

## Study of transfusion transmitted infections among blood donors in a Tertiary care Hospital in Puducherry

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### Abstract

**Introduction:** Transfusion of blood and its components is a life-saving procedure as even a unit of blood can save a patient in need. Though it is said to be a safe procedure as the blood is tested and processed before its use, risk of transmission of infections like HIV, syphilis, hepatitis B, hepatitis C and malaria are still seen. The present study was done to find out the sero-prevalence of Transfusion transmitted infections among blood donors in one of the tertiary health center in south India.

**Materials and Method:** A retrospective study was conducted from January 2012 to May 2016 in a blood bank of a tertiary care hospital in Puducherry. A total of 8959 blood units which were collected from both voluntary and replacement donors during the study period were included. Complete donor's demography and screening status for TTI's were analysed.

**Results:** Present study included a total cases of 8959 blood donors during study period. Out of these, 258(2.87%) were positive for TTIs. Higher seroprevalence of TTI's were noted in replacement donors and younger age group between 18 to 30 years.

**Conclusion:** Following strict donor criteria, adopting sensitive and advanced screening techniques for TTI's and conducting various awareness programs, it is possible to bring down the sero-positivity of transfusion transmitted infections.

**Keywords:** Transfusion Transmitted Infections, HIV, Syphilis, HBV, HCV.

### Introduction

Blood transfusion is a life-saving procedure as even a unit of blood can save a patient in need. Though it is said to be a safe procedure as the blood is tested and processed before its use, risk of transmission of infections like HIV, syphilis, hepatitis B, hepatitis C and malaria are still seen. It was found that there was 1% chance of transfusion associated problems that can occur with every unit of blood.<sup>(1)</sup> It is mainly due to inability to confirm the presence of infections in re-seroconservation or window phase of the infection, highly expensive screening tests, immunologically variant viruses, immuno silent carriers and inadvertent laboratory testing errors.<sup>(1,2)</sup> In July 1989, Mandatory screening tests for HIV antibodies were initiated by Indian National AIDS Control Organisation (NACO), following to the study reports and survey that showed high seropositivity for TTI's in commercial blood donors.<sup>(2)</sup>

Transfusion associated morbidity and mortality is seen in about 50% of virus infected patients. It depends on the number of transfusions and underlying condition of the patient.<sup>(3)</sup> This infection has the ability to transmit in the asymptomatic phase resulting in higher incidence of the Transfusion Transmitted Infections (TTIs). This risk can be reduced by continuous improvement and implementation of donor selection, sensitive screening tests and effective inactivation procedures. Since TTI is often seen with low viral titer, it is best advised to use molecular means of screening for an accurate detection.<sup>(4)</sup>

India being the second most populated nation in the world also has the second largest global pool of HBV infections (with HBsAg carriage 2-7 %). India has a population of more than 1.2 billion with 5.7 (reduced to

2.5) million Human Immunodeficiency Virus (HIV) positive, 43 million HBV positive and 15 million HCV positive persons.<sup>(5)</sup> A study by Chatteraj et al revealed alarming high seroprevalence of TTI's in the range of HBV – 0.66% to 12%, HCV – 0.5% to 1.5%, HIV– 0.084% to 3.87%, and syphilis – 0.85% to 3% respectively.<sup>(6)</sup> The aim of this study was to know the proportions of Transfusion Transmitted Infections amongst voluntary as well as replacement blood donors at the Blood Bank, Rural tertiary care teaching institute, Puducherry.

### Materials and Method

**Study design:** The present descriptive study was conducted at a blood bank of a tertiary care hospital in Puducherry. The study was conducted over the period of 4.5 years from January 2012 to May 2016, after obtaining approval from the Institutional Ethical Committee.

**Study population:** A total of 8959 blood units which were collected from both voluntary and replacement donors over a period of 4.5 years were included in this study. Donors were selected and screened thoroughly as per the standard guidelines of government of India, Drugs and cosmetics act.<sup>(7)</sup>

**Collection of Data:** Data such as donors age, nature of donor (whether replacement or voluntary), gender and results of screening tests for TTI's were collected.

**Sampling Technique:** Following informed consent, 5ml of blood from each donor was used for screening transfusion transmitted infections such as HIV, HBV, HCV, Syphilis and Malaria. The hepatitis B surface antigen (HBsAg) was tested by 3<sup>rd</sup> generation ELISA, HIV (1 and 2) was tested by 3<sup>rd</sup> & 4<sup>th</sup> generation ELISA

& Hepatitis C virus (HCV) was tested by 3rd generation ELISA methods using NACO approved commercially available kits. Screening for syphilis was done by Rapid Plasma Reagin (RPR) method. Malaria was confirmed by the presence of anti-malarial antibodies using an enzyme immunoassay (EIA) kit. The reactive sample was repeated once before considering it seropositive.

**Statistical analysis:** The data was collected and analyzed by using Statistical Package for Social Sciences (SPSS) software. Chi square test was applied as test of significance.

### Observations and Results

A total of 8959 blood donors were screened in last four and half years (Jan 2012 to May 2016). In the present study, out of the total 8959 blood donors, 4460 (49.78 %) were voluntary donors and 4499 (50.22%) were replacement donors. On sex distribution, both voluntary and replacement blood donors showed very higher percentage for male population constituting 99.17% and 99% respectively. Female accounted for less than 1% in both the donor groups. (Table 1)

**Table 1: Year & Gender wise distribution of Blood Donors (Voluntary and replacement)**

Year	Voluntary donors			Replacement donors			Total Blood donors
	Male	Female	Total	Male	Female	Total	
2012	1077	10	1087	963	5	968	2055
2013	973	7	980	986	11	997	1977
2014	1065	14	1079	1032	15	1047	2126
2015	956	6	962	1011	5	1016	1978
2016(till May)	352	0	352	464	7	471	823
Total	4423 (99.17%)	37 (0.8%)	4460 (49.78%)	4456 (99%)	43 (0.96%)	4499 (50.22%)	8959 (100%)

Sero-positivity for TTIs decreased from 2012 to 2016. This decrease in sero-positivity was found to be statistically significant ( $P < 0.05$ ). Yearly distribution of TTIs among blood donors are shown in Table 2.

**Table 2: Yearly distribution of TTI's positive cases**

Year	HIV		HbsAg		HCV		Syphilis		Malaria		Total
	VD	RD	VD	RD	VD	RD	VD	RD	VD	RD	
Jan – Dec 2012	-	-	14	40	2	3	-	6	-	1	66
Jan – Dec 2013	-	1	23	30	1	1	-	4	-	2	62
Jan – Dec 2014	-	2	10	31	1	1	5	10	-	1	61
Jan – Dec 2015	-	3	5	35	-	5	1	9	-	-	58
Jan –May 2016	-	1	1	4	-	-	-	5	-	-	11
Total	0 (0.07%)	7	53 (2.15%)	140	4 (0.15%)	10	6 (0.44%)	34	0 (0.04%)	4	258

VD: Voluntary donor, RD: Replacement donor

The overall prevalence of HBV, Syphilis and HCV was found to be 2.15%, 0.44 % and 0.15% respectively, while the prevalence of HIV and Malaria was 0.07% and 0.04% respectively. The highest percentage of prevalence was observed for HBV, followed by syphilis, HCV, HIV and malaria in decreasing order. Higher prevalence of HBsAg, syphilis and HCV was found to be statistically significant ( $p < 0.05$ ). The Hepatitis B had shown astatic phase in the first two years and then a decreasing trend over a period of time whereas syphilis and HIV was more in 2015 and 2014 respectively.

Age, sex and donors distribution of TTI's positive blood donors were described in table 3. The majority of TTIs were found positive among replacement blood donors constituting 75.5%. 62.7% of blood donors belonging to age group of 18–30 years showed positivity for TTI's followed by 31–40 years of age group (26.7%).

**Table 3: Age, sex and donors distribution of TTI's positive blood donors**

Character	Donors	HIV	HBsAg	HCV	Syphilis	Malaria	Total
Sex	Male: 8879 (99.1%)	7	192	14	39	4	256
	Female: 80 (0.8 %)	-	1	-	1	-	2
Donors	Voluntary : 4460	-	53	4	6	0	63
	Replacement: 4499	7	140	10	34	4	195
Age	18 – 30 years	5	127	11	15	4	162
	31 - 40 years	1	54	1	13	0	69
	>40 years	1	12	2	12	0	27

### Discussion

Transfusion transmitted Infections (TTI's) continue to be a potential threat and affect the safety blood transfusion practices especially in developing and under developed countries. Because of well-established and improved diagnostic methods, the estimated risks of TTI's were found to be very low in western countries.<sup>(8,9)</sup>

In the present study, estimations of the prevalence of TTI's along with donor profile were analyzed. Our study showed almost equal distribution of both voluntary and replacement donors unlike various other studies which showed increased percentage of replacement donors when compared to voluntary donors (68.36% and 99.48% replacement donors respectively).<sup>(10,11)</sup> Reasons being effective donor motivation strategies over the years which includes motivational speeches in educational and academic institutes, phone calls to voluntary registered donors, awareness programs in the

form of continuing medical education and brief lectures etc.

In our study, female donors contributed less than 1%. This was similar to the studies of Bhawani Y et al (10.52%), Pahuja A et al (2.76%) and Agrawal VK et al (8.5%) study.<sup>(10,11,12)</sup>

This is due to various social and financial factors in developing countries like India like majority of females have less awareness about proper nutrition, lower literacy rate among females, misconceptions about blood donation, etc.

The sero-prevalence of TTIs as reported in various studies on blood donors is depicted in Table 4. According to the report of National Aids Control Organization, it was stated that higher incidence of HIV was found in states such as Maharashtra and South India. But the present study showed a very low HIV prevalence of 0.07%. Several other studies also reported higher prevalence of HIV in places like Bhopal, Hisar, Jamnagar, Karimnagar and western UP.<sup>(13-17)</sup>

**Table 4: The prevalence of TTIs as reported in various studies on blood donors**

Studies	Donors	HIV%	HbsAg%	HCV%	VDRL%	Malaria%
Sawke 2010 <sup>(15)</sup>	Bhopal	0.51	2.9	0.57	0.23	-
Arora 2010 <sup>(14)</sup>	South Haryana	0.3	1.7	1.0	0.9	-
Leena 2012 <sup>(16)</sup>	Karimnagar	0.27	0.71	0.14	0.10	0.129
Chaudhary 2013 <sup>(13)</sup>	Western UP	0.27	1.93	1.02	0.16	-
Mehta 2013 <sup>(17)</sup>	Jamnagar	0.3	1.2	0.26	0.5	-
Geta Negi 2014 <sup>(19)</sup>	Uttarakhand	0.2	1.2	0.9	0.3	0.002
Present study	Puducherry	0.07	2.15	0.15	0.44	0.04

Prevalence of HBsAg in our blood donor population was 2.15% which was similar to findings by Chaudhary et al (1.93%) in western UP, Singh B et al (1.8%) in northern India, and Sawke et al (2.9%) in Bhopal.<sup>(13,15,18)</sup> Variable results of 0.71%, 1.2 % and 1.7 % have also been reported in various other studies.<sup>(14,16,19)</sup> Most of the studies had reported that sero-prevalence of hepatitis B among blood donors was higher than HIV, HCV and syphilis.<sup>(14-19)</sup>

To overcome the high prevalence of HBV infections among blood donors, especially in window period, detection of the IgM class of antibodies to the hepatitis B core antigen (Anti Hbc – IgM) can be used as an adjuvant marker. This marker would help in detecting recent infection caused by HBV.<sup>(15)</sup>

The seroprevalence of Syphilis was 0.44% in this study, which is less than the studies of Srikrishna (1.6%) and Arora et al (0.9%).<sup>(14,20)</sup> The seroprevalence of HCV and Malaria in our study was 0.15 and 0.04% respectively. Similar findings of 0.14% and 0.26% were found by other studies.<sup>(16,17)</sup> A study done by Srikrishna et al showed none of the donor positive for Malaria out of 8617 total donors.<sup>(20)</sup> Low seropositivity for few diseases in our study could be attributed to strict donor selection criteria followed by rationale use of blood.

The seroprevalence of TTIs was significantly higher among blood donors in age group 18-30 years as compared to donors above 40 years. Similar findings were noted in the study conducted by Leena et al in South India. According to Leena et al, sexually active age group were having higher seroprevalence which can be very well correlated with various other studies.<sup>(16,21,22)</sup>

In the present study, about 75.5% of TTI's were found occurring in replacement donors. This can be prevented by motivating safe voluntary donors instead of replacement donors by conducting various awareness programs.<sup>(16)</sup> In spite of using all screening tests that are currently used in majority of blood banks in India, the risks of TTI's cannot be reduced to zero due to lack of tests which can give higher sensitivity rate like Nucleic acid amplification testing (NAT) for HIV and HCV, Detection of antibodies to core antigen (HBcAg) and IgM for HBsAg.

### Conclusion

To conclude from the present study, sero-prevalence of replacement blood donors for TTI is higher compared to voluntary blood donors. So, efforts should be made to increase the voluntary blood donations by creating awareness through various health campaigns. Females should be encouraged to do blood donations. Since the seroprevalence are higher in sexually active younger age groups, high sensitive screening methods can be introduced so that proper treatment and follow-up counselling can be given to the infected individuals which can help in preventing further transmission of infections in the community. Sero-positivity of Transfusion Transmitted Infections can be reduced by using sensitive screening techniques, following immaculate donor eligibility criteria and judicious use of blood and blood products apart from blood campaigns.

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