

## Frequency and distribution of ABO and Rhesus blood groups in blood donors in a provincial hospital of Jammu

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### Abstract

**Background:** The ABO and Rhesus (Rh) blood group systems are genetically inherited and play very vital role in blood transfusions, parental and genetic testing and addressing medico legal issues.

**Objective:** This study was conducted to determine the distribution of ABO and Rh blood groups among blood donors in provincial Hospital at Gandhi Nagar, Jammu, India.

**Materials and Methods:** An observational descriptive cross sectional study was conducted at Blood bank of Government Hospital Gandhi Nagar over a period of one year from 1st January 2015 to 31st December 2015. ABO and Rh typing was done using slide agglutination method with antisera ABO and Rh. Tube agglutination method was done in doubtful cases and they were further confirmed by reverse grouping using known pooled A and B cells. Results were reported in percentages and proportions.

**Results & conclusion:** Out of 2808 donors, 2360 (84%) were males and 448 (16%) were females. Majority of donors belonged to age group 26-35 years. The commonest ABO blood group present was B (37%) followed by O (26.3%), A (25.6%) and AB (11.1%) while 2606 (92.8%) donors were Rh-positive and 202(7.2%) donors were Rh negative. Replacement donors (83.1%) were much more than voluntary donors (16.9%).

**Conclusion:** Distribution of ABO and Rh blood groups has important role to play in management and functioning of blood banks.

**Key Words:** ABO, Blood groups, Blood donors, Rhesus (Rh)group

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various levels is pivotal in efficient management and service of blood banks across various regions of our country.

### Material and Methods

The present study was conducted at Blood bank of Government Hospital Gandhi Nagar Jammu over a period of one year from 1st January 2015 to 31st December 2015.

**Study design:** Cross sectional.

**Inclusion criteria:** All the voluntary and replacement donors coming to blood bank for blood donation and considered eligible as per NACO guidelines.<sup>[7]</sup>

Information regarding personal details, demographic details, occupation and past medical history was elicited. Individuals with good health, mentally alert, physically fit were selected as blood donors. The donors were then asked to sign the donor questionnaire inclusive of informed consent form.

Total 2808 donors were considered medically fit and accepted for blood donation.

After blood donation, ABO and Rh typing was done by antigen antibody agglutination test by available standard antisera i.e. anti A, anti B and Anti D after validation at blood bank. Blood groups were done by slide agglutination method. Doubtful cases were confirmed by tube agglutination method and reverse grouping using known pooled A and B cells. Final blood group is confirmed only if both forward group (cell group) and reverse group (serum group) are identical.

### Introduction

Blood group antigens are inherited in a mendelian fashion and appear early in fetal life and remain unchanged till death<sup>[1]</sup>. 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 are most important<sup>[2]</sup>.

The ABO blood group system was the first human blood group system to be discovered by Landsteiner in 1901<sup>[3]</sup>. Later Landsteiner and Wiener defined the Rh blood group in 1941<sup>[4]</sup>. All human populations share the same blood group systems; although they differ in the frequencies of specific types. The incidence of ABO and Rh groups varies markedly in different races, ethnic groups, and socio-economic groups in different part of the world<sup>[5]</sup>. Blood group antigens play very important role in transfusion safety, genetics, understanding inheritance pattern, paternity testing and disease susceptibility. In order to avoid danger of mismatched transfusion it is important to determine the blood group of those involved prior to transfusion<sup>[6]</sup>. Knowledge of availability and distribution of different Blood groups at

Rh negative blood groups were confirmed by antiglobulin technique.

All weak D groups were considered as Rh positive. Data on frequency of ABO and Rh blood groups were reported in simple percentages.

**Table 1: Distribution of donors according to ABO blood group and gender**

Type of Blood Group	Rh Factor	Male n(%)	Female n(%)	Total n(%)	Total N(%)
A	Pos	535	107	642	718(25.6%)
	Neg	57	19	76	
B	Pos	867	108	975	1039(37%)
	Neg	46	18	64	
AB	Pos	222	78	300	312(11.1%)
	Neg	8	4	12	
O	Pos	586	103	689	739(26.3%)
	Neg	39	11	50	
Total		2360(84%)	448(16%)	2808 (100%)	2808(100%)

**Table 3: Distribution of voluntary and replacement donors**

	Number of donors	Percentage
Replacement	2334	83.1
Voluntary	474	16.9
Total	2808	100

**Table: 4 Comparison of frequency of ABO and Rhesus blood group among different regions of country and outside India**

	Place of study	A	B	AB	O	Rh+	Rh-
Northern India	Present study	25.6	37	11.1	26.3	92.8	7.2
	Amritsar <sup>[13]</sup>	18.01	38.06	9.62	34.31	91.28	8.72
	Lucknow <sup>[14]</sup>	21.73	39.84	9.33	29.10	95.71	4.29
Western India	West Ahemdabad <sup>[8]</sup>	21.94	39.40	7.86	30.79	95.05	4.95
	East Ahemdabad <sup>[15]</sup>	23.30	35.50	8.80	32.50	94.20	5.80
Central India	Maharashtra (Loni) <sup>[11]</sup>	28.38	31.89	8.72	30.99	95.36	4.64
Eastern India	Durgapur <sup>[16]</sup>	23.90	33.60	7.70	34.80	94.70	5.30
Southern India	Shimonga-Malnad <sup>[10]</sup>	24.27	29.43	7.13	39.17	94.93	5.07
	Bangalore <sup>[17]</sup>	23.85	29.95	6.39	39.82	94.2	5.8
Outside India	Pakistan <sup>[18]</sup>	27.92	32.40	10.58	29.10	90.13	9.87
	Nepal <sup>[19]</sup>	34	29	4	33	96.7	3.3
	Britain <sup>[20]</sup>	42	8	3	47	83	17
	Saudi Arabia <sup>[21]</sup>	24	17	4	52	93	7

## Discussion

The present study was done to determine the distribution and frequency of ABO and Rhesus blood group among selected donors attending blood bank of Government Hospital Gandhi Nagar, Jammu over a period of one year. We observed that maximum donors belonged to age group of 26 to 35 years. This finding finds consonance with other studies as well.<sup>[8,9]</sup> This may be due to the fact that this age group fulfils maximum inclusion criteria set by NACO<sup>[7]</sup> for blood donation. We

have also observed that voluntary blood donation is more common among donors of this age group. Minimum number of donors belonged to age group 56 and above as mostly they are considered unfit for blood donation as per guidelines of NACO.<sup>[7]</sup> The current study showed that majority of donors were males as compared to females which is comparable with other studies<sup>[9,10,11]</sup>. This may be due to the reason that in developing country like India majority of females in the reproductive age group i.e. 15-49 years are anaemic hence even if they

volunteer blood donation or wish to be a replacement donor are excluded because of haemoglobin levels which are below the cut off range. Among women belonging to age group besides the reproductive age group, there may be lack of motivation or preconceived notion that they may be unfit for blood donation. Voluntary donors in present study were 16.9% which is in contrast to study<sup>[10]</sup> where voluntary donations were 37.30%. This should be an area of concern as there should be more number of voluntary donations so that immediate and safe blood can be provided to all patients in emergency without waiting for the replacement donors. Moreover there is less risk of transmitting transfusion transmitted infections with voluntary donations<sup>[12]</sup>. The frequency of ABO and Rh blood group observed in our study was B>O>A>AB which was comparable with studies done at various parts of Northern India like Amritsar, Lucknow and parts of western and central India.<sup>[8,11,13,14,15]</sup> However studies done in southern part of India reported the frequency of blood group as O>B>A>AB.<sup>[10,16,17]</sup> So, as per geographical distribution of blood group blood group B is most common in north, west and central parts of India whereas O blood group was most common in south and east India. Comparing these findings, with study conducted in Pakistan<sup>[18]</sup>, Nepal,<sup>[19]</sup> Britain<sup>[20]</sup> and Saudi Arabia<sup>[21]</sup> the most common blood groups were reported as B, A and O respectively.

Rh negative blood group was present in 7.2% which is comparable with other studies.<sup>[11,13,14,15]</sup> However little higher figures were reported by other studies.<sup>[18,20]</sup> Knowledge of frequency of ABO Blood Groups help in guiding policy decisions regarding emergency and routine functioning of hospitals and blood banks which will impact our blood transfusion acts and programs. The blood group of every individual must be indicated on identity cards and driving licenses. More research should be conducted in different parts of our country regarding the same to enrich our data base.

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## Results

2808 blood donors were selected. As evident from table no. 1, maximum donors (48.5%) belonged to age group of 26 to 35 years followed by 18 to 25 years. 84% of accepted donors (2360 out of 2808) were males and 16% (448 donors) were females. Blood group B was most commonly observed (37%) (1039 out of 2808 donors) followed by O group (26.3%), A group (25.6%) and AB group (11.1%).(Table 2) While looking at the rhesus grouping, 92.8% accepted donors (2606 donors) were Rh positive and remaining 7.2% (202 donors) were Rh negative.(Table 3) The frequency for ABO and Rhesus negative blood group was given by the formula A>B>O>AB. Replacement donors (83.1%) were more than voluntary donors (16.9%) (Table 4).

## Conclusion

The frequency of ABO and Rh blood groups observed is B>O>A>AB with majority of donors being Rhesus positive. The distribution of ABO blood group varies regionally, ethnically and from one population to another.

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