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Seroprevalence Of Transfusion Transmitted Infections Over A Decade At A Blood Bank Of A Tertiary Care Hospital.

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ABSTRACT

Blood transfusion carries the risk of transmission of transfusion transmitted infections (TTIs). WHO recommends screening for five TTIs i.e. Human immunodeficiency virus(HIV), hepatitis B (HBV), hepatitis C (HCV), syphilis and malaria to ensure risk free blood supply and maintain blood safety. The data retrieved from blood center records was analyzed to obtain seroprevalence of all TTIs over a 10-year period from January 2013 - December 2022. All donors were selected after taking thorough clinical history and complete physical examination. All donated units were tested for HIV (4th generation enzyme-linked immunosorbent assay - ELISA), HBV and HCV (Invitro enzyme immunoassays), malaria (Rapid diagnostic kits) and syphilis (Rapid Plasma Reagin test). Appropriate statistical analysis was carried out on Microsoft Excel. 1,55,696 donors were screened for TTIs and overall seropositivity was 2,325. The highest seroprevalence was of HBV (0.89%). The year-wise overall seroprevalence showed a declining trend from 2.2% to 1.49% over the decade. Syphilis, however, showed a rising trend throughout. More male donors were affected by TTIs contributing to 93.76% of the overall seroprevalence. HBV is the most prevalent TTI. TTIs show a significant declining trend in overall seroprevalence. Syphilis shows a rising trend which is a re-emerging public health concern. Implementing more specific tests like nucleic acid testing (NAT) and motivating for voluntary blood donations is the most effective way of maintaining blood safety.

Keywords: Seroprevalence, blood transfusion, transfusion transmitted infection, blood safety

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INTRODUCTION

Blood transfusion is an integral part of medical and surgical treatment. There is a threat to blood safety by transfusion transmitted infections (TTIs) like HIV, hepatitis, syphilis, malaria, rarely toxoplasmosis, leishmaniasis and viral infections like CMV, herpes, EBV etc [1]. WHO recommends screening for five TTIs i.e. HIV, hepatitis B, hepatitis C, syphilis and malaria in all blood donations [2]. Thus, in accordance to National AIDS Control Organization (NACO) guidelines and Government of India's National Blood Policy, all authorized blood centers are mandated to test for 5 TTIs in all blood donations to ensure risk free blood supply and maintain blood safety [3, 4].

Aims and objectives

- Screening all blood donors for HIV, HBV, HCV, syphilis and malaria over a 10 year period from 2013-2022.
- Estimating seroprevalence of these 5 TTIs and their trend over a period of 10 years.
- Comparing seroprevalence amongst blood donors based on their gender.

MATERIALS AND METHODS

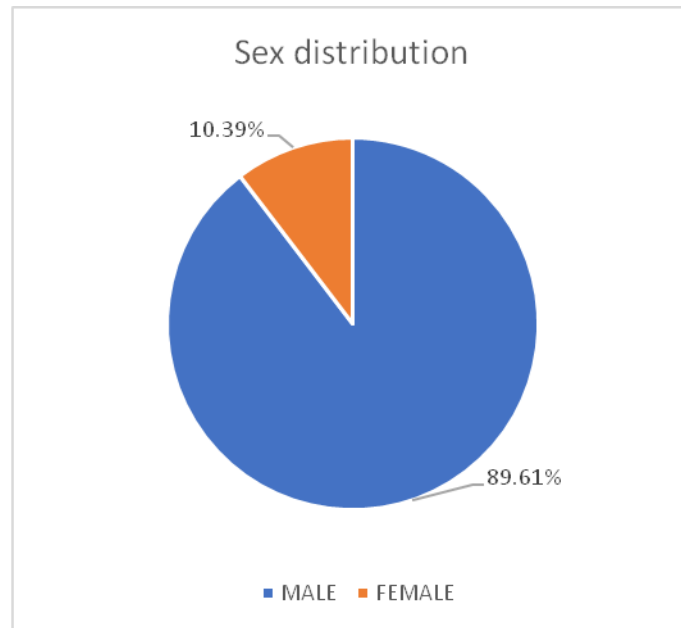
The purpose of this study was to estimate the seroprevalence of 5 TTIs and their trend over a period of 10 years from 2013-2022 amongst both indoor and outdoor blood donors at a blood bank of a tertiary care hospital in Mumbai. A total of 1,55,696 donors were tested for TTIs from January 2013 – December 2022. Amongst these, 10.21% were indoor donors comprising of mainly acquaintances and friends of patients who were motivated to donate blood by our blood center staff along with some regular walk-in donors, students and employees of the institution who donated blood voluntarily. Outdoor donors comprised 89.79% and were collected by organizing blood donation drives where voluntary donors donated blood. All donors were selected after taking thorough clinical history via a donor questionnaire as well as a complete physical examination. All donated units were tested for HIV using 4th generation ELISA (Enzyme Linked Immuno-Sorbent Assay). HBV and HCV were tested using in vitro enzyme immunoassays. Malaria was tested using rapid diagnostic kits detecting LDH (Lactate dehydrogenase) of *P. vivax* and HRP (Histidine-rich protein) for *P. falciparum* and screening for syphilis was done using Rapid Plasma Reagin test. The data was retrieved from blood center records and analyzed to obtain seroprevalence of all TTIs and their trend as well as their distribution according to gender, type of donor, type of infection over a period of 10 years.

RESULTS

Table 1: Distribution of indoor and outdoor donors

Year	Indoor donors	Outdoor donors	Total donors
2022	1127 (6.92%)	15170 (93.08%)	16297
2021	1744 (12.28%)	10459 (73.64%)	14203
2020	1450 (9.41%)	13964 (90.59%)	15414
2019	2157 (13.97%)	12278 (79.55%)	15435
2018	2321 (14.45%)	13739 (85.55%)	16060
2017	1735 (12.24%)	12444 (87.76%)	14179
2016	1158 (6.57%)	16461 (93.43%)	17619
2015	1226 (8.15%)	13821 (91.85%)	15047
2014	1374 (8.56%)	14680 (91.43%)	16056
2013	1518 (9.87%)	13990 (90.93%)	15386
Total	15810 (10.15%)	137006 (87.99%)	155696

Graph 1: Sex distribution of blood donors



A total of 1,55,696 donors were screened for TTIs during the 10-year period from January 2013 – December 2022. Out of these the majority were outdoor donors 1,37,006 (89.79%) and 15,900 (10.21%) donations were collected in the blood center. Male donors 1,39,494 (89.59%) outnumbered the female donors 16,179 (10.39%). Overall seropositivity was 2,325 out of 1,55,696 which showed the highest seroprevalence of HBV (0.89%) followed by HCV (0.32%), HIV (0.16%), syphilis (0.10%) and then malaria (0.01%). The year wise distribution showed a declining trend in overall seroprevalence, with seroprevalence being 2.2% in the first year and decreasing to 1.49% in the tenth year. The lowest seroprevalence was noted in the seventh year of study (0.3%) and showed a slight rise thereafter. All individual TTIs also showed a similar decreasing trend except syphilis, which showed a rising trend throughout. Seropositivity of HIV, HBV, HCV decreased from 0.42%, 1.11%, 1.22% in the first year to 0.12%, 0.64% and 0.29% respectively in the tenth year of study. Male donors were affected more by TTIs and contributed to 93.76% of the overall seroprevalence whereas female donors formed only 6.24% of the total seropositive cases.

Graph 2: Trend of overall seroprevalence over 10 years

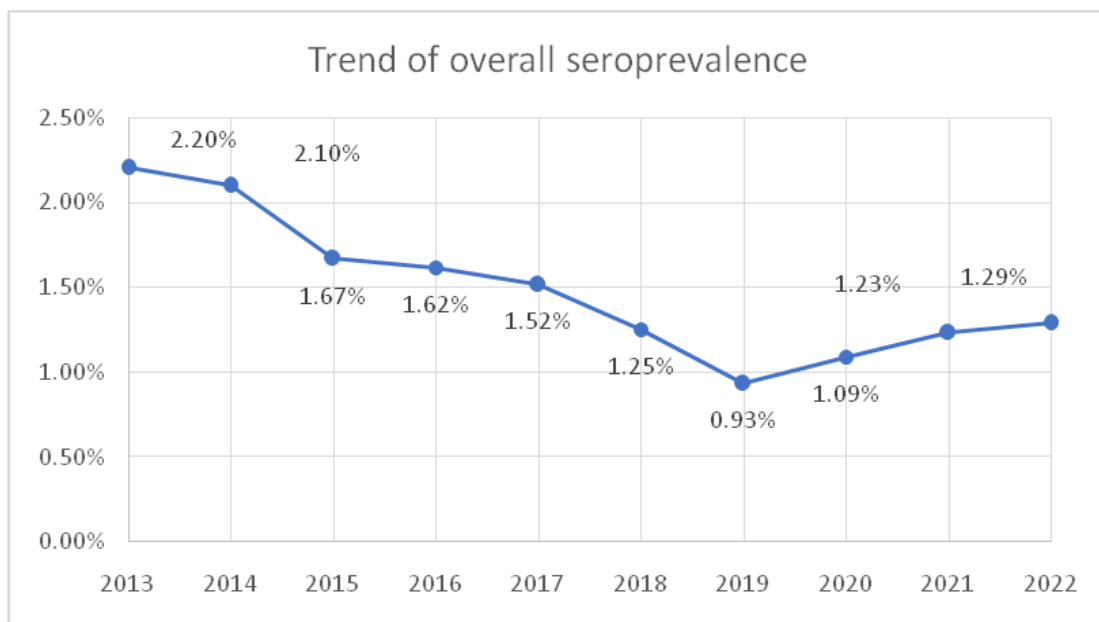


Table 2: Distribution of different TTIs over the 10 year period

Year	HIV	HBV	HCV	Syphilis	Malaria	Total seroprevalence
2022	0.12%	0.64%	0.29%	0.21%	0.02%	210
2021	0.08%	0.78%	0.16%	0.20%	0.01%	175
2020	0.05%	0.80%	0.08%	0.16%	0.00%	168
2019	0.04%	0.64%	0.14%	0.10%	0.01%	144
2018	0.07%	0.77%	0.30%	0.11%	0.01%	201
2017	0.18%	0.87%	0.38%	0.08%	0.00%	215
2016	0.19%	0.99%	0.31%	0.12%	0.01%	285
2015	0.21%	1.08%	0.31%	0.00%	0.07%	251
2014	0.27%	1.08%	1.11%	0.01%	0.00%	337
2013	0.42%	1.11%	1.22%	0.03%	0.00%	339
10-year seroprevalence	0.16%	0.89%	0.32%	0.10%	0.01%	2325 (1.49%)

Graph 3: Gender-wise distribution of TTIs

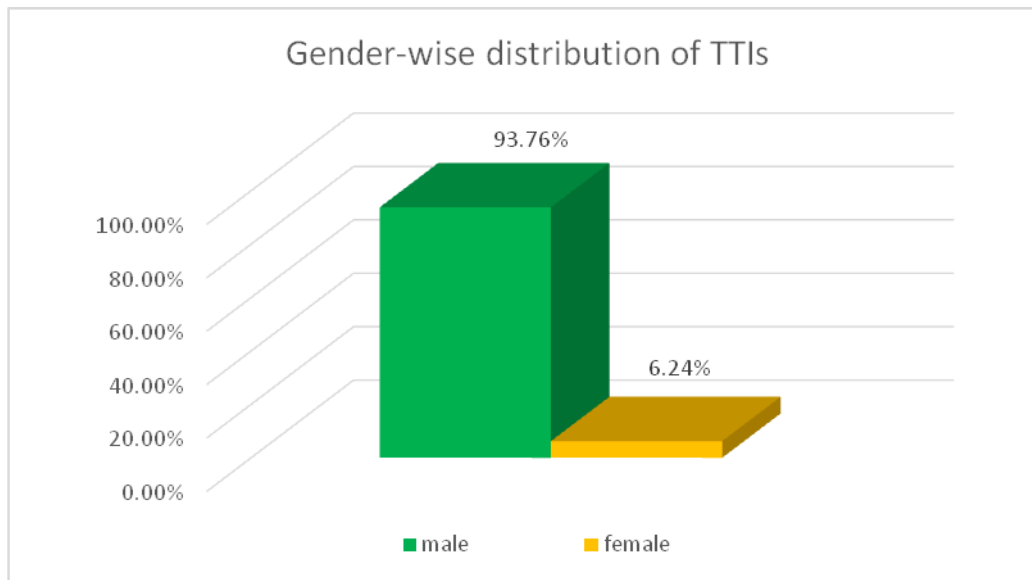


Table 3: Gender-wise distribution of individual TTIs

	HIV	HBV	HCV	Syphilis	Malaria	Total
Male	11.06%	60.78%	20.46%	6.93%	0.78%	2180
Female	10.34%	42.76%	40.69%	5.52%	0.69%	145

DISCUSSION

A total of 1,55,696 blood donors were tested for transfusion transmitted infections over a period of 10 years in the blood center of a tertiary care hospital in Mumbai. In the current study, male donors (89.61%) were more than female donors (10.93%) (Graph 1) which was similar to other studies [4-10] like the study by Satpathy et al [4] where 90.74% donors were males and 9.26% were females. Such low contribution by female donors may be due to the fact that females generally have low hemoglobin and thus are deferred. Also, lack of awareness, less education in females and general trend of not involving females in such activities by head of the family may contribute to this. As a whole, 2,325 seropositive donors were identified from a total of 1,55,696 donations in the current study, corresponding to a total seroprevalence of 1.49%. Seroprevalence of HIV, HBV, HCV, syphilis and malaria in the current study was

0.16%, 0.89%, 0.32%, 0.10% and 0.01% respectively. (Table 2) Although transmission of HIV via blood transfusion is a major concern, it was observed that prevalence of HBV was much more amongst blood donors (5 times that of HIV) (Table 2) as evidenced by the current study as well as other similar studies [4-10]. Amongst seropositive cases, gender distribution showed a majority of male donors (93.76%) compared to female donors (6.24%) (Graph 3). Large number of seropositivity in male donors can be attributed to their overwhelming majority amongst voluntary donors and the difference in risk behavior between the two sexes. Seroprevalence of all TTIs was higher in males except HCV, which was slightly higher in females (Table 3). Studies done on Hepatitis C have found that the risk of contracting HCV is higher in males, and that females show better clearance of this virus [11-13]. However, we were unable to formulate any plausible hypothesis for the findings observed in our study. Makroo et al [14] observed that male donors had 3 times higher risk of seropositivity as compared to female donors. Similar findings were also noted by Sulhyanet alv [7]. As a whole, 2325 seropositive donors were identified from a total of 1,55,696 donations in the current study, corresponding to a summed-up seroprevalence of 1.49% (Table 2). Seroprevalence of HIV, HBV, HCV, syphilis and malaria in the current study was 0.16%, 0.89%, 0.32%, 0.10% and 0.01% respectively. An overall declining trend was observed in the seroprevalence of TTIs over the 10 year study period (Graph 2). Similar decreasing trend was also observed by Sulhyan et al [7] As per NACO 2021, estimated HIV prevalence in India is 0.21%. [15] Seroprevalence of HIV was found to be lower in our study (0.16%). Similarly, WHO estimates HBV prevalence in India to be 3-4.2%, however much lower seroprevalence was noted in our study (0.89%) [18]. HCV seroprevalence in our study (0.32%) was also lower than the estimated HCV seroprevalence in India which is 0.5 – 1% [19, 20]. The urban region in which study was conducted and corresponding greater awareness amongst the donors regarding TTIs compared to rural areas may contribute to lower seroprevalence observed in our study. All TTIs except syphilis showed a declining trend, which was showing an inconsistent rise. Other studies from India and also from other countries have shown a rise in cases of primary and secondary syphilis over the past few years [16,17]. A total of 18 cases of malaria were encountered, all in male donors except one and all these cases were detected during the monsoon season from July to September. Table 4 shows comparison of seroprevalence of TTIs in current study with similar studies done in different parts of India [4, 7-10,21].

Table 4: Comparison of seroprevalence of individual TTIs

Sr. No.	Blood Bank	Area	Year	HIV	HBV	HCV	Syphilis	Malaria
1	Sulhyan et al	Sangli, Maharashtra	2013-2017	0.24	1.15	0.11	0.00	-
2	Satpathy et al	Mumbai, Maharashtra	2007-2015	0.71	2.11	1.04	0.07	0.04
3	Varma et al	Indore, Madhya Pradesh	2015-2018	0.076	1.29	0.072	-	-
4	Divyashree et al	Kuppam, Andhra Pradesh	2012-2018	0.14	0.82	0.02	0.13	0.03
5	Meena et al	Ajmer, Rajasthan	2017-2022	0.07	0.71	0.06	0.29	0.05
6	Adhikari et al	Rampurhat, West Bengal	2016-2022	0.01	0.28	0.12	0.004	-
6	Current study	Mumbai, Maharashtra	2013-2022	0.16	0.89	0.32	0.10	0.01

CONCLUSION

The current study highlights that blood transfusion is one of the major modes of transmission of infections like HIV, HBV, HCV and syphilis. Male voluntary donors form the overwhelming majority of the blood donors. Amongst all TTIs, HBV is the most prevalent infection. All TTIs except syphilis are showing a significant declining trend in seroprevalence through the 10-year study period. Syphilis has become a re-emerging public health concern. Implementing more specific test like nucleic acid testing (NAT) will aid in eliminating transmission of TTIs more effectively. Most importantly, motivating for voluntary blood donations is the most effective way of maintaining safe supply of blood.

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