspiration and fear of blood donation, female contributors are exceptionally less. Moreover enormous number of females from the discharging age group is weak with low weight, so proclaimed unfit for blood donation [6]. In our study we observed an altogether low level of female contributors (0.54%). Similar to the investigations of Mallikarjuna S and Giri PA et al it is observed that the predominant percentage of blood donors is males. [19,33]

In our study the most common blood group was O blood group (39.50%) followed by A blood group (32.76%), B blood group (23.25%) and AB blood group was least common (4.49%). Combining ABO and Rh blood groups, frequencies of different blood groups were in the following order: O positive (39.32%)>A positive (31.96%)>B positive (23.07%)>AB positive (4.40%)>A negative (0.81%)>B negative and O negative (0.18%) each>AB negative (0.09%). In Rh group, frequency of Rh D positive was 98.74% and Rh D negative was 1.26%. In both Rh D positive and Rh D negative person's blood group O was the commonest followed by blood group B. Blood group AB was the least common. Similar studies were reported by Periyavan S et al. [25] from Bangalore, India reported O blood group was having highest prevalence (39.82%) followed by B (29.95%), A (23.85%) and AB (6.37%) blood group. Reddy KSN, Sudha G [26] from Chittor, India also reported O blood group was having highest prevalence (47.37%) followed by B (25.79%), A (18.95%) and AB (7.89%) blood group. Das PK et al. [27] from Vellore, India also reported O blood group was having highest prevalence (38.75%) followed by B (32.69%), A (21.86%) and AB (6.70%) blood group. However Garg P et al. [17] from North India reported B blood group was having highest prevalence (39.80%) followed by O (29.10%), A (21.70%) and AB (9.33%) blood group. Studies from other countries were also reported similar to our study, Mollison PL et al. [28], from USA, in their study O blood group was having highest prevalence (46%) followed by A (41%), B (9%) and AB (4%) blood group. Frances TF [29], Britain, in their study O blood group was having highest prevalence (46.70%) followed by A (41.70%), B (8.6%) and AB (3%) blood group. However Hamed A et al. [30], from Pakistan reported B blood group was having highest prevalence (32.40%) followed by O (30.50%), A and AB blood group. Pramanik T, Pramanik S [31], from Nepal reported on distribution of blood groups, in their study A blood group was having highest prevalence (34%) followed by O (33%), B (29%) and AB (4%) blood group.

CONCLUSION

Information on blood groups is profoundly basic for transfusion services which add to patient's health services. Access to protected and adequate blood gracefully will assist with decreasing the grimness and death rates. Our investigation has noteworthy ramifications of age of a straightforward database of blood groups here. It gives logical information as well as serves to empower understanding into potential outcomes of future weight of blood group related diseases.

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