

## ASSOCIATION OF BLOOD GROUP TYPES TO HEPATITIS B AND HEPATITIS C VIRUS INFECTION

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### ABSTRACT

*Introduction: Frequency of Hepatitis B Surface Antigen (HBsAg) and Hepatitis C Virus Antibodies (Anti-HCV) among blood donors of Lahore and their association with blood group types*

*Objective: To study the frequency of Hepatitis B Surface Antigen (HBsAg) and Hepatitis C Virus Antibodies (Anti-HCV) in blood donors of Lahore and to assess the association with blood group types. The design of study will be cross sectional descriptive study. It was held in the Pathology Department, Nawaz Sharif Social Security Hospital, Lahore, during the period January, 2006 to December, 2008.*

*Materials and Methods: A total of 16695 blood donors were screened for HBsAg and Anti-HCV by rapid test devices based on immuno-chromatographic technique following the instruction given by the manufacturer. In the present study, devices manufactured by Acon, USA were used. The specimens reactive on screening by devices were confirmed on ELISA. The results were subjected to chi-square analysis for determination of statistical difference between the values among different categories.*

*Results: Among 16695 blood donors, 467 (2.79%) were positive for HBsAg and 1326 (7.94%) were positive for Anti-HCV. The frequency of HBsAg was seen to decrease significantly ( $p < 0.01$ ) from 2006 to 2008 (4.23% to 2.31%). However, frequency of anti-HCV was seen to rise significantly ( $< 0.01$ ) from 2006 (6.69%) to 2008 (7.82%). Comparison of HBsAg and anti-HCV positivity among RhD positive and RhD negative donors showed that there was no significant difference for HBsAg positivity (2.79% vs 2.85%). However, significantly higher number of RhD positive donors had HCV infection as compared to RhD negative donors (8.25% vs 3.66%).*

*Conclusion: High frequency of HCV infection in blood donors needs implementation of strict screening policy for donors and public awareness campaigns about preventive measures to reduce the spread of this infection as well as other transfusion transmissible infections. Association of HCV infection with blood group types needs more studies to get more knowledge about this aspect.*

*Keywords: HBV, HCV, ABO Blood groups, blood donors.*

### INTRODUCTION

Hepatitis B Virus (HBV) and Hepatitis C Virus (HCV) infections are significant public health problem all over the world. To prevent transmission of these infections through blood transfusion Hepatitis B surface antigen (HBsAg) and Hepatitis C Virus antibodies (anti-HCV) screening is carried out routinely in all blood transfusion centers. Liver disease due to HBV has become an enormous problem globally.<sup>1</sup> It is estimated that worldwide 2 billion people have been infected with HBV and more than 350 million have chronic lifelong infection.<sup>2</sup>

In 1989, HCV was cloned first time.<sup>3</sup> It is estimated that 170 million people are chronically infected with HCV and 3 – 4 million are newly infected each year.<sup>4</sup> Overall frequency of HCV infection in

general population of Pakistan ranges from 4 – 25% as shown by different studies.<sup>5</sup>

It is well known that incidence of certain diseases is related to blood group type. For example, type O “non-secretors” have about twice the incidence of duodenal ulcer than secretors of types A and B. On the other hand, type A carries a higher incidence of tumours of salivary glands, stomach and pancreas than do type O blood groups.<sup>6</sup> Similarly individuals who lack Duffy system antigen are protected against infection by Plasmodium vivax.<sup>7</sup> In Pakistan, it has been observed that frequency of blood group B was significantly higher and that of blood group O was lower in Diabetes mellitus type 2 patients as compared to general population.<sup>8</sup> However, no study from Pakistan could be found show-

ing association between blood group types and frequency of HBV and HCV infections.

Present study was carried out to determine the frequency of HBsAg and anti-HCV among blood donors of Lahore and to assess association (if any) of blood group type to positivity for HBV and HCV infections in blood donors.

## MATERIALS AND METHODS

Nawaz Sharif Security Hospital, Lahore is a Tertiary Care Hospital where a large number of patients come for management of their surgical as well as medical problems. A well equipped laboratory with blood bank facility is attached to this hospital. A total of 16695 apparently healthy volunteer blood donors were screened for Hepatitis B surface antigen (HBsAg) and antibody to Hepatitis C Virus (anti-HCV) apart from anti-HIV to rule out these infections and ensure safety of blood to be transfused from January 2006 to December 2008. Age of all the donors was between 25 and 50 years. All the donors gave no history of jaundice or liver disease in the past also.

Blood group type of these donors was determined by using ABO blood grouping antisera and confirmed by standard technique where required. For screening against HBsAg and anti-HCV, three to five ml of blood was obtained by standard aseptic technique with the help of 5 ml disposable syringe and added to a sterile test tube. The blood was allowed to clot and serum was separated by centrifugation at 6000 RPM. These sera were immediately screened for HBsAg and anti-HCV using one step rapid immuno-chromatographic technique based devices manufactured by Acon Laboratories Inc, USA. For this purpose instructions given by the manufacturer were strictly followed during performance of test and interpretation of the results. The sera reactive for HBsAg and Anti-HCV on screening

were subjected to ELISA for confirmation. For this purpose ELISA kits manufactured by Human (Germany) were used.

The results were analysed statistically by determining proportions. Comparison between the different groups was assessed for significance by application of chi square test. In the present study, p value of  $< 0.05$  was considered as significant difference between the different groups / categories.

## RESULTS

In a total of 16695 blood donors, a vast majority (16094; 96.4%) were males while a few (601; 3.6%) were females. They all belonged to low income group and about 60% were illiterate. It was observed that 467 (2.79%) of all the donors were HBsAg positive while 1326 (7.94%) were anti-HCV positive. It was observed that there was a significant decline in frequency for HBsAg positivity ( $p < 0.01$ ) when frequency in the year 2006 was compared to that in year 2008. There was a significant tendency for rise in frequency of anti-HCV positivity ( $p < 0.01$ ), when the frequency in year 2006 was compared to that in the year 2007. Another important observation is that there is seen a significant tendency in decline in frequency of Anti-HCV positivity in the year 2008 ( $p < 0.05$ ) when compared to that in year 2007 in the population studied (Table 1).

Breakup of HBsAg and anti-HCV positivity according to blood group types is shown in Table 2. It appears that frequency of HBsAg is similar in all blood types. Statistical analysis shows that there is no significant difference in HBsAg positivity between subjects with RhD positive and RhD negative blood groups ( $p > 0.05$ ). However, frequency of anti-HCV positivity is higher in subjects whose blood groups are RhD positive (7.57% to 8.96%) as compared to those who have RhD negative blood group (1.35% to 4.43%). This difference was statistically significant ( $p < 0.01$ ) as seen in Table 3.

Table 1: Year wise frequency of HBsAg and Anti-HCV among blood donors.

Year	No of Donors	HBsAg positive		Anti-HCV positive	
		Number	%	Number	%
2006	3449	146	4.23	231	6.69
2007	5736	147	2.56	507	8.83**
2008	7510	174	2.31*	588	7.82**
Total	16695	467	2.79	1326	7.94

\* $p < 0.01$  (significant decrease in year 2008 as compared to year 2006)

\*\* $p < 0.01$  (significant increase in these years as compared to year 2006)

## DISCUSSION

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.<sup>9</sup> Present study shows that 2.79% of the blood donors were HBsAg positive and 7.94% were anti-HCV positive.

A number of studies have been carried out in different parts of Pakistan to determine frequency of HBsAg and anti-HCV positivity among blood donors.<sup>10-17</sup> These are shown in Table 4. It can be seen that frequency of these infections varies greatly in different studies. Positivity for HBsAg is shown to vary from

1.04% in Karachi<sup>10</sup> in 2005 to 6.5% in Rawalpindi<sup>13</sup> in 1996. In the present study, frequency of HBsAg positivity is 2.79%. This figure is much lower than that of 6.75% observed in a study on general population of Lahore – Pakistan<sup>18</sup> in 1992. This shows that there is a tendency for HBV infection to decrease in frequency. This fact is also evident from the figures seen for this problem in 2006, 2007 and 2008. The frequency was 4.23% in 2006 and decreased to 2.31% in 2008. This trend reflects the effect of continuous public health awareness given to the masses about the dynamics of HBV infection as well as about the preventive measures including HBV vaccination.

Frequency of HCV infection also varies in different parts of Pakistan Table 4. The frequency is generally on higher side in rural areas as compared to urban areas.<sup>19</sup> Frequency among blood donors is seen to vary from 0.27% in Multan<sup>12</sup> in 2004 to 4.8% in Rawalpindi<sup>13</sup> in 1996. In the present study, anti-HCV positivity was 7.94 percent. This figure is higher than those observed in the above mentioned studies. Year wise data shows that anti-HCV positivity was 6.69% in 2006, increased to 8.83% in 2007 and decreased a little to 7.82% in 2008. Statistical analysis revealed that positivity was significantly higher in years 2007 and 2008 as compared to year 2006. This shows that there is a tendency for HCV infection to rise in our population. Keeping in view the extensive public health campaigns, HCV infection rate is expected to decrease. However, the rise observed in the present study is possibly due to the fact that these cases are those who got infected in the past years and have been only detected now. If data about HCV infection frequency is assessed continuously in the future, it is hoped that frequency of HCV infection will be seen to decrease with the passage of time. The results of the present study are comparable to a recent study carried out on blood donors from interior Sindh.<sup>20</sup> This study shows that 7.5% of donors were Anti-HCV positive and that there was a tendency for frequency to rise with the passage of time (7.2% in 2004 to 8.9% in

Table 2: Breakup of HBsAg and Anti-HCV positivity according to blood group types.

Blood Group	No of Donors	HBsAg positive		Anti-HCV	
		Number	%	Number	%
O Positive	5587	189	3.38	501	8.96
A Positive	3738	100	2.67	305	8.15
B Positive	5627	129	2.29	426	7.57
AB Positive	622	17	2.73	53	8.52
O Negative	495	19	3.83	21	4.24
A Negative	221	3	1.35	3	1.35
B Negative	383	10	2.61	17	4.43
AB Negative	22	Nil	00	Nil	00

Table 3: Breakup of HBsAg and Anti-HCV positivity according to RhD Positive and RhD Negative blood group types.

Blood Group	No of Donors	HBsAg positive		Anti-HCV positive	
		Number	%	Number	%
RhD Positive	15574	435	2.79	1285	8.25**
RhD Negative	1121	32	2.85 *	41	3.66

\* $p > 0.05$  (no significant difference between RhD positive and RhD negative blood group types)

\*\* $p < 0.01$  (Highly significant difference between RhD positive and RhD negative blood group types)

Table 4: Comparison of HBsAg and Anti-HCV positivity among blood donors as shown in various studies carried out in Pakistan.

Place of study	No of donors	HBsAg positive (%)	Anti-HCV positive (%)
Karachi (10)	124046	1.04	0.95
Karachi (11)	11459	1.71	2.07
Multan (12)	6000	3.37	0.27
Rawalpindi (13)	760	6.5	4.8
Rawalpindi (14)	103858	3.3	4.0
Rawalpindi (15)	1885	6.4	4.7
Peshawar (16)	4000	1.9	2.2
Northern Areas (17)	8949	3.66	1.35
Present study (Lahore)	16695	2.79	7.94

2007).

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.<sup>21</sup> Blood group O have the best teeth. Subjects with blood group O have less satisfactory strength of character and personality. In 1973, Nature published a paper by Gibsen et al<sup>(22)</sup> which showed that group A<sub>2</sub> was found to have the highest IQ. There are reports showing that thrombosis, elevated serum cholesterol and myocardial infarction are more common in persons with blood group A than in O.<sup>23</sup>

Anti-A and Anti-B are not RBC antibodies but bacterial antibodies, cross – reacting with RBCs. Individuals lacking A or B antigens make either Anti-A or Anti-B at about 3-6 months of age when they make their own bacterial antibodies in utero. There are many reports associating different infections with particular ABO blood group.<sup>24,25</sup> Individuals who have Anti-A (group B and O) are more resistant to small pox.<sup>21</sup> 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.

The results of the present study showed that frequency of HBsAg and Anti-HCV positivity is different in different ABO blood groups. The variation was seen more in case of HCV infection (Table 2). Comparison between RhD positive and RhD negative blood group types shows there is no significant difference ( $p > 0.05$ ) in case of HBsAg positivity. However, significantly higher ( $p < 0.01$ ) frequency of HCV infection was observed among RhD positive donors (8.25%) as compared to that among RhD negative blood group type (3.66%).

Search on net could retrieve a couple of studies on blood donors who also gave data about association between blood group types and HBV and HCV infections. In a study carried out in Pakistan on patients with chronic hepatitis C infection, it was observed that non-O blood group was associated with increased severity of fibrosis.<sup>26</sup> In a study carried out in Egypt on blood donors, 2157 donors were screened for HBsAg and anti-HCV.<sup>27</sup> It was observed that RhD positive blood group subjects had 4.4% and RhD negative had 3.1% positivity for HBsAg 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. Similarly, in a study carried out in Thailand, 2167 donors were screened for HBsAg and anti-HCV.<sup>28</sup> 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%). These findings correspond to those of the present study.

On the other hand, a study was carried out in Nigeria on 300 blood donors.<sup>29</sup> In this study no donor among RhD negative subjects was anti-HCV positive. But 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. Present study does have some limitations. Blood donors come to the hospital to donate blood according to the demand of a particular blood group. Therefore, blood groups of donors in hospital setting do not follow the pattern of distribution in general population. Moreover, the findings in the present study are from one institution of Lahore which may have some influence on the characteristics of donor population as well as specific practices relating to donor selection. Similarly some individuals may have been included more than once because it was difficult to trace repeat donors. In the present study, total number of RhD negative donors is low as compared to RhD positive blood donors. 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 in the present study is a prominent message. Keeping in view the limitations, it is suggested that further studies be performed on HCV infection to know more about dynamics of this disease especially with reference to association with blood group types in our population. Moreover, regular public health awareness programmes targeting especially our rural areas should be launched to curtail its transmission.

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