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***Research Article***

# ASSOCIATION OF BLOOD GROUP TYPES TO HEPATITIS B AND HEPATITIS C VIRUS INFECTION AMONG BLOOD DONORS- A FIVE YEARS INSTITUTIONAL BASED STUDY

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**ABSTRACT**
Frequency of Hepatitis B surface Antigen (HBsAg ) and Hepatitis C virus Antibodies (Anti-HCV) among blood donors of Kolar and their association with blood group types will help us in understanding the eti-opathogenesis - of the disease better.
Objective was to study the frequency of Hepatitis B Surface Antigen (HBsAg) and Hepatitis C virus Antibodies (Anti-HCV ) in blood donors of Kolar and to assessment the association with blood group types. The design of study will be descriptive.It was held in the Pathology Department, Sri Devaraj Urs Medical College, Kolar, during the period January, 2010 to December 2011. A total of 26,847 blood donors were screened for HBsAg and Anti-HCV by Vitros ECI Chemiluminesence following the instructions given by the manufactures. Sero positive samples for HBsAg & HCV were repeat tested. The results were subjected to chi-square analysis for determination of statistical difference between the values among different categories. Among 26.847 blood donors, 237 (0.88 %) & HCV 72 (0.26%) were positive for anti HCV antibody. Comparison of HBsAg and anti-HCV positivity among RhD positive and RhD negative donors showed that there was no significant difference for HBsAg positivity. However, significantly higher number of RhD positive donors had HCV infection as compared to RhD negative donors. HBsAg & HCV positivity among 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.

***Key Words*:** *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.
HBV and HCV infections are commonly transmitted by pre-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(Ahmed et al., 2004).
Host genetic and environmental factors may be important in the genesis of diseases. ABO blood groups are one set of agglutinogens, which are genetically determined carbohydrate molecules carried on the surface membranes of the red blood cells. ABO blood groups have shown to have some association with various non infectious and infectious diseases. In most people A and B antigens are secreted by the cells and are present in the blood circulation. It seems that non secretors are susceptible to a variety of infections. The possible pathogenesis for this susceptibility is that as many organisms that may bind to polysaccharide on cells and soluble blood group antigens may block this binding (Ahmed et al., 2004).
Present study was carried out to determine the frequency of HBsAg and anti-HCV among blood donors of Kolar and to for the determination of any association of blood groups with regards to HBV and HCV infections as no data regarding the same was available.

## MATERIALS AND METHODS

Ours is the licenciated 900 bedded, tertiary care, teaching hospital based blood bank situated in Kolar, southeastern Karnataka, with the facilities for blood and blood components collection, preparation, storage & distribution. In addition to the routine hospital demand, our blood bank caters to the demand of the neighboring districts of Chikkaballapura, Chittor district of AndhraPradesh and also Hosur and Krishnagiri district of TamilNadu. We also regularly organize voluntary blood donation camps in those places and our donors profile provide valuable data regarding the ABO distribution amongst the donors of bordering districts of the neighboring states.

The population of Kolar district is 2,523,406, population density is 307 sq.km and females are 970 per 1000 males. The literacy rate is 73.14% in males and 52.81% in females. The Kolar district of Karnataka shares the borders with the states of Andhrapradesh and Tamil Nadu amongst the donors of bordering districts of the neighboring states.

ABO and Rh blood grouping was done by using commercially available anti-sera A, B, AB, H and Rh (D), and known cells prepared, in-house, from pooled blood units, were used. For typing of Rh, we did not use other anti-sera like anti-c, anti-C, anti e, anti-E; but only anti-D, which is most immunogenic. Hence those who tested positive were considered to be Rh positive and those who did not were considered to be Rh negative. These anti-sera were validated at our laboratories before using them. For determination of ABO blood groups, both forward and reverse grouping were carried out.

A total of 26,847 apparently healthy voluntary blood donors were screened for Hepatitis B surface antigen (HBsAg) and antibody to Hepatitis C. Virus (anti-HCV) in addition to anti-HIV, M. P & VDRL. HbsAg and HCV testing were done using VITROS Eci/ECiQ System, with proprietary Microwell technology & Enhanced Chemiluminescence technology, are fully automated immunodiagnostics system with patented Intellicheck technology that provides confidence in sample and reagent delivery to ensure accurate and reliable results.

The donor's samples were collected in plain vaccutainer vials and the serum was separated by centrifugation at 3500 RPM for about 10 mins. The serum samples was subjected to HBsAg and HCV antibody screening along with other infectious disease markers as per the manufacturers' instructions with positive and negative controls. Initial reactive results were reconfirmed by the repeat testing. Seropositive cases were referred to Integrated counseling and testing centre (ICTC) for further treatment and evaluation.

## RESULTS

Table 1 shows year wise frequency of HBsAg and Anti-HCV among blood donors. Table 2 shows the group wise distribution of HbsAg and HCV. Blood group O shows the maximum association of HbsAg (1.35% ) & (HCV 0.50%). Table 3 shows breakup of HBsAg and Anti-HCV positivity according to RhD Positive and RhD Negative blood group types. The association of HCV with RhD Positivity is a notable feature.

## DISCUSSION

The biological role of blood groups relates to the presence of chemical moieties on the other cells that were initially indentified as red cell antigens. These act as receptors and ligands for bacteria, parasites and virus. Anti-A and Anti-B are not RBC antibodies but bacterial antibodies, cross-reacting with RBCs. Individuals lacking A or B antigens make either a Anti-A or Anti-B about 3-6 months of age when they make their own bacterial antibodies in utero (Ahmed et al.,2004).

There are many reports associating different infections with particular ABO blood group according to

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 (Choo et al., 1998). Similarly individuals who lack

Duffy system antigen are protected against infection by Plasmodium vivax (Ahmed et al., 2004). In India, it has been observed that frequency

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

| Year | No.of Donors | HBsAg positive | | HCV positive | |
|---|---|---|---|---|---|
| | | Number | % | Number | % |
| 2007 | 4493 | 49 | 1.09 | 11 | 0.244 |
| 2008 | 4915 | 45 | 0.91 | 06 | 0.122 |
| 2009 | 5111 | 39 | 0.76 | 21 | 0.410 |
| 2010 | 5595 | 38 | 0.67 | 10 | 0.178 |
| 2011 | 6733 | 66 | 0.98 | 24 | 0.356 |
| Total | 26,847 | 237 | 0.088 | 72 | 0.26 |

**Table 2:** Breakup of HBsAg and Anti-HCV positivity according to blood group types 2007-2011

| Blood group | Donors | HBSAG | % | HCV | % |
|---|---|---|---|---|---|
| O Positive | 8727 | 118 | 1.35 | 44 | 0.50 |
| A Positive | 4819 | 55 | 1.14 | 12 | 0.24 |
| B Positive | 6866 | 51 | 0.74 | 06 | 0.08 |
| AB Positive | 1929 | 09 | 0.46 | 03 | 0.15 |
| O Negative | 1355 | 02 | 0.14 | 02 | 0.14 |
| A Negative | 1122 | 01 | 0.08 | 01 | 0.08 |
| B Negative | 1134 | 01 | 0.08 | 03 | 0.26 |
| AB Negative | 895 | - | - | 01 | 0.11 |
| Total | 26847 | 237 | | 72 | |

**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 | 20,647 | 200 | 0.96 | 40 | 0.19 ** |
| RhD Negative | 6,200 | 37 | 0.59 * | 32 | 0.51 |
| Total | 26,847 | 237 | | 72 | |

**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)*

of blood group B in Diabetes Mellitus type patient was significantly higher as compared to general population (Ahmed et al., 2004). However, no study from Indian population could be found showing association between blood group types and frequency of HBV and HCV infections. There are reports showing that thrombosis, elevated serum cholesterol and myocardial infarction are more common in persons with blood group A than in O (Zachheaus et al., 2003).

The distribution of HCV-positivity according to blood group, 4.1% of the O RhD- positive subjects, 10% of the A RhD-positive subjects and 25% of the AB RhD-positive were HCV-positive (Zachheaus et al., 2003) No cases of HCV-positivity were found among the donors with other blood group. No significant relationship was found to exist between blood groups and HCV prevalence ($p>0.05$).

The 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%) (Anwar et al.,

1999). However, significantly higher number of RhD positive donors had HCV infection as compared to RhD negative donors 8.25% vs 3.66% (Anwar et al.,1999).

HCV–infected women were significantly more often Rhesus-negative than men (Palitzsch et al., 1999). Recent study in the United States of America has shown no association between blood groups and HCV infection (Zachheaus et al., 2003).

ABO blood group's thrombotic effect is thought to be a least in part medicated through its influence upon plasma level of coagulation factor (Busch et al., 2006). Subjects with non-O blood groups have higher concentrations of factor VIII and are associated with an increase risk of venous thrombosis (Koster et al., 1997). Group O patients were more resistant to dangerous sequelae of acute viral hepatitis (Moulds et al., 2000). A disproportionate excess of blood group O was found in an outbreak of hepatitis B among patients and staff of a Hemodialysis Unit (Lewkonia et al., 1969)

It is, however, important to point out that the results obtained in our study do not reflect the prevalence of anti-HCV antibodies in the unselected general population because blood donors are a pre-selected group[10] and most of them are within the sexually active age group. Further studies aimed at determining the epidemiology of HCV infection among the general population will be of value in determining the safety of blood /blood products in the light of the occurrence of sporadic cases of HCV transmission by non-parenteral routes.

This study also justifies the statement that "in any country, as the proportion of the population with infections diseases (such as HIV and hepatitis) increase the proportion of the population who are eligible to donate blood falls. The need for more low risk, voluntary non-remunerated blood donors becomes even greater" (Richards et al., 1991). This recommendation is in line with the international objective of " reaching young blood donors", a new strategy adopted by the international community to recruit blood donors from 16-25 years old for the purpose of providing safe blood.

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 (Tamim.et al., 2001). Despite all these limitations, high frequency of anti-HCV and its association with RhD positive blood group type in the present study is a important finding. From the above data it is evident that blood group type of an individual does have some biological role in case of HCV infection which needs further studies and investigations for definitive association.

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 India which may have some influence on the characteristics of donors population as well as specific practices relating to donor selection.

Every blood transfusion carriers a potential risk for transmissible diseases. This reflects the need and importance of the mandatory screening of the above infectious markers in blood donations. The prevalence of infection among blood donors has been used as a surrogate marker for the prevalence of infection in the population at large. Although certain pitfalls, like the exclusion of people below 18 years and over 60 years and low number of female donors have been cited, it is still an important indicator of the disease burden (Ahmed et al., 2004). Screening and assessment of these not only alleviates the risk of transmission through infected blood products, but also gives an idea about the prevalence rates of the infections in the community (Ahmed et al., 2004). 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.

***Conclusion***

There is a need to collect data at the national, state, and district level for evaluation and supervision of the public health programmes as the existing systems are not credible enough for monitoring their effectiveness. The epidemiology of viral hepatitis is shifting and presents new challenges which requires support from governmental, academic, and community based organizations Stringent measures need to be taken on urgent basis including dissemination of information, strict screening of blood and blood products, inclusion of the nucleic acid amplification test, antibody to hepatitis B core antigen and other sensitive markers to the mandatory voluntary donations, safer sexual practices, proper sterilization of instruments, proper disposal of contaminated material and immunization of people at risk particularly health care workers (Anwar et al., 1999).

The problem of chronic infection with HCV may be greater than generally recognized .While effective vaccines currently exist for HBV, a fully protective HCV vaccine is not yet available and current treatment methods for HCV infection are not highly effective or globally applicable . The association of HBV & HCV infection with blood group types needs to be studied further to gain more knowledge among about this aspect.

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