

**Prevalence of transfusion transmissible infections among blood donors and associated demographic characteristics**

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**Abstract**

**Introduction:** An integrated strategy for blood safety is required for elimination of transfusion transmitted infections (TTI). Recruitment of safe donors is critical for successful supply of safe and adequate blood to meet patients’ needs

**Aims:** The study was to assess the seroprevalence of HBV, HCV, HIV, syphilis and malaria among blood donors and the associated sociodemographic characteristics.

**Materials and methods:** It was an observational prospective study conducted in the Department of Transfusion Medicine at a Tertiary care centre, Imphal,

Manipur, between April 2020 to October 2021. All the donated blood was screened for HBV, HCV, HIV, syphilis and malaria. From the registration forms, demographic characteristics were recorded.

**Results:** Highest TTI positivity rate was found to be HCV (1.15%), followed by HBV (0.55%), syphilis (0.16%) and least was HIV (0.13%). The older age group (> 40 years) (p <0.00001), lower educated group (undergraduate) (p <0.00001), informal occupation (p= 0.0001) and first-time donors (p<0.00001) were linked to a higher prevalence of TTIs.

**Conclusion:** TTI positivity rate among VBD and RBD, between male and female donors and Marital status were

almost similar and TTI s were significantly lower among repeated donors, 31-40 age group, with higher educational level and in the employed group. The results of this study may be considered by the policy makers to evolve safer donor recruitment strategies.

**Keywords:** TTI, Passivity rate, Comparison, Blood donors.

## **Introduction**

Blood transfusion service (BTS) is the vital part of modern health care system without which efficient medical care is impossible<sup>[1]</sup>. An integrated strategy for blood safety is required for elimination of transfusion transmissible infections (TTI) and for provision of safe and adequate BTS to the people.<sup>[2]</sup> The median prevalence rates of transfusion transmissible infections in blood donations in high income countries are considerably lower than in middle- and low-income countries. This difference reflects the variable prevalence among members of the population who are eligible to donate blood, the type of donors and the effectiveness of the system of educating and selecting donors.<sup>[3]</sup>

The prevalence of viral infections in blood donations can be used as a valuable indicator to assess the safety of blood supply and the potential risk of TTIs.

Changes in this prevalence may also reflect trends in the infections of interests among the general population.<sup>[4]</sup>

Recruitment of donors is critical to the success of supply of safe and adequate blood and its products to meet need of the patients.

The present study was taken up to study the demographic characteristics of blood donors and seroprevalence of TTI among them.

## **Aims**

The study was undertaken to assess the sero prevalence rates of HBV, HCV, HIV, syphilis and malaria among

blood donors and the associated sociodemographic characteristics.

## **Methodology**

A cross sectional analysis of screened blood donors was conducted in the Department of Transfusion Medicine at a Tertiary care centre, Imphal, Manipur between April 2020 to October 2021. Institutional Research Ethics board approval was undertaken before the commencement of the study. All donors were physically examined and counseled properly. The donor registration forms were completely filled. The donors were explained about the whole procedure and they gave their signatures for informed consent on the registration forms.

All the donated blood were screened for HBV, HCV and HIV by ELISA (Eenzyme Linked Immuno sorbent Asay) and the units negative in ELISA were again tested by NAT (nucleic acid test). Syphilis and malaria were tested by rapid kit method. The samples which were found to be positive in any of the above tests were termed as TTI positive

From the registration forms, demographic characteristics including age, sex, replacement or voluntary donation, marital status, educational qualification, occupation, first time or repeat donation were recorded. The associations between categorical variables were tested using Chi-square test and Fisher Exact test.  $P < 0.05$  was considered significant.

## **Results**

During the study period there were 13769 blood donations. 282 were confirmed as TTI positive. HCV was the highest among all the TTIs. 158 donations were found to be positive for HCV.

This was followed by HBV with 76 seropositive donors, syphilis with 22 seropositive donors and HIV with 18 seropositive donors. There were 8 donors with mixed infections. There was not a single case of malaria.

Table 1: Types of TTI positivity

TTI	No. of positive donors
HCV	158
HBV	76
HIV	18
Syphilis	22
Malaria	0
Mixed infections	8
Total	282(2.04%)

Among the donors, 2822 were voluntary blood donors (VBD) and 10947 were replacement blood donors (RBD). 234 RBD (2.1%) were found to be TTI positive and 48 VBD were found to be TTI positive (1.7%). The difference was not found to be statistically significant (P value =0.15).

Table 2: Distribution of TTI positivity rates amongst the Blood Donors

TTI	VBD (2822)	RBD (10947)	P value
HCV	24(0.85%)	134(1.22%)	0.09
HBV	16(0.57%)	60(0.55%)	0.90
HIV	04(0.14%)	14(0.13%)	0.85
Syphilis	04(0.14%)	18(0.16%)	0.78
Mixed infection	0	08(0.07%)	0.37
Overall	48(1.7%)	234(2.1%)	0.15

During the study period 12791 males donated and 978 females donated. Among the TTIs the percentage of seropositivity was found to be higher in males than females for HBV and HCV (Statistically significant). Syphilis was found to be higher in females (statistically significant, P value = 0.04). However, overall, there was no significant statistical difference between male and female TTI seropositivity.

Table 3: Sex wise distribution of TTI positivity rate

TTI	Male (12791)	Female (978)	P- value
HBV	75(0.59%)	01(0.1%)	0.04
HCV	155(1.2%)	03(0.3%)	0.01
HIV	18(0.14%)	nil	0.63
syphilis	18(0.14%)	04(0.4%)	0.04
Mixed	08(0.06%)	nil	1.0

infection			
overall	174(1.36%)	08(0.82%)	0.15

There were 6426 married donors and 7343 unmarried donors. Overall, significant statistical difference cannot be found between the two groups. However, mixed infection was found only in the unmarried group, so there is significant statistical difference (0.008) regarding mixed infection among married and unmarried groups.

Table 4: Marital status distribution of TTI positivity rate

TTI	Married (6426)	Unmarried (7343)	P value
HBV	38(0.59%)	38(0.52%)	0.55
HCV	70(1.09%)	88(1.2%)	0.54
HIV	08(0.12%)	10(0.14%)	0.84
syphilis	14(0.22%)	08(0.11%)	0.11
mixed	NIL	08(0.11%)	0.008
overall	130(2.02%)	152(2.07%)	0.84

5573 first time donors and 8196 repeated donors donated during the study period. Overall, there is significant statistical difference between the two groups (P value < 0.00001). Significant statistical difference could also be found in HBV (P value = 0.001), HCV (P value = < 0.00001) and mixed infection (P value = 0.006) seropositivity.

Table 5: Donor frequency distribution of TTI positivity rate.

TTI	First time donor (5573)	Repeat donor (8196)	P value
HBV	44(0.79%)	32(0.39%)	0.001
HCV	93(1.67%)	65(0.79%)	<0.00001
HIV	07(0.13%)	11(0.13%)	0.89
Syphilis	11(0.2%)	11(0.13%)	0.36
Mixed infection	07(0.13%)	01(0.01%)	0.006
overall	162(2.9%)	120(1.46%)	<0.00001

Donors between the age group 18-65 years donated. We divided this age range into 4 groups: 18-30, 31-40, 41-50 and 51-65 years. Highest HCV seropositivity was found in the age group of 51-65 years (2.47%, P < 0.00001). Syphilis was found to be positive highest in the age

group 41-50 years (0.47%, P value=0.03). Overall, age (2.47%, P value=<0.00001).

group 41-50 years have the highest TTI seropositivity

Table 6: Age wise distribution of TTI positivity rate

TTI	18-30 years (7613)	31-40 years (5022)	41-50 years (1053)	51-65years (81)	P value
HBV	44(0.58%)	25(0.50%)	07(0.66%)	nil	0.79
HCV	108(1.42%)	28(0.56%)	20(1.9%)	02(2.47%)	<0.00001
HIV	10(0.13%)	04(0.08%)	04(0.38%)	nil	0.07
syphilis	12(0.16%)	05(0.10%)	05(0.47%)	nil	0.03
Mixed infection	06(0.08%)	01(0.02%)	01(0.09%)	nil	0.36
Overall	180(2.36%)	63(1.25%)	37(3.51%)	02	<0.00001

We divided all the donors into 4 groups according to their educational qualifications: under matric, matriculate but under graduate, graduate and post graduate. HCV was found to be highest in matriculate but under graduate

group (1.54%, P value = 0.0001). Overall, TTI positivity was highest in the matriculate but undergraduate group, and lowest in the postgraduate group (P value = <0.0001).

Table 7: Educational level distribution of TTI positivity rate

TTI	Post graduate (656)	Graduate (4098)	Undergraduate (6229)	Under matric (2786)	P value
HBV	03	19(0.46%)	44(0.71%)	10(0.36%)	0.15
HCV	03	27(0.66%)	96(1.54%)	32(1.15%)	0.0001
HIV	nil	05(0.12%)	10(0.16%)	03(0.11%)	0.77
Syphilis	nil	04(0.10%)	13(0.21%)	05(0.18%)	0.25
Mix infection	nil	02(0.05%)	06(0.10%)	nil	0.57
Overall	06(0.91%)	57(1.39%)	169(2.71%)	50(1.79%)	<0.00001

The donors are also studied under 4 categories of occupation: student, employed, self-employed, laborer's (including driver). HBV positivity was the highest in the student's category (0.92%, P value=0.01). HCV was the

highest in the laborer's category (1.42%, P value=0.01). Overall, TTI positivity was the highest in the laborer's category (2.6%, P value=0.0001).

Table 8: Occupational distribution of TTI positivity rate

	Student (2705)	Employed (2868)	Self-employed (5655)	Labourers (2541)	P value
HBV	25(0.92%)	10(0.35%)	25(0.44%)	16(0.63%)	0.01
HCV	30(1.1%)	17(0.59%)	75(1.3%)	36(1.42%)	0.01
HIV	3(0.11%)	1(0.03%)	8(0.14%)	6(0.24%)	0.22
syphilis	2(0.07%)	1(0.03%)	14(0.25%)	5(0.20%)	0.07
mixed	1(0.04%)	0	4(0.07%)	3(0.12%)	1.95
overall	61(2.25%)	29(1.01%)	126(2.23%)	66(2.6%)	0.0001

## Discussion

There was no statistically important difference between voluntary blood donors and replacement blood donors (P value=0.15) in the study. Karmakar PR et al<sup>[2]</sup> also did not find any statistically significant difference between voluntary and replacement donors in TTI positivity. This emphasizes the need to look for other factors which may contribute to blood safety, rather than simply relying on voluntary donation as safe donation. However, different studies have reported higher prevalence of TTIs among RBDs as compared to VBDs.<sup>[5]</sup>

HBV positivity was found higher in males (P value=0.04). Also, HCV positivity was found significantly higher in males (P value=0.01). Different researchers have reported higher prevalence of TTIs in males.<sup>[6,7]</sup> Kader et al<sup>[8]</sup> from Turkey and Cao et al<sup>[9]</sup> did not find any significant differences between male and female regarding HCV positivity. Syphilis was found to be higher in female. Higher syphilis in females was also reported by Eren C et al<sup>[10]</sup> in 2019. Overall TTI positivity was higher in males than females but was not significant (P value=0.15).

Regarding marital status, there was no significant difference between married and unmarried (P value=0.84). However, Bartonjo et al<sup>[11]</sup> reported in their study that being married was a risk factor for HIV and syphilis. TTI positivity was significantly lower in repeat donors as compared to first time donors (P value=<0.00001). HBV positivity was significantly lower in repeat donors (P value=0.001). Also, HCV positivity was lower in repeat donors (<0.00001). Song Y et al<sup>[4]</sup> also reported association of decreasing prevalence of TTI with increasing frequency of blood donation. This highlights the importance of regular blood donor as a source of safe blood.

Employment has significant influence on TTI positivity in the present study. Overall, Labourer category had the highest percentage of TTI positivity (2.6%, P value = 0.0001). Regarding occupation, Song Y et al<sup>[4]</sup> found the highest prevalence of TTI positivity among farmers. Bartonjo G et al<sup>[11]</sup> also reported informal occupation as an independent risk factor for HIV infection.

Regarding educational level, lowest TTI positivity was found in the donor category having post graduate level of education (P value=<0.00001). Song Y et al<sup>[4]</sup> found in their study that lower education among the donors was linked to higher prevalence of TTIs. Bartonjo G et al<sup>[11]</sup> also reported in their finding that blood donors who had no formal education or just primary education were at higher risk of HIV positivity.

The study recorded overall TTI positivity to be lowest in the age group of 31-40 years (1.25%, P value=<0.00001). HCV positivity was also found to be lowest in the age group 31-40 years. (0.56%, P value=<0.00001). Syphilis was also found to be lowest in the age group 31-40 years (0.10%, P value=0.03). Eren C<sup>[10]</sup> from Turkey and Niazi et al<sup>[12]</sup> from Pakistan found HBsAg positivity to be least in the 18-30 age group. We didn't find a single positive case for malaria. Very low seroprevalence of malaria was reported by Rawat A et al<sup>[13]</sup> and Negi and Gaur<sup>[14]</sup>. Many other Indian studies<sup>[15,16,17]</sup> did not include malarial antigen positivity in their studies

## Conclusion

TTI positivity rate among VBD and RBD, between male and female donors and Marital status were not statistically significant different. Seroprevalence rate of various TTIs were significantly lower among repeated donors, 31-40 age group, with higher educational level and in the employed group. The findings from the present study may be considered by the policy makers to evolve newer motivation and recruitment strategies for blood

donors. This may help to minimize the risk of TTIs and safeguard public health.

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