

**Original article:**

## **Seroprevalence of transfusion transmitted infection and utility of blood units in a tertiary care hospital in Central India**

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### **ABSTRACT:**

**Introduction:** The magnitude of the TTI [transfusion transmitted infections] varies from country to country depending on TTIs' loads in that particular population from where blood units are sourced.

**Material and methods:** The study was carried out at the blood bank, Jawaharlal Nehru Medical College, Sawangi (Meghe), Wardha on the data of voluntary and replacement donors from January 2009 to December 2013.

**Results:** among the total blood donors; most of them were males (97.2%) and voluntary donors (76.91%). Since 2009 total blood donors were noted to be increased, especially in 2013. The overall cumulative seroprevalence was noted to be highest for HBV (3.2%) followed by HCV (0.98%), HIV (0.92%) and syphilis (0.44%) in decreasing order. The prevalence of HBV, HCV and syphilis was noted to be higher among replacement donors as compared to the voluntary donors while, in HIV, the prevalence was more in voluntary blood donors. This higher prevalence of TTI among voluntary and replacement blood donors was not significant in each year. But when the higher prevalence among replacement blood donors was tested cumulatively for five years; it was observed that prevalence of TTI was significantly higher among replacement blood donors. Blood units utilization index was calculated for each year which range from 89.69% in 2009 to 84.48% in 2013. Most common cause of discard was TTI [86.14] followed by expired products.

**Conclusion:** hence, strict selection of blood donors with the emphasis on getting voluntary donors are highly recommended to ensure the safety of blood.

**Key words:** TTI, HBV, HIV, HCV, Syphilis, Blood donors [voluntary and replacement]

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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 (TTIs) <sup>[1]</sup>. The magnitude of the TTI varies from country to country depending on TTIs' loads in that particular population from where blood units are sourced. Since a person can transmit an infection during its asymptomatic phase, 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 labor force, placing heavy burdens on already overstretched health and social services and on the national economy. Multiple measures are taken to minimize TTI transmission in the respective population. The past several decades have witnessed great

advantage in techniques of detecting these TTIs. With the advent of nucleic acid amplification technique (NAT), western countries have decreased the risk of TTIs to a major extent [2]. The majority of the problems are due to the prevalence of asymptomatic carriers in the society, as well as blood donations during the window period of infections. Concealing of medical history by captive, paid, or professional blood donors, who widely exist in developing countries, also poses a great threat to safe blood supply. There is a long list of viruses, parasites, and bacteria, which can be transmitted through blood transfusions. Among them, important transfusion transmitted viruses are human immunodeficiency virus (HIV-I/II), hepatitis B virus (HBV), hepatitis C virus (HCV), syphilis infection by Spirochetes, and transfusion associated malaria infection. The study was conducted to estimate the prevalence of transfusion transmitted infections in voluntary blood donors in a blood bank at sawangi, wardha in India

#### **MATERIAL AND METHODS:**

**Study design:** The present study was observational cross sectional study.

**Settings:** The study was carried out at the blood bank, Jawaharlal Nehru Medical College, Sawangi (Meghe), Wardha.

**Study participants:** The present study was carried out on the data of voluntary and replacement donors from January 2009 to December 2013.

**Ethical and institutional issues:** The study has been approved by institutional ethics committee of Jawaharlal Nehru Medical College, Sawangi (Meghe), Wardha. Informed consent of the participants was already collected while blood donation. Prior permission from Chief Medical Superintendent as well as blood transfusion officer (In-Charge officer, Blood bank) was also obtained.

**Data collection procedure:** Blood bank, Jawaharlal Nehru Medical college, Sawangi

(Meghe), Wardha is a well established blood bank. Regular FDA inspections are there. We are having internal blood bank audit committee who look after the maintenance the data of donors, quality control registers, TTI registers, issue registers. Year wise filing of forms and registers is also maintained. Care is taken that no personal data is disclosed.

Donors were carefully screened by trained personnel after a complete physical examination and satisfactorily answering the donor's questionnaire as per WHO guidelines/Govt. of India. Donors having age less than 18 and more than 60, history of medication, recent jaundice, previous surgery, lactation and menstruation in female were excluded. Requisition forms are filled by the donors regarding the history and get it signed.

#### **Definitions / terms used in the study:**

**Voluntary-** donated blood without any incentive for the cause. It could be in blood bank or in various blood donation programmes held in periphery.

**Replacement-** donated blood in exchange for receiving blood units for their patients

A total of 21,116 blood units (Voluntary and replacement) were collected from January 2009 to December 2013.

**Processing of collected blood unit:** Out of these units, samples were collected in test tubes at the time of bleeding and blood was screened for Transfusion Transmitted Infections viz. Hepatitis B Virus, Hepatitis C Virus, Human Immunodeficiency Virus and Venereal Disease Research Laboratory test for syphilis.

**Details of serological tests:** Hepatitis B surface antigen (HBsAg) was tested by Monalisa HBsAg Ultra (Biorad) kit which is enzyme immunoassay technique for detection of surface antigen.

Hepatitis C virus (HCV) was tested by Qualisa HCV Kit which is ELISA for detection of

antibodies to HCV in serum or plasma., Human immunodeficiency virus (HIV) was tested by Eliscan (Diagnova) HIV kit. These were fourth generation enzyme-linked immunoadsorbent assay technique for determination of Antibodies to HIV-1, HIV-2 and p24 antigen in serum or plasma (followed by standard protocol). Syphilis was tested by RPR-Rapid Plasma Reagin Kit (modified slide test, SPAN Diagnostic) and Malaria was screened by SD Malaria Kit (one step, rapid immunochromatographic test for the simultaneous detection of malaria, Bio Standard Diagnostic).

**Data analysis:** The collected data entered into Microsoft excel and further analyzed using Epi info version 3.0 CDC Atlanta. The descriptive statistics analyzed using proportions and inferential statistics analyzed.

#### **RESULTS:**

Data received was tabulated and statistical evaluation was performed. It is observed that among the total blood donors; most of them were males (97.2%) and voluntary donors (76.91%). Since 2009 total blood donors were noted to be increased, especially in 2013; when the donors increase to more than thousand as compared with the previous year [Table 1].

The overall cumulative sero-prevalence was noted to be highest for HBV (3.2%) followed by HCV (0.98%), HIV (0.92%) and syphilis (0.44%) in decreasing order. The prevalence of HBV, HCV and syphilis was noted to be higher among replacement donors as compared to the voluntary donors while, in HIV, the prevalence was more in voluntary blood donors. This higher prevalence of TTI among voluntary and replacement blood donors was not significant in each year [Table 2].

But when the higher prevalence among replacement blood donors was tested cumulatively for five years; it was observed that prevalence of

TTI was significantly higher among replacement blood donors [Table 3].

Blood units utilization index was calculated for each year which range from 89.69% in 2009 to 84.48% in 2013. Most common cause of discard was TTI [86.14] followed by expired products. Utilisation in terms of number of blood units was highest in 2013 [Table 4].

#### **DISCUSSION:**

In our study, voluntary blood donors constitute the largest group of blood donors, which is comparable with Bembde et al [2].

Kothari [3] observed that out of a total of 200 blood donors, 3% were positive for HBsAg, 1% for HIV, 2% for HCV and 4.5% for syphilis.

Awasthi [5] reported seropositivity for HIV was 0.1%, HBsAg 1.82%, HCV 0.83% and syphilis 0.13%. There was significant difference in seropositivity of HBsAg between replacement and voluntary donors.

Bembde A. et al [2], reported the seroprevalence as HBV (1.5%) HCV 0.2% and HIV 0.15%.

Agrawal [1] found that overall seroprevalence of HBV and HCV was 1.5% and 0.8% respectively, while the prevalence of syphilis and HIV was 0.07% and 0.1% respectively. The highest prevalence was observed for HBV followed by HCV, HIV and syphilis in decreasing order.

The present study revealed seroprevalence of HBV at 3.2 % among the donors .Variable results of 1.32% [4] 0.66% [10], 3.44% [11], 5.86% [12], 12.5% [14] have also been reported in various other studies. HCV infection is an evolving public health problem globally. For hepatitis C, the estimated prevalence in this study was 0.98%, similar to the other studies 0.79% [7], 0.88% [13] and 0.78% [8]; whereas a few studies reported much higher level of prevalence such as 1.09 % [10], 2.8% [15], and 6.21% [12] and yet another set of studies reported it to be at lower levels of 0.28% [11] and 0.50% [9].

In the present study, the prevalence of HIV was found to be 0.92 %.Other studies reported it 0.13% [7], 0.26% [8], 0.47% [11] have been reported.

For syphilis, the seroprevalence was found to be 0.44 % in the present study which is lower than other studies 0.85[10] &1.2%[12].When TTI in replacement and voluntary donors was compared, it was found to be more in replacement donors which is statistically significant [Table 3]. Total units utilised and discarded were calculated and average index was calculated. The utilization index of blood bank in this study period was ranging from 84.48 to 89.69. It was increasing year wise. We found that units utilized are increasing but in 2013 as the units collected was also significantly raised, the index was lower than 2012(Table- 4). Wastage index was average 6.1%.The major reason for discard was TTI amongst which HBV was the most common cause. It was followed by expired units, low

quantity of blood in bag and leakage of bags and haemolysed. Our study is comparable with Kora S.A.[16] whereas Sigal et al [17]show expiry as the main reason.

Blood is a very important resource. Hence strict selection of blood donors with emphasis on getting voluntary donors and compressive screening of donors for TTI is recommended to ensure safety of blood. To avoid wastage of blood, proper arrangement of units according to expiry should be done. Regular audit of blood issue and discard is essential by hospital transfusion committee.

**CONCLUSION:** Hence, strict selection of blood donors with the emphasis on getting voluntary donors and comprehensive screening of donors for TTIs using standard methods are highly recommended to ensure the safety of blood for recipient.

**Table 1. Baseline information of blood donors of blood bank**

Year	Total	Replacement %	Voluntary %		Males %	Females %
			Blood Bank	Camp		
2009	3242	927 (28.60%)	1586 (48.9%)	741(22.9%)	3165 (97.7%)	77 (2.3%)
2010	3406	893 (26.21%)	1650 (48.4%)	863 ( 25.3%)	3277 (96.2%)	129 (3.8%)
2011	4090	1178 (28.80%)	1935 (47.3%)	977 (23.9%)	3972 (97.1%)	118 (2.9%)
2012	4655	1298 (27.88%)	2193 (47.1%)	1164 (25%)	4551 (97.8%)	104 (2.2%)
2013	5723	580 (10.13%)	3284 (57.4%)	1769 (30.9%)	5555 (97.07%)	168 (2.9%)
<b>Total</b>	21116	4876 (23.09%)	10648 (50.4%)	5514 (26.1%)	20520 (97.2%)	596 (2.8%)

**Table 2. Sero-prevalence of specific TTI in voluntary and replacement donors**

Year	Type of donor	Screening TTI			
		HBS Ag (%)	HCV (%)	HIV (%)	VDRL (%)
2009	Replacement	44 (4.75)	10 (1.08)	5 (0.54)	10 (1.08)
	Voluntary	62 (2.66)	12 (0.52)	17 (0.73)	15 (0.64)
2010	Replacement	44 (4.93)	10 (1.12)	3 (0.34)	7 (0.78)
	Voluntary	76 (3.02)	22 (0.88)	17 (0.68)	2 (0.08)
2011	Replacement	39 (3.31)	19 (1.61)	13 (1.10)	2 (0.17)
	Voluntary	117 (4.02)	34 (1.17)	19 (0.65)	9 (0.31)
2012	Replacement	31 (2.39)	8 (0.62)	16 (1.23)	3 (0.23)
	Voluntary	84 (2.50)	40 (1.19)	60 (1.79)	4 (0.12)
2013	Replacement	14 (2.41)	3 (0.52)	7 (1.21)	5 (0.86)
	Voluntary	100 (1.98)	57 (1.13)	47 (0.93)	4 (0.08)
*Mean	Replacement	3.56 (1.23)	0.99 (0.44)	0.88 (0.42)	0.63 (0.40)
(SD)	Voluntary	2.84 (0.76)	0.98 (0.29)	0.96 (0.48)	0.25 (0.24)
<b>Statistical Significance</b>		T=1.11 P=0.298 95 % CI:- 0.7711to2.2111	T=0.024 P=0.9624 95 % CI:-0.5335 to0.5535	T=0.2805 P=0.7862 95 % CI:- 0.7378to0.5778	T=1.8215 P=0.1060 95 % CI:- 0.1011to0.8611

\*% of each year were analysed.

**Table 3. Cumulative prevalence of TTI among replacement and voluntary blood donors**

Donor	TTI positive (%)	TTI negative (%)	Total (%)	Significance
Replacement	293 (6.01)	4583 (93.99)	4876 (23.18)	X <sup>2</sup> =8.74 P=0.003 95%CI=1.07to1.4
Voluntary	798 (4.94)	5364 (95.06)	16162 (76.82)	
Total	1091 (5.19)	19947 (97.81)	21038 (100)	

**Table 4. Utilisation of collected blood units at blood bank**

Year	No. of blood units collected	Discarded						Used	Utilisation index in percentage
		TTI positive	Expired	Haemolysed	Low quantity	Leakage of bag	Total		
2009	3252	173	08	0	13	5	199	2917	89.69
2010	3406	184	17	1	10	3	215	2863	87.26
2011	4090	242	37	1	07	0	287	3117	85.50
2012	4595	246	08	0	13	5	272	3735	88.78
2013	5688	247	27	0	18	4	296	3870	84.48

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