



ANALYSIS OF TRANSFUSION TRANSMITTED INFECTIONS IN TERTIARY CARE HOSPITAL

Transfusion Medicine

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ABSTRACT

Background: Blood transfusion is a life-saving procedure, but it carries the risk of transmitting infectious agents from donor to recipient. These infections can be caused by viruses, bacteria, parasites, or prions present in the donor's blood. Transfusion-transmitted infections (TTIs) remain a significant concern in transfusion medicine, posing risks to recipients despite advances in donor screening and testing. This study aimed to assess the seroprevalence and trends of major TTIs among blood donors at a tertiary care centre. **Materials And Methods:** A retrospective cross-sectional analysis was conducted at Dr. Pinnamaneni SIMS, Chinnaavutapalli, Gannavaram, over five years (2017–2022), involving 8,816 blood donors. Donors were screened for HIV, HBV, and HCV using ELISA, and for Syphilis and Malaria using rapid diagnostic tests. Reactive samples were retested and appropriately discarded. **Results:** A total of 116 (1.31%) donors were found reactive for at least one TTI. The most prevalent infection was HBV (0.8%), followed by HCV (0.39%), HIV (0.1%), and Syphilis (0.01%), with no cases of Malaria detected. The peak TTI prevalence occurred in 2019, while the lowest was recorded in 2022, indicating a downward trend. **Conclusion:** The findings underscore the effectiveness of existing blood screening protocols but also highlight the need for continual enhancement through advanced testing technologies, regular donor education, and integration with public health initiatives to ensure safer blood transfusion practices.

KEYWORDS

bloodtransfusion, transmitted infection, HIV, HBV, HCV

INTRODUCTION

A transfusion-transmissible infection (TTI) is any infection that is transmissible from person to person through parenteral administration of blood or its components. As per the guidelines of the Ministry of Health and Family Welfare (Government of India) under Drugs and Cosmetics Act, 1945, all blood donors are screened for – HIV 1 & 2, HBV, HCV, Syphilis & Malaria [1]. This study aimed to estimate the seroprevalence of the major TTI among blood donors and assess the changing trend over five years. Among healthy donors in India, the prevalence of HBV among voluntary donors is around 1.1% [2]; the prevalence of HCV, around 0.5% [2]. The prevalence of HIV is 0.249 % [3], and the prevalence of syphilis among blood donors in India is 0.42% [4]. the prevalence of malaria among blood donors in India is 0.09%.[5] Although screening tests for various TTIs are available, there is still a risk of transmission due to the window period between infection and the detection of antibodies [6]. The occurrence of TTIs can lead to serious health complications, increased morbidity and mortality, and also poses a threat to public health [7]. The priority of the BTS (Blood Transfusion Service) is to ensure safety, adequacy, accessibility and efficiency of blood supply at all levels. Estimation of TTIs in blood donors is an indirect indicator of disease burden in the community, as blood donors are asymptomatic individuals from the community. Analysis of data on the incidence of TTIs among blood donors gives an idea of epidemiology and disease burden of these infections in the community, permits an assessment of the accurate estimation of risk of TTIs, measurement of risk versus benefits of blood transfusion, which helps in the formulation of long-term strategies to improve public health and to prevent spread of disease in local population. Considering the paucity of data about TTIs in blood donors in Chinna Avutapalli, Gannavaram, the present study was conducted in blood donors attending the blood Centre of a tertiary care hospital of Pinnamaneni SIMS and RF

MATERIAL AND METHODS

Study Design

The present study was a retrospective cross-sectional study which was carried out in the Department of Transfusion Medicine at Dr. Pinnamaneni SIMS, a tertiary care hospital, for a period of 5 years, from January 2017 to June 2022, among all the donors attending the blood centre. All the information of donors like personal details, demographic details, occupation details and medical history regarding risk factors like h/o previous surgery, hospitalisation, blood transfusion were recorded by a medical officer in the donor questionnaire form and entered in the blood centre records.

All the donors were requested to fill out the questionnaire prepared as per NACO guidelines for donor eligibility. Data on the donor's age, sex, blood group, occupation, number of previous donations and contact number were obtained. BP, temperature, Pulse rate, weight, and height of the donor were recorded. Consent was taken from donors before blood donation. Blood was collected under aseptic precautions from the donors who had passed the selection criteria.

After blood donation, samples were screened for HIV, HBV, HCV using ELISA kits and syphilis & malaria using rapid tests. Screening was done as per the instructions of the manufacturers. All the reactive samples were tested again before labelling them as seropositive. The Seropositive blood products were discarded as per guidelines.

Details of Serological Tests:

- **HIV** screening was done by 4th generation solid phase ELISA which employs agglutinating sera for P24 antigen & highly purified recombinant antigens representing envelope glycoprotein gp41 of HIV 1 & gp36 of HIV 2.
- **HBV** screening was done by 3rd generation solid phase ELISA which employs highly purified, high affinity agglutinating sera for HBsAg having reactivity for both ad & Y subtypes.
- **HCV** screening was done by 3rd generation ELISA that employs highly purified recombinant antigens, that recognize all 6 major genotypes of HCV.
- **SYPHILIS** screening was done by Arkray, Rapid plasma regain that employs highly purified antigens like Cardiolipin for detection of antibodies against syphilis.
- **MALARIA** screening was done by Abbott, Immunochromatographic test that employs highly purified agglutinating sera for detection of P. falciparum and P. Vivax antigens.

RESULTS

The study included a total of 8,816 healthy donors over 5 years from January 2017 to December 2022. In 5 years of study, there were 116 Transfusion Transmitted Infections out of 8,816 blood centre screenings. Out of 116 TTIs, the majority were Hepatitis B virus-positive cases. The seroprevalence for HBV was highest (71/116), followed by HCV (35/116), HIV (9/116), Syphilis (1/116), and Malaria (0/116). The Seropositivity of HBV was 0.8 %, HCV was 0.39 %, HIV was 0.1 %, and Syphilis was 0.01 %.

Table 1. Trends of Annual Prevalence of TTIs over 5 years.

YEAR	HIV	HBsAg	HCV	VDRL	MP
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YEAR 2017	3	19	5	0	0
YEAR 2018	4	16	10	1	0
YEAR 2019	2	22	16	0	0
YEAR 2020	0	1	1	0	0
YEAR 2021	0	10	2	0	0
YEAR 2022	0	3	1	0	0

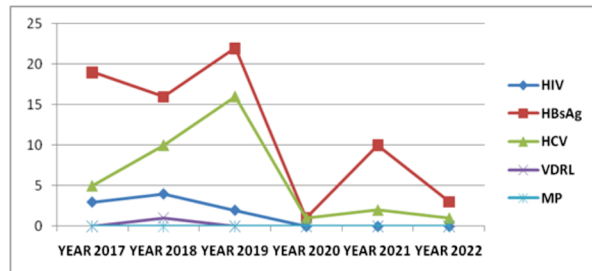


Figure 1: Graph showing Trends of Annual Prevalence of TTIs over 5 years.

From Table 1 & Figure 1, we can see trends in the annual prevalence of Transfusion Transmissible Infections (TTIs) over the past five years. The data shows that HBsAg (Hepatitis B Surface Antigen) has consistently been the most prevalent TTI over the past five years, followed by HCV (Hepatitis C Virus). In 2017, there were three cases of HIV, 19 cases of HBsAg, five cases of HCV, and no cases of VDRL or MP. In 2018, there were four cases of HIV, 16 cases of HBsAg, 10 cases of HCV, one case of VDRL, and no cases of MP. In 2019, there were two cases of HIV, 22 cases of HBsAg, 16 cases of HCV, and no cases of VDRL or MP. In 2020, there were no cases of HIV, one case of HBsAg, one case of HCV, and no cases of VDRL or MP. In 2021, there were no cases of HIV, 10 cases of HBsAg, two cases of HCV, and no cases of VDRL or MP. In 2022, there were no cases of HIV, three cases of HBsAg, one case of HCV, and no cases of VDRL or MP.

DISCUSSION

Our study found that out of 8,816 healthy donors over a period of 5 years, 116 cases of Transfusion Transmitted Infections (TTIs) were reported, with the majority being Hepatitis B virus positive cases, with a seroprevalence of 0.8%. This was followed by HCV with a seroprevalence of 0.39%, HIV with a seroprevalence of 0.1%, Syphilis with a seroprevalence of 0.01%, and no cases of Malaria were reported. The prevalence of TTIs remained relatively consistent over the study period, with the highest number of cases reported in 2019. The blood screening program implemented by the Blood Centre was effective in identifying and preventing the transmission of TTIs, and ongoing efforts are still needed to improve the effectiveness of the screening program.

The table 2 below provides seroprevalence data for various Transfusion Transmissible Infections (TTIs) and Malaria in different regions of India, as reported in four studies. The studies were conducted in North, West, South, and East India.

In North India study of Gupta et.al [8], the seroprevalence rates were 0.6 for HBV, 0.37 for HCV, 0.22 for HIV, and 0.09 for Syphilis, and there was no data reported for Malaria. In Western India study of Bhavasar et.al [9], the seroprevalence rates were 0.56 for HBV, 0.51 for HCV, 0.08 for HIV, and there was no data reported for Syphilis and Malaria. In South India study of Kumar et.al[10], the seroprevalence rates were 1.12 for HBV, 0.71 for HCV, 0.22 for HIV, and there was no data reported for Syphilis and Malaria. In East India study of Mahapatra et.al [11], the seroprevalence rates were 1.28 for HBV, 0.32 for HCV, 0.16 for HIV, 0.19 for Syphilis, and there was no data reported for Malaria. In our study, the seroprevalence rates were 0.8 for HBV, 0.39 for HCV, 0.1 for HIV, 0.01 for Syphilis, and there was no data reported for Malaria. HBV seroprevalence rates were consistently high in all regions, with South and East India showing higher rates compared to North and West India. HCV seroprevalence rates were high in East India and moderately high in West India, while North and South India showed comparatively lower rates. HIV seroprevalence rates were consistently low in all regions, with South India showing slightly higher rates compared to other regions. Syphilis seroprevalence rates were reported only in East and North India, with East India showing a higher rate compared to North India. Malaria seroprevalence rates were not reported in any study except for our study, where it was not detected.

In our study, the seroprevalence rates for HBV and HCV were comparable to those reported in other Indian studies, while the seroprevalence rate for HIV was slightly higher than those reported in other studies. The low seroprevalence rate for Syphilis in our study could be due to differences in the study population, study design, or diagnostic methods used. However, it is difficult to draw any definitive conclusions without more information on the study methodology.

Overall, the findings from these Indian studies suggest that there is a high burden of viral TTIs in India, with HBV being the most prevalent, followed by HCV. These findings highlight the need for comprehensive preventive measures, including vaccination programs, improved blood screening, and safe injection practices. Further studies are needed to assess the burden of other TTIs such as malaria and syphilis in different regions of India.

Table 2: Studies Conducted in India

TTI	HBV	HCV	HIV	Syphilis	Malaria
Seroprevalence in Gupta et.al (2021) - North India	0.6	0.37	0.22	0.09	-
Seroprevalence in Bhavasar et.al (2021) - Western India	0.56	0.51	0.08	-	-
Seroprevalence in Kumar et.al (2020) - South India	1.12	0.71	0.22	-	-
Seroprevalence in Mahapatra et.al (2021) - East India	1.28	0.32	0.16	0.19	-
Seroprevalence in our study	0.8	0.39	0.1	0.01	-

The table 3 below provides seroprevalence data for various Transfusion Transmissible Infections (TTIs) and Malaria in different regions of world, as reported in four studies. The studies were conducted in Ethiopia, Iran, Saharan Africa, Namibia. In Tadesse et.al's study [12] conducted in Ethiopia, the seroprevalence rates were higher than our study, with a 2.2% seroprevalence rate for TTI. This suggests a higher prevalence of TTI in Ethiopia compared to India. Similarly, in Kassaye et.al's study [13] conducted in Saharan Africa, the seroprevalence rates were even higher than in Ethiopia, with an 8.98% seroprevalence rate for TTI. This suggests an even higher prevalence of TTI in Saharan Africa compared to both Ethiopia and India. On the other hand, Javadi et.al's study [14] conducted in Iran reported lower seroprevalence rates for TTI than our study, with a 0.77% seroprevalence rate. This suggests a lower prevalence of TTI in Iran compared to India. Finally, Asmo et.al's study conducted in Namibia reported higher seroprevalence rates for HBV and Syphilis compared to our study, with 2.2% and 0.4% seroprevalence rates, respectively. However, the seroprevalence rates for HCV and HIV were higher in our study compared to Asino et.al's[15] study, suggesting a higher prevalence of these infections in India compared to Namibia.

Table 3: Studies Conducted in Other Countries

TTI	HBV	HCV	HIV	Syphilis	Malaria
Seroprevalence in Tadesse et.al (2021) – Ethiopia	2.2	1.5	0.5	0.4	-
Seroprevalence in Javadi et.al (2021) – Iran	0.77	0.06	0.004	0.03	-
Seroprevalence in Asino et.al (2021) - Namibia	4.9	2.2	1.5	0.4	-
Seroprevalence in Kassaye et.al (2021) - Saharan Africa	8.98	2.56	2.81	1.41	-
Seroprevalence in our study	0.8	0.39	0.1	0.01	-

Summary

Our study compared with other studies overall, suggest these findings that the blood screening program implemented by the Blood Centre was effective in identifying and preventing the transmission of TTIs. However, ongoing efforts are still needed to improve the effectiveness of the screening program and to address any new or emerging infectious diseases that may pose a risk to the blood supply. This can be done through the use of advanced screening technologies, increased education and awareness among donors, and improved communication and collaboration between Blood Centres and public health agencies.

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