



Seroprevalence & changing trends of transfusion-transmitted infections amongst blood donors in a Regional Blood Transfusion Centre in north India

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Background & objectives: Transfusion-transmitted infections (TTIs) are the major problem associated with blood transfusion. Accurate estimates of risk of TTIs are essential for monitoring the safety of blood supply. The present study was undertaken to determine the percentage of voluntary donors (VDs) and replacement donors (RDs) and also, to estimate and compare the seroprevalence and changing trends of TTIs amongst VDs and RDs in a regional blood transfusion centre in north India.

Methods: This retrospective study was based on the records of all voluntary and replacement donations which were collected from January 2008 to December 2014 in a Regional Blood Transfusion Centre placed in a tertiary care hospital in Delhi, India.

Results: Of the total 220,482 donations, 163,540 (74.17%) were voluntary and 56,942 (25.83%) were replacement donation. The overall seroprevalence of human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV), syphilis and malaria were 0.32, 1.61, 0.73, 1.62 and 0.06 per cent, respectively. Furthermore, the TTIs were more frequently encountered in RDs in comparison to VDs.

Interpretation & conclusions: The increase in public awareness regarding voluntary blood donation, meticulous donor screening, counselling and use of highly sensitive tests can help in reducing the risk of TTIs.

Key words Hepatitis B virus - hepatitis C virus - human immunodeficiency virus - replacement donors - syphilis and malaria - transfusion-transmitted infections - voluntary donors

Blood transfusion is an integral part of medical care and treatment. Adequate, safe and timely given transfusion saves millions of life; however, unsafe transfusion leads to many life-threatening complications and increases the possibility of transfusion-transmitted infections (TTIs)¹. Unsafe transfusions are costly from both human and economic points of view and lead to high morbidity and mortality^{2,3}. Most common TTIs

are human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV), syphilis and malaria. An effective donor screening protocol for donor selection, proper counselling of donor, sensitive screening tests and effective discarding techniques for reactive units can ensure a reduction in the risk of acquiring TTIs⁴. The present study was conducted to find out the percentage of voluntary and replacement donors

(VDs and RDs) and also, to estimate and compare the seroprevalence and changing trends of TTIs amongst VDs and RDs during a 7-yr period (2008-2014) in a Regional Blood Transfusion Centre in north India.

Material & Methods

This retrospective study was based on the records of all donations done in the Regional Blood Transfusion Centre (East Delhi), Guru Teg Bahadur Hospital, Delhi, India, from January 2008 to December 2014. The completely filled donor forms which included the type of donation (voluntary/replacement), the patient's details, pre-donation questionnaire, counselling details and medical examination findings available for each case were analyzed along with the TTI records. The samples from all blood donations were screened for HIV 1-2, HBsAg, HCV, syphilis and malaria. Samples were collected in vacutainers at the time of blood donation and screened for HIV 1-2, HBsAg and HCV using fourth-generation enzyme-linked immunosorbent assay (ELISA) technique. HIV was tested using kits manufactured by Avantor (BeneSphera, USA), hepatitis B and hepatitis C viruses were tested using kits manufactured by Bio-Rad, USA, following the standard protocol for each according to the kit inserts. Syphilis was tested by *Treponema pallidum* hemagglutination assay (Bio-Rad) and malaria was tested using Malarial antigen Sure Test kit (Oscar Medicare Pvt. Ltd., India). All samples with reactive results were repeated in duplicate before labelling as reactive.

Results

A total of 220,482 donations were collected during the study period of seven years (January 2008-December 2014) and comprised 163,540 (74.17%) voluntary and 56,942 (25.83%) replacement donations (Table I). The total number of donors, who were found positive for TTIs, was 9622 (4.36%). The HIV, HBV, HCV, syphilis

and malaria infections were found to be in 0.32, 1.61, 0.73, 1.62 and 0.06 per cent donors, respectively (Table II). The trends in seroprevalence of HIV, HBV, HCV, syphilis and malaria during 2008-2014 are shown in Table II. Further subdivision amongst VDs and RDs is shown in Table III. Amongst donors, HBV turned out to be the most prevalent life-threatening TTI. The seropositivity for HIV has decreased overall in both VD and RD over the study period. The seroprevalence of HBV and HCV also showed decline in the VD; however, an increase was seen in the RDs. The seroprevalence of syphilis decreased considerably over the past seven years in both VDs and RDs. Malaria was found to be the least prevalent TTI during the study period.

Discussion

Safe blood transfusion services are a cornerstone of an effective, high-quality healthcare system. However, contaminated blood transfusion is a potential source of TTIs and can be fatal instead of saving life⁵⁻⁷. The prevalence of TTIs amongst blood donors in a well-structured healthcare system with good blood bank services can be used as a reliable tool for

Table I. Yearly distribution data for blood donation

Year	Total donations	Total voluntary donations, n (%)	Total replacement donations, n (%)
2008	27,859	19,736 (70.84)	8123 (29.16)
2009	29,790	21,440 (71.97)	8350 (28.03)
2010	32,553	22,844 (70.17)	9709 (29.83)
2011	32,021	24,074 (75.18)	7947 (24.82)
2012	32,902	25,018 (76.03)	7884 (23.97)
2013	33,046	25,117 (74.00)	7929 (24.00)
2014	32,311	25,311 (78.33)	7000 (21.66)
Total	220,482	163,540 (74.17)	56,942 (25.83)

Table II. Prevalence of human immunodeficiency virus, hepatitis B virus, hepatitis C virus, syphilis and malaria in donors

Year	Total donation	HIV, T (%)	HBsAg, T (%)	HCV, T (%)	Syphilis, T (%)	Malaria, T (%)
2008	27,859	149 (0.53)	478 (1.71)	194 (0.69)	814 (2.92)	13 (0.04)
2009	29,790	101 (0.33)	460 (1.54)	177 (0.59)	648 (2.17)	Nil
2010	32,553	97 (0.29)	531 (1.63)	221 (0.67)	574 (1.76)	16 (0.04)
2011	32,021	95 (0.29)	505 (1.57)	202 (0.63)	464 (1.44)	39 (0.12)
2012	32,902	96 (0.29)	594 (1.80)	266 (0.80)	368 (1.11)	34 (0.10)
2013	33,046	101 (0.30)	482 (1.45)	285 (0.86)	392 (1.18)	17 (0.05)
2014	32,311	81 (0.25)	519 (1.60)	268 (0.82)	320 (0.99)	21 (0.06)
Total	220,482	720 (0.32)	3569 (1.61)	1613 (0.73)	3580 (1.62)	140 (0.06)

T, total number of seroreactive units; HIV, human immunodeficiency virus; HCV, hepatitis C virus; HBsAg, hepatitis B virus surface antigen

Table III. Comparison of seroprevalence of human immunodeficiency virus, hepatitis B virus, hepatitis C virus, syphilis and malaria in voluntary and replacement donors

Year	HIV		HBsAg		HCV		Syphilis		Malaria	
	Voluntary donation	Replacement donation	Voluntary donation	Replacement donation	Voluntary donation	Replacement donation	Voluntary donation	Replacement donation	Voluntary donation	Replacement donation
2008	40	109	129	349	45	149	201	613	2	11
2009	19	92	96	364	28	149	132	516	0	0
2010	14	83	95	436	42	199	91	483	0	16
2011	19	76	86	419	32	170	65	399	2	37
2012	14	82	75	519	37	229	49	319	1	33
2013	10	91	68	424	38	247	31	361	0	17
2014	5	76	95	424	39	229	40	280	0	21

HIV, human immunodeficiency virus; HCV, hepatitis C virus; HBsAg, hepatitis B virus surface antigen

statistical estimations of these infectious agents in the general population⁸.

In the present study, VDs constituted 74.17 per cent of all donors, and a shift towards the voluntary donation was noted during the study period as has been reported earlier^{9,10}. However, preponderance of RDs was noted in many other studies from India¹¹⁻¹⁴ which could possibly be due to lack of understanding amongst general population about voluntary blood donation.

In our study, HIV seropositivity was seen in 0.32 per cent donors which was comparable to other studies^{15,16} from India, whereas some studies reported a lower prevalence of 0.17 and 0.08 per cent¹⁸. Fasola *et al*¹⁹ showed a significantly high prevalence of 13.2 per cent in Nigeria. A similar study conducted at the same institution in 1999 showed 0.8 per cent HIV seropositivity²⁰. The seroprevalence of HBV has also reduced from over a decade in comparison to the previous study conducted at the same institution²⁰. The HBV seroprevalence ranging from 1.25 to 1.96 per cent has been reported in other studies^{10,16,17}; however, two studies from central and north India reported a high prevalence of 2.63 and 2.90 per cent, respectively^{21,22}. Jain *et al*²³ used enhanced chemiluminescence immunoassay and nucleic acid amplification testing (NAT) and found that HBV NAT yield was much higher than studies done in Europe and the USA and emphasized that in a country like India where there are a significant number of window period donations, NAT must be judiciously introduced. In our study, HBV was the most prevalent life-threatening TTI indicating a need for an organized programme for hepatitis B vaccination and use of a highly sensitive technique for its detection like NAT.

Hepatitis C showed an increase in seroprevalence over the seven year period with overall seroprevalence of 0.73 per cent. There was wide variation in prevalence reported in various studies ranging from 0.16 to 1.57 per cent^{13,16,24}. The wide variations of HCV seroprevalence in different studies from India might be due to the use of different methods for testing and use of different generation of ELISA test kits, having different sensitivities and specificities. Syphilis was found in 1.62 per cent donors. Other studies showed prevalence ranging from 0.01 to 0.90 per cent^{10,16-18,25}. Seropositivity for malaria was found to be low at 0.06 per cent. Many other Indian studies^{10,16,17} including our previous study²⁰ did not include malarial antigen positivity in their studies. Negi and Gaur¹⁴ reported very low seroprevalence of malaria (0.002%).

In conclusion, our results showed that though TTIs were seen in both types of donors, their seropositivity was higher in RDs as compared to the VDs. Thus, there is a need to increase public awareness regarding voluntary donation and its benefits. Meticulous donor screening and use of highly sensitive techniques for detection of TTIs may help reduce the risk of TTIs.

Conflicts of Interest: None.

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