Research Article

Sero-prevalence of transfusion transmissible infections and co-infections among blood donors in a tertiary care hospital of the capital: three and half year study

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Abstract

Introduction: This study is conducted to evaluate the seroprevalence of HBV, HCV, HIV and syphilis among blood donors in a tertiary care hospital of New Delhi, India a three and half year experience. A retrospective study of donor records covering the period between Jan 2009 to June 2012 at the blood bank, Safdarjung hospital and VMMC, New Delhi was carried out. All samples were screened for HIV, HBsAg, HCV and syphilis. Out of a total of 95,185 blood donors, 29433 were voluntary donors and the remaining 65,752 were replacement donors. Seroprevalence of HBV, HCV and HIV was studied by ELISA in voluntary and replacement blood donors. RPR was done for screening of syphilis. The seroprevalence of HBV was highest 2.4% followed by HIV and HCV 0.72% and 0.7% respectively. That of syphilis was found to be 0.48%. In all the markers tested there was increased prevalence of TTI among the replacement donors (3.06%) as compared to voluntary donors (1.25%). Blood units having more than one sero reactive infection were 70 (0.07%) in number.. Among HIV seropositive donors 24 were positive for HCV, 18 for HBV and 9 for VDRL. Thus, transmitted transfusion infections as well as co infections are a major hurdle in safe blood donation practise in the capital. Strict and stringent donor criteria and use of sensitive screening tests as well as encouragement of voluntary donations is the need of the hour.

Keywords: Hepatitis B virus; Human immunodeficiency virus; Hepatitis C virus; Syphilis; Blood donor, transfusion transmitted infection.

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INTRODUCTION

Timely transfusion of blood saves millions of lives, but unsafe transfusion practices puts millions of people at risk of transfusion-transmissible infections. (Bihl *et al*, 2007)[1] 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 (Tiwari *et al*, 2008)[2] TTIs can exist as asymptomatic diseases in the hosts, so donors must be screened for high-risk behaviour related diseases. Monitoring the trends in prevalence of transmissible infectious agents in blood donors will provide a mechanism to evaluate the safety of the blood supply. Increase in incidence and prevalence rate of an infectious disease agent may reflect changes in population risks; may result from the introduction of new screening technique or confirmatory method which results in improved detection of infected individuals, an increased number of false positive results, or both (Glynn *et al*., 2000)[3] Although there are many studies on the prevalence of TTIs in blood donors[4,7], data on the presence of coinfection with more than one TTI is sparse[5,8] We analysed the prevalence and patterns of co-infections among voluntary and replacement donors in our region over a 3and half-year period.

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MATERIAL AND METHODS

The present retrospective study was carried out at blood bank,Vardhman Mahavir Medical College and Safdarjung Hospital, New Delhi(A tertiary care hospital) during the 3 and half year period from January 2009 to June 2012. The blood collections were carried out from the voluntary donors at outdoor blood donation camp and in-house blood bank as well as from replacement donors at blood bank. The donors were first required to fill up a registration form which carried all the information like personal details, demographic details, occupation details and medical history regarding risk factor like history of previous surgery, hospitalization, blood transfusion, tattoo mark etc. Next step was pre-donation counselling which included explanation of the procedure of blood donation, post-donation care and the outcome of the donation i.e. TTIs test. They were also counselled about high risk behaviour to make sure that the donor is not engaged in any such type of activities. The donors were then screened by a doctor according to blood donor selection criteria and guideline from drug and cosmetic act and NACO[9]. Haemoglobin estimation was performed. This screening procedure was very helpful to exclude the professional donors. Total 95185 donors were considered medically fit and accepted for blood donation during the study period. All the samples were screened for HIV, HBV, HCV and SYPHILIS. Hepatitis B surface antigen (HBsAg; ELISA 3rd generation), HIV (1and 2;ELISA 3rd generation), hepatitis C virus (HCV; ELISA 3rd generation) by ELISA method using approved commercially available kits. Screening for VDRL was done by Rapid Plasma Reagin method. The reactive sample was retested in duplicate before considering it seropositive. Seropositive blood bags were discarded. The data were recorded on specially formed proforma, tabulated, analyzed and compared with the similar studies by other authors.

RESULTS

Table 1: Patterns in Voluntary and Replacement Blood Donations

Year	Voluntary	Replacement	Total donations
2009	6157	20475	26632
2010	10212	17577	27789
2011	8709	18355	27064
2012(up to June)	4355	9345	13700
Total	**29433(30.92%)**	**65752(69.07%)**	**95185(100%)**

Table 2: Yearly Distribution of Seroreactive Cases

Year	No. of Donors	HIV	HBsAg	HCV	VDRL	Total Infectivity
2009	26632	141(0.52%)	620(2.3%)	179(0.6%)	181(0.6%)	1121(4.2%)
2010	27789	219(0.78%)	604(2.17%)	168(0.60%)	105(0.37%)	1096(3.9%)
2011	27064	228(0.84%)	626(2.3%)	235(0.86%)	126(O.46%)	1215(4.4%)
2012(up to june)	13700	98(0.71%)	441(3.2%)	91(0.6%)	53(0.38%)	683(4.9%)
Total	**95185**	**686(0.72%)**	**2291(2.4%)**	**673(0.7%)**	**465(0.48%)**	**4115(4.3%)**

Table 3: Total Seroreactivity in Voluntary and Replacement Donors

Total Seropositive Cases			HIV		HBV		HCV		VDRL	
4115	VOL	REP	VOL	REP	VOL	REP	VOL	REP	VOL	REP
	1197 (1.25%)	2918 (3.06%)	208 (0.21%)	478 (0.5%)	662 (0.69%)	1629 (1.7%)	202 (0.21%)	471 (0.49%)	125 (0.13%)	340 (0.35%)

Table 4: Yearly Distribution of Co Infections/Multiple in Fections in Donors

Year	2009	2010	2011	2012(up to june)	Total No.	Percentage
HBV+ HCV	2	2	2	2	8	11.4%
HBV+HIV	5	5	4	4	18	25.71%
HBV+VDRL	2	2	3	2	9	12.8%
HIV+VDRL	2	3	2	2	9	12.85
HCV+HIV	8	6	10	-	24	34.2%
HIV+VDRL+HBV	1	-	1	-	2	2.8%

Table 5 (a): Comparison of TTI Prevalence Rate in Different Parts of India

Place	HIV (%)	HBsAg (%)	HCV (%)	Syphilis (%)	Reference
Ludhiana	0.084	0.66	1.09	0.85	[19]
Delhi	0.56	2.23	0.66		[15]
Lucknow (UP)	0.23	1.96	0.85	0.01	[18]

Southern Haryana	0.3	1.7	1.0	0.9	[10]
West Bengal	0.28	1.46	0.31	0.72	[4]
Bangalore, Karnataka	0.44	1.86	1.02	1.6	[20]
Vijayanagara karnataka	0.9%	3.2%	0.35%	0.04%	[21]
Bhopal (MP)	0.51%	2.9%	0.57%	0.23%	[22]
Present study	**0.72%**	**2.4%**	**0.7%**	**0.48%**	

Table 5 (b)

Author andYear	Place	Total TTIs
Gupta N *et al*[19] (2001-2003 [11]	Ludhiana	2.68 %
Chadra *et al* 2001–2006 [18]	Lucknow, U.P.	2.54 %
Nilima Sawke *et al* (2006–2008 [22]	BHANPUR, M.P.	4.21 %
Bhawani *et al* (2004-2009 [23]	Vikarabad, AP	2.72 %
Jasani *et al* 2004-2011 PIpARIA [24]	Piparia Gujarat	3.35 %
Singh *et al* [4]	East delhi	5.86%
Present study	New Delhi	4.3%

A total of 95185 apparently healthy donors were screened during the study period. Among them 65,752 (69.07%) were replacement donors and 29,433 (30.92%) were voluntary donors. (Table1). Total seroprevalence of infections was 4.3 %(4115 cases). Out of which voluntary donors comprised 1.25% (1197) and replacement donors were 3.06% (2918) (Table 2). The overall sero prevalence of HIV, HBsAg, HCV and syphilis were 0.72%, 2.4%, 0.7% and 0.48% respectively (Table 2). Prevalence of HIV, HBsAg , HCV and syphilis among replacement donors were 0.5%, 1.7%, 0.49%, and 0.35% respectively and among voluntary donors was 0.21%, 0.69%, 0.21%, and 0.13% respectively (Table 3). The yearly trends in the seroprevalence of HIV, HBsAg , HCV and syphilis are shown in Table 2.Seropositivity of HIV has increased from 0.52% to 0.71%.HbsAg has also increased from 2.3% to 3.2%. Seroprevalence of HCV has remained static at 0.6% with a slight increase in 2011. VDRL seropositivity has shown a decline from 0.67% to 0.38% in 2012 (Table 2). Out of the the 95185 blood units considered 70(0.07%) had coinfections and multiple infections. Among the 51 HIV seropositive units 24 were positive for HCV, followed by 18 for HBsAg and 9 with VDRL. There were 19 HIV seronegative blood donors, out of which HBsAg with HCV seroreactivity was present in 8 units and HBsAg with VDRL in 9cases. 2 cases showed seroreactivity to HBsAg, HCV and VDRL (Table 4).

DISCUSSION

With every unit of blood, there is 1% chance of transfusion associated problems including TTI[10]. The risk of TTI has declined dramatically in high income nations over the past two decades, primarily because of extraordinary success in preventing HIV and other established transfusion transmitted viruses from entering the blood supply[11]. But the same may not hold good for the developing countries. The national policy for blood transfusion services in our country is of recent origin and the transfusion services are hospital based and fragmented[12]. In the present study, of the total blood donors VD constituted 30.92% while RD was 69.07%. Similarly a predominance of RD was noted by Singh *et al*. (82.4%)[6], Kakkar *et al*. (94.7%)[13], Singh *et al*. (84.43)[14], Pahuja *et al*. (99.48%)[15] and Arora *et al*. (68.6%)[10] This is in contrast to, the study done by Bhattacharya *et al*.[16] who had noticed a predominance of VD. It is shown that replacement donors constitute the largest group of blood donors in India[17], reflecting the lack of awareness amongst the general population. Studies[6,14,15] have showed high seropositivity rate in RD compared to VD, in accordance we observed seropositivity of VD was 1.25% and of RD was 3.06%. Chandra *et al*.[17] have found almost negligible infectivity rate in VD and also no VD was found to be positive for HIV by Arora D *et al*.[10] People are unlikely to become VD's unless they receive accurate information about blood donation for which voluntary blood donation camps have to be encouraged[10] The detailed analysis and comparison of TTIs with the studies by different authors within India is described in Table -5a and b. The overall prevalence of TTIs was 4.3%, similar studies conducted have reported result ranging between 2.54%-5.86% [Table -5b] It is found that HBV is the commonest TTI in the present study. This finding is similar to the studies by Chandra *et al*[18] 2001–2006, Nilima Sawke *et al*[22] (2006–2008), Bhawani *et al*[23] (2004-2009), and Jasani[24] *et al*

2004-2011, who have also found HBV to be the commonest TTI. The overall prevalence was 2.4% which is higher than rest of the studies conducted in various parts of India. Comparable rate was reported by a study done by Pahuja *et al*[15] of 2.23%. N Sawke *et al*[22] and Kulkarni *et al*[21] have observed higher HBsAg seropositivity rates as 2.9% and 3.25% respectively. India is still in the intermediate prevalence zone for HBsAg and has been estimated to be a home to over 40 million HBsAg carriers. Despite the fact that a safe and effective vaccine has been available since 1982, the HBsAg prevalence in India remains high. This is because hepatitis B vaccination is not a part of our national immunization programme[15] The mean seropositivity of HIV was 0.72% in our study. The HIV seroprevalence in Indian scenario has been observed between 0.2% to 0.9%. For HIV, India is second only to South Africa in terms of overall number of people living with HIV. The Indian National AIDS Control Organization (NACO) suggested an overall prevalence of 0.91% (2005) in India with 0.25% in Delhi[15] The prevalence of HIV in various parts of India is different with high rate in western and southern parts[6] The present study showed a HIV prevalence of 0.72%. Pahuja *et al*.[15] have noted 0.56% and Singh *et al*.[6] have noted 0.54% of HIV seroprevalence. Other studies conducted in various parts of India reported HIV seroprevalence ranging between 0.08%-0.9%.[10,15,18,19,21] 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[10] Hence, safe transfusion practices like avoidance of single donors and practices of autologous blood transfusion should be encouraged.[6] The prevalence of HCV was 0.7%.The result was comparable with a study conducted in Delhi in which HCV seroprevalence was reported as 0.66%[15] Other Indian studies observed result between 0.3 to 1.09%[10,15,18,19,21] The prevalence of HCV is less than HBsAg, as HCV is transmitted primarily through blood exposure. In contrast to HBV, about 20 to 40% of HCV cases are acute and majority of them progress to chronic infection. The long term risk of developing cirrhosis and hepatocellular carcinoma is greater in HCV infected individuals than in those infected with HBV. The VDRL sero reactivity was the least as compared to rest of the TTI in the present study i.e 0.48%.Other studies gave a prevalence ranging from 0.01 to 0.85% [10, 15,18,19,21] Though the reactivity for VDRL is least in present study but it is essential to exclude high risk donors. Transfusion transmitted syphilis is not a major hazard of modern blood transfusion therapy. Only rare cases of transfusion transmitted syphilis have been documented. It is not the transmission of syphilis that is worrisome, being a sexually transmitted disease, its presence points towards donor's indulgence in "high risk"behavior and consequent higher risk of exposure to infections like HIV and hepatitis. Data on the prevalence of >2 TTIs is limited. Kapur and Mittal[26] found that in HIV-positive donors, HBsAg was positive in 12.2% while VDRL was reactive in 11.8%. Mathai *et al*[5] found that of 31 942 donors screened over a 6-year period, mixed infections were seen in only 10 donors (0.03%). Kaur *et al*[26] reported 23(0.05%) of 42 439 donors screened over a 5-year period had co-infection. In our study, the overall prevalence of coinfections was 0.07% (70 cases out of 95185). The maximum number of cases showed coinfection with HCV and HIV (34.2%).These two viruses are similar in a number of ways, and infection with both is a serious problem. Both HCV and HIV are transmitted by exposure to infected blood. About one-quarter of the people infected with HIV also have HCV. The majority of coinfected people are IDUs. HCV is acquired relatively soon after individuals begin injecting drugs. Within 5 years of beginning to inject, 50% to 80% of IDUs are infected with HCV. As a result, many IDUs who become infected with HIV are already infected with HCV. It is estimated that 50% to 90% of IDUs with HIV also have HCV infection. Kaur *et al*[26] reported HIV and HBV in 5 of 23 (21.7%) and HCV in 2 of 23 (8.6%) coinfections. Salawu *et al*[27] reported 27 cases of multiple infections in 14,500 donar blood units, Of these, 40.7% were infected with Hepatitis B and C, 33.3% with Hepatitis B and HIV, 18.5% with hepatitis B and syphilis, 7.4% with HIV and syphilis, while another 3.7% had triple infections of hepatitis B, C and syphilis. Many factors favour mixed infections including a high degree of epidemiological similarity between the HIV and hepatitis viruses. They have similar routes of transmission, risk factors such as high risk sexual behaviour and a higher prevalence with other sexually transmitted diseases such as syphilis. It is important to detect these as >2 TTIs would pose a greater threat to the recipient of the infected blood. Yearly trends have shown increasing trends with HIV and HBsAg. The prevalence of HCV has remained constant and VDRL showed a decline. Singh *et al*[4] showed an increasing trend for HIV where as Pahuja *et al*[15] reported a decreasing trend for HIV, HBsAg and HCV. This reflects the fact that the majority of our patient load comprised of lower socioeconomic group and rural background. Also being the national capital there is influx of population from all the states, regions and all categories of society in search of better prospects to earn a livelihood.

CONCLUSION

To conclude, seroprevalence of transfusion transmitted infections was much more in replacement donors as

compared to voluntary donors. Voluntary donations are safer as compared to replacement ones and should be encouraged. Efforts should be made to increase the number of voluntary donors and reduce replacement donations to a minimum. Motivation and recruitment of potential local blood donor population would lead to an effective voluntary system. Despite stringent criterias and policies the trend of HIV, HBsAg and HCV are not on the decline. Due to a similarity in risk factors and routes of transmission, public awareness and education would go a long way in curbing the prevalence of these infections and increasing blood safety Reporting the results of the tests and follow-up counselling with treatment also helps to prevent further transmission of the infection in the community. Transmission of TTIs during serologically negative window period still poses a threat to blood donor safety. Introduction of nucleic acid testing (NAT) for HIV, HBsAg and HCV are highly recommended to detect infection during window period.

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