

Distribution of blood groups among blood donors at a tertiary care hospital in Southern Rajasthan

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Abstract

Introduction: Blood grouping is one of the essential aspects of blood transfusion practice. ABO and Rhesus (Rh) blood groups are the two most important blood group systems among the various types identified so far. Distribution of ABO blood group varies indifferent geographical and ethnic groups. **Objectives:** This study was carried out to determine the distribution pattern of blood groups among blood donors at a tertiary care hospital of Southern Rajasthan. **Methods:** It is a retrospective study covering a period of 3 years from July 2014 to June 2017 that includes 3718 blood donors of which 1297 are voluntary and 2421 are replacement blood donors. Data on the ABO and Rh blood group type of all blood donors was collected and analysed. **Result:** The most common ABO blood group type was Group B (36.6%) followed by group O (32.1%), group A (22.8%) and group AB (8.5%) respectively. The distribution of Rh(D) blood group type revealed 93.5% as Rh-positive and 6.5% as Rh-negative. **Conclusion:** The most common ABO blood group type in our region (Southern Rajasthan) is Group B followed by O and A while, AB is the least common type. Knowledge of the blood group distribution pattern is essential for the effective delivery of blood banking services.

Keywords: ABO, Blood group, Rh factor, Distribution, Blood donors, Rajasthan.

Introduction

Blood group antigens are integrated parts of the red cell membrane and have different biochemical compositions [1]. As per recent updates, International Society of Blood Transfusion (ISBT) has described about 35 blood group systems [2]. Among them, ABO and Rhesus (Rh) blood group systems are most important in clinical practice. ABO blood group system was the first human blood group system to be discovered by Landsteiner in 1901 [3]. Rh blood group system was later discovered by Landsteiner and Weiner in 1940. There are 49 antigens in the Rh blood group system of which D, C, E, c, and e are most common. Presence of D antigen is termed as Rh-positive, while Rh-negative refers to the absence of the D antigen [4].

The Rh-negative phenotype occurs in approximately 15% to 17% of Whites but is less frequent in other populations [5]. Distribution pattern of ABO and Rh blood group systems show variations in different populations, knowledge of which is essential for effective management of blood bank inventory [6]. It is

therefore important to know the blood group distribution of any population. The purpose of this study is to provide data on distribution of ABO and Rh blood groups in Udaipur and surrounding regions of southern Rajasthan and also to compare their frequency with data from similar other studies conducted in other parts of India and elsewhere in the world.

Materials and Methods

Place of study: Blood bank attached to Pacific Medical College and Hospital which is a tertiary level care centre in Udaipur city of Southern Rajasthan.

Type of study: Retrospective study.

Sampling method: Simple Random sampling.

Inclusion criteria: All consecutive blood donors over a period of 3 years from July 2014 to June 2017 involving both voluntary and replacement blood donation types. Even those who donated blood at camps organised outside by our blood bank were part of this study. Blood donors included in this study have fulfilled all the eligibility criteria of a healthy donor (Age between

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18 to 60 years, more than 50 kg weight with haemoglobin more than 12.5 gm%).

Exclusion criteria: None

Data collection: Data on gender distribution, type of donation (Voluntary and Replacement) and blood group type (ABO and Rh) of all blood donors were collected

Results

The total number of blood donors registered at our blood bank from July 2014 to June 2017 was 3718 which included 3577 (96.2%) males and 141(3.8%) females (Table 1). According to the blood donation type, 1297 (34.9%) were voluntary blood donors and 2421(65.1%) were replacement blood donors (Table 2).

Analysis of data collected on the ABO and Rh blood group type of all blood donors revealed Group B (36.6%) as the most common ABO blood group type, followed by group O (32.1%), group A (22.8%) and group AB (8.5%) respectively (Table 1).

The distribution of Rh blood group type revealed 93.5% as Rh-positive and 6.5% as Rh-negative (Table 3).

Table-1: Distribution of ABO blood group.

ABO Blood group	Male	Female	Total	(%)
A	816	34	850	22.8
B	1307	55	1362	36.6
O	1152	37	1189	32.1
AB	302	15	317	8.5
Total	3577 (96.2%)	141 (3.8%)	3718	100

The total number of blood donors included in this study was 3718 of which 3577 (96.2%) were males and 141(3.8%) were females. The most common ABO blood group type is Group B (36.6%) followed by group O (32.1%), group A (22.8%) and group AB (8.5%) respectively.

Table-2: Distribution of Donor types.

Donor type	Number of donors	(%)
Replacement	2421	65.1
Voluntary	1297	34.9
Total	3718	100

According to the blood donation type, 1297(34.9%) were voluntary blood donors and 2421(65.1%) were replacement blood donors.

Table-3: Distribution of Rh blood group

Rh blood group	Male	Female	Total	(%)
Rh-positive	3354	121	3475	93.5
Rh-negative	223	20	243	6.5
Total	3577	141	3718	100

The distribution of Rh(D) blood group type revealed 93.5% as Rh-positive and 6.5% as Rh-negative.

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Table-4: Comparison of frequency distribution of ABO and Rh blood groups among different regions within India.

Place of Study	A	B	AB	O	Rh-positive	Rh-negative
Western India						
Present study (Udaipur)	22.8	36.6	8.5	32.1	93.5	6.5
Udaipur [8]	22.3	35.7	7.6	34.4	94.2	5.8
Jodhpur [6]	22.2	36.4	9.4	31.7	91.75	8.25
Ahmedabad [7]	21.94	39.4	7.86	30.79	95.05	4.95
Vadodara [9]	22.96	35.02	8.92	33.1	96.02	3.98
Northern India						
Jammu [10]	25.6	37	11.1	26.3	92.8	7.2
Lucknow [11]	21.73	39.84	9.33	29.1	95.71	4.29
Delhi [12]	21.24	39.69	10.56	28.51	91.16	8.84
Central India						
Bhopal [13]	25.63	39.25	6.5	28.63	94.88	5.12
Latur [14]	24.9	37.98	9.47	27.65	95.19	4.81
Southern India						
Bangalore [15]	23.85	29.95	6.37	39.82	94.2	5.8
Tirupati [16]	20	32.2	6.1	41.7	92.8	7.2
Vellore [17]	21.86	32.69	6.7	38.75	94.5	5.5
Eastern India						
Durgapur [18]	23.9	33.6	7.7	34.8	94.7	5.3
Assam [19]	24.8	32	5.55	37.65	96.86	3.14

Comparison of frequency distribution of ABO blood group among different regions within India shows that 'B' is the most common ABO blood group type in Western, Northern and Central India while 'O' is most common type in Southern and Eastern India.

Table-5: Comparison of frequency distribution of ABO and Rh blood groups among different regions outside India.

Place of Study	A	B	AB	O	Rh-positive	Rh-negative
USA [20]	37.1	12.2	4.1	46.6	85.4	14.6
Britain [21]	42	8	3	47	83	17
Australia [22]	39	11.4	3.5	46.1	82.1	17.9
Saudi Arabia [23]	33.4	6	3.8	56.8	92.8	7.2
Nigeria [24]	23.1	21.3	2.7	52.9	97	3
Pakistan [25]	23.3	34.1	10.4	32.2	92.2	7.8
Nepal [26]	29.7	27	8.2	35.1	97.3	2.7

Discussion

Blood groups play a vital role in transfusion safety, understanding genetics, inheritance pattern, and disease susceptibility [7]. The present study was done to determine the pattern of ABO and Rh blood group distribution in our region (Southern Rajasthan). Frequencies of ABO and Rh blood group types of our study are shown in Table 1 and 3. Comparison of data on ABO and Rh blood group distribution of our study and similar other studies from different parts of India are depicted in Table 4. The findings of our study are comparable with the data given by similar other studies

of Rajasthan and other parts of Western India [6-9]. All these studies have described 'B' as the most frequent and 'AB' as the least common ABO blood group type. Even similar studies of Northern India [10-12], and Central India [13,14] on ABO blood group distribution have found 'B' blood group as the most prevalent blood type. On the contrary, similar studies from Southern India [15-17] and Eastern India [18,19] have found 'O' as the most common ABO blood group type followed by B, A and AB which is different from the findings of our study. Therefore, as seen in Table 4, 'B'

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is the most common ABO blood group type in Western, Northern and Central India while 'O' is most common type in Southern and Eastern India. The numbers of female donors are very less compared to male donors in our study (Table-1). Similar pattern of gender distribution has been noted by majority of other Indian studies as well [7,8,10,11,14,15,19]. Low body weight and anemia are the common reasons for higher deferral rates among females when it comes to blood donation. Also lack of motivation is another factor for lesser mobilisation of females towards blood donation.

The frequencies of ABO phenotypes are variable among different ethnic populations. In whites, the O and A phenotypes are the most common, while B phenotype is found in approximately 10% of individuals. However, group B is found twice as frequently in Blacks and Asians as in whites [20].

The differences in ABO blood group distribution among various ethnic populations was noted when our study findings were compared with similar studies in other parts of the world, outside India as shown in Table 5. ABO group distribution studies from USA [20], Britain [21], Australia [22], Saudi Arabia [23] and Nigeria [24]. Documented 'O' as the most common ABO blood group type, which is different from the findings of our study.

However, only studies from Southern India [15-17] and Eastern India [18,19] have found 'O' as the most common type. In a Pakistani study [25], the commonest blood group type was 'B' which is same as found in our study, while a study in Nepal [26] found 'A' as the most common blood group type, which is different from the findings of our study (Table 5). Therefore the distribution of ABO blood group types varies in different geographical and ethnic groups. In terms of Rh blood group distribution, the frequency of Rh-positive is much predominant in our study. This finding is comparable with the observations of all other similar studies within India and other parts of the world (Table 4 and 5). However, the frequency of Rh-negative blood group was found to be relatively higher (between 15-18%) in USA [20], Britain [21] and Australia [22] as compared to all other studies from different parts of the world (< 10%) indicating higher frequencies of Rh-negative blood group in whites.

Conclusion

The most common ABO blood group type seen in this study is Group B followed by O and A, whereas AB is the least common type. Distribution pattern of ABO blood group in this region follows the trend seen in

western, northern and central India, but differs from that of southern and eastern India. Motivational campaigns have to be carried out to encourage more voluntary blood donations and for higher mobilisation of females towards blood donation.

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What this study adds to existing knowledge: This study provides data on the blood group distribution pattern in this region where only limited data is available on the same. The study also highlights the variations in patterns of ABO blood group distribution seen in different geographical areas. The findings of this study can help in creating a database towards planning and delivery of blood banking services in and around this region (Southern Rajasthan).

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