

**Original article:**

## **Distribution of ABO blood group and Rh(D) factor in North India**

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### **Abstract**

**Introduction:** India is a vast country with lot of diversity in race, religion & creed. The same diversity has been observed in geographical distribution of blood groups in population within country. The ABO & Rhesus (Rh) blood group system are the most prevalent & important for transfusion of blood & its component, organ transplant, genetic studies & in legal medicine study.

**Methods:** Present study shows data about the prevalence of ABO & Rhesus (Rh) blood groups amongst blood donors during a period of six year (retrospective study from January 2009 to Dec 2014) conducted at Immunohaematology department of S.P. Medical College, Bikaner (India).

**Results:** Blood groups of 147991 donors were screened during the study period, by antigen antibody agglutination method using commercially available antiseras which were validated at our department. The study revealed that the commonest ABO blood group was B(36.72%), followed by O (31.63%), A(22.65%) and AB(9.13%) respectively. Rh Positive were 91.35% and Rh negative were 8.65%.

**Keywords:** ABO blood group, Rh factor, agglutination method

### **Introduction**

People have different blood types, known as Blood Groups. Antigens are hereditary determined & plays a vital role in transfusion safety. The discovery of the ABO blood groups by Karl Landsteiner (1900) was an important achievement in the history of blood transfusion followed by discovery of Rh-D antigen(1940). The genes of ABO & Rh (D) are located on chromosome 9 & 1 respectively. The bombardment of the red blood cells with A & /or B antigen occurs as a consequence of the action of the glycosyltransferases enzymes, that add specific sugars of conformation dependent epitopes along with the Rh(D) protein from the D antigen. There are differences in the distributions of ABO, & Rh(D) blood groups amongst different populations. The study of blood grouping is important as it plays an important role in various genetic studies, in clinical studies for reliable geographical information and in blood transfusion practice as it will help a lot in reducing the morbidity and mortality rate. Knowledge of distribution of ABO & Rh blood group is also essential for effective management of blood bank inventory. The present study was aimed to document the distribution of ABO & Rh blood groups in donors who attended Blood Bank of PBM Hospital to determine the distribution of

ABO & Rh Blood group in North India.  
**Material & method**

A retrospective study of six years was carried out at Blood Bank, SPMC & AG Hospital, Bikaner which is second largest blood bank in Rajasthan and provide patient care to near by states of Rajasthan also (Haryana and Punjab).

Blood group determination of donors was done from January 2009 to Dec 2014 at Blood Bank, PBM Hospital, Bikaner. Total 147991 donors were considered medically fit & donated blood during the study period. All belonged to age group between 18-58 years. After blood donation, blood grouping ABO & Rh was done by antigen antibody agglutination test by commercially available standard antiseras i.e Anti A, Anti B, Anti AB and Anti D were used after validation at our Deptt.

Blood Group was done by test tube agglutination method. Both forward (cell grouping) & reverse grouping (serum grouping) method were done. Final blood group was confirmed only if both forward & reverse groups are identical. The donor blood group data were recorded on specially formed performa.

### **Observation**

The total donors studied from January 2009 to Dec 2014 were 147991. The distribution of blood

groups of donors were, blood group A 22.52%, B 36.72%, O 31.63% and AB 9.13% (Table-1). The most common being blood group B. The

distribution of Rhesus (Rh) factor was 91.75% Rh positive and 8.25% Rh negative (Table-1).

**Table 1: Distribution of ABO & Rh Blood Group Systems.**

ABO Blood Group	Rh +ve	Rh-Negative	Total (Percentage)
A	30558 (20.65%)	2772 (1.87%)	33330 (22.52%)
B	49807 (33.66%)	4535 (3.06%)	54342 (36.72%)
O	42413 (28.67%)	4385 (2.96%)	46798 (31.63%)
AB	12388 (8.37%)	1133 (0.76%)	13521 (9.13%)
<b>Total</b>	<b>135166 (91.35%)</b>	<b>12825 (8.65%)</b>	<b>147991 (100%)</b>

**Table 2: Comparative study on frequency of ABO and Rh phenotypes at different geographical areas (in percentage)**

Place of Study	A	B	AB	O	Rh+ve	Rh-ve
<b>WITH IN INDIA</b>						
<b>Northern Part of India</b>						
Present Study	22.52	36.72	9.13	31.63	91.35	8.65
Lucknow <sup>1</sup>	21.73	39.84	9.33	29.10	95.71	4.29
Punjab <sup>2</sup>	21.91	37.56	9.3	31.21	97.3	2.7
<b>Southern Part of India</b>						
Bangalore <sup>3</sup>	23.85	29.95	6.37	39.82	94.2	5.8
Vellore <sup>4</sup>	21.86	32.69	6.70	38.75	94.5	5.5
Devanagere <sup>5</sup>	26.15	29.85	7.24	31.76	94.8	5.2
Shimoga-Malnad <sup>6</sup>	24.27	29.43	7.13	39.17	94.93	5.07
<b>Eastern Part of India</b>						
Durgapur (Steel City) <sup>7</sup>	23.90	33.60	7.70	34.80	94.70	5.30
<b>Western Part India</b>						
Western Ahmedabad <sup>8</sup>	21.94	39.40	7.86	30.79	95.05	4.95
Eastern Ahmedabad <sup>9</sup>	23.30	35.50	8.80	32.50	94.20	5.80
Surat <sup>10</sup>	24.10	34.89	8.69	32.32	94.18	5.82
<b>Central Part of India</b>						
Indore <sup>11</sup>	24.15	35.25	9.10	31.50	95.43	4.57
<b>OTHER COUNTRIES</b>						
USA <sup>12</sup>	41	9	4	46	85	15
Britain <sup>13</sup>	42.0	8.0	3.0	47.0	83.0	17.0
Australia <sup>14</sup>	38	10	3	49	NA	NA
Pakistan <sup>15</sup>	23.8	38	10	28.2	89.1	10.9
Nepal <sup>16</sup>	34	29	4	33	96.7	3.3

**Discussion**

The studies done in Northern parts of India by authors like Tulika Chandra et al<sup>1</sup> at Lucknow, and by Sidhu et al<sup>2</sup> studies at Punjab, showed blood group B was the commonest, followed by O, A and AB. The same incidence was found in our study i.e. B was more frequent than O and followed by A and AB blood groups. In Southern part of India studies done by Periyavan

A et al<sup>3</sup> at Bangalore, Das PK Nair et al<sup>4</sup> at Vellore, and at Davanagere by Mallikarjuna S et al<sup>5</sup> and at Shimoga-Malnad study done by Girish et al<sup>6</sup>, found that the commonest blood group was O followed by B , A , AB whereas our study showed commonest blood group B followed by O, A & AB. Study done in Eastern part of India, Durgapur by Nag I et al<sup>7</sup> showed O group to be the commonest group which is different from our study.

In Western parts of India like in Western part of Ahmedabad by Patel, Piyush et al<sup>8</sup>, Eastern Ahmedabad by Wadhwa MK et al<sup>9</sup>, and studies done at Surat by Nidhi et al<sup>10</sup>, showed blood group B is the commonest followed by O, A and AB which is same as in our study. Study done at Central India like Indore by Narendra Kumar et al<sup>11</sup> revealed B group to be the most common followed by O, A and AB which is in consonance with present study.

Outside India, in USA the study done by Mollison Outside India, in USA the study done by Mollison PL et al<sup>12</sup>, in Britain by Firkin et al<sup>13</sup>, and in Australia by Red Cross Society<sup>14</sup>, the commonest blood group was O, followed by A, B & AB. The study done in Pakistan by Hammed A et al<sup>15</sup> the commonest blood group is B which is same as in our study.

### Conclusion

It is concluded that the total 147991 blood Donors were studied for group wise distribution. We observed that the most common blood group was B (36.72%) followed by O (31.63%), A (22.52%) and AB (9.13%). Amongst Rhesus (Rh) 91.35% were Rh+ve and 8.65% Rh-ve. The study of distribution of blood group is very important and has significant implications to provide adequate & prompt supply of blood components of different groups in transfusion services that could contribute to the patients health care and in life saving emergencies.

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The study done at Nepal by Pramanik et al<sup>16</sup> found the commonest blood group was A, whereas the studies done in most parts of India the commonest blood group is either B or O followed by A and then AB.

The incidence of Rh blood group in most of the part of India varies from 94 to 98 % were Rh+ve and 2 to 6% were Rh-ve whereas in our study 91.35% were Rh+ve and Rh-ve were 8.65%. Table-2 which depicts Rh-ve to be on the higher side in North India as compared to other places in India. Geographical distribution of Blood Groups in India shows that in Northern & Western part of India, B is the commonest blood group whereas in Eastern, Southern and Central part, O is the most frequently occurring blood group.

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