

SEROPREVALENCE OF TRANSFUSION-TRANSMITTED INFECTIONS AMONG VOLUNTARY BLOOD DONORS AT A TERTIARY CARE HOSPITAL

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ABSTRACT

Objectives: Blood transfusion is an effective treatment for saving millions of lives. However, transfusion-transmitted infections (TTIs) hamper blood safety. To prevent transmission of these diseases, screening for infections is an essential step for blood safety.

Methods: This was a retrospective cross-sectional study at the Department of Immunohematology and Blood Transfusion, Tirunelveli Medical College and Hospital, Tirunelveli, for a period of 6 years from January 2017 to December 2022. Data of the blood donors screened were retrieved and analyzed with the aid of screening register and seropositive donor register over 2 months (December 2022 and January 2023).

Results: Among 53522 donors, 0.44% were seropositive for TTI (0.44%, n=233/53522) in which 99.57% (n=232/233) were male donors. Prevalence was more in 18–25 age group (39.91%, n=93/233). Hepatitis B virus (HBV) was the most prevalent microbe (n=144/53522) (0.27%). The prevalence of HBV showed a decreasing trend, while the prevalence of syphilis showed an increasing trend. The prevalence of human immunodeficiency virus, hepatitis C virus and malaria was unchanged.

Conclusion: Seroprevalence and changing trends of TTI among blood donors reveal the prevalence of infections in the general population which gives an idea of disease burden on society. Education about confidential unit exclusion and implementation can help reduce transmission risk and wastage.

Keywords: Hepatitis B, Seroprevalence, Syphilis, Transfusion transmitted infections.

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INTRODUCTION

Transfusion of blood and its components is one of the lifesaving procedures, in the integrated part of health-care delivery system. A transfusion-transmitted infection (TTI) is an infection by any pathogen that can potentially be transmitted in donated blood through a transfusion to a recipient. Important transfusion-transmitted pathogens are Human immunodeficiency virus (HIV), Hepatitis B virus (HBV), Hepatitis C virus (HCV), syphilis, Human T cell lymphotropic virus, Parvovirus B-19, Cytomegalovirus and malaria [1].

The goal of any transfusion service is to provide blood components that are safe for the recipient and pose minimal risk of TTI. Transfusion transmissible agents have certain characteristics such as persistence in blood for relatively long period of time, giving rise to carrier or latent state, causation of disease with long incubation period, ability to cause symptomatic infections and stability in cold stored blood [2].

Mandatory screening tests for TTIs such as HIV, HBV, HCV, syphilis, and malaria are done in most of the blood centers in India. Continuous monitoring of TTIs among the donor is vital for risk assessment, to minimize disease transmission and optimize donor recruitment strategies, and also to know the prevalence of these diseases in the general population since blood donors are usually healthy members of society [3,4]. This study was aimed to assess the prevalence of TTIs among blood donors and analyze the changing trends of these infections.

METHODS

This was a retrospective cross-sectional study conducted from the 6-year data of voluntary blood donors who had donated between January 2017

and December 2022, at the Department of Immunohematology and Blood Transfusion, Tirunelveli Medical College Hospital, Tirunelveli, Tamil Nadu, India. The data were analyzed over a period of 2 months (December 2022 and January 2023) after obtaining approval from the Institutional Ethics Committee (TIREC number 20232574).

HIV and HCV antibodies were screened by third-generation enzyme-linked immunosorbent assay (ELISA) (replaced with fourth-generation ELISA kits from 2022). HBV surface antigens were screened by sandwich ELISA. Syphilis was screened by rapid plasma regain (RPR) kits while malarial parasite was screened by Leishman's staining of peripheral smear.

Data of the blood donors screened were retrieved with the aid of screening register and seropositive donor register. Basic information of donors including age, sex, occupation, number of previous donations, and details of seropositivity was recorded in a proforma sheet. Donors who were seroreactive in the mandatory screening for HBV, HCV, HIV, syphilis, and malaria parasite were recorded. These data were examined along with the total number of blood units collected during the study period. Seroprevalence of individual TTI was calculated for individual years and any change in prevalence over the years was analyzed.

Statistical analysis

Data were entered in Microsoft Excel and data analysis was performed using SPSS software version 21 (IBM, USA). Descriptive statistical measures, i.e., frequency and percentage were utilized to present the data.

RESULTS

A total of 53522 blood units were collected over a period of 6 years (January 2017–December 2022). The overall seroprevalence of TTI in

all 6 years was 0.44% (n=233/53522). Among the donors who were seropositive, 0.27% (n=144/53522) were positive for HBsAg, 0.07% (n=40/53522) were positive for HCV, 0.06% (n=31/53522) were positive for HIV, 0.03% (n=15/53522) were positive for syphilis by RPR, and 0.004% (n=2/53522) were positive for Malaria. 1 donor was positive for both HIV and HCV (0.002%, n=1/53522) (Table 1).

TTI was most commonly observed in the age group of 18–25 years (39.91%, n=93/233) followed by age group of 31–40 years (25.32%, n=59/233) (Fig. 1). 99.57% of the TTI positive donors were males (n=232/233). TTI positivity was almost equal between first-time donors and repeat blood donors (51.50% in repeat donors, n=120/233).

TTI positivity was more commonly observed in unskilled workers (27.89%, n=65/233) followed by students group (27.47%, n=64/233) (Table 2).

While following the trends in seroprevalence of TTI across the years, there was a decrease in prevalence of hepatitis B from 0.35% in 2017 (n=33/9558) to 0.17% in 2022 (n=17/10015). There was no change in the seroprevalence trends of Hepatitis C, HIV, and Malaria. There was an increase in seroprevalence of syphilis in the past 2 years (0.08%, n=7/9080 in 2021 and 0.08%, n=8/10015 in 2022) (Fig. 2).

DISCUSSION

Transfusion transmissible infections are a major threat to safety of blood worldwide. These organisms have a window period and are screened for their antigenic markers or the antibodies induced by them by various tests such as immunochromatography, ELISA, chemiluminescence, or nucleic acid testing (NAT). The risk of TTI has declined dramatically in high-income countries over the past two decades due to effective screening methods like NAT [5]. However, it is not the same in developing countries where even chemiluminescent immunoassay is not present in all the blood centers.

The study was carried out to note the changing trends of the TTI among blood donors. Seroprevalence among blood donors helps to predict the prevalence in general public as blood donors come from general population. This knowledge gives an idea about disease burden on the society and also the basic epidemiology of these diseases in the community.

In the present study, overall seroprevalence rate was 0.44% which was similar to the results in the study by Sujatha *et al.* (0.55%) and Radhiga

et al. [6,7]. Even though there was a slight reduction in total reactive donors in the year 2020 (n=28/6625), the seroprevalence was 0.42% which was comparable to other years. The reduction in collection was due to the COVID-19 pandemic, which curtailed blood transfusion services worldwide.

The seroprevalence rate of HBsAg in the present study was 0.27% which was lesser than in the studies by Sujatha *et al.* (0.49%), Radhiga *et al.* (0.82%) and Kumar *et al.* (0.97%) [6-8]. Hepatitis B is the most common TTI encountered in blood transfusion services with a long incubation period, latent period and long window period. In the present study, the seroprevalence of HBsAg in donors showed a decreasing trend from 0.34% in 2017 to 0.17% in 2022.

The prevalence rate of hepatitis C in the present study was 0.07%. This was similar to the prevalence found in the studies done by Radhiga *et al.* (0.04 %) and Dobariya *et al.* (0.09%) [7,9]. Seroprevalence of HCV in donors showed a wavering trend with lower prevalence in the years 2019 (0.01%) and 2020 (0.03%) and higher prevalence in 2018 (0.11%) and 2021 (0.11%). All these donors were referred to medical gastroenterology department for confirmation and treatment.

In the present study, seroprevalence of HIV was 0.06% among donors, which was comparable to the studies by Dobariya *et al.* (0.081%) and Giri *et al.* (0.07%) but higher than in the studies by Sujatha *et al.* (0.02%) and Pachori *et al.* (0.0107%) [6,9-11]. HIV seroprevalence was consistently lower across the years. This was due to better awareness among general public of the risk factors and better donor screening.

In this study, prevalence rate of syphilis by RPR was 0.028%, which was lesser than in the study by Radhiga *et al.* (0.07%) [7]. Seroprevalence of syphilis which was negative showed a rise in the years 2021 and 2022 (0.08%). While donors did not inform of their risk behavior during pre-donation counseling, during counseling after seropositivity, many divulged their high-risk behavior such as multiple sexual partners and homosexual activity. They did not inform of their high-risk behavior pre-donation, as they donated in camps along with their friends.

In the present study, seroprevalence of malaria was 0.004% which was similar to study conducted by Negi *et al.* (0.002%) and Kumar *et al.* (0.006%) [8,12]. Seroprevalence of multiple infections was 0.002% in this study, which was similar to the results in the study by Siraj *et al.* (0.07%) [13]. Gaikwad *et al.* reported a seroprevalence of HIV 0.45%,

Table 1: Prevalence of HBV, HCV, HIV, syphilis, malaria in blood donors

Year	Total donors	Reactive donors	HBV	HCV	HIV	Syphilis	Malaria	Both HIV and HCV
2017	9558	47	33	8	6	0	0	0
2018	9295	36	22	10	4	0	0	0
2019	8949	44	35	1	6	0	2	0
2020	6625	28	24	2	2	0	0	0
2021	9080	35	13	10	5	7	0	0
2022	10015	43	17	9	8	8	0	1
Total	53522	233	144	40	31	15	2	1

HBV: Hepatitis B virus, HCV: Hepatitis C virus, HIV: Human immunodeficiency virus

Table 2: Distribution of seropositive donors based on profession

Occupation	HBV	HCV	HIV	Syphilis	Malaria	Both HIV and HCV	Total	%
Student	36	17	7	3	0	1	64	27.47
Unskilled worker	41	8	13	3	0	0	65	27.9
Semiskilled	9	4	3	5	1	0	22	9.44
Skilled	17	3	4	1	1	0	26	11.16
Clerical/shop owner	13	4	2	2	0	0	21	9.01
Semi -Professional	15	3	1	0	0	0	19	8.15
Professional	13	1	1	1	0	0	16	6.87

HBV: Hepatitis B virus, HCV: Hepatitis C virus, HIV: Human immunodeficiency virus

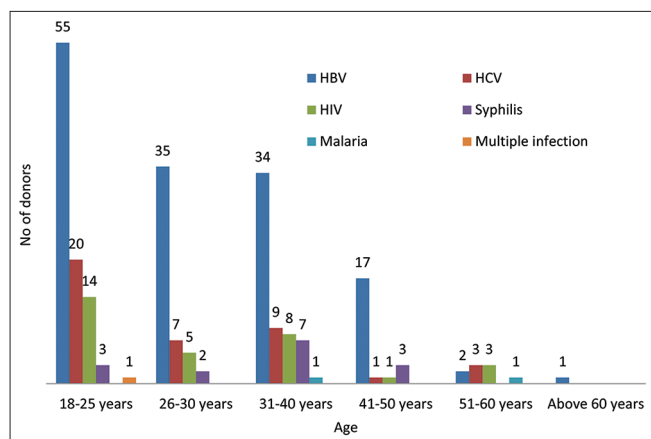


Fig. 1: Age-wise distribution of seropositive donors

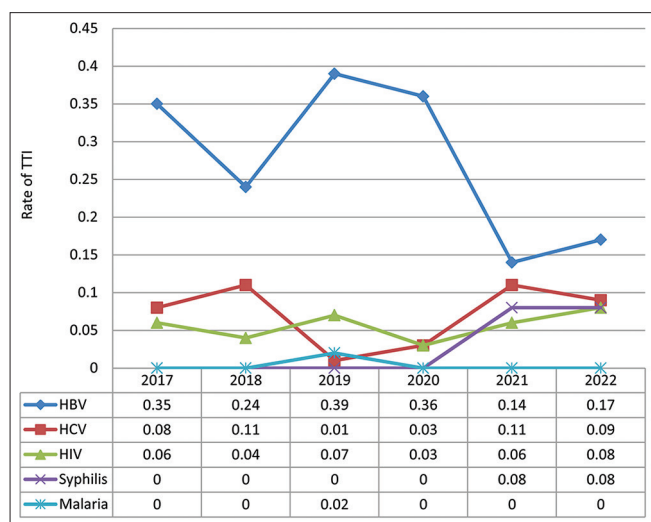


Fig. 2: Change in trends of seroprevalence of transfusion transmitted infections

HBsAg 1.27%, HCV 0.32%, VDRL 0.01%, and malaria 0.02% and also noted increasing trend for all serological markers [14].

CONCLUSION

In the present study, while HBV prevalence was on the decline, the prevalence of HIV, HCV and malaria were consistent and syphilis showed a rising trend. Even though robust donor screening in separate counseling rooms help to defer donors with high-risk behavior, this study showed that this was difficult in crowded public camps. Education about confidential unit exclusion and public awareness campaigns about the risk of transmission of diseases through blood transfusion could curb the TTI. To minimize TTIs and provide safer blood and blood components, sensitive screening test such as NAT should be implemented.

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AUTHORS' CONTRIBUTIONS

SK: Conceptualized the study and collected data. MSA: Critically analyzed and approved the final draft. SPR: Edited manuscript and analyzed data. JR: Analyzed data and prepared manuscript.

CONFLICT OF INTEREST

None declared.

SOURCES OF SUPPORT

Nil.

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