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PHENOTYPIC FREQUENCIES OF ABO AND RH(D) BLOOD GROUPS AMONGST HEALTHY BLOOD DONORS IN BIKANER, RAJASTHAN

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Abstract

Background & Objective: Practically, most important blood groups are A, B, O, AB and RhD(+/-), which are essential for right blood supply to the recipients and in various studies. The incidence of ABO and Rhesus (Rh) groups varies markedly in different parts of the world and in different races. The present study was aimed at determining the prevalence of ABO & RhD blood groups among healthy blood donors in Western Rajasthan.

Material and Methods: At our centre, all the healthy blood donors were assessed and analyzed for ABO-Rh blood grouping during a period of previous 4 years (from January, 2015 to December, 2018). 119200 samples were checked for ABO and RhD blood grouping by manual saline antigen-antibody agglutination method using commercially prepared antisera antiA, antiB, antiAB, antiD, in house prepared reagent cells Acell, Bcell, Ocell and negative control. The results were reconfirmed on fully automated immunohematology analyzer (Galileo Neo, USA) with direct hemagglutination micro-well plates using antiA, antiB, antiD series-5, antiD Novaclone, Monoclonal control, Acell, Bcell and Ocell provided by the manufacturer. Discrepant samples were cross checked separately by column agglutination technique using DG Gel ABO/Rh-2D cards (Diagnostic Grifols S.A.) and tube technique.

Results: We found that the most common blood group was B+ 39758 (33.35%) followed by O+, A+, AB+, B-, O-, A- and AB-. RhD negative donors were 10504 (8.81%) among the total donors. Phenotypic frequencies were expressed under the standard assumption of Hardy-Weinberg equilibrium.

Conclusion: Present study concludes that the most common ABO phenotype found among healthy blood donors in Western Rajasthan (India) is group B with RhD negativity being 8.81%. Larger studies should be conducted to calculate antigenic, phenotypic and allelic frequencies in general population.

Keywords: ABO-RhD blood group, Phenotype, Allele, Blood donors, hemagglutination.

Introduction:

Till date over 30 blood group systems have been discovered, of which ABO and Rh are the most important ones.[1,2] Most important blood groups among these systems are A, B, O, AB and RhD(+/-), which are essential for effective management of blood bank inventory[3], for right blood supply to the recipients for transfusions and organ transplants, in legal medicine study, in genetic studies and in clinical studies for reliable geographical information.[4] The incidence of ABO and Rhesus (Rh) groups varies very markedly in different parts of the world and in different races.[5] The present study was aimed at determining the prevalence of ABO & RhD blood groups among healthy blood donors in Western Rajasthan.

MATERIAL & METHODS

A blood bank based retrospective analytic study was conducted at the Department of Immuno-Hematology & Transfusion Medicine, S.P. Medical College & Associated Group of Hospitals, Bikaner, Rajasthan (India) during a period of previous 4 years (from January, 2015 to December, 2018).

All the healthy blood donors were assessed for ABO and RhD blood grouping by manual saline antigen-antibody agglutination method using commercially prepared and validated antisera antiA, antiB, antiAB,

antiD, in house prepared reagent cells Acell, Bcell, Ocell and negative control. Both forward (cell grouping) & reverse (serum grouping) was done by slide and test tube agglutination methods. The total number of donor samples studied was 119200.

Final blood groups were confirmed either by cross checking the forward & reverse groups together or on fully automated immunohematology analyzer (Galileo Neo, USA) with direct hemagglutination micro-well plates using antiA, antiB, antiD series-5, antiD Novaclone, Monoclonal control, Acell, Bcell and Ocell provided by the manufacturer. Discrepant samples were also cross checked separately by column agglutination technique using DG Gel ABO/Rh-2D cards (Diagnostic Grifols S.A.).

The donor blood group data was recorded on pre-set pro forma and analyzed statistically. Appropriate statistical tests of significance were applied on the results obtained by using the software Microsoft Excel and PRIMER.

OBSERVATION

The prevalence of blood groups among donors were blood group A 21.98%, B 36.48%, O 32.54% and AB 9.01% (Table-1). We found that the most common blood group was B+ followed by O+, A+, AB+, B-, O-, A- and AB-. The distribution of RhD blood group was (108696; 91.19%) RhD+ and (10504; 8.81%) RhD- (Table-1). Calculations of phenotypic frequencies were done by dividing the total number of donors with a particular ABO-RhD phenotype with total number of donors screened and were expressed as percentages. Allele frequencies were calculated under the standard assumption of Hardy-Weinberg equilibrium.

Table 1: Phenotypic frequencies of ABO & RhD Blood Groups among healthy donors.

ABO Blood Group	RhD +	RhD -	Total (Percentage)
A	23917 (20.06%)	2279 (1.91%)	26196 (21.98%)
B	39758 (33.35%)	3721 (3.12%)	43479 (36.48%)
O	35247 (29.57%)	3543 (2.97%)	38790 (32.54%)
AB	9774 (8.20%)	961 (0.81%)	10735 (9.01%)
Total	**108696 (91.19%)**	**10504 (8.81%)**	119200 (100%)

DISCUSSION

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

The studies done in Northern parts of India by authors like Tulika Chandra et al[6] at Lucknow, and by Sidhu et al[7] 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 Western parts of India like in Eastern Ahmedabad by Wadhwa MK et al[8], Western Ahmedabad by Patel, Piyush et al[9] and studies done at Surat by Nidhi et al[10], showed blood group B as 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[11] revealed B group to be the most common followed by O, A and AB which is in consonance with the present study.

Study done in Eastern part of India, Durgapur by Nag I et al[12] 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[13] at Bangalore, Das PK Nair et al[14] at Vellore, and at Davanagere by Mallikarjuna S et al[15] and at Shimoga-Malnad study done by Girish et al[16], found that the commonest blood group was O followed by B, A and AB whereas our study showed commonest blood group B followed by O, A & AB.

Outside India, in Pakistan the study done by Hammed A et al[17] the commonest blood group is B which is same as in our study. The study done in Australia by Red Cross Society[18], in Britain and in USA by Mollison PL et al[19] the commonest blood group was O, followed by A, B & AB. The study done at Nepal by Pramanik et al[20] 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 prevalence of RhD+ blood group in most of the parts of India varies from 91 to 98%. Present study shows 91.19% of RhD+ and 8.81% of RhD- blood group phenotype among healthy blood donors in Western Rajasthan. Table-2 depicts RhD- to be on the higher side in Western Rajasthan as compared to other places in India while RhD- having still higher frequencies in other parts of the world like Pakistan,

USA and Britain.

Table 2: Comparative study on frequencies of ABO and RhD phenotypes at different geographical areas (in percentage).

Geographical area	A	B	AB	O	Rh+ve	Rh-ve
WITHIN INDIA						
Northern Part of India						
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
Southern Part of India						
Bangalore[13]	23.85	29.95	6.37	39.82	94.2	5.8
Vellore[14]	21.86	32.69	6.70	38.75	94.5	5.5
Devanagere[15]	26.15	29.85	7.24	31.76	94.8	5.2
Shimoga-Malnad[16]	24.27	29.43	7.13	39.17	94.93	5.07
Eastern Part of India						
Durgapur (Steel City)[12]	23.90	33.60	7.70	34.80	94.70	5.30
Central Part of India						
Indore[11]	24.15	35.25	9.10	31.50	95.43	4.57
Western Part India						
Western Ahmedabad[9]	21.94	39.40	7.86	30.79	95.05	4.95
Eastern Ahmedabad[8]	23.30	35.50	8.80	32.50	94.20	5.80
Surat[10]	24.10	34.89	8.69	32.32	94.18	5.82
Western Rajasthan (Present Study)	**21.98**	**36.48**	**9.01**	**32.54**	**91.19**	**8.81**
OTHER COUNTRIES						
USA[19]	41	9	4	46	85	15
Britain	42.0	8.0	3.0	47.0	83.0	17.0
Australia[18]	38	10	3	49	NA	NA
Pakistan	23.8	38	10	28.2	89.1	10.9
Nepal[20]	34	29	4	33	96.7	3.3

CONCLUSION

It was concluded that the total 119200 blood donors were studied for ABO-RhD blood group phenotypic frequencies. We observed that the most common ABO phenotype was B (36.48%) followed by O (32.54%), A (21.98%) and AB (9.01%). 91.19% were RhD+ and 8.81% RhD-.

The study of distribution of blood groups is very important for blood banks & transfusion services that could contribute to the patients' health care. Blood group phenotypic frequencies should also be studied among patients and general populations. Larger sample size studies should also be conducted to calculate antigenic and allelic frequencies to get a better idea about genotypic frequencies of blood group systems.

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