

Original Research Article

Frequency Distribution of ABO blood group and Rh factor in Bhanpur, Bhopal

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Abstract: Blood group system was discovered way back in 1901 by Karl Landsteiner. Clinically, only 'ABO' and 'Rhesus' groups are of major importance. ABO blood group distribution varies in different geographical, ethnic and socio-economic groups. Apart from blood transfusion practice, knowing of the ABO and Rh blood groups were useful in population genetic studies, researching population migration patterns as well as resolving certain medico legal issues. This study was conducted to determine and compare the frequency of ABO and Rh blood groups in general population of Bhanpur, Bhopal, and M.P. During the study period from March 2015 to July 2015 volunteers were screened by antigen antibody agglutination method using commercially available antiseras. The study revealed that the commonest ABO blood group was B (39.25 %), followed by O (28.63 %), A (25.63 %) and AB (6.50 %) respectively. Rh positive were 94.88 % and Rh negative were 5.12 %.

Keywords: Blood groups, ABO, Rhesus, Rh +ve and Rh – ve, agglutination method.

INTRODUCTION

Blood group antigens are hereditary determined and plays a vital role in transfusion safety, understanding genetics, inheritance pattern, and disease susceptibility. 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 important [1].

ABO blood group system is widely credited to have been discovered by the Austrian scientist Karl Landsteiner, who found three different blood types in 1900 [2]. He described A, B and O blood groups for which he was awarded the Nobel Prize in 1930. Alfred Von Decastello and Adriano Sturli discovered the fourth type AB, in 1902 [3].

Antibodies against red blood cell antigens are called agglutinins and individuals are divided into four major blood groups A, B AB & O, according to the presence of these antigens & agglutinins [4].

In 1940, Rhesus (Rh) blood group was discovered by Landsteiner and Weiner. Rhesus system is classified into Rh positive and Rh negative according to presence or absence of 'D' antigen. The genes of ABO & Rh (D) are located on chromosome 9 & 1 respectively.

All human populations share the same blood group systems; although they differ in the frequencies of specific types. Blood group distribution varies markedly in different races, ethnic groups, and socio-economic groups in different part of the world. The frequencies of ABO and Rh blood groups vary from one population to another and time to time in the same region. The knowledge of distribution of ABO and Rh blood groups at local and regional levels are helpful in the effective management of blood banks and safe blood transfusion services. Identification of Rh system is important to prevent erythroblastosis fetalis, which commonly arises when an Rh negative (Rh-ve) mother carries an Rh positive (Rh+ve) fetus. This observational cross-sectional study was conducted to determine and compare the frequency of ABO and Rh blood groups in healthy subjects and patients of local population of Bhanpur, Bhopal.

MATERIALS & METHOD

The study was conducted in the People's Hospital and Research Center, Bhanpur, Bhopal, Madhya Pradesh from March 2015 to July 2015. All randomly selected 800 subjects were above 20 years belonging to Bhopal region and gave their informed consent that their blood samples be used to generate information on frequencies of ABO, Rh antigens.

ABO and Rh blood group was determined by conventional slide agglutination method. Under all

aseptic condition ring finger of the subject was pricked. Few drops of blood were mixed with isotonic saline in test tube and subsequently blood group was determined by mixing with antisera (anti A, anti B and anti D) on slide and observing for agglutination. Confirmation of agglutination was done by using microscope.

OBSERVATION AND RESULTS

Out of total 800 subjects studied, 56.25% (450) are males and 43.75 % (350) are females. From

the table 1 it is evident that around 39.11 % of the male and 39.43% of female subjects belong to B blood group whereas only 5.56 % of the males and 7.71 % of the females have AB blood group. Overall, maximum 39.25 % of the study subjects belong to B blood group followed by O (28.63%) and A (25.63%) blood groups whereas AB blood group contributes minimum 6.50 % of the study subjects.

Table 1: Distribution of ABO blood groups

Blood group	Male		Female		Total	
	No	%	No	%	No	%
A	113	25.11	92	26.29	205	25.63
B	176	39.11	138	39.43	314	39.25
AB	25	5.56	27	7.71	52	6.50
O	136	30.22	93	26.57	229	28.63
Total	450	100	350	100	800	100

Table 2 shows that 93.56 % of the male subjects and 96.57 % of the females have Rh positive blood group whereas 6.44 % of the males and 3.43 % of the females have Rh negative blood group. Overall, Rh

positive seen in 94.88 % of the subjects. Only 5.12 % of the subjects in our study group were Rh negative. So, Rh positive is commonest among both males and females.

Table 2. Distribution of Rh positive and Rh negative blood groups

Rh factor	Male		Female		Total	
	No.	%	No.	%	No.	%
Rh +ve	421	93.56	338	96.57	759	94.88
Rh -ve	29	6.44	12	3.43	41	5.12
Total	450	100	350	100	800	100

The complete analysis of ABO group and Rh type of all the subjects in the study group is illustrated in table 3. It is observed that overall B positive is the commonest group in both sexes followed by O positive and A positive. Interestingly we find that the second

most common blood group for male subjects was O positive and for female subjects was A positive. And AB negative blood group is least common and equally distributed in study group.

Table 3: Complete analysis of ABO blood group and Rh type of all subjects included the study.

Blood Group	Male		Female		Total	
	No.	%	No.	%	No.	%
A+ve	103	22.89	89	25.43	192	24
A-ve	10	2.22	03	0.86	13	1.63
B+ve	167	37.11	137	39.14	304	38
B-ve	09	2.00	01	0.29	10	1.25
AB+ve	24	5.33	26	7.43	50	6.25
AB-ve	01	0.22	01	0.29	02	0.25
O+ve	127	28.22	86	24.57	213	26.63
O-ve	09	2.00	07	2.00	16	2.00
Total	450	100	350	100	800	100

We compare the traits of blood group in India and outside India in table 4. It is found that our study shows same trend as found in other two studies done in India in other states. The difference found in

distribution when we compare our study internationally with study done in USA and Nepal. This will help to map the genetic distribution of blood groups all over the world.

Table 4: Comparative study on frequency of ABO and Rh blood groups at different geographical areas (in percentage)

Place of study	A	B	AB	O	Rh +ve	Rh-ve
Within India						
Indore [5]	24.15	35.25	9.10	31.50	95.43	4.57
Lucknow [6]	21.73	39.84	9.33	29.10	95.71	4.29
Punjab [7]	21.91	37.56	9.3	31.21	97.3	2.7
West Rajasthan [8]	22.2	36.4	9.4	31.7	91.75	8.25
Eastern Ahmedabad [9]	23.30	35.50	8.80	32.50	94.20	5.80
Western Ahmedabad [10]	21.94	39.40	7.86	30.79	95.05	4.95
Surat [11]	24.10	34.89	8.69	32.32	94.18	5.82
Latur [12]	29.35	31.25	9.74	29.64	93.10	6.90
Durgapur (Steel City) [13]	23.90	33.60	7.70	34.80	94.70	5.30
Bangalore [14]	23.85	29.95	6.37	39.82	94.20	5.80
Vellore [15]	21.86	32.69	6.70	38.75	94.50	5.50
Devanagere [16]	26.15	29.85	7.24	31.76	94.8	5.2
Present study	25.63	39.25	6.50	28.63	94.88	5.12
Outside India						
Pakistan [17]	23.80	38	10	28.20	89.10	10.90
USA [18]	41	9	4	46	85	15
Nepal [19]	34	29	4	33	96.70	3.30

DISCUSSION

The membrane of a human red blood cell contains a variety of blood group antigen, the most important and best known of these are A and B antigens. The Rh blood group system is the second most important in blood transfusions [20].

In this study, the distribution of ABO and Rh blood groups are depicted in Table I. The results of this study were comparable to the studies done at Indore [5], Lucknow [6], Punjab [7], West Rajasthan [8], Eastern Ahmedabad [9], Western Ahmedabad [10], Surat [11], Latur [12], and Pakistan [17] (Table IV). All these studies have described 'B' as the most frequent and 'AB' as the least common blood group.

The studies done at Indore by Narendra Kumar *et al.*; [5] revealed B group to be the most common followed by O, A and AB. The same incidence is found in our study i.e. B is more frequent than O followed by A and AB blood groups.

The studies done in Northern parts of India by authors like Tulika Chandra *et al.*; [6] at Lucknow, and by Sidhu *et al.*; [7] at Punjab showed blood group B was the commonest, followed by O, A and AB; which is in consonance with present study.

In Western parts of India like in West Rajasthan by Behra R *et al.* ⁸, Eastern Ahmedabad by Wadhwa MK *et al.*; [9], Western part of Ahmedabad by Patel, Piyush *et al.*; [10] and studies done at Surat by Nidhi *et al.*; [11] showed blood group B was the

commonest followed by O, A and AB which is same as in our study.

Study done in Eastern part of India, Durgapur by Nag I *et al.*; [13] showed O group to be the commonest group which is different from our study.

In Southern part of India studies done by Periyavan A *et al.*; [14] at Bangalore, Das PK Nair *et al.*; [15] at Vellore, and at Davanagere by Mallikarjuna S *et al.*; [16] found that the commonest blood group was O followed by B, A and AB whereas our study shows commonest blood group B followed by O, A & AB.

Geographical distribution of Blood Groups in India shows that in Central, Northern and Western part of India, B is the commonest blood group; whereas in Eastern, Southern part, O is the most frequently occurring blood group.

In Pakistan, the study done by Hamed A *et al.*; [17] the commonest blood group is B which is same as in our study. The study done in USA by Mollison PL *et al.*; [18] the commonest blood group was O, followed by A, B & AB, which is different from our study.

The study done at Nepal by Pramanik *et al.*; [19] 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 94.88 % were

Rh+ve and 5.12 % were Rh-ve (table-II). Thus frequency of Rh +ve blood group is more which coincides with most of the other studies done as depicted in table IV.

CONCLUSION

It is concluded that the most common blood group was B (39.25 %) followed by O (28.63 %), A ((25.63 %) and AB (6.50 %). Amongst Rhesus (Rh) factor, 94.88 % were Rh+ve and 5.12 % were Rh-ve. The study of distribution of blood group is very important for blood banks & transfusion services, forensic studies, medical diagnosis, genetic information; genetic counselling that could contribute to the general well-being and health care of individuals.

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