

Sero-Prevalence of Transfusion Transmitted Infections among Blood Donors at Blood Bank of Rajendra Institute of Medical Sciences, Ranchi

Shalini Sunderam¹, Shilpa Karir², Shamim Haider³, S.B. Singh⁴, Asha Kiran⁵

¹Associate Professor, ²Junior Resident, ³Professor and Head, ⁴Lecturer cum Statistician, ⁵Assistant Professor
Department of PSM, Rajendra Institute of Medical Sciences, Ranchi, India – 834009.

Corresponding Author : Shalini Sunderam, E mail: drshalini.sundram@gmail.com

Abstract :

Introduction : An unsafe blood transfusion is very costly from both human and economic points of view. There are several infectious as well as non-infectious risks associated with transfusion of blood. With every unit of blood transfused there is 1% chance of transfusion associated problems including transfusion transmitted infections. In India blood is screened for five diseases which could be transmitted through blood and produce serious illness- HIV, Hepatitis B, Hepatitis C, Syphilis, and Malaria. **Objectives :** (1) To assess the trend of transfusion transmitted infections (TTIs) among blood donors from the records (2008-2012) at blood bank, RIMS, Ranchi. (2) To study the sero-prevalence of TTIs among blood donors from the records. **Method :** A record based study was conducted from June 2013- August 2013. Data were collected from the records of blood bank which also included data of blood donation camps. Data regarding sex, screening test results and type of donors were collected from the records. **Results :** Out of 63803 donors, voluntary donors (56.34%) were more in comparison to replacement donors (43.66%). Out of all TTIs, prevalence of HBV (1.01%) was highest followed by Malaria (0.33%), HCV (0.14%), HIV (0.08%) and Syphilis (0.03%). **Conclusions :** TTIs were more prevalent in replacement donors than voluntary donors. The number of voluntary donors has risen from 2008 -2012, but there is male preponderance in both voluntary and replacement donors than females.

Keywords : TTI, Sero-prevalence, Voluntary donors, Replacement donors.

Introduction :

Blood transfusion saves lives and improves health, but many patients requiring transfusion do not have timely access to safe blood. Providing safe and adequate blood should be an integral part of every country's national health care policy and infrastructure.^[1] Timely transfusion of blood saves millions of lives, but unsafe transfusion practices puts millions of people at risk of transfusion transmitted infections (TTIs).^[2] Globally, more than 81 million units of blood are donated each year.^[3] More than 18 million units of blood are not screened for transfusion transmissible infections.^[4] With every unit of blood, there is a 1% chance of transfusion associated problems including transfusion transmitted diseases.^[5]

The diseases transmitted through blood transfusion are - Human Immunodeficiency virus (HIV), Hepatitis B virus (HBV), Hepatitis C virus (HCV), syphilis, malaria and infrequently

cytomegalovirus, Epstein Barr virus, brucellosis etc. Preventing transmission of these infectious diseases through blood transfusion presents one of the greatest challenges of transfusion medicine.^[6] As per guidelines of the ministry of health and family welfare (Government of India) under The Drug and Cosmetic Act, 1945 (amended from time to time), all the blood donations are to be screened against the five major infections namely HIV I & II, HBsAg, HCV, syphilis and malaria.^[7,8]

There are three types of blood donors: voluntary unpaid; family/replacement and paid. Voluntary unpaid blood donors are vital for ensuring a sufficient, stable blood supply. A well-established voluntary unpaid blood donor programme can contribute to a significant reduction in the risk for infections such as HIV, hepatitis B, hepatitis C and syphilis. India reports the greatest increase in the number of voluntary unpaid blood donations from 3.6 million in 2007 to 4.6 million in 2008.^[9]

The magnitude of the TTIs varies from country to country depending on loads in that particular population. There is a risk of 1–2 per 1000 recipients receiving contaminated blood with viral, bacterial or parasitic agents. The Indian subcontinent is classified as an intermediate Hepatitis B Virus (HBV) endemic (HBsAg) zone and has the second largest global pool of chronic HBV infections. The risk of transfusion transmission of these viruses may be alarming due to high sero-prevalence of HIV, anti-HCV, and HBsAg among blood donors.^[10]

It is important to note that the problem of TTIs is directly proportionate to the prevalence of infections in the blood donor community. Jharkhand is grouped as one of the low prevalence states for HIV but number of people living with HIV in the state is rising. The prevalence of HIV in the state was 0.18% in 2009, 0.21% in 2010 and then to 0.25% in 2011, recording alarming increase of 80% in just three years from 2009 to 2011.^[11] Even after development of medical science to such an extent, still we do not have any substitute to blood for human body, thus making blood and blood transfusion one of the most crucial and basic components of health care and patients, critical care. Thus the present study was conducted with an aim to assess the trend and sero-prevalence of TTIs among blood donors at blood bank from 2008-2012 of Rajendra Institute of Medical Sciences, Ranchi.

Method :

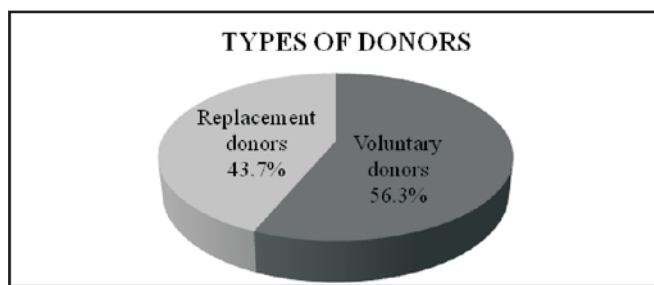
The present study was conducted from June 2013 - August 2013 through records at blood bank of Rajendra Institute of Medical Sciences. In the blood bank each donor blood sample was screened for five infections - HIV, HBV, HCV, Syphilis and Malaria. Data were collected from the records of the blood bank for the duration of January 2008- December 2012. Data regarding all donors coming to donate blood at blood bank as well as various blood donation camps organized by the blood bank were analyzed. Data regarding sex of donors, type of donors and screening test results were collected from the records. Exclusion criteria for blood donation were age <18 years and >60 years, weight < 45kg, current history of medication, recent blood transfusion, any infection, anaemia and recent history of any surgical procedure.

After data collection, template was generated in MS excel sheet. Descriptive analysis and frequency distribution was done using SPSS software.

Results :

In the present study a total of 63,803 donors were screened during the five year period from January 2008- December 2012. Out of them, 35,946 (56.3%) were voluntary donors which included donors at the blood bank of RIMS, Ranchi and also donors at the blood camps organized by the blood bank. The remaining 27,857 (43.7%) were replacement donors (Fig. 1).

**Fig 1: Percentage distribution of type of donors
Total donors (Voluntary + Replacement donors)
= 63803 (JAN 2008 - DEC 2012)**



When gender wise distribution of the donors was studied it was found that majority of donors under voluntary and replacement group were males (>95%) and rest 2-4% only, were females. This shows the predominance of males as compared to females in blood donation for the studied years. (Table 1, Table 2).

Table 1 : Sex wise distribution of Voluntary Donors

Year	Voluntary Donors		Total Voluntary Donors No. (%)
	Male No. (%)	Female No. (%)	
2008	1157 (88.18%)	155 (11.81%)	1312 (100%)
2009	5616 (96.74%)	189 (3.26%)	5805 (100%)
2010	7997 (96.61%)	280 (3.39%)	8277 (100%)
2011	9102 (96.86%)	295 (3.14%)	9397 (100%)
2012	10542 (94.50%)	613 (5.50%)	11155 (100%)
Total	34414 (95.73%)	1532 (4.27%)	35946 (100%)

Table 2 : Sex wise distribution of Replacement Donors

Year	Replacement Donors		Total Replacement Donors No. (%)
	Male No. (%)	Female No. (%)	
2008	10149 (97.81%)	227 (2.19%)	10376 (100%)
2009	5038 (97.56%)	126 (2.44%)	5164 (100%)
2010	3507 (99.40%)	21 (0.6%)	3528 (100%)
2011	3870 (96.84%)	126 (3.26%)	3996 (100%)
2012	4620 (96.39%)	173 (3.61%)	4793 (100%)
TOTAL	27184 (97.58%)	673 (2.42%)	27857 (100%)

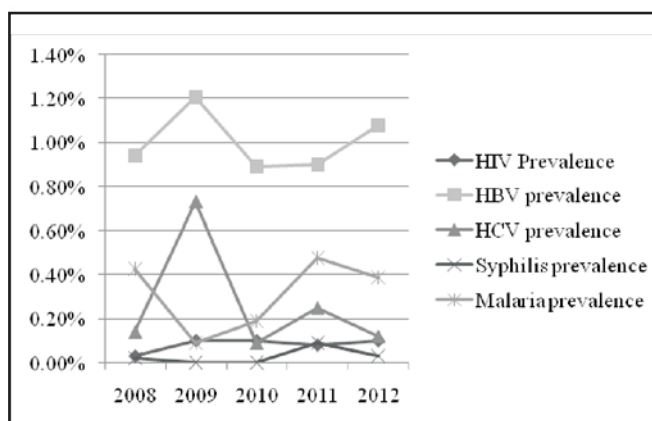
The year wise proportion (in percentages) of different TTIs among blood donors has been depicted in Table 3. With respect to individual TTIs, it was observed that out of total 63803 donors screened, the maximum number of donors 643 were found positive for HBV infection followed by 210 donors positive for malaria, 88 donors for HCV, 53 donors for HIV and 19 donors positive for syphilis. Thus the proportion (in percentages) of TTIs among blood donors at blood bank during five year period was the maximum for HBV (1.01%) followed by malaria (0.33%), HCV (0.14%), HIV (0.08%) and least for syphilis (0.03%).

Table 3 : Year wise trend of sero-prevalence of TTIs from 2008-2012

Year	Number of donors	HIV	HBV	HCV	Syphilis	Malaria
2008	11688	3 (0.03%)	110 (0.94%)	16 (0.14%)	2 (0.02%)	50 (0.43%)
2009	10969	11 (0.10%)	133 (1.21%)	8 (0.73%)	0	10 (0.09%)
2010	11805	12 (0.10%)	106 (0.89%)	11 (0.09%)	0	23 (0.19%)
2011	13393	11 (0.08%)	121 (0.90%)	34 (0.25%)	12 (0.09%)	64 (0.48%)
2012	15948	16 (0.10%)	173 (1.08%)	19 (0.12%)	5 (0.03%)	63 (0.39%)
Total	63803	53	643	88	19	210
Percentage of individual infection		0.08%	1.01%	0.14%	0.03%	0.33%

When year wise trend of individual TTIs was plotted, it was found that for HIV infection there was a peak in prevalence during the year 2009 which was followed by a steady pattern and then again an upsurge during 2012. There was a rising trend for HBV infection from 0.94% in 2008 to 1.08% in 2012 with a decline in percentage only in 2010. HCV positivity in donors is showing two peaks in the year 2009 and 2011. The pattern of trend of syphilis shows an upsurge of infection in donors in the year 2011 followed by a decline in 2012. The prevalence of malaria infection in donors has been seen as a rise from 0.09% in 2009 to 0.39% in 2012 (Fig. 2).

Figure 2 : Trend of sero-prevalence of TTIs from 2008-2012



The pattern of TTIs with respect to donors depicted high prevalence of TTIs in replacement donors as compared to voluntary donors. Out of 53 positive HIV cases (Replacement Donors=43,

Voluntary Donors=10); 643 HBV cases (RD=495, VD=148); 88 HCV cases (RD=78, VD=10); 19 Syphilis cases (RD=13, VD=6); 210 Malaria cases (RD=156, VD=54)(Table 4).

Table 4 : Distribution of seropositive cases in Voluntary donors (VD) and Replacement donors (RD)

Year	HIV		HBV		HCV		Syphilis		Malaria	
	VD	RD	VD	RD	VD	RD	VD	RD	VD	RD
2008	0	3	0	110	0	16	0	2	0	50
2009	0	11	10	123	1	7	0	0	0	10
2010	4	8	47	59	3	8	0	0	10	13
2011	3	8	49	72	5	29	5	7	19	45
2012	3	13	42	131	1	18	1	4	25	38
Total	10	43	148	495	10	78	6	13	54	156
Grand Total	HIV= 53		HBV= 643		HCV= 88		Syphilis= 19		Malaria= 210	

Discussion :

Blood being a scarce and expensive human resource, should be prescribed judiciously and appropriately. Prescribing decisions should be based on national guidelines on the clinical usage of blood; taking the individual patient's needs into consideration, with minimum cost and wastage, optimum safety and efficacy.^[12] Despite of pre-donation counseling and medical fitness test, the presence of TTIs is inevitable in blood donations. Since a person can transmit infection during its asymptomatic phase (window period), transfusions can contribute to an ever widening pool of infection in the population.^[13] Only continuous improvement and implementation of donor selection, sensitive screening tests, and effective inactivation procedures can ensure the elimination, or at least reduction, of the risk of acquiring TTIs.^[14]

In the present study out of total donors, voluntary donors constituted 56.3% and replacement donors 43.7%. Similar predominance of voluntary donors was noted by Bhattacharya et al.^[15] and Shah et al.^[16] in their study. This reflects presence of awareness about blood donation in general population. The proportion was found to be low as compared to study conducted by Singh et al.^[17], Kakkar et al.^[18] and Pahuja et al.^[19] where replacement

donors were the predominant group as 82.4%, 94.7% and 99.48% respectively. The present study revealed that TTIs were more prevalent in replacement donors than voluntary donors. Similar observations with high sero-positivity in replacement donors was observed by Singh et al.^[17] and Pahuja et al.^[19]. On the other hand Chandra et al.^[20] have found almost negligible infectivity rate in voluntary donors and also no voluntary donor was found to be positive for HIV by Arora D et al.^[21]

The sero-prevalence of TTIs in the present study was highest for HBV infection (1.01%). This finding was similar to study conducted by Chandra et al.^[20], Sawke et al.^[22] and Bhawani et al.^[23] who have also found HBV to be the commonest TTI among the donors in different percentages being 1.96%, 2.90% and 1.41% respectively. The prevalence of malaria infection in donors was next to HBV infection being 0.33% in the present study. The third highest prevalence of TTI in the present study was HCV being 0.14%. Other studies reported HCV prevalence as 0.34%, 0.57%, 0.84% and 1.09%.^[20,22-24] For HIV, India is second only to South Africa in terms of overall number of people living with HIV.^[19] The prevalence of HIV in various parts of India is different with high rate in western and southern parts.^[17] In the present study the prevalence of HIV in donors was found to be 0.08%. Other studies conducted in various parts of

India reported HIV prevalence in donors as 0.23%, 0.51%, 0.39% and 0.08%.^[20,22-24] A WHO report states that the viral dose in HIV transmission through blood is so large that one HIV positive transfusion leads to death, on an average, after 2 years in children and after three to 5 years in adults.^[21] The least prevalence of TTI in the present study was for syphilis being 0.03%. Other studies reported syphilis prevalence in donors as 0.01%, 0.23%, 0.08%, 0.85% and 0.90%.^[20, 22-25]

Conclusion :

Out of 63803 donors, voluntary donors (56.3%) were more, in comparison to replacement donors (43.7%). TTIs were more prevalent in replacement donors than voluntary donors. The number of voluntary donors have increased from 2008 -2012, there was an increasing trend for both males and females but there was male preponderance in both voluntary and replacement donors. Out of all TTIs, prevalence of HBV (1.01%) was highest in the donors followed by Malaria (0.33%), HCV (0.14%), HIV (0.08%) and Syphilis (0.03%). The pattern of TTIs among blood donors from 2008-2012 has shown a rising trend for HIV and HBV infections. Therefore it is concluded that voluntary donation should be encouraged for the prevention of transfusion transmitted infections. Replacement and voluntary donors should be screened thoroughly before blood donation and professional donors should be out rightly rejected. Public awareness and counseling could also help in curbing these infections and increase blood safety.

References :

1. WHO factsheet on Blood Safety and donation, 2014. Available at <http://www.who.int/mediacentre/factsheets/fs279/en/>
2. Bihl F, Castelli D, Marincola F, Dodd RY, Brander C. Transfusion transmitted infections. *Journal of Transfusional Medicine*.2007; 5: 25.
3. WHO fact sheet on Blood safety and donation, 2008.
4. WHO Guidelines of Blood Transfusion Safety Appia,CH-1211 Geneva 27,Switzerland.
5. Widman FK. American Association of Blood Banks, Arlington – Technical manual. 1985: 325–344.
6. Srikrishna A, Sitalakshmi S, Damodar P. How safe are our safe donors? *Indian J. Pathol Microbiol*. 1999; 42; 411-6.
7. Government of India .Drugs and Cosmetics rules, 1945 (amended till 30THJune2005) available at <http://www.cdsc.nic.in/html/Drugs&cosmeticsAct.pdf>

8. "National Blood Policy" produced & published by NACO (National AIDS Control Organization), Ministry of Health and Family Welfare, Government of India, New Delhi. June 2003 (reprint 2007).
9. WHO factsheet on Blood Safety and donation , 2011
10. Radhiga ST, Arumugam P, Kalpana S, Natarajan MV. Patterns of Transfusion Transmitted Infection in Past Ten Years Among Voluntary Blood Donors In Chennai- A Cross Sectional Study.*IOSR Journal of Pharmacy and Biological Sciences*. 2012; 2(1); 1-4.
11. <http://www.jharkhandstatenews.com/prostitution-via-migration-behind-spread-of-aids-in-jharkhand>
12. WHO: The clinical use of blood in Medicine, Obstetrics, Paediatrics, Surgery & Anesthesia, Transfusion & Burns, Geneva, Switzerland; 2001.
13. Kitchen AD, Barbara JAJ. Transfusion transmitted infections. In: Murphy M F and Pamphilon D H (Eds): *Practical Transfusion Medicine*. Blackwell Science, Oxford. 2001: 192–210.
14. Tiwari B R, Ghimmire P, Karki S, Raj Kumar M. Seroprevalence of human immunodeficiency virus in Nepalese blood donors: A study from three regional blood transfusion services. *Asian Journal of Transfusion Science*.2008; 2: 66–68.
15. Bhattacharya P, Chakraborty S, Basu SK. Significant increase in HBV, HCV, HIV and syphilis infections among blood donors in West Bengal, Eastern India 2004–2005. Exploratory screening reveals high frequency of occult HBV infection. *World J Gastroenterol*. 2007; 13:3730–3733.
16. Shah N, Shah JM, Jhaveri P, Patel K, Shah CK, Shah NR. Seroprevalence of HBV, HCV, HIV and syphilis among blood donors at a tertiary Care Teaching Hospital in Western India. *Gujarat Medical Journal*.2013; 68(2): 35-39
17. Singh B, Verma M, Kotru M, Verma K, Batra M. Prevalence of HIV and VDRL seropositivity in blood donors of Delhi. *Indian J Med Res* 2005; 122:234–6.
18. Kakkar N, Kaur R, Dhanoa J. Voluntary donors–need for a second look. *Indian J Pathol Microbiol*. 2004; 47:381–383.
19. Pahuja S, Sharma M, Baitha B, Jain M. Prevalence and trends of markers of hepatitis C virus, hepatitis B virus and human immunodeficiency virus in Delhi blood donors. A hospital based study. *Jpn J InfDis*. 2007; 60:389–391.
20. Chandra T, Kumar A, Gupta A. Prevalence of transfusion transmitted infections in blood donors: an Indian experience. *Trop Doct*. 2009; 39:152–154. doi: 10.1258/td.2008.080330
21. Arora D, Arora B, Khetarpal A. Seroprevalence of HIV, HBV, HCV and syphilis in blood donors in Southern Haryana. *Indian J Pathol Microbiol*. 2010; 53:308–309.
22. Sawke N, Sawke G K, Chawla S. Seroprevalence Of Common Transfusion-Transmitted infections among Blood Donors at Bhanpur, B h o p a l, M.P. from 2006–2008. *Peoples J Of sci. Research* 2010; 3(1) 5-7
23. Bhawani Y, Rao PR, Sudhakar V. Seroprevalence of transfusion transmissible infections among blood donors in a tertiary care hospital of Andhra Pradesh from. 2004–2009. *Biology and Medicine* 2010; 2 (4): 45-48.
24. Gupta N, Kumar V, Kaur A. Seroprevalence of HIV, HBV, HCV and syphilis in voluntary blood donors. *Indian J Med Sci*. 2004; 58:255–257.
25. Jasani J, Patel V, Bhuva K, Vachhani A, Patel H, Falleiro JJ. Seroprevalence of transfusion transmissible infections among blood donors in a tertiary care hospital. *Int J Biol Med Res*. 2012; 3(1): 1423-1425.