

Original Research Article**Distribution of ABO and Rhesus (D) Blood Groups among Blood Donors in Tertiary Care Rural Hospital of Central India: A Retrospective Study****Bhaskar B. Jain^a, Bharat U. Patil^b, Nitin M. Gangane^c**^aAssistant Professor ^bAssistant Professor ^cProfessor & HOD, Department of Pathology, Mahatma Gandhi Institute of Medical Sciences, Sevagram, Wardha, Maharashtra 442102, India.**Abstract**

Introduction: A lot of diversity is present in a vast country like India in relation to race, religion and creed. Similar to it the geographical distribution of ABO and Rhesus blood groups varies across the country.

This study was done to examine the distribution of blood groups among voluntary blood donors in a rural hospital in central India.

Methods: A retrospective study was performed over 5 years (from January 2012 to December 2016) at Blood Bank of Mahatma Gandhi Institute of Medical Sciences, Sevagram, Distt. Wardha, Maharashtra, India to determine and compare the distribution of ABO and Rh blood groups. The ABO and Rhesus (D) blood grouping was done by tube method using venous blood samples.

Results: The predominant donors belonged to age group between 26-35 years (50.69%). Male donors were more than female donors (98.78%). The commonest ABO blood group was O (34.46%) followed by B (32.50%), A (24.98%) and AB (8.05%) respectively. The prevalence of Rhesus positive and negative distribution in the studied population was 96.76% and 3.23% respectively.

Conclusion: The commonest ABO blood group in our study was O followed by B, A, and AB respectively. The knowledge of the distribution of blood group in a particular geographical area is very important for blood banks. Transfusion service play an important role in the patient's health care.

Keywords: ABO Rhesus (D) Blood Groups; Blood Donors; Blood Bank.

Corresponding Author:

Bharat Umakant Patil,
Department of Pathology,
Mahatma Gandhi Institute of
Medical Sciences, Sevagram,
Wardha, Maharashtra 442102,
India.

E-mail:
drbharatpatil84@gmail.com

(Received on 13.01.2018,
Accepted on 09.02.2018)

Introduction

The ABO blood group system was first discovered by Karl Landsteiner in 1900 [1] and later he discovered Rh blood group in 1941 with Weiner [2]. Together these two systems have proved to be a breakthrough in the history of blood transfusion and immunohematology. Red blood cells contain a series of glycoproteins and glycolipids on their surface which constitutes the blood group antigens.

Production of blood group antigens is genetically controlled. On the basis of presence or absence of A and B surface antigens ABO blood group system is divided into four blood types namely A, B, AB and O [3-4].

ABO blood group system is important as the A and B antigens are strongly antigenic and anti-A and anti B are naturally occurring antibodies present in the serum of persons lacking the corresponding antigen.

In case of incompatible blood transfusions, these antibodies are capable of producing intravascular hemolysis [5].

Rh (rhesus) blood group system is the second most important blood group system and classified as Rh positive and Rh negative depending upon whether Rh antigen is present on red cells or not [6].

Rh antigens are highly immunogenic. D antigen is most significant out of 49 Rh antigens identified till now. The Rh status is routinely determined in blood donors, transfusion recipients, and in a pregnant woman [7] as the D negative individuals produce anti-D if they encounter the D antigen through transfusion or pregnancy and causes hemolytic transfusion reaction, or hemolytic disease of the fetus and newborn [6].

It is important to have the knowledge of ABO and Rh blood group distribution [8-9] for the effective blood banks inventory management.

It is also important for clinical studies, for reliable geographical information, reducing maternal and premature mortality rate [10], for genetic studies and for doing research in population migration patterns in addition to resolving certain medico-legal issues particularly in case of disputed paternity [11]. This study reports the distribution of ABO and Rhesus blood groups among blood donors.

Material & Methods

A retrospective study of the distribution of ABO and Rhesus (D) blood groups among blood donors was

carried out at our Blood Bank, in a tertiary care health institute, in a rural area in Maharashtra. This study was done for five years from January 2012 to December 2016. Total 22,255 medically fit donors in the age group of 18 – 60 years donated blood during this period. After blood donation, ABO blood grouping & Rh typing was done by test tube agglutination method by commercially available standard antisera i.e Anti A, Anti B, Anti AB and Anti D. Both forward (cell grouping) & reverse grouping (serum grouping) was carried out for determination of ABO blood groups. Final blood group was confirmed only if both forward & reverse groups were identical. Those who tested positive with anti-sera D were considered to be Rh positive and those who did not be were considered to be Rh negative. The donor blood group data were analyzed on specially prepared proforma and compiled.

Results

The total donors examined from January 2012 to December 2016 were 22255 out of which 21964 were male donors and 291 were female donors. Most of the donors belonged to the age group 26-35 years (50.69%) and least were from age group 60 and above. The commonest ABO blood group was O (34.46%) followed by B (32.50%), A (24.98 %) and AB (8.05%) respectively (Table 1). The distribution of Rhesus (Rh) D factor was as follows, 21535 (96.76 %) Rh D positive and 720 (3.24 %) Rh D negative. (Table 2). Out of 21964 male blood donors, 21282 were Rh D positive, 682 were Rh D negative. Out of 291 female blood donors, 253 were Rh D positive, 38 were Rh D negative. The

Table 1: Sex-wise distribution of ABO blood groups over a period of five years

Sex	A	B	AB	O
Male	5495	7131	1762	7576
Female	65	102	29	95
Total (%)	5560(24.98 %)	7233(32.50 %)	1791(8.05%)	7671(34.46%)

Table 2: Sex- wise distribution of Rh blood groups over a period of five Years

Rhesus blood group	Male (%)	Female (%)
Rh +ve	21282(96.9%)	253(86.9%)
Rh -ve	682(3.1%)	38(13.1%)
Total	21964(100%)	291(100%)

Table 3: Sex-wise distribution of RH positive and negative blood groups over a period of five years

Sex	Blood Groups							
	A+	A-	B+	B-	AB+	AB-	O+	O-
Male	5341	154	6928	203	1706	56	7307	269
Female	52	13	91	11	23	6	87	8
Total (%)	5393(24.23 %)	167(0.75%)	7019(31.53%)	214(1%)	1729(7.77%)	62(0.28%)	7394(33.22%)	277(1.2%)

distribution of ABO Rh-positive blood groups was as follows, blood group A positive 24.23 %, B positive 31.53 %, O positive 33.22 % and AB positive 7.77%, the most common being blood group is O positive. Among total 720 (3.24 %) Rh D negative blood donors, O negative (1.2%) was most common followed by B negative (1%), A negative (0.75%), and AB negative (0.28%) (Table 3).

Discussion

There is marked variation in incidence of ABO and Rh groups in different races, ethnic groups, and socio-economic groups in a densely populated country like India. There is variation in frequencies of ABO and Rh blood groups from one population to another and time to time in the same region.

The present study showed a large number of male donors compared to female donors which are comparable with other studies within India [12-13].

The most common age group donating blood is 26–35 yrs. This is comparable with other studies [14-15]. Above 60 yrs of age, people suffer from various ailments like hypertension, diabetes mellitus, low hemoglobin and ischemic heart diseases and hence restricted from donating blood or are considered unfit.

We compared our results with other studies carried out in different geographical areas. A study was done in Eastern India, by Nag et al [16], southern India by S Periyavan et al [17] Mallikarjuna et al [18] and Das et al [19] found that the commonest blood group was 'O', followed by B, A, and AB.

The studies done in Northern India by Tulika et al [20], and by Sidhu et al [21], showed blood group B to be the commonest, followed by O, A, and AB. The studies done in Western India by Wadhwa et al [22], Patel et al [15] and by Mehta et al [23], showed blood group B is the commonest followed by O, A, and AB. Geographical distribution of Blood Groups in India shows that in Eastern and Southern part, O is the most frequently occurring blood group, similar findings are seen in our study, whereas in Northern & Western part of India, B is the commonest blood group contrary to our study.

Outside India, the studies done in USA by Mollison et al [24], in Ethiopia by Kassahun et al [25], the commonest blood group was O similar to our study. The study done in in Pakistan by Rehman et al [26], observed that the commonest blood group was B. Study done at Nepal by Pramanik et al [27] found that the commonest blood group was A.

The incidence of Rh D positivity blood group in most of Indian studies varies from 94 to 98 % and Rh D negativity from 2 to 6% [28] whereas in our study 96.78 % were Rh D positive and 3.22 % were Rh D negative.

So to frame better National Transfusion Policy and efficient delivery of services regional Blood Grouping studies are the need of hour especially for management during emergency situations.

Conclusion

The knowledge of the distribution of blood group is very important for blood banks. Transfusion services plays an important role in the patient's health care. Access to safe and sufficient blood supply will help to reduce the morbidity and mortality rates. Every transfusion centre should have a record of frequency of blood group system in their population. It not only provides scientific data but also serves to enable insight into possibilities of the future burden of blood group associated diseases.

Funding: Nil,

Conflict of Interest:

None initiated.

Permission from IEC: Yes

References

1. Garratty G, Dzik W, Issitt PD, Lublin DM, Reid ME, Zelinski T. Terminology for blood group antigens and genes - Historical origins and guidelines in the new millennium. Vol. 40, Transfusion. 2000.p.477–89.
2. Klein H, Anstee D. Mollison's blood transfusion in clinical medicine. Blackwell Publishing. 2008.p.93-110 .
3. Monika Y KB. Frequency Distribution of ABO, & RH Blood Group Amongst Medical Students in SKNMC & GH, Pune. Indian J Appl Res. 2013;3:p.458–60.
4. Daniels G, Contreras M. ABO blood group system. Encycl Ref Immunotoxicol. 2005;p.4–7.
5. Hosoi E. Biological and clinical aspects of ABO blood group system. J Med Invest. 2008;55(3–4):p.174–82.
6. Garg P, Upadhyay S, Chufal SS, Hasan Y, Tayal I. Prevalence of ABO and Rhesus blood groups in blood donors: A study from a tertiary care teaching hospital of Kumaon region of Uttarakhand. J Clin Diagnostic Res. 2014;8(12):FC16-FC19.
7. Dean L. Blood Groups and Red Cell Antigens. Bethesda (MD): National Center for Biotechnology Information (US); 2005.
8. Behra R JY. Distribution of ABO blood group and Rh(D) Factor in western Rajasthan. Natl J Med Res. 2013;3: p.73–75.
9. Gadwalkar Srikant R, Kumar N Sunil, Ravidhar. Distribution of Blood Groups in and Around Bellary, Karnataka. Indian Journal of Clinical Practice. 2013 Aug;24(3):p.247-250.
10. Shubhra A RN. Prevalence of Rhesus Negative Pregnant Population at a Tertiary Care Hospital. Int J Sci Study. 2015;2:p.67–69.

11. Smita M DS. Distribution and Prevalence of ABO and Rh Phenotype blood groups in Eastern India. *J Pharm Biomed Sci.* 2014;2230:p.712–715.
 12. Giri PA, Yadav S, Parhar G S PD. The 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): p.988–90.
 13. Girish C J, Chandrashekhar T N, Ramesh Babu K KSM. ABO and Rhesus blood group distribution among Malnad region blood donors. *Res Rev Biomed Biotechnol [RRBB].* 2011;2(3):p.25–30.
 14. S. M. Prevalence of ABO and Rhesus blood group among blood donors. *Indian J Pub Heal Res Dev.* 2012;3(2): p.106–9.
 15. Patel Piyush A, Patel Sangeeta P, Shah Jigesh V OH V. Frequency and distribution of blood groups in blood donors in western Ahmedabad – a Hospital-based study. *Natl J Med Res.* 2012;2(2):p.207–10.
 16. Nag IDS. 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):p.54–5.
 17. Periyavan S, Sangeetha S K, Marimuthu P, Manjunath B K, Seema D M. Distribution of ABO and Rhesus-D blood groups in and around Bangalore. *Asian J Transfus Sci* 2010;4:41.
 18. Mallikarjuna Swamy CM, Basavaraj PB, Kavitha GU, Shashikala P. Prevalence of ABO and Rhesus blood groups among blood donors. *Indian J Public Heal Res Dev.* 2012;3(3):p.68–72.
 19. Das PK, Nair SC, Harris VK, Rose D, Mammen JJ, Bose YN, et al. Distribution of ABO and Rh-D Blood Groups among Blood Donors in a Tertiary Care Centre in South India. *Trop Doct.* 2001;31(1):p.47–8.
 20. Tulika Chandra GA. The frequency of ABO and Rhesus blood groups in blood donors. *Asian J Trans Sci.* 2012;6(1):p.52–3.
 21. Sidhu S. Distribution of the ABO Blood Groups and Rh(D) factor among the Scheduled Caste Population of Punjab. *Anthropologist.* 2003;5:p.203–204.
 22. Wadhwa MK, Patel SM, Kothari DC, Pandey M PD. Distribution of ABO and Rhesus D groups in Gujrat, India- a hospital based study. *Indian J Ped Oncol.* 1998;19(4): p.137–41.
 23. Mehta Nidhi SB. Prevalence of ABO Blood groups at Mahavir Heart Institute Surat. *Asian J Trans Sci.* 2012;6(1):74.
 24. Mollison PL, Engelfriet CP CM. The Rh blood group system. In: *Blood Transfusion in Clinical Medicine.* 9th ed. Oxford: Blackwell. 1993. p.2008-9.
 25. Tesfaye K, Petros Y, Andargie M. Frequency distribution of ABO and Rh (D) blood group alleles in Silte Zone, Ethiopia. *Egypt J Med Hum Genet.* 2015;16(1):p.71–6.
 26. Zaman et al 2015. Study of ABO and Rh-D blood group among the common people of Chittagong city corporation area of Bangladesh. *Pakistan J Med Heal Sci.* 2015;7(September):p.305–10.
 27. Pramanik T, Pramanik S. Distribution of ABO and Rh blood groups in Nepalese medical students: A report. *East Mediterr Heal J.* 2000;6(1):p.156–8.
 28. Agrawal A, Bhattacharya P, Kamath S, Mehta N, Tiwari A, Tulsiani S, et al. ABO and Rh (D) group distribution and gene frequency; the first multicentric study in India. *Asian J Transfus Sci.* 2014;8(2):121.
-