

Original Article:

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

B. Suresh,¹ K.V. Sreedhar Babu,¹ B. Venkataramana,² P. Chandra Mouli¹

Departments of ¹Transfusion Medicine, ²Microbiology, Sri Venkateswara Institute of Medical Sciences, Tirupati

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

Suresh B, Sreedhar Babu KV, Venkataramana B, Chandra Mouli P. Burden of transfusion transmissible viral infections among blood donors at a tertiary care referral teaching hospital in South India. J Clin Sci Res 2016;5:160-3. DOI: <http://dx.doi.org/10.15380/2277-5706.JCSR.15.023>.

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.

Received: March 24, 2015; Revised manuscript received: September 09,2015; Accepted: September 11,2015.

Corresponding author: K.V. Sreedhar Babu, Associate Professor, Department of Transfusion Medicine, Sri Venkateswara Institute of Medical Sciences, Tirupati, India.
e-mail: kinneravsb@gmail.com



Online access

http://svimstpt.ap.nic.in/jcsr/jul-sep16_files/20a.15.023.pdf
DOI: <http://dx.doi.org/10.15380/2277-5706.JCSR.15.023>

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, 1945,⁷ registered at the blood bank during January to December 2014. As per these rules,⁷ 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,⁸ 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 HIV1, 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 \pm 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.⁹ The first documented HIV infection in India was among a cohort of sex workers in the Southern state of Tamil Nadu, in 1986.^{10, 11} 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.¹² Transfusion transmitted HIV infection is thought to account for 2% to 4% of all cases of HIV transmission.¹³ In low income countries, it is estimated that up to 15% of HIV infections comes from infected blood products.¹⁴ In our study, we observed the prevalence of HIV to be 0.36% in blood donors. In some of the studies,^{15,16} 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.¹⁷ In some studies HIV seropositivity was observed to be 0.8%¹⁸ and 0.44%¹⁹, which is higher compared to our study. In a study²⁰ done from East India, HIV

Table 1: Prevalence of TTIs in 9958 blood donors

TTIs	No. of donors reactive for viral markers (%)
HIV	36 (0.4)
HBV	166 (1.7)
HCV	56 (0.6)

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.²¹ It is estimated to be approximately 50% or more in multiple transfused subjects and approximately 1.5% in post surgical recipients.²² It is around 20% in certain reports.^{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,^{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,²⁵ the HBsAg seroreactivity was observed to be 1.4%, which was similar to what we had observed.²⁷

Anti-HCV positivity (0.56%) was lower than the 0.2%,¹⁹ 1.6%,²⁶ and 0.4%²⁷ reported in some studies and higher than the 0.06%¹⁷ and 0.39%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%.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

1. Arankalle VA, Chadha MS, Jha J, Amrapurkar DN, Banerjee K. Prevalence of anti-HCV antibodies in western India. *Indian J Med Res* 1995;101:91-3.
2. Donegan E, Lee H, Operskalski EA, Shaw GM, Kleinman SH, Busch MP, et al. Transfusion transmission of retroviruses: Human T lymphotropic virus types I and II compared with human immunodeficiency virus type 1. *Transfusion* 1994;34:478-83.
3. Natural history of primary infection with LAV in multitransfused patients. By the AIDS-Hemophilia French Study Group. *Blood* 1986;68:89-94.
4. National AIDS Control Organization. National AIDS Control Programme, India: country scenario, an update. National AIDS Control Organization, Ministry of Health & Family Welfare, Govt. of India, 1996. Available from: [http://www.naco.gov.in/NACO/about NACO](http://www.naco.gov.in/NACO/about%20NACO). Accessed on February 2, 2015.
5. Pathak S, Chandrashekhar M. Transfusion transmissible infections - Seroprevalence among blood donors in a tertiary care hospital of Delhi. *Asian J Transfus Sci* 2013;7:116-8.
6. Kaur P, Basu S. Transfusion-transmitted infections: existing and emerging pathogens. *J Postgrad Med* 2005;51:146-51.
7. Malik V. Law relating to drugs and cosmetics. 22nd edition. Lucknow: Eastern Book Company, 2011.
8. Saran RK. Transfusion medicine, Technical Manual. 2nd ed. New Delhi, India: Directorate General of Health Services (DGHS), Ministry of Health and Family Welfare, Government of India; 2003.
9. Klein HG, Anstee D. Mollison's blood transfusion in clinical medicine. 11th ed. Oxford: Blackwell Publishing Ltd; 2005.
10. John TJ, Babu PG, Jayakumari HM, Simoes EAF. Prevalence of HIV infection in risk groups in Tamil Nadu, India. *Lancet* 1987;1160-1.
11. Simoes EA, Babu PG, Jayakumari HM, John TJ. The initial detection of human immunodeficiency virus 1 and its subsequent spread in prostitutes in Tamil Nadu, India. *J Acquir Immune Defic Syndr* 1993;6:1030-4.

12. Coovadia H. Antiretroviral agents—how best to protect infants from HIV and save their mothers from AIDS. *N Engl J Med* 2004;351:289-92.
13. Noel L. Safe blood starts with me! Blood saves Lives! Transcripts of World Health Day 2000 April 7, 2000. Available from: <http://www.who.int/multimedia/whd2000/#>. Accessed on February 2, 2015.
14. Bharucha ZS. Risk management strategies for HIV in blood transfusion in developing countries. *Vox Sang* 2002;83 Suppl 1:S167-71.
15. Patel SV, Popat CN, Mazumdar VS, Shah MB, Shringarpure K, Mehta KG, et al. Seroprevalence of HIV, HBV, HCV and syphilis among blood donors at blood bank of a tertiary care hospital. *Int J Med Sci Public Health* 2013;2:747-50.
16. Rani K, Molly R, Mary PC, Daniel D. Trend of HBV, HCV and HIV seroprevalence among blood donations at a blood bank of a tertiary care hospital in southern India. Proceedings of TRANSCON 2011 - 36th Annual National Conference of Indian Society of Blood Transfusion and Immunohematology (ISBTI). *Asian J Transfus Sci* 2012;6:59-129.
17. Fernandes H, D'souza PF, D'souza PM. Prevalence of transfusion transmitted infections in voluntary and replacement donors. *Indian J Hematol Blood Transfus* 2010;26:89-91.
18. Singh B, Kataria SP, Gupta R. Infectious markers in blood donors of East Delhi: prevalence and trends. *Indian J Pathol Microbiol* 2004;47:477-9.
19. Pallavi P, Ganesh CK, Jayashree K, Manjunath GV. Seroprevalence and trends in transfusion transmitted infections among blood donors in a university hospital blood bank: a 5 year study. *Indian J Hematol Blood Transfus* 2011;27:1-6.
20. Sinha SK, Roychoudhury S, Biswas K, Biswas P, Bandopadhyay R. Prevalence of HIV, Hepatitis B, Hepatitis C and Syphilis in donor's blood: A study from eastern part of India. *Open J Hematol* 2013;3:1.
21. Anand AC, Puri P. Hepatitis B infection: emerging challenges for the armed forces. *Med J Armed Forces India* 2007;63:312-4.
22. Saraswat S, Banerjee K, Chaudhury N, Mahant T, Khandekar P, Gupta RK, et al. Post-transfusion hepatitis type B following multiple transfusions of HBsAg-negative blood. *J Hepatol* 1996;25:639-43.
23. Dasarathy S, Mira SC, Acharya SK, Irshad M, Joshi YK, Venugopal P, et al. Prospective controlled study of post-transfusion hepatitis after cardiac surgery in a large referral hospital in India. *Liver* 1992;12:116-20.
24. Saxena R, Thakur V, Sood B, Guptan RC, Gururaja S, Sarin SK. Transfusion-associated hepatitis in a tertiary care hospital in India. A prospective study. *Vox Sang* 1999;77:6-10.
25. Jain R, Gupta G. Family/friend donors are not true voluntary donors. *Asian J Transfus Sci* 2012;6:29-31.
26. Jain A, Rana SS, Chakravarty P, Gupta RK, Murthy NS, Nath MC, et al. The prevalence of hepatitis C virus antibodies among the voluntary blood donors of New Delhi, India. *Eur J Epidemiol* 2003;18:695-7.
27. Das BK, Gayen BK, Aditya S, Chakravorty SK, Datta PK, Joseph A. Seroprevalence of hepatitis B, hepatitis C, and human immunodeficiency virus among healthy voluntary first-time blood donors in Kolkata. *Ann Trop Med Public Health* 2011;4:86-90.
28. Makroo RN, Walia RS, Chowdhry M, Bhatia A, Hegde V, Rosamma NL. Seroprevalence of anti-HCV antibodies among blood donors of north India. *Indian J Med Res* 2010;138:125-8.
29. Sharma RR, Cheema R, Vajpayee M, Rao U, Kumar S, Marwaha N, et al. Prevalence of markers of transfusion transmissible diseases in voluntary and replacement blood donors. *Natl Med J India* 2004;17:19-21.
30. Chandrasekaran S, Palaniappan N, Krishnan V, Mohan G, Chandrasekaran N. Relative prevalence of hepatitis B viral markers and hepatitis C virus antibodies (anti HCV) in Madurai, south India. *Indian J Med Sci* 2000;54:270-3.
31. Srikrishna A, Sitalakshmi S, Damodar P. How safe are our safe donors? *Indian J Pathol Microbiol* 1999;42:411-6.
32. Gupta N, Kumar V, Kaur A. Seroprevalence of HIV, HBV, HCV and syphilis in voluntary blood donors. *Indian J Med Sci* 2004;58:255-7.