Original article:

Retrospective study of the five-Year Prevalence and Trends of transfusion transmitted infections (TTIs) among blood donors at a charitable hospital blood bank in Pune, India.

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Abstract:

Introduction: Transfusion Transmitted Infections (TTIs) remain important measures of healthcare delivery systems and need to be kept in check. The present study was planned to assess the prevalence of TTIs among the donor population of the blood bank of a tertiary care hospital and compare them with rates from other studies of blood donors across India. Follow up of TTIs positive donors was also examined.

A retrospective analysis of TTIs among blood donors at the Blood Bank of a charitable tertiary care hospital and teaching medical school in Pune, India.

Methods and Material: Data on TTIs were examined on a total of 13,078 blood units collected from voluntary donors for five years between Aug 2008 and Aug 2013. Screening for TTIs underwent changes from second to fourth generation kits during the five years. The follow up of all donors and further care of those who were TTI positive was also examined.

Results: Overall sero-prevalence of HIV, HBV, HCV, Syphilis and malaria were 0.28%, 0.41%, 1.23 %, 0.1% and nil respectively; 205 donors were TTI positive; 36 for HIV, 161 for HBV, 44 for HCV and one for VDRL. From Jan-Aug 2013, 14/ 22 (63.6%) TTI positive donors returned for follow up care.

Conclusions: Sero-prevalence of TTIs prevents potentially infectious blood from being transmitted. The system to increase follow up and care of TTI positive donors should be strengthened.

Key-words: Seroprevalence, blood donors, transfusion transmittable infections

Introduction:

Screening of blood donors first started in 1947 (1). Today, India’s blood transfusion program mandates the screening of HIV, HBV, HCV, malaria and syphilis (2). The prevalence of TTIs in voluntary non-remunerated blood donors is lower than among family/replacement (3, 4, 5) & paid donors (6, 7, 8).

Therefore, TTI risk is reduced if collected from low-risk populations (9). Estimated adult HIV prevalence in India is 0.2-0.3 %(10); and up to 40 million of 350 million hepatitis B chronic carriers worldwide are in India (11). HBsAg prevalence varies from 1-13%, with an average of 4.7% (12). HCV carriers in India are around 12–13 million
(13). With this background the present study was planned to assess the prevalence of TTI markers among the donor population of the blood bank of a tertiary care and teaching hospital, since it was set up in 2008 and to see if these rates were comparable with rates from some other studies of blood donors in India.

**Material and Methods:**
Retrospective data of blood collected at the hospital’s blood bank from August 2008 – August 2013 were analyzed. The prevalence of TTIs was calculated and records of follow up data of all donors who tested positive for any of the TTIs was also examined. Different tests were used for screening for HIV, HBV, HBV and Malaria over the five years mostly for converting from third to fourth generation kits and are detailed below:

From 2008-09, HIV screening was done using Detect, Eliscan HIV, and Microlisa and from 2010-13, fourth generation ELISA as Enzydus, Wualisa and Genscreen HIV Ultra were used. Screening for HBs antigen used the following tests: EIAgen (Lenco Hellas, Greece), Eliscan (Ranbaxy) and Hepalisa (J Mitra &co), all third generation tests, were used from 2008-09. From 2010-11 initially Qualisa (Tulip group, India), a third generation test, followed later by Hepalisa Ultra (fourth generation) were used. From 2012-13, Monolisa (Biorad) and Hepalisa Ultra both fourth generation tests were used.

For screening for HCV, in 2008, the following screening assays were used: ElAgen Ab, Qualisa HCV (Tulip group, India), Microlisa - all third generation ELISA tests for HCV antibodies. ElAgen was replaced by Erbalisa (Transasia), a third generation test from 2009-10, which was replaced by Monolisa (Biorad) in 2011 and by GENEDIA HCV, a fourth generation EIA, in 2012-13. Screening for malarial parasite was done using Leishmann (2008-10). From 2010-13, Pan Malaria Rapid and Qualisa ELISA (Tulip Group) were used.. And lastly, screening for syphilis, was done using RPR (Span) throughout the five years. This blood bank accepted voluntary donors only and so there were no replacement donors. NACO’s guidelines were strictly followed for testing to ensure safe blood transfusion (1) and donors were informed about the tests for TTIs, consented and strongly encouraged to come back for their results and post test counselling. The publication of this study was approved by the Ethics Committee of the Institute.

**Results:**
All blood donations at the blood bank were voluntary and replacement donors were not accepted. Of 13,078 blood donors 12,715 (96.6%) were males and 363 (3.4%) were females. The mean age for males was 34 years (18-50 years) and 24 years (18-30 years) for females. Blood was screened for HIV, HBV, HCV, malaria and syphilis, and the overall prevalence of sero-reactive samples over the five years are shown (Fig. 1), while the yearly prevalence rates are shown in (Fig. 2).

The overall sero-prevalence of HIV, HBV, and HCV, syphilis and malaria were found to be 0.28%, 1.23 %, 0.41%, 0.008 and 0% respectively (Fig. 2). Trend over the five years showed that HIV prevalence declined from 0.49 in 2009 to 0.22 in 2013. HBV prevalence progressively declined from 1.89% (n=899) in 2008 to 0.67% in 2013 (n=1795). While the prevalence of HCV was 0.44% in 2008 and 2009 and fell to 0.33 in 2013, there were fluctuations in between with 0.28% in 2010 and 0.46% in 2011and 0.50% in 2012. There was one sample that was positive test for RPR for syphilis in 2008 (0.04%) and no malarial parasites were seen in the five years (Fig. 3a-d).
It was found that co-infections of TTIs among 13,078 samples tested in the five years were as follows: HIV and HBsAg were positive in three (0.023%) donors, HIV and HCV in one donor (0.008%) and HBsAg and HCV in one donor (0.008%). In all 205 (1.56%) donors tested positive for any TTI in the study period, of whom 36 donors tested positive for HIV, 161 for HBV, 44 for HCV and 1 for RPR. Further details of these individuals were not available for reporting.

Regarding post test counselling, the system for maintaining written records for follow up and counselling was initiated only from Jan 2013. Prior to this, there is no systematic documentation, but the bank reports that attempts were made to contact donors who had provided mobile phone numbers but were unsuccessful in many cases due to reasons such as phones being out of service or coverage area, changed numbers, unrecognizable receivers etc. However those who came for follow up were counselled and referred for treatment at the same hospital but no record. From Jan-Aug 2013, documented data shows that all 22 donors who were positive for any TTI were contacted by telephone. However only 14 (63.6%) came back for post test counselling. All 14 were referred to the department of Medicine at hospital for further care and treatment.

Figure 1: Overall prevalence of TTIs among blood donors at a hospital blood bank from Aug 2008 - Aug 2013

![Overall prevalence of TTIs among blood donors at a hospital blood bank from Aug 2008 - Aug 2013](image1)

Figure 2: Yearly prevalence rate of TTIs in Blood Donors at a hospital blood bank from 2008-2013

![Yearly prevalence rate of TTIs in Blood Donors at a hospital blood bank from 2008-2013](image2)
Fig 3: Trends of TTI prevalence among blood donors from 2008-13 at a hospital blood bank:

Fig 3a: Sero-prevalence of HIV

Fig 3b: Sero-prevalence of HBsAg

Fig 3c: Sero-prevalence of HCV

Fig 3d: Sero-prevalence of Syphilis
Discussion:

The HIV/AIDS pandemic has focused particular attention on the importance of preventing transfusion-transmitted infections (TTIs). Up to 3% of HIV infections worldwide are transmitted through the transfusion of contaminated blood and blood products. Many more recipients of blood products are infected by hepatitis B and C viruses, syphilis and other infectious agents, such as Chagas disease (14).

In 2009, an estimated 2.4 million people were living with HIV in India, which translates to a prevalence of 0.3% (15). In our study, the overall sero-reactivity was 0.28% for HIV which correlates well with the national average. HIV prevalence in our study declined from 0.49 in 2009 to 0.22 in 2013. The reason for this is not clear but may perhaps be explained by the fact that third generation kits were used until 2009 and were changed to fourth generation kits from 2010 onwards.

HBsAg prevalence in our study showed a slightly declining trend in study period from Jan 2008-Aug 2013 from 1.89-0.93, while others studies in Karnataka (16, 17) reported HBsAg prevalence of 1.27 and 0.87.

In our study the overall prevalence of HCV was 0.41% which correlates well with the study of Beenu Thakral et al (18) from Chandigarh that reported an overall HCV sero-positivity of 0.44 percent (72/16,250). However, Mukhopadhya (19) reported HCV prevalence in blood donors from different parts of India ranging from 0.5% to 1.85% and Meena et al (20) showed a significant increasing trend in the prevalence of HCV among blood donors from 0.18% in 2005 to 0.82% in 2009 and Unnikrishnan B et al (17) showed an HCV prevalence of 0.36. Similarly, two studies from Vellore and Chennai in Tamil Nadu (21, 22) reported a prevalence of 0.22% prevalence for HCV. From the studies referred to in the period 2004-2013, it appears that most studies in the north India (23-27) excepting the Chandigarh (18) and Delhi (28) studies of 2005 and 2013 report prevalence >0.5%, (0.65-1.18%) with the southern states of Tamil Nadu & Karnataka (excepting the Karnataka study of 1999(29)) report lower prevalence 0.06-0.36% (30, 16,17,22) while the eastern city of West Bengal (31) reported 0.31%, our own study which is in the western zone, is reporting 0.41% o HCV (Table 1). However Garg et al (32) from Jodhpur reported a higher prevalence of HBsAg of 2.57-3.53%.

Our study showed just one case that was reactive for Syphilis (0.008%) while the study by Pallavi P. et al (16) showed a positive rate of 0.28%. The prevalence of syphilis in India from 1999-2013 have shown a declining trend (Table 1). Only one study from Karnataka (30) reported 0.01% (1/9599) prevalence of malarial parasite.

Regarding co-infections, while there was no information regarding this in most of the above studies, our study showed HIV and HBsAg were positive in three (0.023%) donors, HIV and HCV in 1 donor (0.008%) and HBsAg and HCV in 1 donor (0.008%).

In general there is correlation is seen between the prevalence rates of all TTIs i.e. HIV, HBV, HCV, syphilis and malaria among blood donors in our study with some of the above reported studies from India from 2006-2012 (Table 1).

Data of follow up of donors at the blood bank started only from Jan 2013, and until August 2013, 63.6% (14/22) donors who positive for any of the TTIs came for follow up and were counselled and referred for further treatment to the Medicine Department. A study by Kaur G et al reported that only approximately 35% (60/172) donors found to be positive for any TTI, responded to letters and were counselled (33) and a response rate of 59.8%
(249/416) among reactive donors in a study in Uttarkhand by Agarwal N (34). The follow up of blood donors in our study is for a much shorter period and has to be reviewed over the coming years, while making systematic efforts to strengthen and increase follow up. Sero-prevalence of transmissible transfusion infections continues to be an important function of healthcare delivery systems which helps in preventing potentially infectious blood from being transmitted in all phases of infection. In addition, a system to increase follow up of donors who are found test positive for any of the TTIs should be strengthened so that they may be appropriately counselled and treated, if required.

Certain studies have used more sensitive such as PCR and NAT for HBV and HCV (23) that can uncover latent infections in the window period and may actually suggest underestimation of prevalence by currently used screening tests in our study. This implies that screening for TTIs needs to be upgraded across blood banks in India.

**Conclusion:** The prevalence of TTIs in our study correlate well with prevalence rates from some of the other studies on blood donors in India. HBV continues to be the most prevalent TTI. In India, HBV vaccine was initiated in Universal Immunization Program (UIP) in a phased manner since 2007 (35) and is currently widely available. This means that youth born before 2008, who have not been immunized for HBV, should receive the vaccine at their earliest point of contact with the healthcare system. This can also reduce the complications of its co-infection with HIV and HCV.

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**References:**


