



*Original Research Article*

## **Seroprevalence of Transfusion Transmitted Infections among Healthy Blood Donors at Blood Bank Attached to a Tertiary Care Hospital in Maharashtra State of India**

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### **ABSTRACT**

**Background:** It is well known that blood transfusion is associated with a large number of complications, some are only trivial and others are potentially life threatening, demanding for meticulous pretransfusion testing and screening. More than 18 million units of blood are not screened for transfusion transmissible infections (TTIs). With every unit of blood, there is a 1% chance of transfusion associated problems including transfusion transmitted diseases.

**Objectives:** To find out the seroprevalence of TTIs (HIV, HBV, HCV, Syphilis and Malaria) among healthy blood donors.

**Methods:** The study was conducted at the blood bank of a tertiary care hospital. A retrospective review of blood donors' records over a period of seven years (2005-2011) was done. Sterile venous anticoagulated blood was collected from each of the donor and analyzed for HIV, HBV HCV, Syphilis and Malaria using highly sensitive and specific kits.

**Results:** A total of 29,916 apparently healthy donors were screened during the period of 7 years. The overall prevalence of HIV, HBsAg, HCV and syphilis among the blood donors were 0.53%, 1.60%, 0.14% and 0.03%, respectively. No blood donor tested showed positivity for malarial parasite.

**Conclusion:** The present study clearly documents a relatively low seroprevalence of major TTIs among blood donors. With the implementation of strict donor selection criteria, use of sensitive

screening tests and establishment of strict guidelines for blood transfusion it may be possible to reduce the incidence of TTI in the Indian scenario.

**Keywords:** Blood donor, Transfusion transmitted infection, Human immunodeficiency virus, Hepatitis B virus

## INTRODUCTION

Transfusion of blood and blood components, as a specialized modality of patient management saves millions of lives worldwide each year and reduces morbidity. It is well known that blood transfusion is associated with a large number of complications, some are only trivial and others are potentially life threatening, demanding for meticulous pretransfusion testing and screening. <sup>(1)</sup>

Globally more than 81 million units of blood are donated each year. <sup>(2)</sup> More than 18 million units of blood are not screened for transfusion transmissible infections (TTIs). <sup>(3)</sup> With every unit of blood, there is a 1% chance of transfusion associated problems including transfusion transmitted diseases. <sup>(4)</sup>

Use of unscreened blood transfusion keep the patient at risk of acquiring many TTIs like hepatitis viruses (HBV, HCV), Human Immune Deficiency viruses (HIV), syphilis, malaria etc. As per guidelines of the Ministry of Health and Family Welfare, Government of India under the 'Drug and Cosmetic Act' 1945, all the blood donations are to be screened against these major TTIs. <sup>(5,6)</sup>

These unsafe blood transfusions are very costly from both human and economic points of view. Morbidity and mortality resulting from the transfusion of infected blood have far-reaching consequences, not only for the recipients themselves, but also for their families, their communities and the wider society. <sup>(7)</sup>

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. <sup>(8)</sup> 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. <sup>(9)</sup>

The present study was conducted at a blood bank of a tertiary care hospital to find out the status (seroprevalence) of TTIs among healthy non enumerated blood donors so as to heighten the awareness of the infectious complications of blood transfusion.

## MATERIAL AND METHODS

A retrospective review of blood donors record covering the period between 2005 and 2011 carried out at a blood bank of a tertiary health care hospital in district Akola of Maharashtra state.

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 first filled up a form which carried the information of their demographic details, medical history regarding risk factor like history of previous surgery, hospitalization, blood transfusion, high risk behavior, tattoo mark etc. Next steps were pre-blood donation counseling which included explanation of the procedure of blood donation, post-blood donation care and the outcome of the blood donation i.e. TTIs test.

The donors were then screened by a physician according to blood donor selection

criteria and guidelines from ‘Drug and Cosmetic Act’-1945. 5 milliliters of each donor’s venous blood was dispensed in a small sterile test tube labeled with a unique sample number for mandatory screening of the TTIs. Hemoglobin estimation was performed. Professional donors found out of the screening procedure and those with history of jaundice were excluded from the study.

Total 29,916 donors were considered medically fit and accepted for blood donation during the period mentioned as above. On completion of blood donation, the units were screened for the five commonest TTIs namely HIV I & II, Hepatitis B surface antigen (HBsAg), HCV, Syphilis and Malaria. All the donors’ serum samples were screened for these TTIs. HIV and HBsAg were screened using third generation ELISA kits with reported sensitivity & Specificity of 100% each. HCV was also screened using third generation ELISA kits with reported sensitivity & specificity of 100% and 97.4% respectively. Tests were

performed according to manufacturer’s instructions. All reactive samples were repeated in duplicates. Repeat reactive sera were labelled as ELISA positive cases. Such seropositive blood bags were discarded.

Verbal informed consent was obtained from the authorities of the blood bank and the protocol for this study was approved by the Ethical Committee. The data were recorded on specially formed proforma, tabulated, analyzed.

## RESULTS

A total of 29,916 apparently healthy donors were screened during the period of 7 years. Among these 29,196(97.59%) were males and 720(2.41%) were females. Among the study subjects 26,067 (87.13%) were voluntary donors (VD) either from the out-door blood donation camp or in door at blood bank. The remaining 3,849(12.87%) were replacement donors (RD) from the relatives and friends of the patients admitted at the hospital. (Table 1).

**Table No 1: Gender and type of donor wise distribution of blood donors during the period from year 2005-2011**

Year	Total donors	Gender		Type of donor	
		Males	Females	Voluntary Donors	Replacement Donors
2005	1175	1164	11	1135	40
2006	4003	3901	102	3823	180
2007	3030	2938	92	1414	1616
2008	5075	4958	117	4920	155
2009	5357	5165	192	4631	726
2010	5378	5291	87	4845	533
2011	5898	5779	119	5299	599
Total	29916 (100)	29196 (97.59%)	720 (2.41%)	26067 (87.13%)	3849 (12.87%)

\*Figures in parenthesis indicate percentage

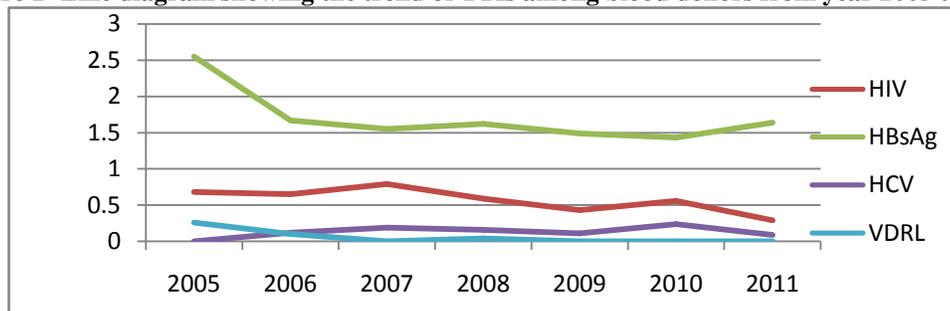
The overall prevalence of HIV, HBsAg, HCV and syphilis among the blood donors were 0.53%, 1.60%, 0.14% and 0.03%, respectively (Table 2, Figure 1). No blood donor tested showed positivity for malarial parasite.

**Table No 2: Trends of Different TTIs among Blood Donors**

Year	No. of Donors	HIV	HBsAg	HCV	VDRL Reactivity
2005	1175 (100)	08 (0.68)	30 (2.55)	00 (0.00)	03 (0.26)
2006	4003 (100)	26 (0.65)	67 (1.67)	05 (0.12)	04 (0.10)
2007	3030 (100)	24 (0.79)	47 (1.55)	06 (0.19)	00 (0.00)
2008	5075(100)	30 (0.59)	82 (1.62)	08 (0.16)	02 (0.04)
2009	5357 (100)	23 (0.43)	80 (1.49)	06 (0.11)	00 (0.00)
2010	5378(100)	30 (0.56)	77 (1.43)	13 (0.24)	00 (0.00)
2011	5898(100)	17 (0.29)	97 (1.64)	05 (0.09)	00 (0.00)
Total	29916(100)	158 (0.53)	480(1.60)	43(0.14)	09 (0.03)

\*Figures in parenthesis indicate percentage

**Figure 1- Line diagram showing the trend of TTIs among blood donors from year 2005 to 2011**



The prevalence of HIV, HBsAg, HCV and Syphilis among replacement donors were 0.13%, 0.35%, 0.03% and 0.002%, respectively, while in voluntary donors it was 0.44%, 1.36%, 0.09% and 0.05%, respectively (Table 3)

**Table No 3- Trends of Different TTI amongst Voluntary and Replacement donors during 7 years period (2005-2011)**

Year	Voluntary Donors				Replacement Donors			
	HIV	HBsAg	HCV	VDRL Reactivity	HIV	HBsAg	HCV	VDRL Reactivity
2005	0.68	2.55	0	0.26	0	0	0	0
2006	0.60	1.35	0.12	0.07	0.05	0.32	0	0.03
2007	0.26	0.66	0.13	0.00	0.53	0.89	0.07	0.00
2008	0.53	1.46	0.10	0.04	0.06	0.16	0.02	0.00
2009	0.30	1.05	0.06	0.00	0.13	0.45	0.06	0.00
2010	0.41	1.06	0.17	0.00	0.15	0.37	0.07	0.00
2011	0.27	1.39	0.08	0.00	0.02	0.25	0.00	0.00
Avg	0.44	1.36	0.09	0.05	0.13	0.35	0.03	0.002

## DISCUSSION

Amongst the 29,916 accepted donors, male donors (97.59%) outnumbered the female (2.41%). This may be due to the fact that in developing country like India,

because of social taboo and cultural habits, number of female donors was very less. Other reason is that a large number of females from the menstruating age-group are anemic, so declared unfit for blood donation and eliminated by the predonation

screening and counseling. The preponderance of male donors more than 90% was also shown in study by P. Pallavi *et al.* <sup>(10)</sup> While the findings of the present study contradicts the findings by John O. Dirisu *et al* <sup>(11)</sup> in Nigeria with 58.5% male and 41.5% female donors.

Voluntary donors (VD) are motivated blood donors who donates blood at regular intervals and replacement donors (RD) are usually one time blood donors who donates blood only when a relative is in need of blood. <sup>(12)</sup> In the present study, of the total blood donors VD constituted 87.13%, while RD was 12.87%. This is more or less comparable to the study done by <sup>(10, 13)</sup> (64.78%) and (95.5%) respectively who noticed a predominance of VD. In contrast, a predominance of RD was noted by <sup>(12, 14, 15)</sup> (69.8%), (82.4%) and (99.48%) respectively. It is shown that replacement donors constitute the largest group of blood donors in India reflecting the lack of awareness amongst the general population regarding voluntary blood donation.

In the present study the prevalence of four major TTIs i.e. HIV, HbsAg, HCV and syphilis in blood donor population was 0.53%, 1.6%, 0.14% and 0.03%, respectively.

For HIV, India is second only to South Africa in terms of overall number of people living with HIV. The National AIDS Control Organization (NACO) suggested an overall prevalence of 0.91% (2005) in India. <sup>(15)</sup> The prevalence of HIV in various parts of India is different with high rate in western and southern parts. <sup>(14)</sup> The present study showed a HIV prevalence of 0.53%. Similarly, P. Pallavi *et al* <sup>(10)</sup> and Srikrishna *et al* <sup>(16)</sup> have noted 0.44% HIV seroprevalence each while the prevalence in studies by <sup>(14, 15)</sup> were 0.54% and 0.56% respectively. 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 3 to 5 years in adults. Hence, safe transfusion practices like avoidance of single donors and practices of autologous blood transfusion should be encouraged. <sup>(10)</sup>

India has been placed in the intermediate zone of prevalence of Hepatitis B by the WHO (2–7% prevalence rates) with a HBsAg prevalence rate of 1–2%. <sup>(15)</sup> Supporting this, HBsAg prevalence in blood donors from various studies <sup>(14, 16, 17)</sup> were 1.8%, 1.86% and 1.7%. Prevalence of HBsAg in blood donors of present study was 1.6% comparable to the above mentioned studies. 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. <sup>(15)</sup>

With regard to Hepatitis C Virus, P. Pallavi *et al* <sup>(10)</sup> have reported an HCV prevalence of 0.23% in blood donors and similar low prevalence of 0.14% has been noted in present study. But the present study findings were not in accordance with <sup>(15, 18)</sup> who reported 0.66% and 0.83% HCV prevalence respectively. The wide variations of HCV seroprevalance in different studies in India might be due to the use of different generation of ELISA test kits, having different sensitivities and specificities. <sup>(15)</sup>

Sexually transmitted infections are widespread in developing countries and constitute a major public health problem. The VDRL reactivity in present study was 0.03%, a very low value when compared to 2.6% noted by <sup>(14)</sup> and 1.6% by Srikrishna *et al.* <sup>(16)</sup> Arora D *et al* <sup>(19)</sup> and Bhattacharya P *et al* <sup>(20)</sup> have reported a 0.9% and 0.72% of VDRL reactivity respectively. Syphilis has also acquired a new potential for morbidity and mortality through association with

increased risk of HIV infection, thus making safe blood more difficult to get.

None of the donor was found positive for malarial parasite. This may be due to the fact that infection with malarial parasite results in development of fever and weakness. Because of the prominent signs and symptoms majority of the infected persons will not visit the blood donation camp/centre and even if they come, will be readily excluded by medical fitness examination and counselling. Piyush A. Patel *et al* <sup>(13)</sup> has also not found any of the donors positive for malaria.

Despite of pre-donation counseling and medical fitness test, the presence of TTIs is inevitable in blood donations. Since a person can transmit an infection during its asymptomatic phase (window period), transfusions can contribute to an ever widening pool of infection in the population. The economic costs of the failure to control the transmission of infection include increased requirement for medical care, higher levels of dependency and the loss of productive labour force, placing heavy burdens on already overstretched health and social services and on the national economy. <sup>(13)</sup>

## CONCLUSION AND RECOMMENDATION

The present study clearly documents a relatively low seroprevalence of major TTIs among blood donors. With the implementation of strict donor selection criteria, use of sensitive screening tests and establishment of strict guidelines for blood transfusion it may be possible to reduce the incidence of TTI in the Indian scenario.

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