



## A STUDY OF DISTRIBUTION PATTERN OF BLOOD GROUP (ABO AND RH) AMONG THE PATIENTS REPORTING TO THE DEPARTMENT OF MICROBIOLOGY, RIMS, RANCHI, JHARKHAND, 834009

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### ABSTRACT

**INTRODUCTION:** The ABO blood group system was the first human blood group system to be discovered by Karl Landsteiner in 1900. This pioneering study opened a new chapter in the interest of medical science and anthropology. The ABO blood group system is divided into four groups and is determined by the presence or absence of two distinct antigens, A and B, on the surface of red blood cells. The blood groups are A, B, O and AB.

**AIMS AND OBJECTIVES:** This prospective study was aimed to determine the distribution pattern of the ABO and Rh blood groups among the patient reporting to the Department of Microbiology, Rajendra Institute of Medical Sciences, RIMS, Ranchi and compare it with other data from similar studies within India and all over the world.

**MATERIAL AND METHODS:** The present prospective study work was undertaken in the Department of Microbiology of Rajendra Institute of Medical Sciences,(RIMS), Ranchi in the duration of September 2017 to October 2018. The institutional ethical committee clearance was obtained for the study of the same. A total of 300 samples were taken from the patients attending to the Department of Microbiology, Rajendra Institute of Medical Sciences, (RIMS), Ranchi for the purpose of blood grouping. ABO grouping and Rh typing was done by slide agglutination method.

**OBSERVATIONS:** Out of total 300 patients, 121 (44.33%) were males and 179(59.67) females. In our study, the most frequently occurring blood group was group B (38.33%) followed by O group (31.00%), A group (23.33%) and AB group (7.34%). 278(92.66%) patients were Rh positive where as only 22 (7.34%) were Rh negative.

**DISCUSSION AND CONCLUSION:** ABO and Rh blood group distribution are important as they play an utmost important role in blood transfusion, organ transplantation, research in the field of genetics, human evolution and forensic examination and investigations.

### KEYWORDS :

#### INTRODUCTION:

The ABO blood group system was the first human blood group system to be discovered by Karl Landsteiner in 1900<sup>1</sup>. This pioneering study opened a new chapter in the interest of medical science and anthropology. The ABO blood group system is divided into four groups and is determined by the presence or absence of two distinct antigens, A and B, on the surface of red blood cells. The blood groups are A, B, O and AB. These four groups are also distinguished by the presence or absence of two distinct isoantibodies in the serum. The serum contains the isoantibodies specific for the antigen that is absent in the red cell. The serum of blood group A individual has anti-B antibody, group of B has anti-A and group O both anti-A and anti-B, while in group AB both anti-A and anti-B are absent. The ABO blood group system is important because of the fact that A and B are strongly antigenic and anti-A and anti-B are naturally occurring antibodies present in the serum of persons lacking the corresponding antigen. Blood group antigens are inherited according to simple Mendelian laws<sup>2</sup>. Their synthesis is determined by allelomorphous genes A, B and O. Genes A and B give rise to the corresponding antigens, but O is amorphous and does not produce any antigen.

Rhesus system is the second most important blood group system after ABO. Currently, the Rh-system consists of 50 defined blood group antigens out of which only five are important. Apart from their importance in blood transfusion practice, the ABO and Rh blood groups are useful in clinical studies, genetic studies researching population migration patterns as well as resolving certain medico-legal issues, particularly of disputed paternity cases<sup>3</sup>.

Knowledge of availability of different blood groups at various levels is the need of the hour for more efficient delivery of blood bank services, obstetrical and paediatric practices and so the study of this study stands very important to know the availability and their frequency percentage.

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#### MATERIAL AND METHODS:

The present prospective study work was undertaken in the Department of Microbiology of Rajendra Institute of Medical Sciences ,(RIMS),Ranchi in the duration of September 2017 to October 2018. The institutional ethical committee clearance was obtained for the study of the same.

A total of 300 samples were taken from the patients attending to the Department of Microbiology, Rajendra Institute of Medical Sciences, (RIMS), Ranchi and samples were processed for ABO grouping and Rh factor determination by standard operating procedure of saline washed 10% suspension method followed by slide agglutination test.

To the collected samples normal saline in 2:1 ratio was added and subjected to centrifugation at rate of 3000 rpm for 3 minutes then supernatant was discarded with the help of different pipettes. Again normal saline was added to the centrifuged blood samples in 2:1 ratio then further centrifuged for another 2 minutes at the rate of 2000 rpm and supernatant was again discarded. Thereafter, in a fresh sterile vial containing anticoagulant 1 drop of centrifuged blood was mixed with 9 drops of normal saline making it 10% saline suspension.

Then from the mixed solution, a drop of sample was taken into the each pre-labelled glass slide A, D and B with the help of micropipette and anti-A, anti-D and anti-B antiserum was added respectively. Separate applicator sticks were used to mix the blood drops with anti sera for three glass slides to prevent false results. The mixture observed for agglutination, macroscopically and microscopically for confirmation

and compared with the control and the results were recorded in the serology register immediately.

**STATISTICAL ANALYSIS**

The data was analysed and final results were listed according to frequency and gender. Data was expressed in percentages.

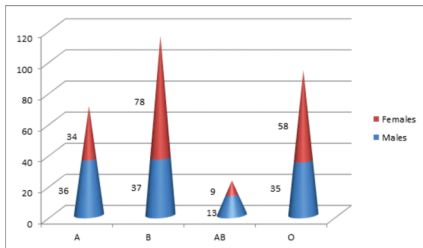
**OBSERVATION**

Out of total 300 patients, 121 (44.33%) were males and 179(59.67) females. The results this study are illustrated in Table 1, Table 2 and Table 3 also in Figure 1 and 2. In our study, the most frequently occurring blood group was group B (38.33%) followed by O group (31.00%), A group (23.33%) and AB group (7.34%). 278(92.66%) patients were Rh positive where as only 22 (7.34%) were Rh negative (Table 1 and fig.4). Among the most frequently occurring B group, females were 67.82% and males 32.18% while in AB group which was least frequent males were 59.10% and 40.90% females in AB group. In Rh positive blood group distribution, B blood group had highest frequency of 33.33% (N=115) followed by O blood group 31% (N=93), A blood group 23.33% (N=70) and AB 7.34% (N=22). Rh negative blood group distribution showed 45.45% (N=10) belonging to O group followed by B 22.73% (N=5), A 18.18% (N=4) and AB 13.64% (N=3). Among the males and females, most of the Rh negatives belonging to blood group O(50%), followed by B(28.58%) blood group, A(14.28%) blood group and AB(7.14%). Among Rh positive females the highest frequency belongs to blood group B(44.85%) followed by O(30.90%) blood group, A(19.39%) and AB(4.85%). In males the highest frequency of Rh positive blood group belonging to blood group B(31.86%), followed by blood group A(30.09%), blood group O (28.31%) and AB(9.74%) and among the Rh negative males O(37.5%),A(25%), AB(25%) and B(12.5%) respectively (Table 2 and 3).

**Table-1 Sex wise distribution of blood group.**

Blood Group	Male	Female	Total
A	36 (29.76%)	34(19%)	70
B	37(30.57%)	78(43.57%)	115
AB	13(10.74%)	09 (5.02%)	22
O	35(28.93%)	58 (32.41%)	93
Total	121	179	300

Among the 300 patients 179(59.67%) were female and 121(40.33%) were male.

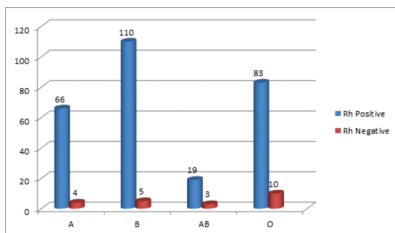


**Fig-1 Sex wise distribution of blood groups.**

**Table- 2. Blood group distribution pattern among the patients reporting to the Department of Microbiology, RIMS, Ranchi.**

Blood group	Rh+ve	Rh-ve	Total
A	66	4	70 (23.33%)
B	110	5	115 (38.33%)
AB	19	3	22 (7.34%)
O	83	10	93 (31%)
Total	278 (92.66%)	22 (7.34%)	300 (100%)

Among 300 patients 278 (92.66%) were Rh +ve and 22(7.34%) were Rh-ve.

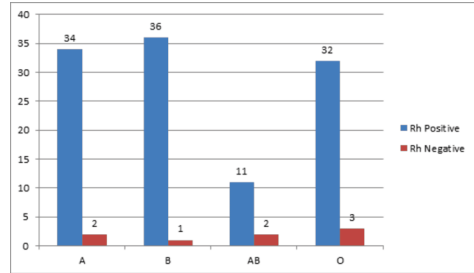


**Fig-2. ABO and Rh blood groups distribution among the patients reporting to Department of Microbiology, RIMS, Ranchi.**

Blood group	Rh+ve males	Rh-ve males	Total
A	34	02	36
B	36	01	37
AB	11	02	13
O	32	03	35
Total	113	08	121

**Table-3. Distribution of ABO and Rh group among males.**

Among 121 males 113(93.39%) were Rh+ve and 8(6.615) were Rh-ve.

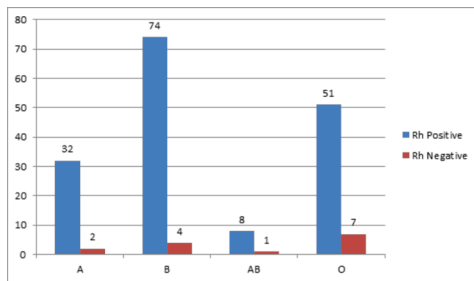


**Fig.3. Distribution of ABO and Rh blood group among male patients.**

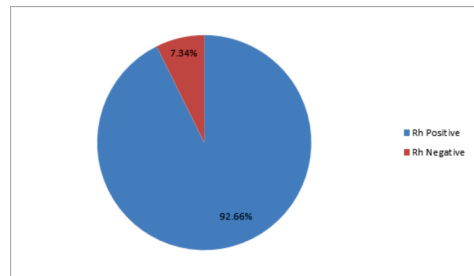
Blood group	Rh Positive females	Rh Negative females	Total
A	32	02	34
B	74	04	78
AB	08	01	09
O	51	07	58
Total	165	14	179

**Table-4. Distribution of ABO and Rh group among females**

Among 179 females 165(92.18%) were Rh+ve and 14(7.82%) were Rh-ve.



**Fig-4 Distribution of ABO and Rh group among female patients.**



**Figure 4. Rh factor distribution pattern.**

**DISCUSSION**

ABO and Rh blood group distribution are important as they play an utmost important role in blood transfusion, organ transplantation, research in the field of genetics, human evolution and forensic examination and investigations. Some blood groups are more prone for some diseases like diabetes mellitus, duodenal ulcers, and UTI<sup>1</sup>. Blood groups are known to have genetic association with some diseases. Studies conducted shows that 'A' group individuals are more prone for cardiovascular diseases like coronary heart disease, venous thrombosis, ischemic heart disease and atherosclerosis. These cardiovascular diseases are less likely in people with O blood group. These O blood group individuals are known to have protection against squamous and basal cell carcinoma with risk reduced by 14% and 4% respectively as compared to other groups. It is also known to have less risk of pancreatic cancer. The ovarian cancer is more in blood group B individuals. Blood group 'A' people are more prone to gastric

carcinoma whereas it least in O blood group individuals. So, it is important to do blood group studies in each institution and regional level so as to draft appropriate national transfusion policies, to know demand and supply of required blood group during emergency to the needy people and migration pattern of human population<sup>7</sup>.

The blood group distribution has been studied and observed to be different in different parts of the world based on ethnic origin of races. Indians from South Africa belong to blood group O whereas blood groups O and A were more common in people of Australian origin. Blood group B was found to be more frequent in Africans whereas blood group A among Europeans. In USA, 46% constitute group O, 41% A, 9% B and 4% AB<sup>8</sup>.

Blood group distribution also differs in different populations inside India and also within different districts in each state in India.

In this study, the frequency distribution of blood groups B was the highest with percentage frequency of 38.33% followed by blood group O, 31%; blood group A, 23.33%; and least percentage frequency being AB with 7.34%. In my study it is further confirmed that the Rhesus positive (92.66%) has the highest percentage frequency while Rhesus negative (7.34%) has the lowest percentage frequency. In Rh- positive blood group distribution, blood group B has the highest frequency of (39.56%) followed by O (29.85%), A (23.74%) and AB (6.83%). In Rh negative blood group distribution, O blood group (45.45%) followed by B blood group (22.73%), blood group A (18.18%) and AB (13.64%). The frequency of Rh negative was found to be more in females than males as well as Rh positive frequency was also more in females than males.

The study by Chandra et al at Lucknow<sup>7</sup> and Sindhu et al<sup>8</sup> Punjab in Northern parts of India showed blood group B was the commonest, followed by O, A and AB which is similar to this study. Blood group B (36.5%) was found to be predominant in Ahmadabad region, the western part of India followed by O (30.5%), A (21%) and AB (12%). Studies done at Surat by Nidhi Mehta et al<sup>9</sup> and Giri h et al<sup>10</sup> in Maharashtra, showed that the B group was commonest among people studied followed by O, A and AB groups, similar to present study.

The study done by Behra R et al<sup>11</sup> at Western Rajasthan in western parts of India showed that the commonest blood group was B (36.4%), followed by O (31.7%), A (22.2%) and AB (9.4%), same as this study. Another study conducted by Hemlatha N.R<sup>12</sup>, at Mandya, Karnataka among medical students in Mandya, found that the frequency distribution of blood group B was the highest with percentage frequency of 39.02% followed by blood group O, 31.71% blood group A, 26.83% and the least percentage frequency being AB with 2.44%, which is similar to this study also.

Study done at Central India like Indore by Narendra Kumar et al<sup>13</sup> revealed B group to be the most common followed by O, A and AB which is consonance with present study. All these studies showed Rh positive as predominant group compared to Rh negative.

Study done in Eastern part of India, Durgapur by Nag I et al<sup>14</sup> 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<sup>15</sup> at Bangalore, Das PK Nair et al<sup>16</sup> at Vellore, and at Devanagere by Mallikarjuna S et al<sup>17</sup> and Shimoga-Malnad study by Girish et al<sup>18</sup>, found that the commonest blood group was O followed by B, A and AB whereas in this study commonest blood group was B followed by O, A, and AB.

Geographical distribution of blood groups in India shows that in Northern and Western part of India, B is the commonest blood group where as in Eastern, Southern and Central part, O is the most frequently occurring blood group.

Outside India, in Pakistan the study done by Hamed A. et al<sup>19</sup> the commonest blood group was B (38.004%), followed by O (28.755%), A (23.260%) and AB(9.981%), which is same as present study. The study done in Australia by Red Cross Society, and in USA by Mollison et al<sup>20</sup> the commonest blood group was O, followed by A, B and AB.

The study done at Nepal by Pramanik et al<sup>21</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 positive and 2 to 6% were Rh negative whereas in this present study 92.66% were Rh positive and Rh negative were 7.34%.

## CONCLUSION

1. Studies from Northern, Central and Western parts of India done by Garg P et al (2014), at Kumaon region of Uttarakhand, Singh A et al (2013) at Rewa, Madhya Pradesh and Behra R et al (2013) in Western Rajasthan reported that blood group B was commonest followed by O, A and AB consonance to present study.

2. In study done at Southern States by Periyavan A et al (2010) at Bangalore, Das PK, Nair SC et al (2001) at Vellore showed that blood group O was predominant followed by blood group B, A and AB which was different from this study.

3. Outside India, in Pakistan study done by Hamed A et al (2002) the commonest blood group was B(38.004%), followed by O (28.755%), A (23.26%) and AB(9.98%), which is same as this study whereas study done at Nepal by Pramanik et al (2000) found that the commonest blood group was A (34%), followed by O (32%), B (29%) and AB (5%) which is different from present study.

4. The study done by Red Cross Society in Australia and in USA by Mollison PL et al (2008) the commonest blood group was O, followed by A, B and AB which is not similar to this study.

5. By this present study, it can be concluded that the blood group B (38.33%) was found to be more common among the patients reporting to Department of Microbiology, Rajendra Institute of Medical Sciences, (RIMS), Ranchi, followed by O (31%), A (23.33%) and AB (7.34%).

Geographical distribution of blood groups in India shows that in Northern, Central and Western part of India, blood group B is the commonest blood group where as in the Southern states blood group O is predominant and AB is least common.

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## REFERENCES

- Owen R. Karl Landsteiner and the first human marker locus. *Genetics*. 2000; 155:995-8.
- Ananthanarayan and Paniker's Textbook of Microbiology; 10th edition. 2017; PP-193.
- Khan MS, Subham F, Tahir F, Kazi BM, Dil AS, Sultan S. Prevalence of blood groups and Rh factor in Bannu region NWFP (Pakistan) Pak J Med Res. 2004;43(1):8-10.
- Chandrika Rao, Jayaprakash Shetty. Frequency of ABO and rhesus blood groups in Dakshina Kannada district of Karnataka-A study from rural tertiary care teaching hospital in South India. *NUJHS*. 2014;4:57-60.
- Swami CM, Basavaraj PB, Kavitha GU, Shashikala P. Prevalence of ABO and Rhesus blood among blood donors. *Indian J Public Health Res Dev*. 2012;3:106-9.
- Khan MI, Michael S, Akhtar F, Naveed A, Ahmed A and Qamar R. Association of ABO blood groups with glaucoma in the Pakistani population. *Can J Ophthalmol*. 2009;44:582-6.
- Tulika C, Gupta. Frequency of ABO and Rhesus blood groups in blood donors. *Asian J. Trans. Sci*. 2012;6:52-3.
- Sindhu S. Distribution of the ABO blood groups and Rh (D) factor among the scheduled caste population of Punjab. *Anthropologist*. 2003;5:203-4.
- Mehta N, Swadas B. Prevalence of ABO blood groups at Mahavir Heart Institute Surat. *Asian J Trans Sci*. 2012;6:74-5.
- Giri PA, Yadav S, Parhar GS, Phalke DB. Frequency of ABO and Rhesus: A study from a rural tertiary care teaching hospital in India. *Int J Biol Med Res*. 2011;2:988-90.
- Behra R, Yogi J. Distribution of ABO blood group and Rh(D) factor in Western Rajasthan. *National J Med. Research*. Vol.6;issue 1;Jan-March 2013.
- Hemlatha N.R: ABO and Rh blood group Distribution among Medical Students in Mandya. *International J. Contemporary Med. Research*. Vol 4; Issue ; Aug 2017.
- Narendra Kumar, Dadwal S. Distribution of ABO and Rhesus-D Blood groups. *Asian J. Trans. Sci*. 2012;V6;1:73.
- Nag I, Das SS. ABO and Rhesus blood groups in potential blood donors at Durgapur Steel City of the district of Burdwan, West Bengal. *Asian J. Transfuse. Sci*. 2012;6:54-5.
- Periyavan A, Sangeetha SK, Marimuthu P, Manjunath BK, Seema. Distribution of ABO and Rhesus-D, groups in and around Bangalore. *Asian J Transfus Sci*. 2010;4(1):41.
- Das P.K., Nair SC, Harris VK, Rose D, Mammen JJ, Bose YN, Sudarshan A. Distribution of Rh-D blood groups among blood donors in a tertiary care centre in South India. *Trop. D. Oct. 2001; 31(1):47-8.*
- Mallikarjuna S. Prevalence of ABO and Rhesus blood group among blood donors. *Indian J. Pub. Health, Research and Development*. 2012;3(2): 106-109.
- Girish CJ, Chandrashekhar TN, Ramesh Babu K, Kantikar SM. ABO and Rhesus blood

- group distribution among Malnad region blood donors Research and Reviews in Biomedicine and Biotechnology (RRBB). 2011;2(3):25-30.
19. Hammed A, Hussain W, Ahmed J, Rabbi F, Quersh J A. Prevalence of Phenotypes and Genes of ABO and Rhesus(Rh) blood groups in Faisalabad, Pakistan. Pak J Biol.Sci.2002;;5:722-724.
  20. Mollison Pl, Engelfriet CP, Conteras M. The Rh blood group system. In Blood Transfusion in Clinical Medicine,9th Edition. Oxford:Black well Scietific Publication. 1993;2008-9.
  21. Pramanik T, Pramanik S, Distribution of ABO and Rh blood groups in Nepalese medical students: a report. East Mediterr Health J. 2000 Jan; 6 (1):156-8.