

A Study on Prevalence of Transfusion Related Infections amongst Voluntary Blood Donors in a Tertiary Health Care Centre

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Abstract

Background: In several medical and surgical circumstances, blood transfusion is a life-saving intervention. In addition to its relevance for the medical treatment of each patient, transfusion medicine has a substantial impact on public health.

Aim: The purpose of this research is to investigate the seroprevalence of HIV, HBV, HCV, SYPHILIS, and Malaria amongst voluntary blood donors in a tertiary health care facility.

Material and Methods: The current research was conducted at the Kakatiya Medical College, MGM Hospital Warangal, Department of General Medicine. The study was conducted between December 2019 and November 2021. By using the ELISA approach, 300 volunteer blood donors (270 males, 30 females) aged between 18 to 50 years were evaluated for the presence of HIV, HBV, HCV, syphilis, and malaria.

Observations and Results: 90% of the 300 volunteer blood donors were men, whereas 10 % were women. 2.667 % were positive for transfusion-related infection. The most common infections among blood donors were HBV1% and HCV1%. HIV is 0.33 %, malaria is 0.33 % and no cases of syphilis were found.

Conclusion: Blood transfusion is an essential and life-saving procedure in critical care medicine, which depends on the supply of safe blood made available to those who are in need. Vigorous screening of blood donors and donated blood may help accomplish this goal.

Keywords: Transfusion transmissible infections, Seroprevalence, Voluntary Blood Donors

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Introduction

Modern healthcare relies heavily on blood transfusions; thus, it is crucial to make sure

that blood and blood products adhere to the necessary national criteria for the safety and

effectiveness of transfusion and benefit blood recipients throughout their clinical management process. In rare situations, parenteral injection of blood or blood products provides a possible 'legal' route for transmission of numerous infectious organisms of public health relevance such as HIV, Hepatitis C Virus, Hepatitis B Virus, Malaria, and syphilis. The high incidence of these infectious illnesses raises the danger to blood safety all throughout the globe, particularly in middle and low-income nations [1].

The most common transfusion-transmitted diseases are (a) viruses-HIV-I/II, hepatitis B virus (HBV), hepatitis C virus (HCV), parvovirus B-19, and cytomegalovirus (CMV) (b)Bacteria: *Yersinia enterocolitica*, *Bacteroides fragilis*, and other pathogens, (c) parasitic infections, such as malaria, filariasis and emerging prion disease [2].

Mortality and morbidity caused by contaminated blood transfusions may have their deleterious effects not just on the recipients but on their families and the entire community [3]. Only by constantly improving donor selection, sensitive screening tests, and efficient inactivation techniques can the danger of getting TTIs to be eliminated or at least reduced [4]. Those who provide blood to a patient in order to save their life should be required to ensure that the patient has no negative side effects from the blood transfusion [5].

The transmission of certain illnesses (TTIs), such as HIV, Hepatitis B and C, and syphilis, are particularly relevant for the long-term negative side effects of transfusion of blood and blood products. The urgent need is for meticulous pretransfusion testing and screening, notably for transfusion transmissible illnesses (TTI) [6]. Every blood unit must be tested for HIV, HCV, HbsAg, syphilis, and malaria in accordance with the criteria of the National

AIDS Control Organization (NACO) of India [7,8].

There are three types of blood donors: unpaid volunteers, family members, and paid donors. Voluntary unpaid blood donors are essential for maintaining a stable and adequate blood supply in society. A well-established voluntary, unpaid blood donor program may significantly reduce the incidence of HIV, hepatitis B, hepatitis C, and syphilis, among others. The number of voluntary unpaid blood donations in India has increased from 3.6 million in 2007 to 4.6 million in 2008 [9-14].

Donors who donate freely are seen to be the safest kind of donors since they are frequently in good health. Their health-seeking behavior is superior to that of replacement blood donors, and they aim to donate blood to a stranger out of compassion [14]. The reported prevalence of TTIs among Indian blood donors is as follows: HBV – 0.66 % to 12 %, HCV – 0.5 % to 1.5 %, HIV – 0.084 % to 3.87 %, HCV – 0.5 % to 1.5 %, and 0.85 % to 3% for syphilis respectively [15].

Materials and Methods

The current study was undertaken in the department of General Medicine at the Kakatiya Medical College MGM Hospital, Warangal. The research was conducted from December 2019 to November 2021. 300 voluntary blood donors (270 males, 30 females) were tested for the presence of HIV, HBV, HCV, syphilis, and malaria using the ELISA method.

As part of the donor selection process, factors such as the age and weight of the donor, haemoglobin (Hb/dL) levels and a questionnaire answered by the donor about the high-risk behaviour were taken into consideration.

Walk-in donors and blood donation camps hosted by various institutions, neighbouring

universities, and diverse social and political groups were the sources of the blood donations.

Professional and paid donations were meticulously weeded out. Prior to donation, the written consent of the donor was also obtained. We took 3 ml of blood from the satellite bag into the plain container, and 2 ml into the EDTA (ethylene diamine tetra acetic acid) container.

All the samples were screened for HIV, HBsAg, HCV, Syphilis and malaria in all of the samples. Elisa kits and a fast card approach were used to conduct the tests. In accordance with NACO procedures, all seropositive blood units were disposed of away. Tables, summaries, and statistical comparisons of TTIs, data from NACO-supported blood banks and donor information were prepared for the three-year period.

Results

The following are some of the conclusions that could be derived from research that looked at the incidence of transfusion-transmissible illnesses among a total of 300 voluntary blood donors ranging in age from 18 to 50 years.

Within the total population of 270 males, 12.6 % were between the 18-20 age range, 40% were in the 21-30 age range, 37.6 % were in the 31-40 age range, and 10.4 % were in 41-50 age range as depicted in Figure 1.

Within the group of thirty females, 26.7 % of the donors were aged between the ages of 18 and 20, 46.7 % were between 21 and 30, 20 % were between 31 and 40, and 6.7 % were between 41 and 50 as shown in Figure 2. The seroprevalence of transmissible transfusion infections was depicted in Table 1 and Figure 3. The total number of blood transfusions during the study period was as shown in Figure 4.

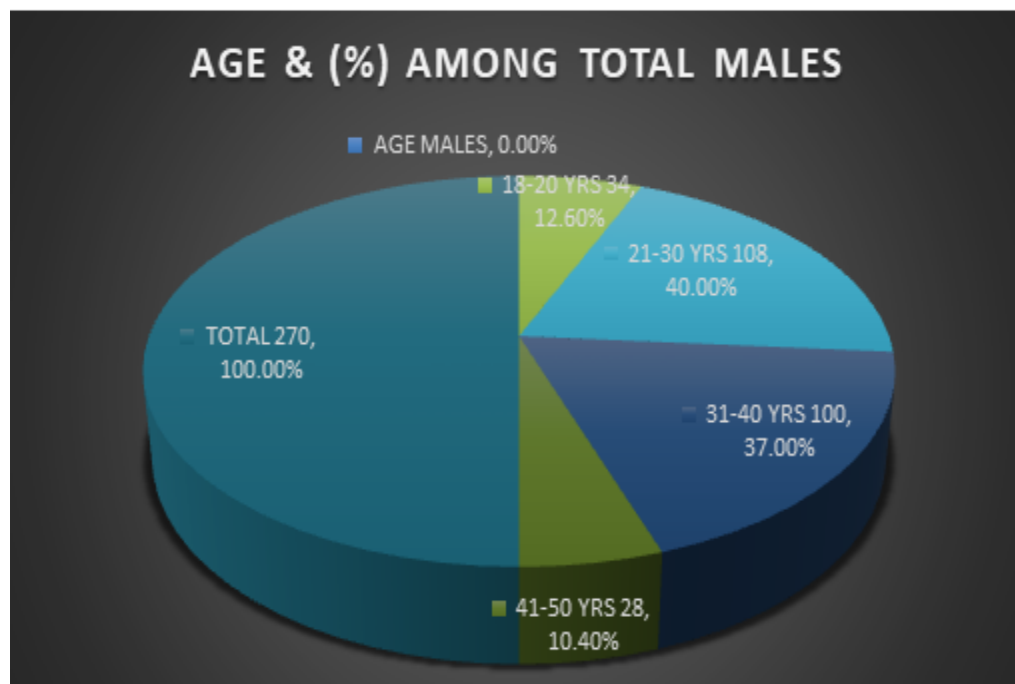


Figure 1: Age & Percentage of Voluntary Blood Donors among Males

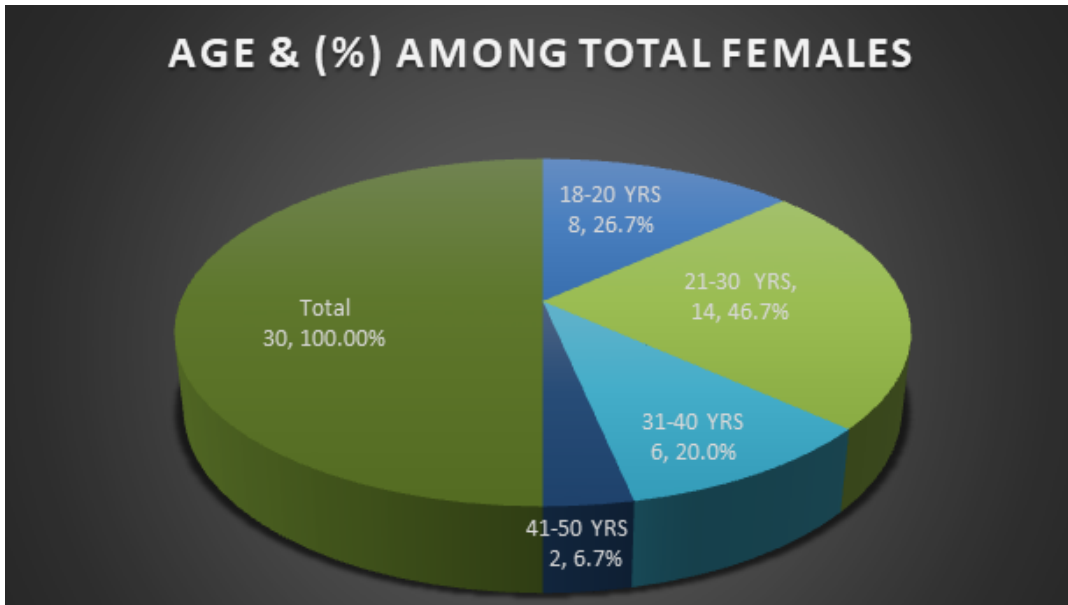


Figure 2: Age & percentage of voluntary blood donors among females

Table 1: Seroprevalence Frequency of Transmissible Transfusion Infections

Seroprevalence	No.	Frequency (%)
HIV	1	0.33%
HBV	3	1.0%
HCV	3	1.0%
Malaria	1	0.33%
Syphilis	0	0.0%
Total	8	2.667%

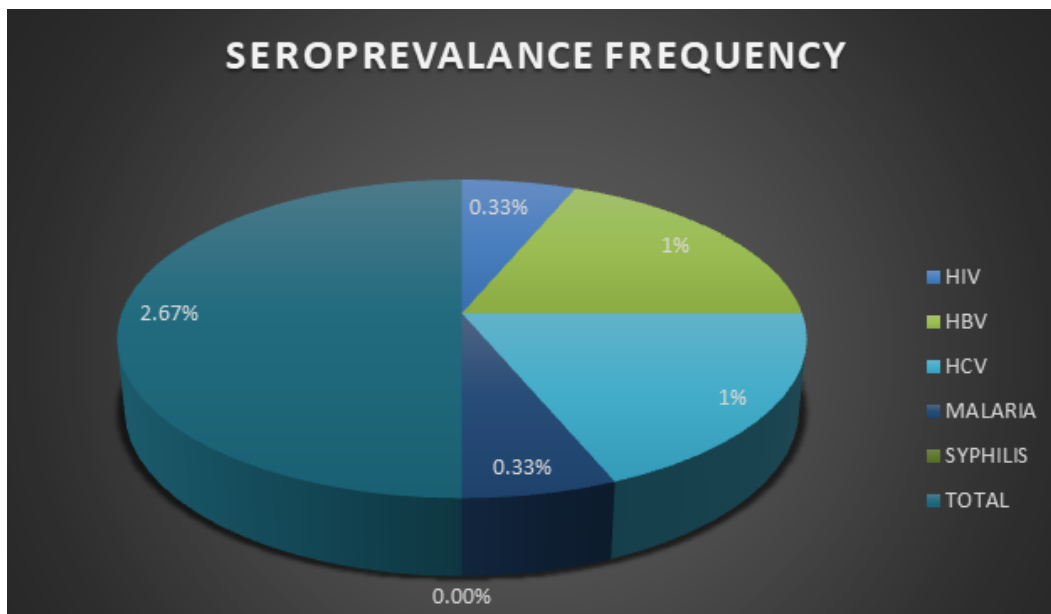


Figure 3: Seroprevalence Frequency of Transmissible Transfusion Infections

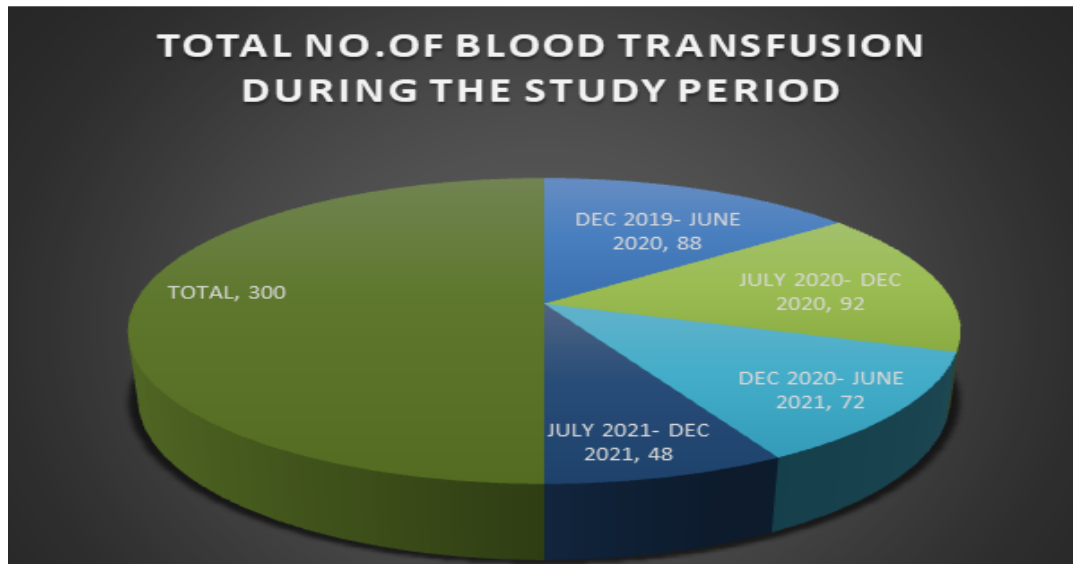


Figure 4: Total Number of Blood Transfusions during the Study Period

Discussion

Syphilis was the only known TTI in the 1930s. There have been an additional seventy-two pathogens that have been discovered to have the potential to spread by blood transfusion since the original 68, which was released by the American Association of Blood Banks (AABB) in 2009. Many screening tests for TTI's are not being used because of the high cost and low prevalence of the organisms implicated in the disease. High-income countries have seen a huge decrease in TTI risk over the last two decades, mostly due to effective screening strategies. However, this isn't the case in undeveloped countries [16].

Hepatitis B and C viruses, syphilis, malaria, cytomegalovirus, Epstein-Barr virus, brucellosis, and other viruses may all be spread by blood transfusion. The receivers of blood transfusions are at risk of developing post-transfusion infections. Transfusion-transmitted illnesses, such as HCV, HIV, HBV, malaria parasites and syphilis are all on the list of recommended screening by the World Health Organization (WHO). Changing medical practices cause regional variations in the prevalence of

various infectious illnesses. Middle and low-income nations are particularly vulnerable to blood-borne infections because of the high incidence of these diseases. When infected blood is obtained prior to the detection of serological markers in the blood (the "window period" or "incubation period"), transfusion-transmitted illnesses are more likely to occur.

Evaluation of the incidence of TTI in blood and blood products will offer a good indicator of the trend and epidemiology of infectious illnesses in the general population and therefore serve as a helpful indicator for determining the safety of blood transfusions. On the basis of these results, initiatives to enhance blood transfusion and reduce TTI, particularly among the elderly, children, and pregnant women can be proposed.

India, which has the world's second-biggest population, is considered to be in an intermediate HBV endemic zone (HBsAg carriage 2-7 %), and it also has the second largest pool of chronic HBV infections [1]. HCV is a leading cause of chronic liver diseases such as hepatic fibrosis, cirrhosis, end-stage liver disease, and hepatocellular

carcinoma (HCC). There are approximately 12-13 million HCV carriers in India alone, and modelling data predict that the burden of the disease could soon, significantly increase.

According to the National AIDS Control Organization (NACO), all blood samples must be tested for HIV 1 and 2, Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), syphilis, and malaria. All blood samples and blood units that test positive should be discarded. Research conducted in the state of Andhra Pradesh found that the seroprevalence of HBsAg was 1.41 %, HCV was 0.84 %, HIV was 0.39 %, and syphilis was 0.08 %. In South India studies conducted in the state of Karnataka also revealed some modest variations in the incidence of TTI antibodies.

In a research conducted in Mysore, which is located in southern Karnataka, the seroprevalence of HBsAg was found to be 1.77 %, HCV was found to be 0.13 %, HIV was found to be 0.63 %, and syphilis was found to be 0.28 % [17].

The seroprevalence of HBsAg was found to be 0.34 %, HCV was 0.06 %, HIV was 0.06 %, and syphilis was 0.11 %, according to research that was conducted at a blood bank in the metropolitan region of Mangalore.

More than two-thirds seropositive donors belonged to the 21–40 years age group in the study conducted by Karmakar *et al.* In the present study most of the sero-positive donors, i.e., about 41% belonged to 21-30 years of age

The mean age group distribution in this study is 30.8 years, donors of the age group 18- 20 years were 14 %, 21-30 years were 40.7%, 31-40 years were 35.3% and 41-50 years was 10%. Amongst the donors, 90% were males and 10% were females. In the age group of 18-20 years, 12.6 % were males and 26.7% were females, and in the

21-30 years age group, 40% were males, 46.7 % were females, in the age group 31-40 years, 37 % were males and 20 % were females and 41 – 50 years group, 10.4% were males and 6.7 % were females. The majority of donors (both male and female) belonged to the age group 21-30 years.

Amongst the 300 blood donors, the prevalence of transmissible transfusion infections (TTIs) was 8, with 2.67% seroprevalence, amongst whom HBV was positive in 3 donors (1%), HCV was positive in 3 donors (1%), followed by Malaria in 1 donor (0.33%), HIV in 1 donor (0.33%) and no donor was positive for syphilis.

The gender ratio of males making up to 90% of the population and females making up to 10% was consistent with other studies.

According to research conducted by Umesh *et al.*, the proportion of male blood donors in their study was 94%, while the proportion of female blood donors was only 6%.

When the gender of the donors was taken into consideration, it was discovered that the vast majority of donors who gave blood as part of the voluntary and replacement groups were males (more than 95 %), and only 2-5 % of the donors were females in most of the studies conducted. This demonstrates that males, as opposed to females, have been more likely to donate blood.

In keeping with the findings of our research, male predominance was found to exist in a number of Indian studies. Garg *et al.* [18], Patel *et al.* [19], and Bhagwan Singh Yadav *et al.* [20] each reported 61.2 %, 93.1%, and 98 % of male preponderance respectively.

The research demonstrated a statistically significant difference between males and females in the incidence of blood transfusion-transmitted illnesses. The disparity in seroprevalence between men and women might be attributable to their

differing risk behaviour. According to Koshy *et al*, the majority of the seropositive donors they evaluated were between the ages of 31-40 years.

Most of the seropositive donors in the research by Karmakar *et al* [21] belonged to 21–40 years of age. Most of the infected donors in the research, conducted by Umesh *et al*, [22] were between 26- 35 years. Furthermore, there was a statistically significant increase in HBs Ag seroprevalence, HCV Seroprevalence, and syphilis seroprevalence among donors aged 26–45 years in our study majority of the seropositive donors were aged between 21-30 years.

Total transmissible infections had a seroprevalence of 2.67 percent. The seroprevalence of individual infections like HIV was 0.23% in a study conducted by Chandra T *et al* [23]. In our research, the seroprevalence of HIV was 0.33 percent, with one positive among the 300 donors, which is comparable with the earlier study.

The knowledge among the general population regarding the transmission of HIV may have increased over time, resulting in a decrease in the number of blood donors with high-risk behaviour donating blood. Improved education and training of blood bank staff in the area of HIV screening might also have helped to reduce the number of infected donations. Between 1989 and 1995, New Delhi had a rise in HIV prevalence of 0.04 to 0.55 percent, but blood donors in Bhopal saw a decrease in HIV incidence of 0.81 percent in 2006, 0.32 percent in 2007, and 0.53 percent in 2008. The HIV prevalence in Kerala (0.16-0.18%) was stable from 1990 to 1999.

The incidence of HBV among India's various tribal populations has been shown to be quite high (4.4 to 37.8 percent). Due to inbreeding, low sanitary living circumstances, intimate personal contact,

and specific socio-cultural behaviours, tribal communities have a high endemicity of HBV infection.

The seroprevalence of HBV was found to be 0.08% in a study by Yadav *et al*, in the year 2018, Madhya Pradesh and 1.55% by sujatha kumbha *et al*, in the year 2015, Karnataka. The prevalence of HBV was found to be 1% in our study.

HCV is transmitted predominantly by blood exposure, and the majority of infected people develop chronic infection, with a higher risk of cirrhosis and hepatocellular cancer than HBV. Because blood is one of the primary routes of Hepatitis C infection, donor selection is critical.

The seroprevalence of HCV was found to be 0.85% in the study by Chandra *et al* and 1.08% in the study by Sujatha kumbha *et al*. In the present research the seroprevalence of HCV is observed to be 1% which is in accordance with the earlier studies.

According to many Indian researchers, the seroprevalence of Syphilis ranges from 0.3-0.82 percent. A low prevalence of syphilis was reported among blood donors in a study by Pallavi *et al* which was 0.23% and a higher prevalence was reported by Arora *et al* (0.9%) and Kumar A *et al* (1.05%) in Bastar region of Chhattisgarh. In our study, we found no cases of syphilis.

The majority of India's population lives in malaria-prone regions, 80 percent of malaria cases recorded in the nation occur in tribal, difficult-to-reach or inaccessible hilly areas, where 20 percent of the population lives. The seroprevalence of malaria was found to be 0.04% in the study conducted by Yadav *et al* and 0.12% in a study from Andhra Pradesh conducted by Leena *et al*. In our study we found the prevalence of malaria to be 0.33%. An important shortcoming of this research is the lack of past data from our institute, to draw

comparisons and record the changing trends of TTI's occurring in our area.

Transfusion of blood and blood components is a life-saving measure that is practiced worldwide. At the same time, however blood transfusion is an important mode of transmission of infections to the recipients. In developing countries, the prevalence of TTIs is much higher and quite far from attaining a zero-risk level at the present moment.

Conclusion

To summarize, 2.67% of healthy blood donors tested positive for TTI's in this research, which demonstrates the risk of transmission by blood transfusion. HBV and HCV were the most prevalent TTI's found in healthy blood donors. Donor selection criteria should be rigorously enforced and well implemented to prevent TTI's. High-generation kits and innovative methodologies shall be used in order to reduce the transmission of infections via transfusion and deliver safer blood and blood products.

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