

Research Article**Seroprevalence of Viral Transfusion Transmitted Infections (HIV, HBV and HCV) and Their Possible Correlation with ABO and RhD Blood Group Types in Blood Donors at a Tertiary Care Institute in Haryana****Dr. Pawan Singh¹, Dr. Shivani Kalhan², Dr. Shweta Rana³, Dr. Sonia Hasija⁴, Dr. Ashok Sangwaiya⁵,
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Abstract: Human Immunodeficiency Virus (HIV), Hepatitis B virus (HBV) and C virus (HCV) are known to be transmitted through blood and blood products. Many studies have been performed to determine relationship between infectious diseases and blood groups. This study aims to detect the relationship between the HIV, HBV and HCV infections with ABO and Rh D blood groups in Haryana. After blood donation, blood grouping ABO & RhD was done by antigen antibody agglutination test by test tube agglutination method. Both forward (cell grouping) & reverse grouping (serum grouping) method were done. Elisa (Enzyme linked immune sorbent assay) was conducted for anti HIV I & II antibodies, Hepatitis B surface antigen and anti HCV antibodies to detect the prevalence of these viral infections among blood. Among 4231 blood donors, 28(.66 %) were positive for HIV, 128 (3.02%) for HBs Ag and 53 (2.01%) for HCV antibodies (HCVAb). HIV, Hepatitis B and Hepatitis C infections were significantly associated with blood group of the donors; overall seropositivity was highest in O positive blood group donors(5.40%) as compared to AB negative donors in which seropositivity was observed nil. When considering ABO blood groups, HIV seropositivity was highest in A blood group donors(.83%), however HBs Ag(3.5%) and HCV(1.33%) seropositivity was highest in O blood donors. The seropositivity was higher among the RhD positive donors(5.08%) as compared to RhD negative (3.33%). There was a significant association between blood group of donors and infections.**Keywords:** HIV, Hepatitis B virus, Hepatitis C virus, ABO Blood group, RhD.

INTRODUCTION

Many studies have been performed to determine the relationship between infectious diseases and blood groups. Interaction of microorganisms and Red Blood Cell membrane is probably because of antigenic similarity, adherence through specific receptors or modulation of antibody response [1]. The first known relationship between blood group and infectious diseases was seen in Plasmodium vivax, and it is believed that susceptibility to HIV infection is related to blood groups and Rh factor [2].

Among infectious diseases, Human immunodeficiency virus (HIV) and Hepatitis virus are of great concern because of their prolonged viraemia and carrier or latent state. They also cause fatal, chronic and life-threatening disorders. AIDS in human was first reported in 1981 in USA and HIV was first isolated in 1983[3,4]. HIV has infected more than 33 million people thus far worldwide and infection rates continue to increase[5]. Infection with hepatitis B and hepatitis C are also the major health problems worldwide. There

are about 2 billion people infected by HBV and among them more than 240 million have chronic (long-term) liver infections [6]. It is estimated that 150 million people are chronically infected with HCV and 3 – 4 million are newly infected each year [7].

Several studies have assessed the association of blood groups with blood-borne infections but based on different sample size, test methodology, covered age, social risk factors and geographic conditions, results have been different.

The aim of this study was to investigate the prevalence of HIV, Hepatitis B and Hepatitis C viral infections in blood donors and to determine the association if any between these transfusion transmitted infections and ABO and Rh blood groups.

MATERIAL & METHODS

After blood donation, blood grouping ABO & Rh was done by antigen antibody agglutination test by commercially available standard antisera i.e Anti A,

Anti B, Anti AB and Anti D by test tube agglutination method. Both forward (cell grouping) & reverse grouping (serum grouping) method were done. Final blood group was confirmed only if both forward & reverse groups are identical. The blood sample which showed agglutination with anti D was labelled as positive and rest were labelled as negative for Rh D blood group. RhD negative blood donor's samples were tested further for weak D and Partial D antigens by indirect anti-globulin test . We conducted Elisa (Enzyme linked immune sorbent assay) tests for detection of anti HIV I & II antibodies, Hepatitis B surface antigen and anti HCV antibodies to detect the

prevalence of these viral infections among blood donors at the blood bank. The results were analyzed to study the relationship between these viral infections and different blood groups.

RESULTS

During the period from August 2013 to February 2015, 4231 serum specimens collected from blood donors were tested by Elisa procedure. Out of these 209 (4.93 %) turned out to be seropositive for HIV, HBsAg and HCV. Total 28(.66%) cases were seropositive for HIV, 128 (3.02%) for HBV and 53 (1.25 %) for HCV infections (Table 1).

Table -1: Blood group wise sero-positivity of HIV, HBsAg, and HCV in blood donors.

Blood group	Total donors		Anti HIV		HBsAg		Anti HCV		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
A positive	865	20.44	8	.92	24	2.77	11	1.27	43	4.97
B positive	1471	34.76	13	.88	41	2.78	20	1.35	74	5.03
AB positive	369	8.72	2	.54	10	2.71	5	1.35	17	4.60
O positive	1166	27.55	3	.25	44	3.77	16	1.37	63	5.40
A negative	88	2.07	0	0	3	3.40	0	0	3	3.40
B negative	130	3.07	0	0	4	3.07	0	0	4	3.07
AB negative	30	.70	0	0	0	0	0	0	0	0
O negative	112	2.64	2	1.78	2	1.78	1	.89	5	4.46
Total	4231		28	.66	128	3.02	53	1.25	209	4.93

The HIV seropositivity among ABO blood group donors was as follows: group A 0.83% (n= 8), B 0.81% (n=13), AB .50 % (n=2), and O 0.39 %(n=5).The hepatitis B surface Ag positive among ABO blood group donors were as follows: group A 2.8% (n=27), B

2.8% (n=45), AB 2.5% (n=10), and O 3.5 % (n=46), while the seropositivity of hepatitis C virus among ABO blood group donors was : group A 1.15% (n=11), B 1.24% (n=20), AB 1.25 % (n=5), and O 1.33 %(n=17) (Table 2).

Table -2: ABO blood group wise seropositivity of HIV, HBsAg, and HCV

Blood group	Total donors	Anti HIV		HBsAg		Anti HCV		Total	
		No.	%	No.	%	No.	%	No.	%
A	953	8	0.83	27	2.8	11	1.15	46	4.82
B	1601	13	0.81	45	2.8	20	1.24	78	4.74
AB	399	2	0.50	10	2.5	5	1.25	17	4.26
O	1278	5	0.39	46	3.5	17	1.33	68	5.32
Total	4231	28	0.66	128	3.02	53	1.25	209	4.93

The distribution of Rh positivity among the HIV positive cases showed 0.67 %(n=26), to be Rh(D) positive, 0.55%(n= 2) Rh(D) negative, HBsAg positive cases showed 3.07 %(n=119) Rh positive, 2.5 %(n=9)

Rh negative, while on hepatitis C viral Ab positive cases showed 1.34 %(n=52) Rh positive, and 0.27 %(n=1) Rh negative (Table 3).

Table -3: Seropositivity of HIV, HBsAg and HCV according to Rh D Positive and Rh D Negative blood group types.

Blood group	Blood Donors		HIV		HBsAg		HCV		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Rh positive	3871	91.49	26	0.67	119	3.07	52	1.34	197	5.08
Rh negative	360	8.5	2	0.55	9	2.5	1	0.27	12	3.33
	4231		28	0.66	128	3.02	53	1.25	209	4.93

DISCUSSION

After the discovery of blood groups, numerous studies on associations of blood groups and various diseases have been performed.

The biological role of blood groups relates to the presence of chemical moieties on the other cells that were initially identified as red cell antigens. These act as receptors and ligands for bacteria, parasites and viruses. There are many reports associating different infections with particular ABO blood group [8,9].

So far, in several studies the association of specific blood groups to certain diseases has been investigated. Prevalence of cardiovascular disease, ischemic heart disease, venous thrombosis, atherosclerosis, squamous cell carcinoma and basal cell carcinoma is higher in individuals with non-O blood groups. B antigen links with increased risk of ovarian cancer and diabetes mellitus. Prevalence of gastric cancer, pancreatic cancer and salivary gland tumors is higher in "A" blood group. "O" blood group individuals are known to have a higher risk of cholera, gastrointestinal infection with *E. coli*, peptic ulcer, duodenal ulcer, chronic myelocytic leukemia, acute lymphocytic leukemia and thalassemia. HTLV-1, cervical carcinoma and pulmonary tuberculosis have reported to be more common in persons with blood group "AB". On the other hand, some studies have demonstrated association of specific blood groups and resistance to certain infections for example blood groups "O" and "B" are associated with resistance to small pox, blood group "P_k" is associated with resistance to HIV-1 and the absence of the Duffy blood group is associated with resistance to *Plasmodium vivax*[10].

In this study, blood group B positive was found to be commonest and AB negative was least frequent among blood donors. The overall prevalence of HIV, hepatitis B and hepatitis C viral infections was 0.66%, 3.02 % and 1.25 % respectively.

HIV seropositivity was observed to be the highest in blood group A (.83%) as compared to group O(.39%), revealing lowest seropositivity. Rh positive (0.67%) donors were more seropositive for HIV than Rh negative (.55%). However in one study, patients who were HIV sero-positive, "O positive" was the most prevalent blood group and "AB negative" blood group was the least prevalent [11]. In Nigeria in pregnant women, the prevalence of blood group "O positive" was higher than in the general population[12]. Farhud *et al.* showed a significant decrease of "B" blood group in anti-HIV positive individuals [13].

The mechanism between blood type and infections remains undefined, which may be related to red cell immune adherence function among persons with different blood types[14]. The Swedish researchers

investigated cell surface-expressed P_k in HIV infection and concluded that P_k expression strongly influences susceptibility to HIV-1 infection. This implicates P_k as a new endogenous cell-surface factor that may provide protection against HIV-1 infection and shows that Individuals with high P_k levels exhibited a greater natural resistance to HIV infection [10], ABO and Rh blood group polymorphisms may be involved in viral transmission. This study also justifies the statement that "in any country, as the proportion of the population with infectious diseases, such as HIV and hepatitis, increase the proportion of the population who are eligible to donate blood falls [15].

HBV and HCV infections are commonly transmitted by per-cutaneous or per-mucosal exposure to contaminated blood, blood products or blood derived body fluids. As little as 0.01 ml of such secretions can transmit these infections [16]. As regards association of HBsAg and Anti-HCV, it has long been observed that blood group antigens do have a biological role in the human beings [17]. Present study shows that 3.02 % of the blood donors were HBsAg positive, 1.25 % anti-HCV positive. The frequency of HBsAg and Anti-HCV positivity is different in different ABO blood groups. Seroprevalence of HBsAg and HCVAb were found to be higher in donors who have blood group O (3.5 %, 1.33 %) respectively as compared to other ABO blood groups. Similar distribution of blood groups was reported[18]. In similar finding, in a study, performed on patients with hepatitis B in the hemodialysis center [19], blood group "O" was more frequent among people with HBV. In another study, higher frequency of blood group "B" in HBV infected patients was reported but there was no significant correlation between HBV infection and blood groups[20]. Patients with chronic hepatitis B were found to have higher serum bilirubin level, prothrombin time and higher risk of Hepato-cellular carcinoma in blood group A individuals. Significant association was also found between the presence of HBe Ag and blood groups [21].

A relation between the likelihood of developing hepatitis and the ABO blood groups would suggest that host factors may be of importance in the genesis of this disease [22]. Other studies revealed that blood groups of patients are not related to the hepatitis infections [23]. The possibility of antigenic differences between the respective viruses [22] may lead to this variety in results or it might be due to smaller sample size and different design of studies. In spite of that, the possible association of blood group antigens with HCV and HBV cannot be ruled out [24].

In a study carried out in Egypt on blood donors, 2157 donors were screened for HBsAg and anti-HCV[25]. It was observed that RhD positive blood group subjects had 4.4% and RhD negative had 3.1% positivity for HBs- Ag and that there was no significant difference between these two groups. As far as anti-

HCV positivity is concerned, RhD positive donors were 2.9% positive and RhD negative were 0.0% positive for anti-HCV with significant difference between the two groups. These findings are consistent with the present study. Similarly, in a study carried out in Thailand, 2167 donors were screened for HBsAg and anti-HCV[26]. It was observed that there was no significant difference between frequencies of HBsAg positivity among various blood group types. However, donors with blood group A had significantly higher positivity for anti-HCV (4.62%) as compared to blood group O (1.89%). In our study, seropositivity was higher in blood donors of O blood groups in relation to both the HBV and HCV viral infections. On the other hand, in a study carried out in Nigeria on 300 blood donors[27], no donor among RhD negative subjects was anti-HCV positive. No significant association could be found between HCV and blood group types including RhD positive and RhD negative subjects. From the above data it is evident that blood group type of an individual does have some biological role in case of HCV infection.

In the present study, total number of RhD negative donors (360) is low as compared to RhD positive blood donors (3871). This is merely because of naturally low frequency of RhD negative blood group type in human population. Despite all these limitations, high frequency of Anti-HCV and its association with RhD positive blood group type(1.34%)as compared to Rh negative (.27%) in the present study is a prominent finding. Keeping in view the limitations, it is suggested that further studies be performed on HCV infection to know more about the dynamics of this disease especially with reference to association with blood group types in our population.

However, in some studies, with smaller sample size, a significant association between blood groups and hepatitis C was reported [28, 26].

In the present study, there was a significant association between HIV infection and blood groups. Blood group A was the commonest blood group in HIV infected patients and percentage of HIV (Ag/Ab) was lower in donors who has blood group O. We observed highest seroprevalence of HBV and HCV in O blood group donors.

The blood bank data provides reliable information to assess prevalence of these infections among various blood groups; on the other hand more studies should be performed to investigate the correlation between blood groups and viral transfusion transmissible infections.

CONCLUSION

In this study, HIV seropositivity was found to be the highest in Blood group A donors and lowest in O blood group donors. However, seropositivity of HBsAg and HCVAb were found to be higher in donors with blood group O. Seropositivity of all the viral infections was higher in Rh positive donors as compared to Rh negative blood donors.

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