

RECENT TRENDS AND SEROPREVALENCE OF TRANSFUSION TRANSMITTED DISEASES AMONG BLOOD DONORS IN WESTERN INDIA

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ABSTRACT Introduction: Assessments of Transfusion Transmitted Diseases (TTDs) are essential for evaluating blood transfusion safety and monitoring current screening procedures' efficacy. It also helps formulate lifelong planning to upgrade our public health and stop the spread of TTDs in the general public. **Materials and Methods:** Our objective was to determine the recent trends and seroprevalence of TTDs in voluntary blood donors at a tertiary care hospital in the western part of India. 4117 donors are included in our study from January to December 2019. The blood samples were tested for Human Immunodeficiency Virus I and II, Hepatitis B and C virus, Syphilis and Malaria. **Results:** Out of 4117 donors, a total of 39 (0.95%) donors were positive for Transfusion Transmitted Diseases, out of which 23 (0.56%), 7(0.17%) and 9 (0.22%) donors were positive for HBV, HIV and HCV respectively. **Conclusion:** The most substantial part of every blood donation is finding accurate blood donors at very low risk for Transfusion Transmitted Diseases. This is achieved through efficient counselling and the inclusion of more sophisticated techniques for screening to reduce transmission during the window period.

KEYWORDS Transfusion Transmitted Diseases, blood donors, seroprevalence, the Window period

Introduction

Transfusion of blood and its components have become an important life-saving modality in patient management in recent years. It has become an integral and indispensable part of medical and surgical treatment in our healthcare system [1]. Blood transfusion saves millions of lives worldwide and reduces morbidity [2]. At the same time, it is associated with many mild and life-threatening complications. Transfusion-transmitted Diseases (TTD) come under the severe category. There is a 1% possibility of getting TTDs after a transfusion of each blood unit. [3] Most TTDs comprise HIV I and II virus, Hepatitis B and C virus

and Treponema Pallidum infection. All these infections cause chronic, fatal and life-threatening disorders [4].

Ensuring the safety of transfusing blood products is crucial to preventing such dangerous complications. Meticulous pretransfusion testing and screening of blood are compulsory. However, in an underdeveloped nation like India, it is very challenging to ensure this safety as the resources may not always be available even though the policies and strategies are in place. Although the approaches have been very successful, the transmission of these diseases is still occurring. The main reasons include the lack of available screening tests to find the diseases in the pre-seroconversion period or "window" period, immunological variants of the organism, silent carriers and errors during testing [5]. Assessments of TTDs are necessary for evaluating the secure blood transfusion and monitoring the effectiveness of current screening policies. It also helps formulate long-term strategies to improve health and prevent the spread of TTDs in the general public [6]. Our aim of this study was to assess the recent trends and seroprevalence of TTDs among all voluntary blood donors of our blood bank.

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Table 1 Age-wise distribution of donors

Age (Years)	No. of Donors	Infective status of donors					
		HBV	HIV	HCV	Syphilis	Malaria	Total
18-30	2768	10	4	5	-	-	19
31-40	849	8	2	1	-	-	11
41-50	373	3	1	2	-	-	6
51-60	127	2	-	1	-	-	3
Total	4117	23	7	9	-	-	39

Table 2 Distribution of donors according to gender.

Sex	Infective status of donors						
	No. of donors	HBV	HIV	HCV	Syphilis	Malaria	Total
Male	3565	22	5	8	-	-	35
Female	552	1	2	1	-	-	4
Total	4117	23	7	9	-	-	39

Materials and Methods

Our study is a retrospective, cross-sectional study conducted at a tertiary care hospital in Maharashtra, India. The period of study was one year, from January to December 2019. The study included voluntary blood donors who came to the blood bank as well as to the blood camps held by the hospital.

The study protocol was approved by the Scientific and Ethical Committee of the Institution (Research Protocol No. IESC/PGS/2019/186 dated 11/09/2019). Donors were interviewed and explained about Transfusion Transmitted Diseases. Written consent was obtained from all the donors after counselling. Confidentiality of the personal details of the donors and other information associated with the study was strictly followed. The first routine physical checkup was done for all blood donors for exclusion criteria, and then screening was done. Replacement donors were paid, and professional donors and donors with a previous history of HBV, HCV and HIV infections were eliminated.

A total of 4117 donors fulfilled the inclusion criteria and were accepted for blood donation during the study period of January to December 2019. Five ml of blood was collected in the plain bulb. The screening was done on the same day as the manufacturer's instructions. In cases where the screening tests were not able to perform on the same day, centrifugation of the blood sample was done, and the serum from centrifugation was refrigerated. These samples were tested the next day along with the fresh batch of samples of that day for Hepatitis B Surface Antigen (HbsAg) using Monolisa™ HBsAg ULTRA by enzyme immunoassay technique, HIV p24 antigen and anti - HIV 1 and 2 antibody using Genscreen™ ULTRA HIV Ag-Ab by enzyme immunoassay technique, and anti-HCV antibody using Monolisa™ Anti HCV PLUS Version by indirect enzyme immunoassay technique. Rapid Plasma Reagin (RPR) card test / Carbogen Antigen test was used for screening Syphilis. In addition, a rapid test for the detection of Plasmodium falciparum specific histidine-rich protein-2 (Pf HRP-2) and Plasmodium vivax-specific pLDH using Falcivax was used for testing Malaria. If the donor sample turns out to be positive for transfusion-transmitted diseases, it is discarded. The data were recorded on Excel sheets per the proforma, tabulated and analyzed.

Results

The study included 4117 healthy donors, of which 86.6% were males, and 13.4% were females. Their age group ranged from 18 – 60 yrs. Out of the total 4117 donors, a total 39 (0.95%) donors were positive for transfusion-transmitted diseases, out of which 23 (0.56%) were positive for HBsAg antigen, 7 (0.17%) were HIV positive, and 9 (0.22%) were HCV positive. Hepatitis B constituted the majority of TTDs in our study. Among the 23 HBsAg positive donors, 95.65% were males, the rest were females, and a maximum number of HBsAg positive donors (43.5 %) were from 18 – 30 yrs. Out of 7 HIV-positive donors, 71.4% were males, the rest were females, and the majority (57.1%) were in the age group 18 – 30 years. The least was in the age group 51 to 60 years. Out of 9 HCV-positive donors, the majority were males constituting about 88.89%, and the maximum number of donors (55.55%) were in the age group 18 -30 years, and the least 11.11% was in the age group 31 – 40 years and 51 – 60 years age group. None of the donors was positive for Syphilis or Malaria. Also, zero donors were positive for all three. The age and gender distribution of donors are shown in Table 1 and Table 2, respectively.

Discussion

The objective of our study was to assess the current trends and seroprevalence of transfusion-transmitted infections in our country. We conducted this study in the voluntary blood donor population who visited our blood bank. Assessing the burden of infections transmitted through blood transfusion is very important every year to analyze the effectiveness of screening tests and the awareness of Transfusion and transmitted Infections among the population.

We had a total of 4117 voluntary blood donors in 2019 between ages 18 and 65 years. The increased number of voluntary donors in India is an appreciable effort and a huge achievement on the part of various government organizations like the National AIDS Control Organization (NACO), which relentlessly works for public awareness and propagation of voluntary donation [5]. Most donors were 18 to 30 years old, owing to more college students volunteering for blood donation. Also, the 18 to 30 years age group comprised more healthy individuals meeting the criteria for blood donation than other age groups.

Table 3 Comparison of similar studies.

Author	Year	HIV	HBV	HCV	Syphilis	Total
Srikrishna A et al.	1999	0.44 %	1.86 %	1.02 %	1.6 %	4.92 %
Gupta N et al.	2004	0.084%	0.66%	1.09%	0.85%	2.68%
Pahuja S et al.	2007	0.56%	2.23%	0.66%	-	3.45%
Bhattacharya P et al.	2007	0.28%	1.46%	0.31%	0.72%	2.77%
Chandra T et al.	2009	0.23%	1.96%	0.85%	0.01%	3.05%
Arora D et al.	2010	0.3%	1.7%	1.0%	0.9%	3.9%
Chandekar SA et al.	2017	0.26%	1.3%	0.25%	0.28%	2.09%
Present study	2019	0.17%	0.56%	0.22%	-	0.95%

On the other hand, the majority of blood donors were males. This could be because of the increased prevalence of anaemia among women of menstruating age group in India. Therefore, most women do not meet the essential criteria of Hemoglobin of more than 12.5 g/dl for blood donation and hence more male donors.

Out of the 4117 donors, our study's overall prevalence of Transfusion was transmitted. Infections are 0.95%. None of the donors was positive for Syphilis or Malaria. When we compare the studies conducted by Srikrishna A et al., the prevalence rate is syphilis 1.6% [12], while the study by Chandra T et al. shows a prevalence rate of 0.01% [9], which is almost comparable to our study result of zero percentage. Comparing other studies by Gupta N et al. [7], Bhattacharya P et al. [11], Arora D et al. [10], and Chandekar SA et al. [4], the prevalence rates have decreased indicates the better management of these infections when a person has contracted these diseases in recent years. It also implies an achievement for the health care workers on overall health care in a developing country like India.

Also, out of the total donors, 0.56 % were positive for HBsAg. The studies done by Pahuja S et al. in 2007 showed a prevalence rate was 2.23 % [8] for HBsAg, while the studies conducted by Gupta N et al. in 2004 was 0.66% [7], which is comparable to the prevalence rate of the present study of 0.56% of HBsAg. Over the years, when we compare the studies conducted by Srikrishna A et al. [12], Bhattacharya P et al. [11], Chandra T et al. [9], Arora D et al. [10], Chandekar SA et al. [4] and our study shows a huge decrease in the positivity rates which can be attributable to the effective immunizations, screening and diagnosing of patients with Hepatitis B as well as the effective treatment protocols.

The prevalence of HIV infection in our present study is 0.17% which is comparable with the results of the study by Gupta N et al., where the prevalence rate of HIV is 0.084% [7]. The HIV prevalence rates ranged from 0.56% to 0.084% in the studies by Srikrishna A et al. [12], Bhattacharya P et al. [11], Chandra T et al. [9], Arora D et al. [10], Chandekar SA et al. [4]. The prevalence of HIV seems not to be varying much as compared to other studies. This indicates that the social awareness of HIV infection, as well as the awareness of safe sexual contact, needs to be improved among the general population. Also, measures need to be implemented to diagnose more HIV-positive and asymptomatic people by conducting more screening campaigns and providing prophylactic treatment and routine screening for all healthcare personnel exposed to blood-borne infections.

The prevalence rate of HCV among the voluntary blood donors in our present study is 0.22% which is comparable to the studies done by Chandekar SA et al. [4] and Bhattacharya P et al. [11]

where the prevalence rates of HCV are 0.25% and 0.31%,

respectively, while we compare the studies done by Srikrishna A et al. [12], Gupta N et al. [7], Bhattacharya P et al. [11], Chandra T et al. [9], Arora D et al. [10], Chandekar SA et al. [4] from 1999 to 2017, the prevalence of HCV also seems to be declining over the years. Therefore, it implies early diagnosis of HCV patients and more infection screening in the general population and early treatment institutions. The comparison of similar studies is shown in Table 3.

Out of all the positive donors, most of the positive donors were males attributing to more male donors in India, as discussed earlier. The majority of positive donors of all three infections were mostly from the age group 18 to 30 years which also constituted the majority of donors of all age groups as well as the sexually active group in India, which is comparable with the study by Piyush AP et al. [1,13]

Patients who require frequent blood transfusions, like Thalassemia patients, are more prone to Transfusion Transmitted Diseases [14]. The Hepatitis B virus is transmitted vertically from mother to child through blood transfusion, sexual contact, and sharing of needles by intravenous drug abusers. Syphilis can also be transmitted the same way through vertical, sexual, and intravenous drug abuse as well as through transfusion of blood and blood products. The main agent for non-A non-B post-transfusion hepatitis is considered to be Hepatitis C Virus. Vertical transmission and sexual transmission are other routes which are less common [15]. In the case of the Human Immunodeficiency virus (HIV) and HBV, the infection can be transmitted during the window period, which is a major risk. So, to reduce the transmission during the window period, we encourage blood donation from groups at low risk, which can be assessed by taking proper history and screening questions before donation [16]. HIV and HBV can also be transmitted through tears, saliva, person-to-person contact etc [17]. Therefore it is essential to develop tests that could detect HBV and HIV even during the window period. Nucleic Acid Test (NATs) has become very useful [2] in such situations. However, in a country like India, NATs are unavailable everywhere due to their high cost, and facilities resort to cheaper screening techniques [18].

Conclusion

Our study shows the seroprevalence rates of transfusion-transmitted infections in the general healthy population as voluntary blood donors reflect the general population. This data will be beneficial in planning the strategies for improving public health by increasing the awareness of blood-borne infections through more health awareness programs and camps, thereby increasing the availability of screening tests for the general population. The methods for ensuring blood transfusion safety

should also be encouraged by selecting donors very precisely and screening them with the help of more sensitive screening tests like the Nucleic Acid Test assay, which will help reduce the risk of infections transmitted through blood transfusions. The most substantial part of every blood donation is finding accurate blood donors at very low risk for Transfusion Transmitted Diseases, achieved through efficient counselling and the inclusion of more sophisticated screening techniques.

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Conflict of interest

There are no conflicts of interest to declare by any of the authors of this study.

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