



SEROPREVALENCE OF TRANSFUSION TRANSMITTED INFECTIONS IN BLOOD DONORS AND ITS ASSOCIATION WITH ABO AND RH BLOOD GROUPS.

Pathology

**Dr. Kalyani
Ruprao
Deshmukh***

Junior Resident, Department of Pathology, Dr. Panjabrao Deshmukh Memorial Medical College, Amravati. *Corresponding Author

Dr. Ashish A. Tayde

Associate Professor, Department of Pathology, Dr. Panjabrao Deshmukh Memorial Medical College, Amravati.

**Dr. Chetna
Agrawal**

Assistant Professor, Department of Pathology, Dr. Panjabrao Deshmukh Memorial Medical College, Amravati.

Dr. Nafees Nomaan

Assistant Professor, Department of Pathology, Dr. Panjabrao Deshmukh Memorial Medical College, Amravati.

**Dr. Ramawatar
Soni**

Professor & Head of Department of Pathology, Dr. Panjabrao Deshmukh Memorial Medical College, Amravati.

ABSTRACT

Background: A blood screening is a procedure that is mandatory in health care services to reduce the incidence of transfusion-transmitted infections (TTI). Numerous studies have found a correlation between ABO blood groups and a various infectious and non-infectious diseases. Some blood groups may even act as receptors and ligand for various infectious agent. **Materials and Methods:** Cross sectional observational study, conducted over a period of one & half years at Blood Centre and Component Lab, Dr. Panjabrao Deshmukh Memorial Medical College, Amravati. Total 14515 healthy donors were collected and their blood samples were subjected to blood grouping and TTI testing. **Results:** Among all the donors, B Positive was the most common blood group accounting for 4730 (32.59%) donors. Overall seropositivity for TTI was 236 (1.62%) cases. Seropositivity among replacement blood donors (16.25%) was more compared to voluntary blood donors (1.26%). Hepatitis B infection was most common (1.14%) infection among all TTIs. Maximum seropositivity was observed in A Positive blood group (1.99%) followed by B Positive (1.88%) blood group. **Conclusion:** Even though no significant association between ABO and Rh blood groups was observed with TTIs, Hepatitis B was the most common infection found in blood donors. This high prevalence points towards the need for a comprehensive public health approach to eliminate TTI.

KEYWORDS

Seroprevalence, ABO and Rh blood group, TTI (Transfusion Transmitted Infections).

INTRODUCTION

Transfusion-Transmissible Infections (TTI) refers to those infections which are passed on from person to person via parenteral administration of infected blood or blood products. There is always 1% risk of transfusion transmitted infections (TTI) with every unit of blood transfusion¹.

Screening of donor's blood for TTI is carried out routinely in all blood transfusion centres to prevent transmission of these infection². There is a possibility of transmission of diseases such as HIV, HBV, HCV, Syphilis and Malaria despite of screening tests done prior to blood transfusion³.

Major problems in preventing the transmission of infectious diseases through blood transfusion are due to prevalence of asymptomatic carriers in the society, blood donation during window period of infection, inability of the screening tests to detect the disease in pre-seroconversion or window phase of their infection, high cost of screening, immunologically variant viruses, non-seroconverting chronic or immunosilent carriers and inadvertent laboratory testing errors.

Studies have found that blood collected from low-risk populations has a low percentage of TTI⁴, hence voluntary blood donors has less prevalence of TTI compared to paid and replacement blood donors⁵.

In addition to the significance of blood groups in transfusion the association of various blood groups with different human pathogens causing health related hazards especially Transfusion-Transmissible Infections (TTIs) such as hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV), human T-lymphotropic virus (HTLV) frequently occur during blood transfusion^{6,7}.

In this regard, the blood groups distribution plays important role in blood transfusion because of their relation to certain diseases^{8,9}.

Blood group antigens of the ABO blood group system are polysaccharides and protein molecules which are present on the surface of red blood cells¹⁰. It has been revealed that risk to a variety of transfusion transmitted infections (TTI) is associated with blood group type as presence of genetically determined ABO blood group antigen may block the binding of causative organism to the cell surface¹¹.

AIMS AND OBJECTIVES:

AIM: To determine the distribution of TTI in blood donors and determining association of TTI with any specific blood group type.

MATERIAL & METHODS:

This was cross sectional observational study conducted over a period of one & half years at Blood Centre and Component Lab, Dr. Panjabrao Deshmukh Memorial Medical College, Amravati. In this study all the donors fit for Blood donation between age 18 to 60 years were included. During the said period total 14515 healthy donors were collected. All the Donors who were fulfilling the criteria laid down by National Blood Transfusion Council were included. During donor collection blood samples were collected for Blood Grouping and TTI testing in pilot tubes. All samples were subjected to Blood grouping and were tested for TTI (HIV, HBsAg, HCV by ELISA method and Malaria Antigen and Syphilis by rapid card method).

OBSERVATIONS/RESULTS

The total number of donors included in present study were 14515 which were screened for TTI and their distribution among different blood groups was determined. Maximum donors (44.77%) were in a age group 18 to 30 years and most of the donors were males (97.55%). In present study most of the donors (32.59%) belong to "B" Positive blood group followed by blood group "O" Positive (31.11%), A Positive (19.99%), AB Positive (8.89%).

Out of 14515 donors, 236 cases (1.62%) showed seropositivity for TTI with HBV being the most common TTI (166 cases i.e 1.14%) as shown in table.

Table 01: Disease wise distribution of seropositive cases in donors

Seropositivity	Frequency
HIV	18 (0.124%)
HBV	166 (1.14%)
HCV	46 (0.32%)
Syphilis	4 (0.027%)
Malaria	2(0.013%)
Total Seropositive cases	236 (1.62%)
Total Donors	14515

Maximum seropositive cases were from the age group 18 to 30 yrs which accounted for 114 cases (1.75%). Out of 236 seropositive cases 230 (1.62%) were males and only 06 cases were females (1.68%). HBV was the most common TTI observed in males (162 cases i.e. 1.14%) as well as females (04 cases i.e 1.12%). Out of total 14515 donors, voluntary donors constituted for 14158 cases (97.54%) and only 357 were replacement donors (2.45%). Only 1.26% of voluntary donors showed seropositivity for TTI with HBV being most common TTI (0.89%) while 16.25 % of replacement donors showed positivity for TTI with HBV being most common (11.20%).

Table 2: Diseasewise distribution of the donors according to type of donors

Type of Donor	Total Voluntary donors (%)	HIV (%)	HBV (%)	HCV (%)	Syphilis (%)	Malaria (%)	Total seropositive donors (%)
Voluntary donors	14158 (97.54)	13 (0.09)	126 (0.89)	34 (0.24)	3 (0.02)	02 (0.014)	178 (1.26)
Replacement donors	357 (2.46)	5 (1.40)	40 (11.20)	12 (3.36)	1 (0.28)	00	58 (16.25)
Total	14515	18	166	46	4	2	236 (1.62)

Maximum seropositivity was found in A Positive blood group (1.99%) followed by B Positive, AB Positive, A Negative, O Positive, O Negative, B Negative accounting for 1.88%, 1.55%, 1.4%, 1.35%, 1.03%, 0.45% respectively.

Table 3 : Seropositivity for TTI according to ABO and Rh blood groups.

Blood Groups	Total Donors	HIV (%)	HBV (%)	HCV (%)	Syphilis (%)	Malaria (%)	Total Seropositive donors (%)
A Positive	2902 (19.99%)	8 (0.28)	36 (1.24)	10 (0.34)	03 (0.10)	1 (0.03)	58 (1.99)
A Negative	142 (0.99%)	0	02 (1.4)	0	0	0	02 (1.4)
B Positive	4730 (32.59%)	3 (0.06)	66 (1.4)	19 (0.42)	1 (0.02)	0 (0)	89 (1.88)
B Negative	443 (3.05%)	0	2 (0.45)	0	0	0	02 (0.45)
AB Positive	1290 (8.89%)	2 (0.16)	14 (1.09)	4 (0.23)	0	0	20 (1.55)
AB Negative	107 (0.74%)	0	0	0	0	0	0
O Positive	4516(31.11%)	4 (0.09)	44 (0.97)	12 (0.27)	0	1 (0.02)	61 (1.35)
O Negative	385 (2.65%)	1 (0.26)	2 (0.52)	1 (0.26)	0	0	04 (1.03)
Total cases	14515	18	166	46	04	02	

Among all the blood groups seropositivity for Hepatitis B was maximum. Overall seropositivity for TTI is maximum in A Positive blood group (1.99%). HIV is more prevalent in A Positive blood group (0.28%) followed by O Negative blood group (0.26%). Hepatitis B was commonly observed in B Positive(1.4%). Percentage of HCV positivity was more in B Positive (0.42%) followed by A Positive (0.34%) and O Positive (0.27%). Prevalence of Syphilis was more in A Positive blood group (0.1%) followed by B Positive (0.02%). Malaria

also shows more prevalence in A Positive blood group (0.03%) followed by O Positive blood group (0.02%). AB Negative blood group did not show any seropositivity.

DISCUSSION:

In the present study, B Positive was the most common blood group (32.58%) among all the donors followed by O Positive (31.11%) which correlates the results of Bharadva et al¹² and Sharma et al¹³ where percentage of B Positive and O Positive donors were 32.76 %, 29.9% and 34.42%, 29.6% respectively.

Present study showed that seropositivity among replacement donors was more (16.25%) as compared to voluntary donors (1.25%) which correlates with the study done by Nejat Siraj et al¹⁴ in which the seroprevalence in replacement donors was 6.9% and in voluntary donors it was 3.3%. It also correlates with the study of Hilda Fernandes et al³ in which 0.99% of replacement donors and 0.54% voluntary donors showed positivity for TTI.

This suggests that seropositivity in replacement donors was more than voluntary donors.

Table 04: Comparison of blood group with seropositivity

Blood Group	Present study		Sharma et al ¹³		Jitendra Singh Nigam et al ¹⁵	
	Seropositive Donors	Total Donors	Seropositive cases (%)	Total Donors	Seropositive cases	Total Donors
A Positive	58 (1.99%)	2902	133 (4.20%)	3169	22 (2.26%)	973
A Negative	02 (1.4%)	142	(3.97%)	151	02 (4%)	50
B Positive	89 (1.88%)	4730	219 (4.22%)	5184	30 (2.17%)	1382
B Negative	02 (0.45%)	443	07 (2.97%)	236	01 (1.09%)	91
AB Positive	20 (1.55%)	1290	64 (4.04%)	1585	08 (2.12%)	377
AB Negative	00	107	02 (3.08%)	65	00	24
O Positive	61 (1.35%)	4516	198 (4.44%)	4463	27 (2.31%)	1165
O Negative	04 (1.03%)	385	03 (0.145%)	207	03 (4.54%)	66
Total cases	236 (1.62%)	14515	632 (4.21%)	15060	93 (2.25%)	4128

In our study, out of 14,515 donors, B blood group was the most common blood group which accounted for 5173 donors (35.64%), followed by blood group O accounting for 4901 cases (33.76%) followed by A and AB blood groups.

The overall seropositivity in blood group A was found to be 1.97% followed by blood group B (1.76%), AB (1.43%) and blood group O (1.32%) respectively.

Above table shows that in the present study, there is no significant difference in overall seropositivity of TTI in different ABO blood groups except for slightly increased seroprevalence in A blood group.

CONCLUSION

In present study, B Positive blood group was found to be most common blood group and Hepatitis B was the most common TTI. Overall seropositivity in replacement donors was found to be more as compared to voluntary donors with Hepatitis B was most common TTI. TTI was in general found to be more common in A Positive blood group with Hepatitis B being the most common TTI. In present study we conclude that there is no direct correlation between ABO, Rh blood group with TTI positivity.

REFERENCES

- Widman FK (ed) (1985) Technical manual. American Association of Blood Banks, Arlington, pp 325-344.
- Amar MS, Siddiqi GM, Haq SN, Khokhar G, Jaffery G. Association of Blood Group Types to Hepatitis B and Hepatitis C virus Infection. Biomedica. 2011;27(12):57-61.
- Hilda Fernandes, PremaFancyD'souza, and Pushpa Maria D'souza. Prevalence of Transfusion Transmitted Infections in Voluntary and Replacement Donors. Indian J

- Haematol Blood Transfus. 2016;26(3):89-91.
4. WHO. Screening Donated Blood for TTIs: Recommendations. Geneva: WHO; 2010. p. 6.
 5. National AIDS Control Organization (NACO, India). Standards for Blood Banks & Blood Transfusion Services. New Delhi: NACO, Ministry of Health and Family Welfare, Government of India; 2007.
 6. R.R. Seeley, T.D. Stephens, P. Tate Anatomy and physiology (4th Ed.), The McGraw Hill Companies, Inc., USA (1998), p. 1098.
 7. M. Contreras, G. Daniels Antigens in human blood V.A. Hoffbrand, D. Catovsky, E.G.D. Tuddenham, A.R. Green (Eds.), Postgraduate haematology (6th ed.), Wiley-Blackwell, Oxford UK (2011), pp. 244-258.
 8. Changqing Li, Xiaopu Xiao, Huimin Yin, Miao He, Jianping Li, *et al.* Prevalence and prevalence trends of transfusion transmissible infections among blood donors at four chinese regional blood centers between 2000 and 2010 *J Translational Med*, 10 (2012), p. 176.
 9. Mohammed Yusuf, Alemayehu Bekele Seroprevalence of transfusion transmitted infection among blood donors at Jijiga blood bank, Eastern Ethiopia: retrospective 4 years study *BMC Research Notes*, 9 (2016), p. 129.
 10. Agarwal N. Response rate of blood donors in the Uttarakhand region of India after notification of reactive test results on their blood samples. *Blood Transfus.* 2014 Jan;12 Suppl 1(Suppl 1):s51-3.
 11. D. Subhashish, M.L.H. Kumar Association of blood group types to hepatitis B and hepatitis C virus infection among blood donors: a five years institutional based study *Int J Applied Basic Med Res*, 2 (2012), pp. 191-195.
 12. Bharadva S, Vachhani J, Dholakiya S. ABO and Rh association to transfusion transmitted infections among healthy blood donors in Jamnagar, Gujarat, India. *J Res Med Den Sci* 2016;4(1):58-62.
 13. Sharma P, Chaurasia RK, Singh P. Distribution of Transfusion Transmitted Infections in ABO and Rh Blood Groups: A 5 Year Study. *Ann. Int. Med. Den. Res.* 2017; 3(5):PT16-PT18.
 14. NejatSirat et al "Seroprevalence of transfusion-transmissible infections among blood donors at National Blood Transfusion Service, Eritrea: a seven- year retrospective study" *BMC Infectious Diseases* (2018) 18:264.
 15. Jitendra Singh Nigam, Savitri Singh, Ravi Prakash Kaushal, "The Prevalence of Transfusion Transmitted Infections in ABO Blood Groups and Rh Type System" *Hematol Rep.* 2014 Nov 19; 6(4): 5602.