

Prevalence of ABO and rhesus (D) antigens with possible transfusion transmitted infections in correlation to rhesus and ABO blood group systems

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ABSTRACT

Objective: The objective was to study the frequency of ABO and Rh (D) blood groups and its correlation to transfusion transmitted infections (TTI) among the blood donors who donated at Vinayaka Mission's Kirupananda Variyar blood bank, Salem, Tamilnadu. **Materials and Methods:** Details about blood grouping and TTI positivity of a total of 17678 potential blood donors were collected from the records of transfusion medicine department of our institution for 3 years period between July 2011 and June 2014. **Results:** Blood group 'B' had the highest incidence and 93.33% of the blood groups tested were Rh positive. 'A' blood group with Rh positivity was more commonly associated with TTI. **Conclusion:** The most common blood group tested in our blood bank was 'B positive,' whereas TTI was common in the 'A positive' blood donors.

Key words: ABO, Blood group, Prevalence, Rhesus, Transfusion transmitted infections

INTRODUCTION

The discovery of ABO blood groups by Karl Landsteiner was an important achievement in the history of blood transfusion along with Rh blood group antigens. People inherit different blood groups and this plays a very important role in transfusion safety.^[1] The ABO blood group system is the only system with naturally occurring antibodies and is consistent and predictable. Rh-D phenotype is categorized as Rh-D positive or Rh-D negative based on the presence or absence of Rh-D antigen. In transfusion practice, after A and B antigen, the D antigen is most immunogenic.^[2]

The prevalence of ABO blood groups is different among various populations. The study of blood groups is necessary, due to its role in various genetic studies, clinical studies for reliable geographical information, and blood transfusion practices.^[1] ABO blood groups are known to exert a major influence on hemostasis, more in relation to venous rather than arterial thrombosis. Studies have also shown an increased association between non-O blood group and gastric/pancreatic cancers.^[3] It is also used as genetic marker for obesity and is one of the strongest predictors of national suicide rate.^[2]

The present study was conducted to document the distribution of ABO and Rh blood groups among voluntary blood donors, who

attended blood bank of Vinayaka Missions Kirupananda Variyar Medical College and Hospital.

MATERIALS AND METHODS

This 3 years retrospective study conducted between July 2011 and June 2014 was carried out at blood bank of Vinayaka Missions Kirupananda Variyar Medical College and Hospital, Salem, Tamil Nadu which included both urban and rural population of Salem, Tamil Nadu.

The donors belonged to the age group of 18-56 years were medically fit for donation. All the blood units donated were tested for ABO and Rh blood groups and then screened for the recommended transfusion transmitted infections (TTI) infections as

Table 1: Prevalence of blood groups in the present study

ABO type	Percent
O	33.3
A	19.8
B	36.4
AB	10.6

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Table 2: Prevalence of TTI in relation to blood groups in the present study

Characteristics	No of units 17678 (100) (%)	HIV positive 30 (0.17) (%)	HBsAg positive 205 (1.16) (%)	HCV positive 21 (0.12) (%)	Syphilis positive 46 (0.26) (%)
ABO group					
A	3500 (19.79)	6 (0.03)	64 (0.36)	7 (0.03)	9 (0.05)
B	6436 (36.4)	12 (0.06)	58 (0.32)	5 (0.03)	13 (0.07)
O	5868 (33.1)	10 (0.05)	52 (0.29)	6 (0.03)	18 (0.10)
AB	1874 (10.6)	2 (0.01)	26 (0.14)	3 (0.015)	6 (0.03)
Rh group					
Rh positive	16361 (93.3)	27 (0.152)	59 (0.33)	17 (0.095)	44 (0.24)
Rh negative	1317 (7.45)	3 (0.018)	5 (0.032)	3 (0.016)	2 (0.01)

TTI: Transfusion transmitted infections, HIV: human immunodeficiency virus, HBsAg: Hepatitis B surface antigen, HCV: hepatitis C virus

per National guidelines. Among those who were screened positive for any of the five TTIs were categorized into blood groups. Hepatitis B surface antigen was tested by 3rd generation enzyme-linked immunoassay (ELISA), human immunodeficiency virus (HIV) 1, and 2 were tested by 4th generation ELISA, and hepatitis C virus was tested by 3rd generation, ELISA methods using NACO approved commercially available kits. Screening for syphilis was done by Venereal Disease Research Laboratory.

RESULTS

A total of 17678 potential blood donors were screened for their blood groups during a period of 3 years from July 2011 to June 2014. Prevalence of ABO blood groups area as shown in Table 1.

Of 17678 potential blood donors, Blood group B was the most prevalent (36.4%) among the blood units donated during the 1 year study period, followed by Group O, A, and AB i.e. 33.3%, 19.8%, 10.6%, respectively. Prevalence of Rh negative blood group was at only 6.7%. The prevalence of TTI in relation to blood groups is as shown in Table 2.

DISCUSSION

The distribution of blood group frequency follows a known pattern, which is governed by gene to gene transmission among generations (ABO gene is located on 9th chromosome and Rh antigen gene is located on 1st chromosome), and varies with race and geographical distribution of human beings. This establishes the fact that the character of ABO, Rh blood groups is exclusively an integrally heritable, genetically determined at birth and remains fixed for life.^[4,5]

The studies done in Southern part of India shows O blood group to be the most common, our study shows B blood group to be common. Studies in other parts of India show B blood group to be the most common. Countries like Australia and USA also have O blood group as most common blood group.^[1,5]

The incidence of Rh positivity varies in India from 94% to 98%. In our study, the Rh positivity was 93.33%. Britain and USA have the highest Rh negative incidence of 17% and 15%, respectively.^[1,5]

Association between blood groups and diseases is commonly seen. Association with blood groups is seen with peptic ulcer, gastric carcinoma, venous thromboembolism, stress, mental disorders, etc., In our study, TTI were common among Rh positive blood group donors than among Rh negative donors as they are mostly prevalent. Most studies have shown increased prevalence of TTI in Rh positive groups. Among ABO blood groups, HIV was more commonly seen in 'B' blood group donors, while hepatitis B and C was commonly seen in 'A' blood group. In various studies, 'O' blood group is commonly known to be associated with TTI.^[6,7]

Regarding syphilis, prevalence was more in 'O' blood group, however, in other studies, 'A' blood group had more prevalence.^[6]

It is better to identify blood group as early as 1 year of birth, since the antigens are naturally occurring, and this should be indicated on national identity cards, driving licenses, school/office identity cards, etc., as it will be very useful during urgent transfusion, especially when yet to be cross matched blood is necessary. Prevalence of infections in various blood groups still requires further study. Much larger studies are needed to identify its prevalence and research is necessary toward evaluation of the possible cause which makes this particular blood group prone for TTI in various geographic locations.^[6,7]

CONCLUSION

It is concluded that B blood group with Rh positivity is common in our study. It also concludes that 'A' blood group with 'Rh' positivity have increased the risk of TTI. This study is vital for blood banks and transfusion services that contribute to patient's health care. Large population and multi-centric studies are required to estimate an accurate prevalence of common blood group in Tamil Nadu. Knowledge of blood group distribution is essential for reliable geographical information, medical diagnosis, genetic information, genetic counseling, clinical/forensic studies in the population and also for the general wellbeing of individuals.

REFERENCES

- Rajshree B, Raj JY. Distribution of ABO blood group and Rh (D) factor in Western Rajasthan. *Natl J Med Res* 2013;3:73-5.
- Chandra T, Gupta A. Frequency of ABO and rhesus blood groups in blood donors. *Asian J Transfus Sci* 2012;6:52-3.
- Franchini M, Favaloro EJ, Targher G, Lippi G. ABO blood group, hypercoagulability, and cardiovascular and cancer risk. *Crit Rev Clin Lab Sci* 2012;49:137-49.
- Gangwar V, Kumar D, Khan FA, Gangwar RS, Kumar G, Malik K. Frequency distribution of ABO, Rh blood groups amongst the population of Uttar Pradesh. *Int J APSBMS* 2012;1:332-4.
- 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;2:988-90.
- Tyagi S, Tyagi A. Possible correlation of transfusion transmitted diseases with Rh type and ABO blood group system. *J Clin Diagn Res* 2013;7:1930-1.
- Deshpande RH, Kolhe SM. Distribution of blood groups in blood donors at Smt. Saraswati Karad blood bank, Latur. *J Med Educ Res* 2012;2:5-11.

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