Patterns of infective sero positivity among blood donors in a rural Medical College Regional Blood Transfusion centre: A retrospective study

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ABSTRACT

Background: Transfusion-transmitted infections (TTI) is still burden that continue to be a threat to safe transfusion practices of blood & components and one of the major problem in delayed transfusion hazards. In the present study prevalence and patterns of co-infections among voluntary and replacement donors were analyzed**.**

Methods: This is descriptive study. Blood collected over a 6-year period were studied for the type of donation (voluntary or replacement), number of seroreactive cases and the number, type and distribution of co-infections among different type of donors.

Results: Out of 127995 units of collected blood, 106755 (83.40%) were voluntary and 21240(16.60%) replacement donors of them 1463 were seroreactive. Out of 1463 seroreactive cases (1.14%) 128(0.10%), 137(0.11%),1025(0.8%) & 173(0.13%) were HIV, HCV, HBsAg (Hepatitis B surface antigen) & VDRL (Venereal Diseases Research Laboratory) respectively. 30 (0.02%) cases of seropositive samples showed more than one seroreactive reactions which were collected 14(0.06%) from replacement donors and 16(0.01%) samples from voluntary donors. Only 2 samples (0.001 %) of repeat donors show seropositivity.

Conclusion: Possibilities of transfusion transmitted infections were more with replacement blood donors in comparison to voluntary blood donors. Repeat donors were safer than first time donors. Though the incidence was less, chances of multiple infections were still problems to the recipients. Proper history taking, screening and encouragement of blood donation would definitely reduce the chances of transfusion transmitted infection.

Keywords: Transfusion-transmitted infections; blood donors; seropositivity

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Background:

In spite of history taking & screening Transfusion Transmitted Infections (TTI) is still burden for safe transfusion and responsible for hazards of Blood Transfusion. Blood is a life saving resource; still it can be the one of the source of infective diseases if there remain any lacunae in screening of blood during processing. Several factors play a role to detect TTI .In spite of meticulous testing one can not detect the infections in "Window Phase". If we look back the

incidence of TTI would be more .In spite of technological advancements, the problems of 'window period', false-negative results, prevalence of asymptomatic carriers, genetic variability in viral strains and technical errors to be considered.[1]

Hepatitis B is one of the common TTI. In most of the blood banks the diagnosis of HBV infection is based on the presence of Hepatitis B Surface Antigen in the Blood stream which does not confirm the absence of HBV infection. The occult HBV infection can only be diagnosed by HBc and HBV DNA. Many workers had shown a significant numbers of HBsAg negative blood donors were anti HBc positive and exposed to HBV infection. These donors are potential for transmitting HBV contaminated blood.[2]

Hepatitis C virus (HCV) is another important cause of post transfusion non-A non B hepatitis and 200 million individuals had chronic HCV infection. The global seroprevalance of HCV among blood donors varies from 0.4-19.2%.[3]

Some literatures showed 0.81% HIV Positivity[4] and presence of co- infection TTI among blood donors. Currently safe blood transfusion is ensured by careful donor's selection and mandatory screening for TTI. In spite of all precautions, transmission of HIV via blood and components transfusion is still present. This is mostly due to collection of blood during window phase .[5]

There are many studies on the prevalence of TTI in blood donors.[6-8] Less number of data showed presence of co-infection with more than one TTI.[6-9] In the present study we analyzed the patterns of infections among the blood donors and the recipients including multireceipients (thalassaemia), in a rural medical college and hospital blood bank in our region covering about average distance of 30 km around the centre over a period of 6 years. TTI continue to be problems in many part of the world as well India and the multitransfused patients of Thalassaemia major are particularly at increased risk of TTI.[10] The aim of this study was to find out the incidence of seropositivity of TTI among the blood donors (voluntary + replacement) and increase the number of donors for safe blood.

Methods:

The present study was conducted at the Department of Pathology, Burdwan Medical College and Hospital, Burdwan over a period of 6 years (2006-2011) taking all blood collected during this period. The donors were either voluntary (Camp) or replacement donors (relatives or friends of patients in the blood bank). All samples were screened for hepatitis B surface antigen (HBsAg; Hepalisa, J.Mitra ELISA of SPAN), anti-human immunodeficiency virus antibodies (HIV Ab;HIV 3rd generation kit for detection of antibodies to HIV1 and HIV2, J. Mitra & S.D. lab), anti-hepatitis C virus antibodies (HCV Ab; Micro ELISA 3rd generation, J. Mitra & SD Lab) and Venereal Diseases Research Laboratory (VDRL) reactivity (Carbogen kit, Tulip Diagnostics as well as RPR Span). The multi transfused patients of Thalassaemia major were tested for TTI at an interval of 6 months. The total number of seroreactive cases and their distribution were noted. Cross checking was done by calling the donors through post or over telephone. The donors with more than one seroreactivity were noted and were identified as co- infection. All statistical analysis were done using SPSS version 17.

Results:

Out of total 127995 units of collected blood 106755 (83.40%) were from voluntary and 21240 (16.60%) from replacement donors .Total collection showed 75% were rural donor and 25% urban donors. Of the Voluntary donors 91.70% were male 8.30% were female (Table-I). Among replacement donors 97.89% were male and 2.11% were female. This study showed increased trend of Voluntary blood donation (13764 in 2006 to 21631 in 2011) and increased numbers of Voluntary blood donation camp [241(2006) to 353 (2011)] (Table -1 and Chart -I).

Table IA Year wise collection of Blood(Voluntary & Replacement) for the period 2006-2011

	2006	2007	2008	2009	2010	2011	Total
Total collection	17283	17713	19628	21177	24165	28029	127995
Voluntary collection	13764	14921	18375	18689	19375	21631	106755 (83.40%)
Replacement collection	3519	2792	1253	2488	4790	6398	21240 (16.6%)

Table IB Year wise Voluntary collection of blood through camp according to sex for the period 2006-2011

	2006	2007	2008	2009	2010	2011	Total
Voluntary male	12364	13360	17791	16793	17340	19824	97472 (91.30%)
Voluntary female	1400	1561	584	1896	2035	1807	9283 (8.70%)
No. of Camp	241	268	268	283	324	353	

Table IC Year wise replacement collection of blood according to sex for 2006-2011.

	2006	2007	2008	2009	2010	2011	Total
Replacement male	3477	2742	1200	2424	4678	6271	20792 (97.89%)
Replacement female	42	50	53	64	112	127	448 (2.11%)
Camp	241	268	268	283	324	353	

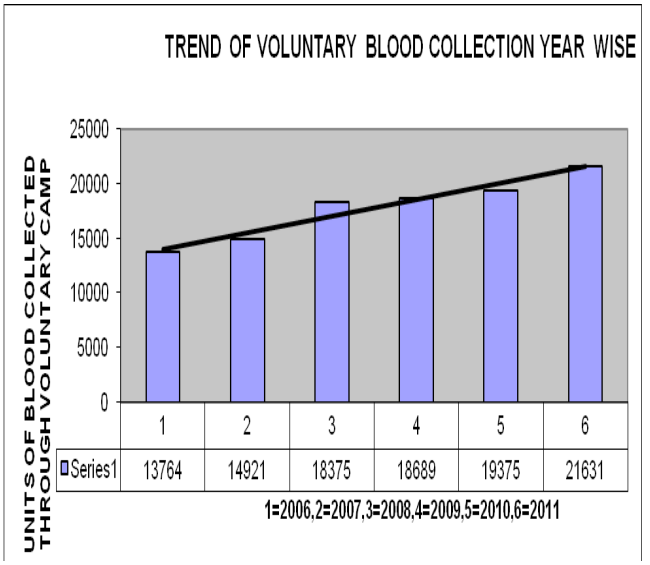

Chart-I : Showing increased trend of voluntary blood donation.

Out of total 127995 blood donors (Voluntary +Replacement) 1463(1.14%) were seroreactive and incidence of HIV, HCV, HBsAg, VDRL reactivity were 128(0.10%), 137(0.11%), 1025(0.80%), 173(013%) respectively, which indicates highest incidence of HbsAg infection (72.3%, 8 times more than that of HIV reactivity). The seropositivity of the voluntary & replacement donors were 1166 (1.09%) & 297 (1.39%) respectively (Table -2) which indicates higher seropositivity among replacement donors. Out of 1463 sero positive donors 30 (2.05%) had co-infection (more than one infection) and showed 16(1.37%) were voluntary donors & 14 were replacement donors (4.47%). VDRL & HIV confections were observed among 6(0.41%) donors & VDRL, HIV & HBsAg co infections in 1 donor (0.06%). HBsAg &HIV, HIV with HCV, HIV with HCV & HbsAg, HbsAg &VDRL, HCV with VDRL, HbsAg and HCV confections were 7(0.47%), 2 donors(0.17%), 3 donors (0.21%),6(0.41%), 2(0.13%) and 3 donors(0.21%) respectively.

Table- 2A Year wise HIV&HCVpositivity of Voluntary donors for the period 2006-2011

	2006	2007	2008	2009	2010	2011	Total	%
Voluntary collection	13764	14921	18375	18689	19375	21631	106755	83.40
Seropositivity HIV	13	16	17	18	11	10	85	0.08
Seropositivity HCV	17	20	22	19	16	26	120	0.11

Table2B Year wise HBsAg & VDRLpositivity of Voluntary donors for the period 2006-2011

	2006	2007	2008	2009	2010	2011	Total	%
Voluntary collection	13764	14921	18375	18689	19375	21631	106755	83.40
Seropositivity HBsAg	106	109	130	121	173	162	801	0.75
Seropositivity VDRL	18	28	22	25	28	39	160	0.15

Table 2C Year wise HIV&HCVpositivity of Replacement donors for the period 2006-2011

	2006	2007	2008	2009	2010	2011	Total	%
Replacement donors	3519	2792	1253	2488	4790	6398	21240	16.6
Seropositivity HIV	8	7	5	6	8	9	43	0.2
Seropositivity HCV	3	3	2	3	4	5	20	0.09

Table 2D Year wise HBsAg & VDRLpositivity of Replacement donors for the period 2006-2011

	2006	2007	2008	2009	2010	2011	Total	%
Replacement donors	3519	2792	1253	2488	4790	6398	21240	16.6
Seropositivity HBsAg	38	30	15	23	50	65	221	1.04
Seropositivity VDRL	2	2	1	4	3	1	13	0.06

Table 2E Year wise total Seropositivity of Voluntary & Replacement donors

	2006	2007	2008	2009	2010	2011	Total	%
Total Seropositivity of Voluntary collection	154	173	191	183	228	237	1166	1.09
Total Seropositivity ofReplacement donors	51	42	23	36	65	80	297	1.39

Out of total donors only 13 female (0.01%) were seroreactive and none had co infection.

The age incidence of seropositive donors ranged from 19 to 50 years where as about 80% donors with co infection were 26 to 33 years.

Out of total 127995 collected blood 1645(1.28%) blood were discarded, of which 1463(88.94%) were due to seropositivity and 182(11.06%) were due to other causes include hemolysis, less collection , damage to the bags during transportation and date expiry etc.126350 units of blood were issued for transfusion. 9 multitransfused recipients were found seropositive and 7 of them were Thalssaemic. All of them were seronegaive before transfusion.

The incidence of co infection reduced dramatically from 2009. No donors were detected with co- infection in 2010& 2011.

Discussion:

In spite of screening, TTIs continue to be burden to safe blood transfusion practices. With every unit of blood, there is 1% chance of a transfusion related problem including TTIs.[8] Professional donors and donors with high risk behavior such as drug addict, homosexual, commercial sex workers carry more risk of TTI positivity.[11]

Transfusion of blood & blood components are life saving measures of innumerable of patients worldwide. On the contrary blood and blood components are one the important route for transmission of TTI. In developing country absolute safe transfusion is far away which need awareness, education and improved technology for attaining zero level of Transfusion acquired infection.

In our study there were no professional donors and the blood was collected from 106755 (83.40%) voluntary donors which is nearer to the target of NACP III (90%) &.21240 (16.60%) from replacement donors.

The present study showed the seropositivity of replacement donors higher than voluntary donors (p=0.02). The replacement donors were usually friends or relatives of the recipients. Sometimes replacement donors due to social factors may conceal their high risk activities to their relatives. In the present study it was observed the seroreactivity was higher in replacement donors (1.39%) than voluntary donors (1.09%) The concealment of Medical history and life style are the important causes of seropositivity among the voluntary and replacement donors. Higher seropositivity was observed in replacement donors in this study.

Difference in infection rates between voluntary and replacement donors have been observed in many earlier studies (Table-3).[14-16] Family donors cannot be included amongst voluntary-non-remunerated blood donors as they have a higher rate of TTIs.[17]

Table-3A Prevalence of transfusion - transmissible infection in different studies from India

Study duration	Singh et al 1997-99	Garg et al 1994-98	Sharma et al 1997-2002	Gangadeep et al 2001-2005	Present study 2006-2011
HIV	Voluntary-0.8	Voluntary-0.4	Voluntary-0.45	Voluntary-0.15	Voluntary-0.08
	Replacement-0.8	Replacement-0.2	Replacement-0.32	Replacement-0.44	Replacement-0.2
HBsAg	Voluntary-1.9	Voluntary-3.5	Voluntary-1.26	Voluntary-0.65	Voluntary-0.75
	Replacement-1.2	Replacement-2.6	Replacement-0.91	Replacement-1.07	Replacement-1.04

Table 3B Prevalence of transfusion - transmissible infection in different studies from India

Study duration	Singh et al 1997-99	Garg et al 1994-98	Sharma et al 1997-2002	Gangadeep et al 2001-2005	Present study 2006-2011
HCV	Voluntary-3.0	Voluntary-0.23	Voluntary-0.52	Voluntary-0.3	Voluntary-0.11
	Replacement-1.3	Replacement-0.13	Replacement-0.23	Replacement-0.5	Replacement-0.09
VDRL	Voluntary--	Voluntary--	Voluntary-0.52	Voluntary-0.19	Voluntary-0.15
	Replacement--	Replacement--	Replacement-0.26	Replacement-0.48	Replacement-0.06

Table 3C Prevalence of transfusion - transmissible infection in different studies from India

Study, Duration	HIV+ HBsAg	HIV+ HCV	HIV+ VDRL	HIV+ HBsAg+ HCV	HBsAg+ VDRL	HCV+ VDRL	HBsAg+ HCV	HIV+ HBsAg+ VDRL
Gagandeep Kaur etall 2001-2005	22.7%	4.5%	18.25%	-	22.7%	18.25%	9.1%	4.5%
Our study 2006-2011	23.33%	6.7%	20%	10%	20%	6.7%	10%	3.33%

In the present study 1463 donors were sero reactive showing a gradual tendency of declining seroreactivity (Chart-II).The co infection is statistically higher in replacement donors ($p < 0.001$) though the rate of co infection is less in our country. Gangadeep Kaur et al (2010) showed co infection is higher in replacement donors than voluntary donors ($P < 0.005$) and similar to other studies (Table - 4).

Table -4 Comparison of prevalence of co- infection with other study

Study, Duration	HIV+ HBsAg	HIV+ HCV	HIV+ VDRL	HIV+ HBsAg+ HCV	HBsAg+ VDRL	HCV+ VDRL	HBsAg+ HCV	HIV+ HBsAg+ VDRL
Gagandeep Kaur etall 2001-2005	22.7%	4.5%	18.25%	-	22.7%	18.25%	9.1%	4.5%
Our study 2006-2011	23.33%	6.7%	20%	10%	20%	6.7%	10%	3.33%

Our study showed 66.66% co infection with HBsAg and 63.33% with HIV and 50% had VDRL co infection. Most common co infection was HIV& HBsAg (23.33%) followed by HIV& VDRL (20%) and HBsAg& VDRL (20%) and 93.33% donors had co infection either with HBsAg or HIV.

Post transfusion infections occurred in 9 recipients (0.007%) and mostly were Thalssaemic (77.77%) and all were multitransfused. The TTI from screened blood depends on various factors like the safety of donor population, sensitivity of the screening tests used & numbers of test performed window-period donations, and other reasons such as mutant strains. [20]

Roopam Jain et al in their study showed that out of 96 multitransfused Thalssaemic patients, 24 (25%) were reactive for anti-HCV. The seroreactivity of males were significantly higher than females ($p < 0.0001$) No female donor showed co infection.

India has one of the largest pools of hepatitis B-infected patients[12,13] and of all seroreactive donors HBV is more common (0.8%) .

Chronic hepatitis B virus (HBV) infection remains a major public health problem worldwide with more than 300 million chronic carriers.[14] The course of HBV infection depends on several factors that can influence the immune system, including age at infection and host genetic factors, and genetic variability of the virus influencing the expression of the viral antigens.[18] Proper screening of HBV can be done to prevent transfusion-transmitted hepatitis B virus (HBV) by using progressively more sensitive HBsAg assays.

Nucleic acid amplification testing (NAT) for HCV and HIV infection had been successfully introduced to screen donors in many developed countries but the cost- effective ness to be considered in our country.[19]

HIV reactor among blood donors in the present study was 0.10% and had co infection 63.33%. According to the action plan of NACO all the HIV reactive blood donors should be notified of their status. In the developing countries like India confirmatory tests using Nucleic acid amplification technique (NAT) on HIV seroreactive blood is not feasible.

In India seroprevalance of HCV varies 0.12-4 % [21] which varies geographically.

Based on the results we feel that to reduce the risk of these infections blood should be accepted from voluntary donors & repeat voluntary donor. Donor selection and screening procedures must be strictly followed for the blood safety. Voluntary blood donation has to be made a part of healthy lifestyle, proper health education to be given to public about the benefits of voluntary blood donation & proper assurance to be given to all donors regarding the life style.

Conclusion:

To wipe of scarcity of blood and ensure availability of safe quality blood & component round the clock and throughout the year the transfusion service must necessarily be supported by voluntary blood donors.

Consequently, the recruitment of voluntary donors becomes one the most important aspects of blood transfusion services. Thus, healthy, responsive and motivated voluntary blood donors are the back-bone of the transfusion service.

Blood is a life saving agent but blood transfusion can be responsible of life threatening infections to the recipient if pre transfusion screening tests are not done properly.

Presently the safety of blood for transfusion is maintained by careful selection of voluntary donors and performing the mandatory screening for transfusion transmissible infections (TTI) as meticulously as possible.

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