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A STUDY TO ASSESS THE ABO BLOOD GROUP ANTIGEN PHENOTYPE AND GENE DISTRIBUTION AMONG BLOOD DONORS AT A TERTIARY CARE RESEARCH INSTITUTE IN SOUTH INDIA

Immunohematology

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ABSTRACT

ABO blood group antigens form the basis of current blood transfusion practice and their prevalence among blood donors can provide a glimpse into the population distribution of ABO genes and hence this study was undertaken to assess the ABO antigen phenotype prevalence and ABO gene prevalence among blood donors at a tertiary care teaching research Institute in South India. A total of 49,279 donors have been checked for their ABO blood group. The O, A, B, AB blood group prevalence were 42, 20, 32, 6 percent respectively while the O, A, B gene frequencies were 65, 14, 21 percent respectively.

KEYWORDS

ABO gene, frequency, blood donors

INTRODUCTION:

The ABO blood group system was the first human blood group system to be discovered by Karl Landsteiner, an Austrian Scientist in 1900 [1]. The ABO blood group system is the only system in which antibodies are consistently and predictably present in the serum of normal individuals whose red cells lack the corresponding antigens [2]. The classification of blood groups into type A, B, AB and O in ABO system, is based on the presence or absence of inherited antigenic substances on the surface of the red blood cells and corresponding antibodies in serum of individuals. ABO blood group system has three i.e., *A, B, O genes,* of which *A* and *B genes* are co-dominant over the recessive *O gene*.

The frequencies of ABO blood groups vary from one population to another and time to time in the same region. The knowledge of distribution of ABO and Rhesus (Rh) blood groups at local and regional levels is helpful in the effective management of blood banks and safe blood transfusion services[3]. Hence the present study was undertaken.

AIM OF THE STUDY

To assess the ABO blood group antigen phenotype and gene distribution among the blood donors donating blood at the department of Transfusion Medicine of a tertiary care teaching research institute, Sri Venkateswara Institute of Medical Sciences(SVIMS), Tirupati.

MATERIAL & METHODS

This retrospective cross-sectional study was undertaken by analysis of the ABO blood groups of blood donors who donated blood between 1st Jan 2013 and 31st Dec 2017 at the Department of Transfusion Medicine, SVIMS, Tirupati. All the donors who donated blood were checked for ABO blood grouping by both forward(cell) and reverse(serum) grouping, cross checked for ABO blood group discrepancies if any and resolved following national guidelines[4]. All O group donors were checked for Bombay or parabombay phenotype using commercial anti-H Lectin (Tulip Diagnostics, India) and if found to be lacking H antigen, the donors were excluded. The reagents used to perform forward grouping and the pooled A, B, O cells used for performing serum grouping passed the daily quality control checks and Lot Quality checks before being used for donor group testing.

ABO blood group phenotypes were tabulated and ABO gene frequencies were calculated using Hardy Weinberg Equation.Data were recorded on a predesigned proforma and managed using Microsoft Excel 2007 (Microsoft Corp,Redmond, WA). All the entries were double checked for any possible error.

RESULTS

A total of 59,011 donors volunteered to donate blood during the study period, out of which 9,719 donors were defered as they were not fit to donate blood and 49,292 donors donated blood. Out of 49,292 donors who donated blood during the 5 year study period 41,566 donors were voluntary and 7,726 donors were replacement donors. Out of these 49,292 donors, 13 donors were lacking H antigen and were excluded from the present study. The ABO blood group frequency of 49,279 donors is tabulated (Table 1).Blood group O, A, B, AB had a frequency of 42, 20, 32, 6 percent respectively with O group being the most common group and AB the least common group.

Table 1: Year wise ABO blood group frequency distribution among donors

S.No	Year	Group A	Group B	Group O	Group AB	Total
1	2013	1674	2840	3429	540	8493
2	2014	1926	3312	4092	624	9954
3	2015	1838	2883	3888	570	9179
4	2016	1983	2996	4009	576	9564
5	2017	2505	3802	5061	721	12089
	Total	9926 (20%)	15833 (32%)	20489 (42%)	3031 (6%)	49279 (100%)

The ABO allele frequency was calculated (Table 2) using Hardy Weinberg law. The alleles had a frequency distribution in descending order as follows with OO, BO, AO, AB, BB, AA having prevalence of 42, 28, 18, 6, 4, 2 percent respectively. The ABO gene frequency were derived from Table 2 and tabulated (Table 3) which shows the gene frequency of O, B, A as 65, 21, 14 percent respectively in descending order.

Table 2: ABO allelic and gene frequency distribution among donors

S. No	Phenotype	Frequency	Genotype	Hardy Weinberg Equivalent	Frequency
1	A	0.20	AA	P2	0.02
			AO	2PR	0.18
2	B	0.32	BB	Q2	0.04

			BO	2QR	0.28
3	O	0.42	OO	R2	0.42
4	AB	0.06	AB	2PQ	0.06
	Total	1.00		P2+Q2+R2+2PQ +2QR+2PR	1.00

Table 3: ABO gene frequency distribution among donors

S.No	Name of the gene	Hardy Weinberg equivalent	Gene frequency
1	A gene	P	0.14
2	B gene	Q	0.21
3	O gene	R	0.65
	Total	P+Q+R	1.00

DISCUSSION:

The need for blood group prevalence studies is multipurpose, as besides their importance in evolution, their relation to disease and environment is being increasingly sought in modern medicine[5]. ABO blood group distribution varies geographically and temporally and is affected by migration, mutations, environmental pressures locally. The ABO Blood group prevalence from other studies were tabulated in comparison to the present study (Table 4) from which it can be observed that in South India, O group remains to be the most common group unlike B group in North India, A group in Britain or Switzerland.

Table 4: ABO blood group distribution across various parts of India and other countries

S.No	Place of study	ABO Group frequency in percentage			
		A	B	O	AB
1	Britain (Firkin F et al, 2008)[6]	42	8	47	3
2	Lucknow (Chandra et al, 2012)[7]	21.7	39.8	39.1	9.3
3	Bhopal (Rajesh et al, 2015)[8]	22.52	35.92	30.99	10.55
4	Switzerland (Thomas V et al, 2017)[9]	45.2	9.8	40.9	4.1
5	Gandhi Nagar (Rupali et al, 2017)[10]	25.19	35.65	29.11	10.05
6	Tirupati (Saiprasad BV et al, 2018)[11]	6.98	42.61	45.59	4.8
7	Present study	20	32	42	6

From the Table 4, it can be observed that, ABO blood group distribution varies across India and other parts of the world and may reflect the prevalent bacterial environment pressure in developing the most common blood group in that region.

CONCLUSION

The O, A, B, AB blood group prevalence were 42, 20, 32, 6 percent respectively while the O, A, B gene frequencies were 65, 14, 21 percent respectively. The ABO blood group frequency of this particular geographical region, Tirupati, South India, demonstrates the unknown local factors that might have caused to the preponderance of blood group O among the donors in particular and general population in particular of this region.

REFERENCES

1. Garratty G, Dzik W,Issitt PD, Lublin DM, Reid ME, ZelinskiT (2000).Terminology for blood group antigens and genes – historical origins and guideline in the new millennium. Transfusion, 40, 477-489.
2. Dennis LY, Hjlem NM, Fidler C (1998). Prenatal diagnosis of fetal Rh D status by molecular analysis of maternal plasma. New England Journal of Medicine, 339, 1734–1738.
3. Patel P, Sangeeta P, Jigesh S, Haren O (2012). Frequency and distribution of blood groups in donors in Western Ahmedabad-A hospital based study. National Journal of Medical Research, 2(2), 202-206.
4. Saran RK (2003). Technical Manual: Transfusion Medicine. 2nd Edition: Directorate General of Health Services, Ministry of Health and Family Welfare, The Government of India. New Delhi.
5. Platt D, Muhlberg W, Kiehl L, Schmitt RR (1985). ABO blood group system, age, sex, risk factors and cardiac infarction. Archives of Gerontology and Geriatrics, 4, 241-249.
6. Firkin F, Chesterman C, Penington D, Rush B (2008). De Gruchy's Clinical haematology in medical Practice, Blackwell Science Publisher, 5th Edition, 475.
7. Chandra T, Gupta A (2012). Frequency of ABO and rhesus blood groups in blood donors. Asian Journal of Transfusion Science, 6, 52-53.
8. Rajesh KC, Puja S, Vivek VB, Amit H, Shweeta R, Sawke GK, Shalaka A, Nilima S (2015). A study of distribution of ABO and Rh Blood groups system among blood donors at a tertiary care hospital. Journal of Evolution of Medicine and Dental Sciences, 4(18), 3138-3142.
9. Thomas V, Rebecca JC, Soraya A, Edgar M, Anita T, Behrouz MT (2017). Blood Group Distribution in Switzerland - a Historical Comparison. Transfusion Medicine and Hemotherapy, 44(4), 210-216.
10. Rupali P, Vandana P, Minesh BG (2017). Frequency and distribution of ABO and Rh Blood group antigens in healthy blood donors at the blood bank of a tertiary care hospital in Gandhinagar, Gujarat, India. Indian Journal of Pathology and Oncology, 4(4), 586-590.
11. Saiprasad BV, Faheem MK, Rajeshkrishna NVH, Chandrasekhar BHP, Vijayalakshmi S, Preethi, Venkatalakshmi A, Anuradha B (July 2018). IOSR Journal of Dental and Medical Sciences, 17(7), 1-5.