

Distribution of ABO and RH Blood Grouping in Rural Community of South India: A Population Based Study

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Abstract

Background: A wide knowledge about the distribution of blood grouping in any population will help in the successful management of the blood banks. *Aim:* This study was conducted to find the distribution of ABO blood grouping and Rh typing in a tertiary care hospital in South India and to compare it with previous literature from India and other parts of the globe. *Materials and Methods:* This was a retrospective study done at the blood bank of a tertiary care hospital for a period of 5 years and 6 months (January 2012 to June 2016). Forward blood grouping (Cell grouping) was done by both slide and tube agglutination method and Reverse grouping (Serum grouping) by tube agglutination method using daily freshly prepared known pooled A, B and O cells. Rh typing was done using antiglobulin technique. The results were recorded, analysed, tabulated and compared with previous similar studies. *Results:* Amongst the 9992 donors, O blood group formed the most common one - 3618 numbers (36.2%), followed by B blood group -3328 (33.3%) and A blood group - 2305 numbers (23.06%). AB was the least common blood group with 739 numbers (7.39%). 2 numbers (0.02%) of the rare Bombay blood group was present during the study period. In the Rh typing, majority, 9074 (90.8%) were Rh positive and only 918 (9.2%) were Rh negative. *Conclusion:* Regional blood group studies will provide a wide knowledge about the distribution of blood grouping in the population and will help in the successful management of the blood banks. A knowledge about the distribution of blood groups may also be useful to take preventive measures against certain diseases which have possible relationship with specific ABO groups.

Keywords: ABO Grouping; RH Typing; Blood Groups; Blood Bank; Transfusion.

Introduction

Blood grouping system are based on the antigens expressed on the surface of the RBCs. The expression of these antigens follow Mendelian inheritance which appear in fetal life and persists throughout the life. There are more than 700 antigens expressed on surface of RBCs and International Society of Blood Transfusion(ISBT) have organized the significant 287 antigens in the 33 blood groups.

ABO blood grouping system is the most significant one which was first discovered by the Austrian scientist, Karl Landsteiner in 1901[1] who described

initially only A, B and O blood groups. Later in 1902, Alfred Von Decastello and Adriano Sturli discovered AB group [2]. In 1937, Landsteiner with Alexander Weiner discovered the Rh antigen from Rhesus Monkey and defined the Rh blood group in 1940.

A wide knowledge about the distribution of blood grouping in any population will help in the successful management of the blood banks. A safe, sufficient and timely supply of blood products may save many preventable deaths. Apart from its utility in transfusion medicine, blood groups have their wide spread utility in various other fields like population based genetic studies, medicolegal issues including disputed paternity cases and their relationship to some diseases. The effective transfusion services should consider the antigenic profile of the local population and the South Indian donors differ widely in their antigenic frequencies when compared to western data

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and other parts of the country.

Hence this study was conducted to find the antigenic frequency and distribution of blood groups in a tertiary care hospital in South India and to compare it with previous literature from India and other parts of the globe.

Materials and Methods

This was a retrospective study done at the blood bank of Sri Manakula Vinayagar Medical College and Hospital, Puducherry for a period of 5 years and 6 months (January 2012 to June 2016). Blood were collected both from voluntary and replacement donors. The donors between age group (18-60) were considered medically fit for donation after standard

screening protocol. Forward blood grouping (Cell grouping) was done by both slide and tube agglutination method using commercially available standard antisera after validation in the blood bank. Reverse grouping (Serum grouping) was done by tube agglutination method using daily freshly prepared known pooled A, B and O cells. Rh typing was done using antiglobulin technique. All weak D groups were considered as Rh positive. The results were recorded, analysed, tabulated and compared with previous similar studies.

Results

A total of 9992 donors (both voluntary and replacement) were considered to be fit for blood

Table 1: ABO and Rhesus blood grouping

Blood Groups	Total Donors	Percentage
Abo Blood Grouping		
A	2305	23.06
B	3328	33.30
O	3618	36.20
Ab	739	7.39
Oh	2	0.02
Rhesus(Rh)Blood Group		
Rh+Ve	9074	90.8
Rh--Ve	918	9.2

Table 2: Genderwise distribution of ABO and Rhesus blood group in the study population

Blood Groups	Male	Female	Total donors
A +ve	2081(20.82)	18(0.18)	2099(21)
B+ve	3007(30.09)	29(0.29)	3036(30.38)
O+ve	3220(32.22)	24(0.24)	3244(32.46)
AB+ve	689(6.89)	4(0.04)	693(6.93)
A--ve	201(2.01)	5(0.05)	206(2.06)
B--ve	288(2.88)	4(0.04)	292(2.92)
O--ve	373(3.73)	1(0.01)	374(3.74)
AB --ve	43(0.43)	3(0.03)	46(0.46)
OH-ve	2(0.02)	0	2(0.02)
Total	9904 (99.11)	88 (0.88)	9992 (100)

Table 3: Comparison of frequency percentage of ABO grouping and Rh typing in various parts of the country and globe

Sl. No.	Study	A	B	AB	O	Rh+ve	Rh-ve
1	Present study	23.06	33.3	7.39	36.22	90.8	9.2
2	Khanna et al(4)	28.7	32.07	10.53	28.7	94.49	5.51
3	Chandra et al(5)	21.73	39.84	9.33	29.1	95.71	4.29
4	Garg et al(3)	28.7	32.07	10.53	28.7	94.49	5.51
5	Wadhwa et al(19)	23.3	35.5	8.8	32.5	94.2	5.8
6	Patel Piyush et al(6)	21.94	39.4	7.86	30.79	95.05	4.95
7	Singh et al(20)	22.9	38.83	9.54	28.7	90.72	9.28
8	Giri et al(7)	28.38	31.89	8.72	30.99	95.36	4.64
9	Nag et al(21)	23.9	33.6	7.7	34.8	94.7	5.3
10	Periyavan et al(9)	23.85	29.95	6.37	39.82	94.2	5.8
11	Das et al (8)	18.85	32.69	5.27	38.75	94.6	5.4
11	Khattak et al(22)	27.92	32.4	10.58	29.1	90.13	9.87
12	Pramanik et al(23)	34	29	4	33	95.7	3.3
13	Mwangi et al(10)	21.6	21.4	2.8	54.2	95.2	4.8
14	Bashwari et al(11)	24	17	4	52	93	7

donation during the study period of 4 years (January 2012 to December 2015). Out of them, 9904 (99.11%) were males and 88 (0.88%) were females. Amongst the 9992 donors, O blood group formed the most common one - 3618 numbers (36.2%), followed by B blood group - 3328 (33.3%) and A blood group - 2305 numbers (23.06%). AB was the least common blood group with 739 numbers (7.39%). 2 numbers (0.02%) of the rare Bombay blood group was present during the study period. In the Rh typing, majority, 9074 (90.8%) were Rh positive and only 918 (9.2%) were Rh negative.

Discussion

The proportion of male donors in this study population is large when compared to female donors which is similar to that in various other studies. This is because of the fact that most of the female donors, especially those from rural community are anemic and low weight and they are deferred at the screening stage itself. Improving the general health of the females by nutritional supplementation and spreading awareness about the blood donation process may help to recruit more female donor.

While looking at the ABO grouping, we observed O (36.22%) to be the commonest blood group followed by B (33.3%). This finding is in contrast to most studies like Garg et al [3], Khanna et al [4], Chandra et al [5], Patel Piyush et al [6] Giri et al [7] which are from the northern and western parts of the country reported B as the commonest blood group followed by O. But Das et al [8] and Periyavan et al [9] which are from the southern part of the country reports O to be the commonest blood group which is similar to our finding. Studies by Mwangi et al [10] from Africa, Bashwari et al [11] from Saudi Arabia also reports O to be the commonest blood group followed by B blood group.

Regarding Rh typing most studies reports 89-95% of the donors as Rh positive which is similar to our study which reports 90.8% of Rh positive. But the prevalence of Rh positivity in USA and Britain is only 83-85% [12].

Apart from its utility in transfusion services a knowledge about the distribution of blood groups may also be useful to take preventive measures against certain diseases which have possible relationship with specific ABO groups.

Various studies have explored the relationship between the ABO blood groups and their association with certain diseases. People with A blood group are

more prone to have cardiovascular diseases like atherosclerosis, ischemic heart disease and venous thrombosis when compared to people with O blood group [13]. Individuals with O blood group will have reduced risk of many malignancies including skin cancers like squamous cell carcinoma (14% lesser risk) and basal cell carcinoma (4% lesser risk) [14] and pancreatic cancer [15,16] when compared to people with other blood groups. Gastric cancer is more prevalent in individuals with A blood groups and least prevalent in O blood group individuals [17]. B blood group females are more prone to develop ovarian cancers [18]. Hence there regional blood group studies are needed to know the future load of these diseases.

Conclusion

The most common prevalent blood group in the present study is O blood group, followed by B blood group, which is similar to many studies from southern part of India and in contrast with studies from northern parts of India where B is the most common prevalent blood group. Regarding Rh typing, the present study reports 90.8% of Rh positive donors which is comparable to most studies which report 89-95% of the donors as Rh positive. Regional blood group studies will provide a wide knowledge about the distribution of blood grouping in the population and will help in the successful management of the blood banks. A knowledge about the distribution of blood groups may also be useful to take preventive measures against certain diseases which have possible relationship with specific ABO groups.

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