Original Article

ABO and Rh association to transfusion transmitted infections among healthy blood donors in Jamnagar, Gujarat, India

Sumit Bharadva[1], Jitendra Vachhani[1], Spruha Dholakiya[1]

[1]Department of IHBT, Shri M P Shah Government Medical College & G.G. Hospital, Jamnagar, Gujarat, India.

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ABSTRACT

Background: International society of blood transfusion has defined 33 blood group systems and 700 erythrocyte antigens of them some have direct association with infections**.**

Aims & objectives: This study aims at investigating the seroprevalence, correlation between ABO and Rh groups and transfusion transmitted infection namely: HIV, HBV, HCV & syphilis.

Methods: The serum samples of the donors were tested for the most common transfusion transmitted infections as mentioned above by Third generation ELISA for HBV and HCV, Fourth generation sandwich HIV -ELISA and RPR tests for syphilis. Blood grouping of the donors was done through standard tube agglutination technique with forward and reverse grouping. The results thus obtained were put for chi square analysis in order to determine statistical significance.

Results: Total, 41909 serum samples were tested from January -2013 to March-2015, of which 317 were positive for transfusion transmitted infections. The seroprevalence of HBV, HCV, HIV and syphilis was 0.57%, 0.05%, 0.10% and 0.05% respectively. HCV infection were significantly associated with blood group of donors ($P<0.05$). Percentage of HCV was found to be higher in donors with blood group A. There was no significant association found between HIV, HBV and syphilis with blood group of donors.

Conclusion: Prevalence of transfusion transmitted infections among blood donors of G. G. Hospital is relatively low as compared with different regions of India. From the study it was concluded that blood group type of an individual has got some association with HCV infection.

Keywords: ABO Blood groups, Rhesus (Rh) blood group, transfusion transmitted infections

INTRODUCTION

Blood group antigens which can be polysaccharides and proteins are present on the surface of red blood cells. International society of blood transfusion has defined 33 blood group systems which include around 700 erythrocyte antigens. Out of them ABO and Rh grouping is most important [1, 2].

These blood group antigens play a very crucial role in solving some medico legal issues, population genetic studying, understanding the pattern of inheritance and migration. In the era of modern medicine, these antigens also play an important role in establishing relation between disease and environment. Some blood groups may act as receptor and ligand for bacteria, parasites and viruses. As group antigens are soluble they may block the binding of polysaccharide to organisms, this can be the probable pathogenesis [3].

Various studies have revealed the correlations of blood grouping with infectious and non infectious diseases. Out of them, HIV, HCV are of more concern then other infectious disease due to their high degree of viremia & carrier or latent stage. Some life threatening disorders are also caused by them.

AIDS first reported in 1981 in USA and HIV isolated in 1983. 35 million people are infected of HIV and the number is still increasing [4, 7]. Similarly, Hepatitis B and Hepatitis C are also considered as major health problem in the society. About 2 billion people are infected by HBV; 240 million of them have developed chronicity to the disease [5]. About 3-4 million are newly infected to HCV every year [6]. An organism

named Treponema pallidum causes a systemic disease called Syphilis. Though cost effectiveness of syphilis tests is bit high but considering the safety and health of patients, test for syphilis is also included in transfusion transmitted infections. Thus, testing for syphilis is considered to have a value as a lifestyle indicator.

Various studies have taken place regarding association of ABO and Rh blood grouping and transfusion transmitted infections but due to different methods, sample size, social factors and geographic locations, the results obtained were different.

This study aims to investigate the prevalence of Hepatitis B, Hepatitis C, HIV and Syphilis infection in blood donors of Blood Bank, Dept of IHBT, M. P. Shah Govt Medical College and G.G. Hospital, Jamnagar, having donation of about average 18500 per year. The study was undertaken between 1st January2013 to 31st march 2015.

MATERIALS AND METHODS

This a retrospective study conducted at Blood Bank, Dept of IHBT, M. P. Shah Govt Medical College and G.G. Hospital, Jamnagar, Gujarat. All donations from 1st January 2013 to 31st march 2015 were reviewed. All donors who passed through routine medical examination and pre-donation counselling were included in this study. Total 41909 donors were found eligible to donate blood. All the serum samples of these donors were tested by Third generation ELISA kit for Hepatitis B and Hepatitis C, Fourth generation sandwich ELISA kit for HIV and RPR tests for syphilis.

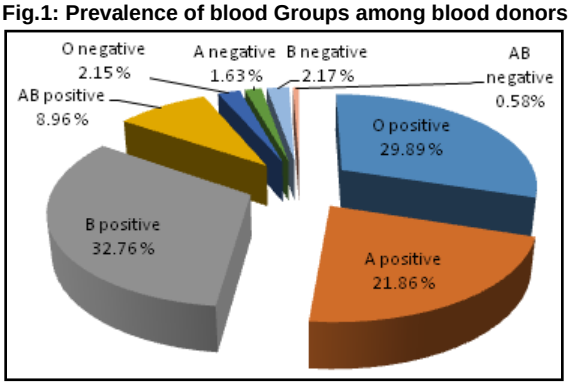
Blood grouping was done by standard test tube agglutination method. Both forward grouping (cell grouping) and reverse grouping (serum grouping) were done. Final groups were confirmed only when both cell type and back type are identical. Antiglobulin technique was used to confirm Rh negative status of donor. All weak Du groups were considered Rh positive.

Collection of data was done from Easy Software Blood Bank Data Management system (it is the software used for blood banking in G.G. Hospital, Jamnagar). Chi-square was performed by Epi info™ 7 software. 0.05 p value was considered statistically significant.

RESULTS

A total of 41909 donations were collected over a period of 2 years and 3 months. Blood grouping of all of them was done. Donors having blood group “O” positive with frequency of 12530(29.89%) were most common where as those with blood group “AB” Negative with frequency of 240 (00.57%) were least. (**Figure 1**)

Fig.1: Prevalence of blood Groups among blood donors



The overall prevalence of HBsAg, anti-HCV, HIV Ag/Ab and Syphilis antibody were 0.57%, 0.05%, 0.10% and 0.05% respectively. (**Table 1**)

Table 1: Frequency of transfusion transmitted infections

Types of Infections	Number of positive cases (%, n= 41909)
HIV	44 (0.10%)
HBV	237 (0.57%)
HCV	19 (0.05%)
Syphilis	19 (0.05%)

Apart from HCV, no other transfusion transmitted infections namely: HIV, HBV and Syphilis were significantly associated with ABO and Rh Blood group system

In HCV positive donors, there was a significant association found between Hepatitis C infection and ABO Blood groups system (P value=0.003, X^2=8.74). Percentage of HCV was found to be higher in donors with blood group “A” and lower with those having blood group “B”. If the entire ABO and Rh group is taken in to consideration, it was found that percentage of “A Negative” donor was most significantly associated with HCV positivity (P value=0.012, X^2=6.32).

Table 2: The prevalence of transfusion transmitted infections according to ABO status

Blood group	Number of donors	HIV +Ve		HBV +Ve		HCV +Ve		SYPHILIS +Ve	
		Number	(%)	Number	(%)	Number	%	Number	%
O	13434	13	(0.10)	68	(0.51)	3	(0.02)	4	(0.03)
A	9846	10	(0.10)	62	(0.63)	9	(0.09)	6	(0.06)
B	14633	20	(0.14)	85	(0.58)	3	(0.02)	7	(0.05)
AB	3996	01	(0.03)	22	(0.55)	4	(0.10)	2	(0.05)
TOTAL	41909	44	(0.10)	237	(0.57)	19	(0.05)	19	(0.05)
P Value		0.08		0.63		0.003		0.62	

Table 3: The prevalence of transfusion transmitted infections according to Rh status

Blood group	Number of donors	HIV POSITIVE		HBV POSITIVE		HCV POSITIVE		SYPHILIS POSITIVE	
		Number	%	Number	%	Number	%	Number	%
Rh D positive	39179	41	(0.11)	224	(0.57)	17	(0.04)	16	(0.04)
Rh D negative	2730	03	(0.11)	13	(0.48)	02	(0.07)	03	(0.11)
TOTAL	41909	44	(0.10)	237	(0.57)	19	(0.05)	19	(0.05)
P Value		0.93		0.52		0.48		0.10	

Table 4: Prevalence of transfusion transmitted infections according to ABO with Rh status

Blood group	Number of donors	HIV POSITIVE		HBV POSITIVE		HCV POSITIVE		SYPHILIS POSITIVE	
		Number	%	Number	%	Number	%	Number	%
O positive	12530	13	(0.02)	60	(0.47)	03	(0.02)	04	(0.03)
A positive	9165	08	(0.09)	61	(0.66)	07	(0.07)	05	(0.05)
B positive	13728	19	(0.14)	83	(0.60)	03	(0.02)	05	(0.04)
AB positive	3756	01	(0.03)	20	(0.53)	04	(0.11)	02	(0.05)
O negative	904	00	(0)	08	(0.88)	00	(0)	00	(0)
A negative	681	02	(0.29)	01	(0.15)	02	(0.29)	01	(0.15)
B negative	905	01	(0.11)	02	(0.22)	00	(0)	02	(0.22)
AB negative	240	00	(0)	02	(0.83)	00	(0)	00	(0)
TOTAL	41909	44	(0.10)	237	(0.57)	19	(0.05)	19	(0.05)
P Value		0.18		0.80		0.012		0.11	

Table 5: Prevalence of seropositivity according to type of collection

Type of collection	Number of donors	HIV POSITIVE		HBV POSITIVE		HCV POSITIVE		SYPHILIS POSITIVE	
		Number	%	Number	%	Number	%	Number	%
Camp	18507	07	(0.04)	102	(0.55)	10	(0.05)	07	(0.04)
In house	23402	37	(0.16)	135	(0.58)	9	(0.04)	12	(0.05)
TOTAL	41909	44	(0.10)	237	(0.57)	19	(0.05)	19	(0.05)

Table 2 and **Table 3** are gives idea about ABO Blood group wise and Rh Blood group wise distribution of these tests: HIV, Hepatitis B, Hepatitis C, and Syphilis.

The prevalence of transfusion transmitted infections according to ABO/Rh status, given in **Table 4.**

Prevalence of seropositivity according to type of collection is shown in **Table 6.**

DISCUSSION

Association of blood groups with numerous diseases were investigated once blood groups were discovered. In determining therapeutic strategies, the associating and prognostic factors' identification lead to better treatment.

The above study demonstrated that donors having blood group "B" positive with frequency of 13728 (32.76%) were most common where as those with blood group "AB" Negative with frequency of 240 (00.57%) were least.

In the current study, overall prevalence of HIV, HBsAg, HCV and Syphilis was 0.10 %, 0.57%, 0.05% and 0.05% respectively. Compared with different regions of India, this level of prevalence of blood-borne infections among blood donors is relatively low [8]. In our study a significant correlation was established between Hepatitis C infection and ABO blood groups. Maximum correlation is established between "A Negative" donors and HCV Positivity. Our results show that presence of "A" antigen has got some correlation with HCV positivity.

With regards to type of collection, in-house donation shows higher cases of positivity than camp (voluntary) donation, this clearly signifies that voluntary donation leads to reduced seropositivity as far as data is concerned. Table5

In overall study it was found that there was maximum prevalence of HBV among blood donors. The trend of seropositivity does not seem to reduce since the years of study. It is possible to reduce this prevalence among blood donors by vaccination of health worker and families of HBV positive donors, creating public awareness about blood-borne infections and their routes of transmission.

So far, in several studies association of specific blood group to specific diseases has been investigated. In "non O" blood group, prevalence of cardiac disease, ischemic heart disease, venous thrombosis, squamous-basal cell carcinoma is high. Whereas those with "A" blood group are at increased risk of gastric, pancreatic and salivary gland tumours. Those having B-antigen are at high risk of ovarian cancer and diabetes mellitus [9, 10]. Some blood groups showed resistance towards specific infections, like blood groups B and O are associated with resistance to small pox, blood group "Pk" is associated with resistance to HIV-1 and absence of duffy blood group associated with resistance to *plasmodium vivax* [11].

In present study, correlation is established between "A Negative" donors and HCV Positivity. Our results show that presence of "A" antigen has got some correlation with HCV positivity. In similar study of Mohammadali and Pourfathollah , there was a significant association observed between HCV and ABO/ Rh wherein blood group "O" and "AB" were most common among blood donors [12]. In another study of Surabhi Tyagi and Alok Tyagi, it was found that donors with blood group "Rh Negative" were more prone for TTI infections, whereas those with Blood group "B Negative" were found to be more prone to HCV infection [13].

In present study, no significant association was found between ABO/Rh group and infectivity for transfusion transmitted infection namely: HBV, HIV and Syphilis. In one study of Abolfazl Pourhassan, there was a significant association found between ABO/Rh groups and HIV & HBV, and no noteworthy association was established for HCV & VDRL [14]. Such results may be due to limited sample size, dynamic geographic distribution or varied genetic makeup of the donors.

CONCLUSION

From the above study it can be concluded that, there is definitely some association between ABO/Rh blood group and Hepatitis-C infectivity. According to this study, other transfusion transmitted infections are not significantly correlated with ABO/Rh groups.

LIMITATION

The study was conducted for a short period of time of 2 and ½ years, due unavailability of exact data, as we lacked the computer software for the same. Moreover, due to limited sample size, exact correlation could not be established between the blood groups ABO & Rh and infectivity of transfusion transmitted infections.

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Corresponding Author:

Sumit Bharadva,
Resident
Dept of IHBT
Shri M. P. Shah Government Medical College & G.G. Hospital,
Jamnagar,
Gujarat, India.
E-mail: sumit_bharadva@Hotmail.Com

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