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A Cross sectional study on distribution of ABO and Rh blood group antigens among the blood donors at a tertiary care hospital in Andhra Pradesh, India

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Aims: The study is aimed to determine the distribution pattern of the ABO grouping and Rh typing among blood donors in Great Eastern Medical School and Hospital, Srikakulam and to correlate it with the available data from studies inside India and other parts of the world. **Materials and Method:** The present study was conducted at Great Eastern Medical School and Hospital, Srikakulam, a tertiary care teaching hospital. All blood donors were done counseling as per NACO guidelines and considered fit for blood donation were included in this study. A total of 5868 blood donors was considered physically screened and declared fit and accepted for blood donation. **Results:** Out of 5868 donors, 5850 (99.6%) were males and 18 (0.4%) were females. The majority of donors belonged to the age group 26-35 years. The commonest ABO blood group present was B (36.4%) followed by O (35.08%), A (24.4%), and AB (4.12%) while 5743 (97.86%) donors were Rh-positive and 125(2.13%) donors were Rh-negative. **Conclusion:** Knowledge of the distribution pattern of the different blood groups is very crucial for blood banks and blood transfusion services which significantly contribute to the Health System of the Nation. Knowledge of blood group distribution is important for clinical studies, geographical information, and forensic studies in the general population.

Keywords: ABO, Blood groups, Blood donors, Rhesus (Rh) group, Andhra Pradesh

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Introduction

Human red blood cells contain on their surface a series of carbohydrate structures of glycoproteins and glycolipids, which represent blood group antigens. These antigens are genetically controlled and are inherited in early fetal life by Mendelian manner and remain the same until death [1].

International Society of Blood Transfusion has identified 30 blood group system genes. The most important blood group systems are ABO and Rh [2].

The first human blood group system to be discovered by Landsteiner was the ABO blood group system in 1901. [3].

The definition of a blood group was given in 1941 by Landsteiner and Wiener [4]. Both ABO and Rh type plays a significant role in blood transfusions. Discovery of the ABO blood group system led to research in the field of immunohematology, blood transfusion, unmatched pregnancy, forensic medicine, anthropology, and the discovery of other blood group systems [5].

In the ABO system, the four main types of blood groups are A, B, O, and AB. ABO blood grouping system is important because A and B are highly antigenic and anti-A and anti B antibodies are always present in the serum of individuals who lack corresponding antigen (s) on their red blood cells. These antibodies can destroy transfused red cells in case of incompatible transfusion [6].

Rhesus antigens are the most immunogenic. Out of 49 Rh antigens identified, the expression of D antigen is most crucial. When D negative individuals encounter the D antigen, they produce anti D which causes hemolytic transfusion reaction or hemolytic disease of the new-born. For this reason, the status of Rh typing is determined in blood donors, recipients who receive a blood transfusion, and pregnant ladies [7].

In addition to their significance in blood transfusion practice, the ABO grouping and Rh typing are also useful in clinical studies, genetic studies in population, and in solving medico-legal issues [8].

All humans share the same blood group systems; although the frequencies of specific types are different. The incidence of ABO and Rh groups varies markedly in different ethnic groups, races, and socio-economic status in different parts of the world [9].

Aims and Objectives

To know the distribution frequency of different blood groups in healthy and adult blood donors, to compare this study data with other study data in other states of India and all over the world, and to make documentation of a blood group data registry.

Material and Methods

Study Setting and Duration: The present study was conducted at the Blood bank of Great Eastern Medical School and Hospital, Srikakulam over a Period of one year from February 2018 to February 2019.

Study design and Sample size: It is a Cross-sectional with a sample size of 5868 participants.

Inclusion criteria: All the voluntary and replacement donors coming to the blood bank for blood donation and Considered eligible as per NACO guidelines.

Exclusion Criteria: Those who don't qualify NACO guidelines.

Data Collection: Information regarding personal details, demographic details, occupation, and past medical history was elicited. Individuals with good health, mentally alert, physically fit were selected as blood donors. The donors were then asked to sign the donor questionnaire inclusive of the informed consent form.

After blood donation, ABO and Rh typing were done by antigen-antibody agglutination test by available standard antisera i.e. anti-A, anti B, and Anti D after validation at the blood bank. Blood groups were done by slide agglutination method. Doubtful cases were confirmed by tube agglutination method and reverse grouping using known pooled A and B cells. The final blood group is confirmed only if both forward group (cell group) and reverse group (serum group) are identical. Rh-negative blood groups were confirmed by the antiglobulin technique. All weak D groups were considered as Rh-positive.

Ethical Consideration and Permission: Institutional Ethics Committee approval is taken before conducting this study. Informed Consent is taken from the participants.

Statistical Analysis: The recorded data was compiled and entered in a spreadsheet computer program (Microsoft Excel 2007) and then exported

To the data editor page of SPSS version 20(SPSS Inc., Chicago, Illinois, USA).Data on the frequency of ABO and Rh blood groups were reported in simple percentages.

Results

Out of 5868, 5850 (99.6%) were male and 18 (0.4%) were female. The majority of donors belonged to the age group 26-35 years. The commonest ABO blood group present was B (36.4%) followed by O (35.08%), A (24.4%) and AB (4.12%) [Table 1] while 5743 (97.86%) donors were Rh-positive and 125(2.13%) donors were Rh-negative. [Table 2]

Table-1: Distribution of donors according to ABO blood group,

Type of Blood Group	Number of Donors	Percentage
B	2136	36.4
O	2059	35.08
A	1432	24.4
AB	241	4.12

Table-2: Distribution of blood donors according to Rhesus Phenotype.

Type of Blood Group	Number of Donors		Total (%)
	Rh-positive (%)	Rh-negative (%)	
B	2098	38	2136 (36.4)
O	1981	78	2059 (35.08)
A	1424	8	1432 (24.4)
AB	240	1	241 (4.12)
Total	5743 (97.86)	125 (2.13)	5868 (100)

Discussion

The present study shows that the majority of donors (99.6%) were males as compared to females which are comparable with other studies [10,12,17]. The reason in India as being a developing country, and the majority of females in the reproductive age group are anemic and their hemoglobin level needs to be increased by improving their food quality and health status. There may also be a lack of Motivation. Hence, there is a need to encourage female donors and their diet should be improved by their food quality and also supplemented with good nutrients.

Table 3 shows that, in the present study, the frequency and distribution of ABO and Rh blood group in the healthy blood donors in rural areas of Northern Andhra Pradesh are compared with the similar type of studies done in another state of India and also outside India.

Frequency of ABO blood groups of the present study was compared to the studies done at Ahmedabad by Patel PA et al and Wadhwa MK et al [12,13] at Uttarakhand by Parul G et al [14] at Lucknow by Chandra T et al [15] at Amritsar by Kaur H et al [16] and at Maharashtra by Giri PA et al [17] In all these studies, most common ABO blood group was B, which was followed by O, A, and AB respectively.

On other hand, studies were done at Shimoga-Malnad by Girish CJ et al [10], at Bangalore by Periyavan A et al [11] and at Durgapur by Nag I et al [18], the commonest ABO blood group was 'O', which is in contrast to present study where B is the most common ABO blood group.

Outside India, in the study at Pakistan by Khattak ID et al [19] the commonest ABO blood group was B which is similar to the present study. While in other countries of the world, like in the USA [20] and Australia [21], and Saudi Arabia by Bashwari LA [22\ showed the frequency of ABO blood group O was highly frequent which is in contrast to our present study.

Table 3 also show that, frequency of Rhesus blood groups of present study was 97.86% and 2.13% for Rh-positive and Rh-negative donors respectively, which is similar to all studies [10-23] except in USA [20] where it is 85% and 15% respectively. Some of the factors which can affect the overall distribution of the ABO Rh blood group depend upon the donor selection and deferral which are unique to specific locations [24,25].

Table-3: Comparison of the distribution of ABO and Rh blood groups in different regions of India and with different countries.

Area	Study Area	ABO Group (%)				Rhesus Group (%)	
		A	B	AB	O	Positive	Negative
Southern India	Present study	24.4	36.4	4.12	35.08	97.86	2.13
	Shimoga-Malnad Girish CJ et al [10]	24.3	29.4	7.1	39.1	94.9	5.1
	Banglore Periyavan A et al [11]	23.8	30	6.4	39.8	94.2	5.8

Western India	Ahmedabad West Patel PA et al [12]	21.9	39.4	7.9	30.8	95	5
	Ahmedabad East Wadhwa MK et al [13]	23.3	35.5	8.8	32.5	94.2	5.8
Northern India	Uttarakhand Parul Garg et al [14]	28.7	32	10.5	28.7	94.5	5.5
	Lucknow Chandra T et al [(15]	21.7	39.8	9.3	29.1	95.7	4.3
	Amritsar Kaur H et al [16]	18	38.1	9.6	34.3	91.3	8.7
Central India	Maharashtra Loni Giri PA et al [17]	28.4	31.8	8.8	31	95.3	4.4
Eastern India	Durgapur Nag I et al [18]	23.9	33.6	7.7	34.8	94.7	5.3
Outside India	Pakistan Khattak ID et al [19]	27.9	32.4	10.6	29.1	90.1	9.9
	USA Mollison PL et al [20]	41	9	4	46	85	15
	Australia [21]	38	10	3	49	NA	NA
	Saudi Arabia Bashwari LA et al [22]	24	17	4	52	93	7
	Nepal Pramanik T et al [23]	34	29	4	33	96.3	3.3

Conclusion

Knowledge of different blood groups and frequency of ABO and Rh type blood groups is most important for the management of blood banks and patients and also be policy decisions regarding emergency and routine functioning of hospitals and blood banks. The blood group must be indicated on all types of identity cards.

This will also be of tremendous use in case of emergencies when urgent transfusion is required. It is also necessary to conduct a similar type of well-designed studies in other states of India to determine the ABO and Rh blood group frequencies in them.

What does the study add to the existing knowledge

Awareness about the donation of blood has to be created in order to increase the number of female donors. The frequency distribution of ABO and Rh blood groups always varies in regards to a different region, ethnicity, and also from one population to another. The data obtained in the present study and several other studies of different regions of India will be useful to face future health challenges in the state.

Author's contribution

Dr. P.J. Naidu formulated the aims and objectives with study design and helped in data collection and Analysis.

Dr. Shamili Moningi contributed to the preparation of the manuscript and helped in data collection and analysis.

Reference

01. Firkin F, Chesterman C, Penington D, Rush B. Blood groups; blood transfusion; acquired immune deficiency syndrome, In- De Gruchy's clinical haematology in medical practice. 5th ed, Wiley-Blackwell. 1989;475-496.
[Crossref]

02. International Society of Blood Transfusion (ISBT). Table of blood group systems. Oct 2008. Available at
[Article] [Crossref]

03. Garraty G, Dzik W, Issitt PD, Lubin DM, Reid ME, Zelinski T. Terminology for blood group antigens and genes-historical origins and guideline in the new millennium. Transfusion. 2000;40(4)477-489.
[Crossref]

04. Rahman M and Lodhi Y. Frequency of ABO and Rhesus blood groups in blood donors in Punjab. Pak J Med Sci. 2004;20(4)315-318.
[Crossref]

05. Harmening MD, Firestone D. The ABO blood group system, In- Harmening MN, editor, Modern Blood Banking and Transfusion Practices. 5th ed, USA- FA Davis Company, Philadelphia, USA. 2005; p-108-132.
[Crossref]

06. Bethesda DL. Blood Groups and Red Cell Antigens, In- The Rh blood group. USA- National Center for Biotechnology Information. 2005; p;1-6.
[Crossref]

07. Jolly J G. Medicolegal significance of human blood groups. J Indian Med Assoc. 2000;98(6)340–41.
[Crossref]

08. Khan MS, Subhan 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;4(1)8–10.
[Crossref]

09. Sidhu S, Sidhu LS. ABO blood group frequencies among the Sansis of Punjab. Coll Anthropol. 1980;4(1)55-58.
[Crossref]

10. Girish CJ, Chandrashekhar TN, Ramesh Babu K, Kantikar SM. ABO and Rhesus blood group distribution among Malnad region blood donors. Res Rev Biomed Biotechnol (RRBB). 2011;2(3)25-30.
[Crossref]

11. Periyavan A, Sangeetha S K, Marimuthu P, Manjunath BK, Seema DM. Distribution of ABO and Rhesus-D, groups in and around Bangalore. Asian J Transfus Sci. 2010;4(1)41.
[Crossref]

12. Patel PA, Patel SP, Shah JV, Oza HV. Frequency and distribution of blood groups in blood donors in western Ahmedabad – a hospital based study. National J Med Res. 2012;2(2)207-210.
[Crossref]

13. Wadhwa MK, Patel SM, Kothari DC, Pandey M, Patel DD. Distribution of ABO and Rhesus-D groups in Gujarat, India- a hospital based study. Indan J Ped Oncol. 1998;19(4)137–141.
[Crossref]

14. Parul G, Saloni U, Sanjay SC, Uman H, Ishwer T. Prevalence of ABO and Rhesus Blood Groups in blood donors- A study from a tirtiary care teaching hospital of Kumaon region of Uttarakhand. J Clin Diagnos Res. 2014;8(12)16-19.
[Crossref]

15. Kaur H, Khanna A, Manjari M, Khanna M. Prevalence of ABO blood groups and rhesus (Rh) factor in the population residing in and around Amritsar, Punjab (a 4-year study from June 2007 to June 2011). Asian J Transfus Sci. 2013;7(2)159.
[Crossref]

16. Giri PA, Yadav S, Parhar GS, Phalke DB. Frequency of ABO and Rhesus Blood Groups- A study from a rural tertiary care teaching hospital in India. Int J Biol Med Res. 2011;2(4)988-990.
[Crossref]

17. 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 Transfus Sci. 2012;6(1)54-55.
[Crossref]

18. Khattak ID, Khan TM, Khan P Shah SM, Khattak ST, Ali A. Frequency of ABO and Rhesus blood group in district Swat, Pakistan. J Ayub Med Coll. 2008;20(4)127-129.
[Crossref]

19. Mollison PL, Engelfriet CP, Conteras M. The Rh blood Group system, In Blood Transfusion in Clinical Medicine, 9th Ed, Oxford- Black well Scientific Publication. 1993;2008–09.
[Crossref]

20. Bashwari LA, Al-Mulhim AA, Ahmad MS, Ahmed MA. Frequency of ABO blood groups in the Eastern region of Saudi Arabia. Saudi Med J. 2001;22(11)1008-1012.
[Crossref]

21. Pramanik T, Pramanik S. Distribution of ABO and Rh blood groups in Nepalese medical students-a report. East Mediterr Health J. 2000;6(1)156-158.
[Crossref]

22. Kaur H, Mannan R, Manjari M, Sharma S, Garg T, Bhasin T. Blood donor deferral analysis- A tertiary care centre experience. Ann Pathol Lab Med. 2016;3(5)A471-475.
[Crossref]

23. Kasraian L, Negarestani N. Rates and reasons for blood donor deferral, Shiraz, Iran, A retrospective study. Sao Paulo Med J. 2015;133(1)36-42.
[Crossref]

24. Chandra T, Gupta A. Frequency of ABO and rhesus blood groups in blood donors. Asian J Transfus Sci. 2012;6(1)52-53.
[Crossref]