

Prevalence and Trends of Transfusion Transmitted Infections among Voluntary Blood Donors in a Blood Bank of Tertiary Care Hospital in Nagpur, 2017-2021

Vaibhav Vinod Mendhe¹, Dr. Trupti Dongre²

¹ (MBBS student-2nd year) NKP salve institute of medical science and research centre, Digdoh hills, police Nagar Nagpur. 440019, Maharashtra, India.

² (Assistant Professor, Pathology) Department of Pathology, NKP salve institute of medical science and research centre Nagpur, Maharashtra, India.

ABSTRACT

Background: Blood transfusion is an effective treatment that saves millions of lives. Nevertheless, transfusion transmitted infections (TTIs) are a major problem. The aim of this study is to assess the prevalence and trends of TTI in healthy blood donors in tertiary care hospital blood banks and compare it with national data and other studies in different regions.

Methods: A retrospective cross-sectional study was conducted from January 2017 to December 2021 in healthy donors aged between 18 to 65 years. TTIs tests were performed using CLIA (Chemiluminescent Immunoassay) for HIV, HBV, HCV, and HBsAg, and RPR (Rapid Plasma Reagin) for syphilis.

Results: Of the 12,193 normal healthy donors enrolled in this study, 124 (1.01%) donors were sero-reactive to various TTIs. Of the 124 donors, 11 (0.09%) were seropositive for HIV, 13 (0.106%) for HCV, 95 (0.7%) for HBsAg, and 5 (0.04%) for VDRL. There were no reactive donors for malaria. The most common age group for sero-reactivity was 21–30 years (50.8%) of all seropositive donors.

Conclusion: The overall positive rate for all test combinations for TTI showed a steady trend with a gradual decrease from 2017 to 2021. We should raise public awareness and target people in their 21s to 30s, and contribute to safe blood transfusion.

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INTRODUCTION

Blood transfusion is an effective treatment that saves millions of lives worldwide every year, and blood donation is a very essential and life-saving practice performed in transfusion [1]. Donated blood is used to treat patients posted for surgery, accidents, anaemias, thalassemia, sickle cell disease, thrombocytopenia, etc. [2]

However, unsafe blood transfusion leads to many life-threatening complications and increases the possibility of transfusion-transmitted infections (TTIs). The severity of this problem is directly related to the prevalence of TTIs among blood donors. In India, transfusion-transmitted diseases include Hepatitis B, C, A, E, Chikungunya virus, Dengue fever, HIV, Human T-lymphotropic virus. The most common include HIV, Hepatitis-B virus, Hepatitis-C virus, Syphilis and Malaria [3]. Pathogens can be transmitted from donated blood to recipients through blood transfusion and can cause serious morbidity.

Among healthy donors in India, HBV positivity is around 4.7% [4]. The prevalence of HIV among voluntary blood donors is around 0.247% [5]. HCV is the leading cause of post-transfusion hepatitis in India with a prevalence of around 1% [6]. Therefore, a pre-transfusion examination is necessary. TTIs can also be transmitted from one infected individual to another during childbirth, unprotected sex, and sharing needles [7].

Screening in India is commonly performed by serological methods (CLIA, ELISA, GICA) and in some centres also by nucleic acid amplification testing (NAT) methods [8]. Efforts were directed at raising awareness of the importance of voluntary donation and counselling unsuitable donors to self-deferral.

Prevalence rates among donors, if lower than in the general population, indicate good pretext counselling and screening at the blood centre [9]. Epidemiological data on blood donors

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are therefore important for understanding and formulating better donor selection, testing policies and TTI trends.

Using data from a tertiary care hospital, this study attempts to analyse how these efforts have evolved over the past 5 years and their impact on trends in the prevalence of TTI among voluntary blood donors.

Thus, the aim of this study is to determine the seroprevalence of TTI among voluntary blood donors in the blood bank of a tertiary care hospital in Nagpur.

MATERIAL AND METHODS

- Study design and scope - A retrospective study was conducted in a tertiary care hospital blood bank among blood donors who donated between January 2017 and December 2021. The blood bank is located in the rural (western) region of Nagpur, Maharashtra. On average, blood bank collects nearly 2500 units of blood annually and provide the majority of that blood to the devoted tertiary care hospital.
- Study Population - All blood donors who donated blood to tertiary care hospital blood bank during the study period were screened for HBsAg, anti-HCV, anti-HIV, malaria parasite and syphilis. In total, 12,193 blood donor records were reviewed and included in the current study.
- Serology - Serum samples were tested for HCV, HIV, Syphilis, HBV, and Malaria.

TTIs tests were performed using CLIA (Chemiluminescent Immunoassay) for HIV, HBsAg and HCV, and Rapid Plasma Rea-gin (RPR) for Syphilis. All tests were performed according to the manufacturer's instructions and the standard operating procedures for the TTI. In addition to this the blood bank also participates in the external quality assessment programs. The prevalence of TTIs over 5 years was calculated and the records of all donors who were sero-reactive for any of the TTIs were also examined.

- Ethical Considerations - This study was conducted after obtaining ethical clearance from the institutional ethics committee.

RESULTS

A total of 12,193 apparently healthy adult donors were screened for TTIs during the study period. Of the 12,193 donors, 11,395 (93.45%) were male and 798 (6.54%) were female. The overall prevalence of donors responding to the TTIs markers over 5 years is shown in Graph 1. Of 12,193 donors, 124 (1.01%) donors were sero-reactive. Of these, 11 (0.09%) were sero-reactive to HIV, 13 (0.106%) to HCV, 95 (0.7%) to HBsAg, and 5 (0.04%) to VDRL. All donors were negative for malaria during the study period.

Table 1. Number of normal donations in each year and respective total seropositive in each year

Year	No. of Donations	No. of Seropositive
2017	3189	39
2018	2601	19
2019	2531	37
2020	1910	20
2021	1962	9
Total	12193	124

Table 2. Age-wise distribution of sero-reactivity among voluntary blood donors

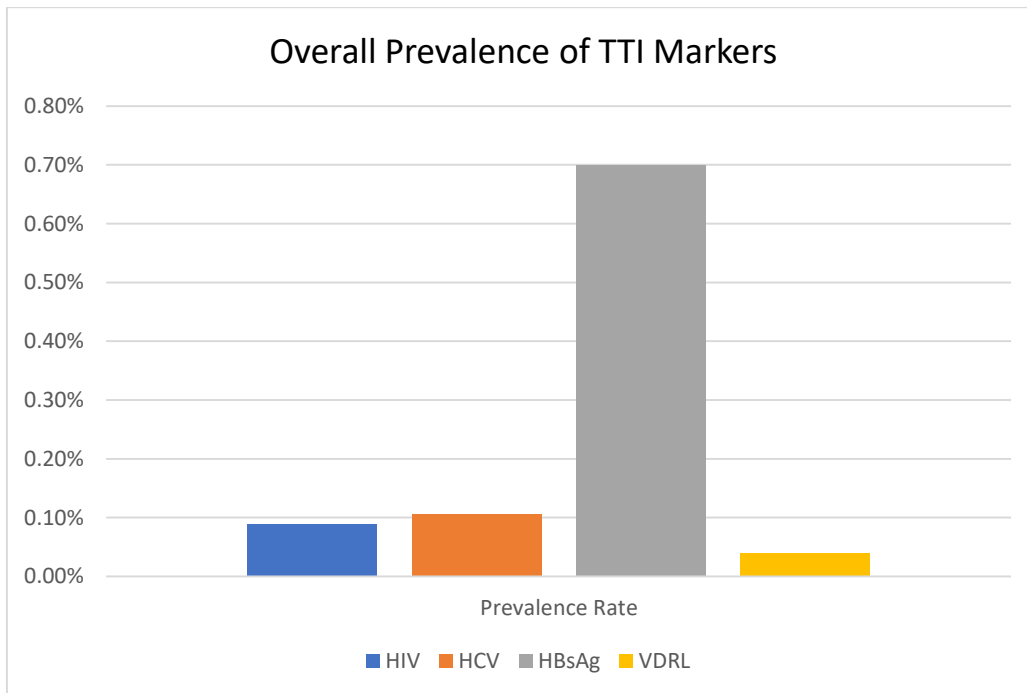
YEAR	18-20	21-30	31-40	41-50	51-60	≥61
2017	3	21	11	2	1	0
2018	3	12	4	0	0	0
2019	5	15	12	4	2	0
2020	1	10	7	2	0	0
2021	0	5	4	0	0	0
TOTAL	12	63	38	8	3	0

Table 2 shows the age distribution of TTIs. The most common age group that was sero reactive in this study was 21-30 years (50.8%), followed by 31-40 years (30.64%), and the least common age group

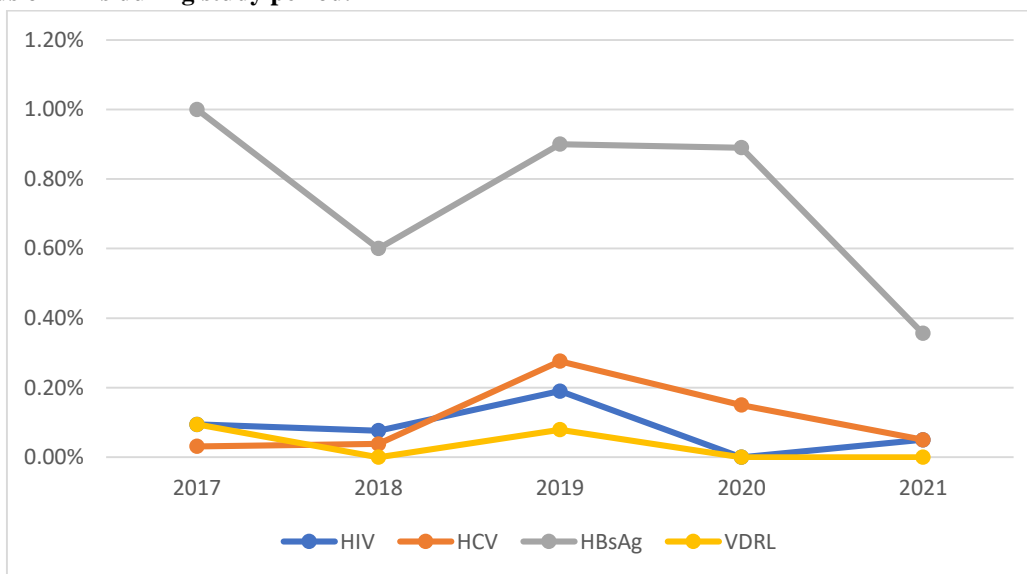
was 50 years and older. The gender distribution showed that of the 124 TTIs marker sero-reactive donors, only 3 were female donors (2.4% of all reactive donors).

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Graph 1: Overall Prevalence of TTIs



Graph 2: Trends of TTIs during study period.



DISCUSSION

An analysis of voluntary blood donations in the Central India region showed constant or declining TTI rates between 2017 and 2021. The prevalence of 5-year TTI is 124 (1.016%).

According to WHO, the prevalence of HBV, HCV and HIV infections among blood donors in different parts of the world ranges from 0.008% to 6.08%, 0.004% to 1.96% and 0.0004% to 2.0% respectively [10].

Table 3

Studies	Study Region		HBV	HCV	HIV	Syphilis	Malaria
Kumar R et al	Punjab	2008-2013	1.03	1.53	0.26	1.74	0.006
Sastry JM et al	Pune	2008-2013	1.23	0.41	0.28	0.008	0
Singh K et al	Karnataka	2005-2007	0.62				
Dobariya GH et al	South Gujarat	2011-2015	0.98	0.098	0.081	0.16	0.024
Present Study	Nagpur	2017-2021	0.7	0.106	0.09	0.04	0

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Table 1 - Shows that in 2017 the maximum donations were made and the donations gradually decreased. The main factor may be the COVID pandemic.

During the study period, hepatitis B was the most common infection among blood donors, however, a descending tendency was observed over the years. Increased vaccination and stringent donor selection may be the vital factors.

The overall prevalence of donors reactive to TTI markers during 5 years is shown in graph 1. Out of 12,193 donors, 124 (1.01%) donors were seropositive. Of these, 11 (0.09%) were HIV reactive, which was similar to the study by Dobariya GH et al [11]. The highest number of HIV-reactive donors was detected in 2019. HIV prevalence in our centre showed a gradual increase from 2017 (0.09%) to 2019 (0.19%) and then a trivial decline in 2020 and an upsurge again in 2021 (0.05%). For HCV infection, 13 (0.106%) were sero-reactive, the number of seropositive was parallel to the study by Dobariya GH et al. Since 2019, there has been a gradual decrease in sero-reactivity for HCV.

Among all TTI markers, the highest prevalence of HBV was 95 (0.7%) in this study, but its prevalence was lower compared to other studies conducted in Pune and Punjab [12,13].

The rate of syphilis showed a decrease from 2017 to 2018 and then rise in 2019, followed by diminution in 2020 and 2021. The prevalence of syphilis in the current study is 5 (0.04%) for VDRL, which is less than the study by Dobariya GH et al and Kumar et al [14-15]. Although malaria is endemic in the study area, its positivity rate in the general population in India has been declining over the years. All donors were negative for malaria during the study period. One factor is better pre-donation screening and good knowledge of malaria-related symptoms in blood donors. A study by Dobariya GH et al reported a prevalence of 0.024.

Blood banks in India now use a chemiluminescence test for HIV, HBsAg and HCV, but there is still a period when the infection cannot be detected [16]. Because a large amount of blood is transfused during transfusion therapy, a single unit of infected blood can cause infection in the recipient. It is essential that all blood units are effectively screened for all TTIs and sero-reactive blood units should be effectively segregated [17].

Because the majority of TTIs are due to the prevalence of asymptomatic carriers and blood transfusions during the window period, rigorous hemovigilance should always be used [18]. Voluntary blood donations should be promoted and sero-reactive donors should be counselled. Compared with other studies, the prevalence of our study was similar to that of Dobariya GH et al, and subordinate than other studies conducted in Punjab, Pune and Karnataka [19].

CONCLUSION

The prevalence of TTI is low in the current study compared to studies conducted in other parts of India. HBV is the most common TTI in this region compared to other states where HCV is detected more frequently. Actions such as universal immunization, counselling and other health programs at the community level should be initiated to raise public awareness, especially targeting young people aged between 21yrs-30yrs, will contribute to safe blood transfusion.

Ethical statements: This study was conducted after obtaining ethical clearance from the institutional ethics committee (from mentioned institution).

This article is my original work that has not been published elsewhere before. This article is not currently being considered for publication elsewhere.

This article is a true and complete reflection of my own research and analysis.

Conflicts of interest - NONE

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