Prevalence of Major Transfusion-Transmissible Infections among Blood Donors at a Rural Tertiary Healthcare Teaching Hospital of North India

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Original Research Article

Introduction: Transfusion of blood and its components is a life saving measure in various medical and surgical emergencies. Transfusion carries the risk of transmitting the life threatening transfusion transmissible infections (TTIs) agents like Human immunodeficiency virus (HIV), Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Syphilis and Malaria. Aim & Objectives: To estimate the prevalence of Major Transfusion-Transmissible Infections among Blood Donors at a rural tertiary healthcare teaching hospital of North India. Materials and Methods: The present study was conducted on 7405 blood donors who donated blood in the Blood Transfusion Department, BPS Government medical college for women, Khanpur Kalan, Sonipat over a period of one year. For testing purpose, ELISA kits of 4th generation for HIV I & II, while 3rd generation kits for HBsAg and HCV were used. Syphilis antigen was screened by Anti-TP Test and malaria was screened by the Pan Antigen Card Test. Results: Amongst a total of 7405 donors, 7235 (97.7%) were male donors and only 170 were (2.3%) female donors. There were 6987 (95.3%) voluntary donors whereas 418 (5.7%) replacement donors. The overall seroprevalence of 2.84 % (211 cases of TTI in 7405 donors) was observed. The prevalence of HIV, HBsAg, HCV, Syphilis and Malaria were 0.06%, 1.18%, 1.02%, 0.56% and 0% respectively. Conclusion: Voluntary donations are safer as compared to replacement ones and should be encouraged. Proper efforts in planned way should be made to increase the number of voluntary donors with a target of 100% and reduce replacement donations to a minimum.

Keywords: Blood Transfusion, Transfusion Transmissible Infections (TTI), National AIDS Control Organization (NACO), donors.

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INTRODUCTION

A blood transfusion is the transfer of blood or blood products from one person (donor) into another person’s bloodstream (recipient). Blood transfusion is an integral and life saving procedure of modern medicine. Transfusion of blood and its components, saves millions of lives all over the world and markedly reduces the morbidity and mortality. Disease transmission is one of the most dreaded complications of blood transfusion. The aim of any blood transfusion department is thus, to ensure safety, adequacy, accessibility as well as efficiency of blood supply at every level. A transfusion transmitted infection (TTI) is any infection identified in a recipient that is suspected to have been transmitted by blood or blood products at any point of time or any infection with the potential of being carried from person to person because of blood transfusion. According to National AIDS Control Organization (NACO) guidelines, mandatory tests should be carried out on donor’s blood samples for diseases including HIV, HBV, HCV, syphilis and malaria. The whole blood or components from any unit that tests positive for any of these infections is discarded.

Blood transfusion departments not only screen TTI but also give clue about the prevalence of these infections in healthy populations [1]. India has a population of more than 1.2 billion with 2.1 million Human Immunodeficiency Virus (HIV) positive [2], 43 million HBV positive and 15 million HCV positive persons [3]. The risk of transfusion transmission of these viruses may be alarming due to high seroprevalence of HIV, HBV, HCV, syphilis and malaria (0.12%, 0.92%, 0.3%, 0.21% and 0.05% respectively) among the blood donors [4]. The prevalence of TTIs in voluntary non-remunerated blood donors is generally much lower than among family/replacement [5] and paid donors [6].
The problem of TTI is directly proportionate to the prevalence of infection in the blood donor community. In India, HIV, Hepatitis B, Hepatitis C, syphilis and malaria are important causes of concern. Post transfusion hepatitis B and hepatitis C is a major problem in India because of low viraemia and mutant strain undetectable by routine ELISA.

Our study is to estimate the prevalence of Major Transfusion-Transmissible Infections among Blood Donors at a rural tertiary healthcare teaching hospital of North India.

**Materials and Methods**

The present study was conducted on 7405 blood donors who donated blood in the Blood Transfusion Department, BPS Government medical college for women, Khapur Kalan, Sonipat over a period of one year. All voluntary, replacement donors and those who donated blood in out-door blood donation camps were prospectively enrolled. The donors were then screened according to blood donor selection criteria and guidelines from drug and cosmetic act 1940 & NACO [7]. The blood donors who were unfit to donate blood according to standard blood donors selection criteria (As per the Drugs and Cosmetics Act, 1999) were excluded. Care was taken to eliminate professional and paid donors by taking history and with clinical examination of the donor. Basic information regarding age, sex, occupation, number of previous donations were obtained. After taking informed consent, blood was taken.

Samples were collected from blood bags were tested for five major infections transmitted by transfusion which included HIV I & II, Hepatitis B virus, Hepatitis C virus, Syphilis and Malaria. The sera were separated and analyzed based on WHO recommended testing strategies involving Enzyme-Linked Immunosorbent Assay (ELISA) [8]. The ELISA was validated by the acceptance criteria laid down by the manufacturer for the absorbance of reagent blank as well mean absorbance of the positive and negative controls provided with the test kits. Known positive and negative samples were used randomly as external controls in each screening. The cut off value was calculated as per manufacturer’s directions for reporting positive and negative results. Screening for Syphilis was carried out by using one step syphilis Anti-TP Test and Malaria was screened by the Pan Antigen Card Test. All samples with reactive results were repeated in duplicate before labelling them as seropositive.

**Results**

Our study included 7405 donors, out of which 7235 (97.7%) were male donors and only 170 were (2.3%) female donors (Figure 1). There were 6987 (95.3%) voluntary donors whereas 418 (5.7%) replacement donors (Table 1). Amongst the voluntary donors 97.6% were males and 2.4% were females, whereas among replacement donors, 99.5% were males and 0.5% were females.

The median age of the donors was 28 years (range 18-62 years). Majority (42.3%) of the donors were in the age group of 21-30 years, which were mostly voluntary donors.

The overall seroprevalence of 2.84% (211 cases of TTI in 7405 donors) was observed. Out of total 211 seropositive cases, 90.5% (191) were voluntary donors, whereas 9.5% (20) were replacement donors. The prevalence of HIV, HBsAg, HCV, Syphilis and Malaria observed was 0.06%, 1.18%, 1.02%, 0.56% and 0% respectively (Figure 2). The prevalence of HIV, HBsAg, HCV, Syphilis and Malaria among voluntary donors was 0.05%, 1.12%, 0.89%, 0.5% and 0% respectively, while in replacement donors it was 0.01%, 0.06%, 0.13%, 0.05% and 0% respectively, (Table 3) depicting higher seroprevalence of TTIs amongst voluntary donors than replacement donors.

![Fig-1: Distribution of blood donors in the study population according to Gender](image)

![Table-1: Distribution of blood donors in the study population according to type of donor](table)

<table>
<thead>
<tr>
<th>Type of donor</th>
<th>Voluntary</th>
<th>Replacement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>6987</td>
<td>418</td>
</tr>
<tr>
<td>Percentage</td>
<td>94.3%</td>
<td>5.7%</td>
</tr>
</tbody>
</table>

**Seroprevalence of various TTIs**

**Fig-2: Seroprevalence of various Transfusion Transmitted Infections**

**Table-2: Relationship of Transfusion Transmitted Infection to type of donor**

<table>
<thead>
<tr>
<th>Transfusion Transmitted Infection</th>
<th>Voluntary</th>
<th>Replacement</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV</td>
<td>4</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Hepatitis B</td>
<td>83</td>
<td>5</td>
<td>88</td>
</tr>
<tr>
<td>Hepatitis C</td>
<td>66</td>
<td>10</td>
<td>76</td>
</tr>
<tr>
<td>Syphilis</td>
<td>38</td>
<td>4</td>
<td>42</td>
</tr>
<tr>
<td>Malaria</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>191</td>
<td>20</td>
<td>211</td>
</tr>
</tbody>
</table>

**DISCUSSION**

In the present study, total number of blood donors were 7,405. Among them 7,235 (97.7%) donors were male donors and 170 (2.3%) donors were females. Various other studies by Agarwal et al., [9] Arya DR et al., [10] and Makroo et al., [11] also revealed similar trends.

94.3% blood donors were voluntary donors and remaining 5.7% were replacement donors. So, majority of the donors were voluntary donors as we have most of the donations from outdoor camps and very few replacement donors. Similar predominance of voluntary donors was noted by Arya et al., [10], Pallavi et al., [12] and Shah et al., [13] in their study. However, the number of replacement donors as compared to voluntary donors was higher in studies done by Makroo et al., [11], Yadav et al., [14] and Agarwal et al., [9] This reflects presence of awareness about blood donation in general population in our area.

In the present study, median age of the donors was 28 years (range 18-62 years). Majority of the donors were in the age group of 21-30 years, 3,132 (42.3%). In a study by Yadav et al., [14] the donor population was mostly in the age group of 18-30 years (69.1%), which is comparable to our study. Hilda Fernandes et al., [15] also showed similar results that 6,576 donors (68.5%) of the donors were between 18 to 30 years of age group.

Present study shows that, overall prevalence of Transfusion Transmitted Infections was 2.84% (211/7405). Other studies, when compared showed an overall prevalence between 2.05% to 4.57%. The seroprevalence of TTI as observed in our donor population was relatively low as compared to other studies. Present study shows that prevalence of HIV, HBsAg, HCV and Syphilis and Malaria among voluntary donors were 0.05%, 1.12%, 0.89%, 0.5% and 0 % respectively, while in replacement donors it was 0.01%, 0.06%, 0.13%, 0.05% and 0% respectively.

This variation may be attributed to the increased number of voluntary donations, difference in the sensitivities of ELISA kits used, effectiveness of donor screening to exclude donors with a history of high risk behaviour, pre-donation counselling and self-deferral by donors. On comparison with other studies, the following results were seen, as shown in Table-3.

Present study also showed an interesting case of co-infections among blood donors where one donor was found positive for HIV and Hepatitis C infections at the same time.

Many factors favor co infection including high degree of epidemiological similarity between their mode of transmission. In HIV infected persons an estimated 2-4 million have chronic HBV infection and 4-5 million have HCV co infection [21].

A study by Bhaumik et al., also showed co-positivity for HIV and HBsAg in three donors [22]. Khagesan et al., [23] showed, co infection in 8 (0.09%) donors, 3 cases of HBsAg and syphilis, and 1 case each of HIV and HBsAg, HBsAg and Syphilis. Kumari et
al., [24], showed 03 donors, co- infections with HBV and HIV.

**Table-3: Comparison between various studies for sero-prevalence of transfusion transmissible infections**

<table>
<thead>
<tr>
<th>Studies</th>
<th>HIV</th>
<th>HBV</th>
<th>HCV</th>
<th>Syphilis</th>
<th>Malaria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Present study</td>
<td>0.06</td>
<td>1.18</td>
<td>1.02</td>
<td>0.56</td>
<td>0.00</td>
</tr>
<tr>
<td>Fernandes H et al., [15]</td>
<td>0.06</td>
<td>0.34</td>
<td>0.06</td>
<td>0.11</td>
<td>0.01</td>
</tr>
<tr>
<td>Arya DR et al., [10]</td>
<td>0.1</td>
<td>1.6</td>
<td>0.18</td>
<td>0.89</td>
<td>0.04</td>
</tr>
<tr>
<td>Makroon RN et al., [11]</td>
<td>0.24</td>
<td>1.18</td>
<td>0.43</td>
<td>0.23</td>
<td>-</td>
</tr>
<tr>
<td>Yadav et al., [14]</td>
<td>0.14</td>
<td>1.77</td>
<td>0.09</td>
<td>0.04</td>
<td>-</td>
</tr>
<tr>
<td>Agarwal et al., [9]</td>
<td>0.14</td>
<td>0.89</td>
<td>0</td>
<td>1.2</td>
<td>0.1</td>
</tr>
<tr>
<td>Kumar et al., [16]</td>
<td>0.26</td>
<td>1.03</td>
<td>1.53</td>
<td>1.74</td>
<td>0.006</td>
</tr>
<tr>
<td>Chatoraj et al., [17]</td>
<td>0.13</td>
<td>0.99</td>
<td>0.19</td>
<td>0.62</td>
<td>0</td>
</tr>
<tr>
<td>P. Pallavi et al., [12]</td>
<td>0.44</td>
<td>1.27</td>
<td>0.23</td>
<td>0.28</td>
<td>0</td>
</tr>
<tr>
<td>Gupta A et al., [18]</td>
<td>0.28</td>
<td>2.03</td>
<td>0.21</td>
<td>0.12</td>
<td>0.03</td>
</tr>
<tr>
<td>Shah et al., [13]</td>
<td>0.21</td>
<td>0.78</td>
<td>0.33</td>
<td>0.34</td>
<td>0</td>
</tr>
<tr>
<td>Singh et al., [19]</td>
<td>0.37</td>
<td>1.79</td>
<td>1.16</td>
<td>0.05</td>
<td>0.01</td>
</tr>
<tr>
<td>Rawat et al., [20]</td>
<td>0.32</td>
<td>1.61</td>
<td>0.73</td>
<td>1.62</td>
<td>0.06</td>
</tr>
</tbody>
</table>

**CONCLUSION**

Voluntary donations are safer as compared to replacement ones and should be encouraged. Proper efforts in planned way should be made to increase the number of voluntary donors with a target of 100% and reduce replacement donations to a minimum. Therefore, strict selection of blood donors and comprehensive screening of donor’s blood using standard methods are highly recommended to ensure the safety of blood for recipient.

This trend suggests that for prevention of TTI healthy voluntary blood donor recruitment and safe voluntary blood donor retention strategies should be strengthened at all levels in blood transfusion service.

**REFERENCES**


