Original Article:

Burden of transfusion transmissible viral infections among blood donors at a tertiary care referral teaching hospital in South India

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ABSTRACT

Background: Blood serves as a vehicle for transmission of blood-borne pathogens including human immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus (HCV). The present study was conducted to estimate the prevalence of these transfusion transmitted infections (TTIs) in blood donors.

Methods: All blood donors presenting to the blood bank at our tertiary care teaching hospital were screened for HIV, HBV and HCV by using enzyme-linked immunosorbent assay (ELISA) method.

Results: During the period January to December 2014, 9958 blood donors were screened for viral markers. The prevalence of HIV, HBsAg and HCV was 0.36%, 1.67%, and 0.56% respectively.

Conclusions: Although multiple critical steps are taken to minimize the risk of infection from transfusion of blood or blood products, this risk can never be entirely eliminated. Stringent donor selection, proper counseling and deferral/self exclusion may reduce the seroreactivity in donated blood and wastage of resources.

Key words: Blood donors, Blood component transfusion, viral transmission, infections


INTRODUCTION

Among blood transfusion hazards, blood borne viral infections are very important. These include human immunodeficiency virus (HIV), hepatitis B virus (HBV) and hepatitis C virus (HCV) infections. HCV is responsible for 80%-90% of post-transfusion hepatitis in patients who received blood transfusions prior to the introduction of routine screening of blood products in 1990.1 Transmission of HIV, HBV and HCV can occur due to transfusion of whole blood or components including frozen plasma, cryoprecipitate and platelets derived from the blood of infected individuals. Other blood products like coagulation factor concentrates can also transmit HIV.2,3 The estimated HIV prevalence in adults was 0.31% in 2009. As per the National AIDS Control Organization (NACO), 2.5% of HIV infection is attributed to blood transfusion.4 India has intermediate endemicity of hepatitis B with hepatitis B surface antigen (HBsAg) prevalence of 2%-10% among study population. In India, there are about 12-13 million HCV carriers and the disease could soon increase further.5 In developing nations like India, blood safety continues to be a major problem due to the high prevalence of infectious markers among blood donors compounded with the problem of limited resources that preclude the use of sophisticated, sensitive but expensive technologies for screening of blood products.6 Accurate estimations on risk of transfusion transmitted infections (TTIs) are needed, in order to monitor the safety of the blood supply.

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The present study was conducted to estimate the burden of TTIs in blood donors attending our blood bank.

**MATERIAL AND METHODS**

We reviewed the records of all blood donors eligible to donate blood as per the Drugs & Cosmetics Act, 1940 and Rules, 1945, registered at the blood bank during January to December 2014. As per these rules, to operate a blood bank for collection, storage and processing of whole human blood for sale or distribution, each blood unit should be tested before for freedom from HIV 1 and 2 antibodies, hepatitis B surface antigen, antibodies to HCV, malarial parasites and other tests.

**Sample collection and laboratory testing**

After getting written informed consent following pre-donation counselling which include an assessment of risk factors and an opportunity for self-exclusion or confidential unit exclusion, five mL of peripheral venous blood was collected from the blood donors into plain, sterile test tubes. The plain samples were centrifuged and the sera were separated and analyzed for different TTIs such as HIV, HBV, HCV as per the standard operating procedures followed in the blood bank. Samples were analyzed for antibodies to HIV 1, 2 and p24 antigen (Microlisa HIV Ag & Ab, J.Mitra & Co. Pvt. Ltd, New Delhi, India), HBsAg (Hepalisa, J.Mitra & Co. Pvt. Ltd, New Delhi, India), and anti HCV antibodies (Microlisa, HCV Ab, J.Mitra & Co. Pvt. Ltd, New Delhi, India) by ELISA.

**Statistical analysis**

Continuous variables are summarized as mean ± standard deviation. Categorical variables are presented as percentages.

**RESULTS**

A total of 9958 blood units from male and female donors were collected and screened during the one year (study period). Of these, 9674 (97.1%) were males. Overall, 0.36%, 1.97% and 0.56% donors had tested reactive for HIV, HBsAg and HCV, respectively (Table 1).

**DISCUSSION**

The first reported case of transfusion associated AIDS turned out to be an 18-month-old infant with severe combined immunodeficiency who had been transfused repeatedly at birth and had received a unit of platelets from a donor who subsequently developed AIDS. The first documented HIV infection in India was among a cohort of sex workers in the Southern state of Tamil Nadu, in 1986. TTIs have always been a major problem in multi transfused patients in the past. The risk of HIV transmission through infected blood products exceeds that of any other exposures and it accounts for about 90% compared to other modes of transmission. Transfusion transmitted HIV infection is thought to account for 2% to 4% of all cases of HIV transmission. In low income countries, it is estimated that up to 15% of HIV infections comes from infected blood products. In our study, we observed the prevalence of HIV to be 0.36% in blood donors. In some of the studies, the overall prevalence of HIV seropositivity was 0.30% and 0.37% among blood donors, which is similar to our study. This rate is also higher (0.06%) than that found in a study done in Mangalore. In some studies HIV seropositivity was observed to be 0.8% and 0.44%, which is higher compared to our study. In a study done from East India, the overall prevalence of HIV seropositivity was 0.30% and 0.37% among blood donors, which is similar to our study.

<table>
<thead>
<tr>
<th>TTIs</th>
<th>No. of donors reactive for viral markers (%)</th>
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</thead>
<tbody>
<tr>
<td>HIV</td>
<td>36 (0.4)</td>
</tr>
<tr>
<td>HBV</td>
<td>166 (1.7)</td>
</tr>
<tr>
<td>HCV</td>
<td>56 (0.6)</td>
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</tbody>
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TTIs = transfusion transmitted infections; HIV = human immunodeficiency virus; HBV = hepatitis B virus; HCV = hepatitis C virus
sero prevalence was observed to be 0.62% and 0.68% in the years 2007 and 2008 respectively. Transfusion associated HBV has been reported to be significant in our country.\textsuperscript{21} It is estimated to be approximately 50% or more in multiple transfused subjects and approximately 1.5% in post surgical recipients.\textsuperscript{22} It is around 20% in certain reports.\textsuperscript{23,24} The overall prevalence rate of HBsAg seroreactivity is 1.7% and 1.1% in donors as observed in our study. In some studies,\textsuperscript{16,19} authors reported seropositivity rates of 2.3%. Higher prevalence of HBsAg observed in general may be due to higher prevalence of HBV infection in that population and hence in the blood donors. Non-repetition of the initial seroreactive samples may be one cause, as that can exclude false-positive reactivity in those individuals. In another study,\textsuperscript{25} the HBsAg seroreactivity was observed to be 1.4%, which was similar to what we had observed.\textsuperscript{27} Anti-HCV positivity (0.56% ) was lower than the 0.2%,\textsuperscript{19} 1.6%,\textsuperscript{26} and 0.4%\textsuperscript{27} reported in some studies and higher than the 0.06%\textsuperscript{17} and 0.39%\textsuperscript{28} reported in other studies. In general, majority of studies carried out in India indicated anti-HCV antibody seroprevalence ranging between 0.4% and 1.1%.\textsuperscript{29,32} The reported variation in the prevalence of anti-HCV antibodies among blood donors in different regions of the world might be attributed to the differences in the type, literacy rate and level of awareness among the blood donors. Use of lower sensitivity kits or technical errors may contribute to lower prevalence.

Stringent donor selection, proper counseling and deferral/self exclusion may reduce the seroreactivity in donated blood and wastage of resources. Implementation of more sensitive tests such as nucleic acid amplification testing (NAT) for TTI that detects infections earlier during the window period have potential to further decrease the risk of TTI and improve the blood safety.

REFERENCES


