

SEROPREVALENCE OF TTI AMONG BLOOD DONORS AT THE BLOOD CENTER, LALITPUR: A RETROSPECTIVE CROSS-SECTIONAL STUDY

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Abstract

Background

Millions of lives are saved by timely, safe, and enough transfusions; yet inappropriate transfusions raise the risk of transfusion-transmitted infections (TTIs) and cause numerous potentially fatal consequences. All infections that can spread from person to person by parenterally administering blood or blood products are known as TTIs.

Objectives

At a blood center at Autonomous State Medical College (ASMC), Lalitpur, Uttar Pradesh, the study sought to ascertain the TTI prevalence in both replacement and voluntary donors.

Materials and Methods

Data that were collected on donors of blood collected at a blood center between 2021 and 2024 was the subject of retrospective descriptive research. Data that were extracted from the database included age, sex, and donation type. The outcomes were total TTI, syphilis seropositivity, HIV, HBV, and HCV.

Results

The sociodemographic analysis revealed a predominantly male donor population (95.6%) with a mean age of 43.9 ± 7.3 years, and the majority were family donors (81%). The overall seroprevalence of transfusion-transmitted infections (TTIs) was low, with Hepatitis B being the most prevalent at 0.48%, followed by HCV at 0.06%. No cases of HIV, syphilis, or malaria were detected. Year-wise distribution showed a non-significant variation in TTI seropositivity over the study period ($p=0.24$).

Conclusion

The study concludes that the prevalence of transfusion-transmitted infections is medium and has been declining over time. The most common infection is hepatitis B (HBsAg), which is followed by syphilis, HIV, and HCV.

Recommendation

Regular screening, stringent donor selection, and promotion of voluntary donations are recommended to further reduce the prevalence of transfusion-transmitted infections.

Keywords: Prevalence, Transfusion-transmitted Infections (TTI), Blood Donor, Blood Centre, HIV

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Introduction

A vital component of medical care and treatment is blood transfusion. Effective medical care is impossible without a transfusion of blood, which is a crucial part of the

contemporary system of healthcare. The goal of BTS is to supply safe, sufficient, and effective blood and blood products to satisfy the demands of patients [1]. Millions of lives are saved by timely, safe, and enough transfusions; yet,

inappropriate transfusions raise the risk of transfusion-transmitted infections (TTIs) and cause numerous potentially fatal consequences [2].

TTI is the term used to describe any infection that can be transmitted from person to person through the infusion of blood or blood products. Depending on the prevalence of TTIs in that particular community, the extent of TTIs fluctuates or differs from nation to nation. The World Health Organization (WHO) has recommended that, before blood transfusion, some pre-testing for diseases such as syphilis, hepatitis B (HBV), hepatitis C (HCV), and human immunodeficiency virus (HIV) is necessary to assess their severity [3].

Infections that are caused by viruses are the most prevalent of the three types of transfusion-transmissible infections: bacterial, viral, and parasitic. Among the most prevalent viruses that cause diseases following transfusions are HBV, HIV, and HCV. The prevalence of HBV infection varies substantially by region worldwide. The WHO established three classifications for HBV prevalence, such as low endemicity, which is less than 2%, moderate is between 2–7%, and high endemicity is more than 8% [4].

Numerous issues have been linked to the increased risk of contracting TTIs in the area, such as subpar test kits and/or inconsistent test kit supply, many facilities have insufficient quality assurance (QA) processes, and there is a shortage of qualified laboratory staff, the inability to recognize those who have just contracted the infection, and the lack of chemical or physical treatment of blood products [5].

At a blood center at Autonomous State Medical College (ASMC), Lalitpur, Uttar Pradesh—a government medical institution affiliated with Atal Bihari Vajpayee Medical University—the study sought to ascertain the transfusion-transmitted diseases in both replacement and voluntary donors.

Methodology

Study Design

A retrospective cross-sectional study was conducted using data from blood donors between 2021 and 2024 to assess the prevalence of transfusion-transmitted infections. Data that were extracted from the database included age, sex, and

donation type. The outcomes were total TTI, syphilis seropositivity, HIV, HBV, and HCV.

Study Population

20931 donors of blood who donated to the blood center between 2021 and 2024 were included in the study population. A predetermined criterion that focused on age between 16–65 years, weight more than 50 kg, and medical history was used to choose donors. Donors were excluded if they were below 16 or above 65 years of age, weighed less than 50 kg, had a history of chronic illness, recent infections, high-risk behavior, or failed to meet the medical fitness standards set by national blood donation guidelines.

Study Procedure

ELISA-1 (VironostikaR HIV-1 Plus O Microelisa System) and ELISA-2 (AccuDiag™ HIV 1&2 Ag/Ab ELISA 4th Generation) or Murex HIV Ag/Ab Combination (ABBOTT Diagnostics Division) were the assays used by the blood center TTI screening department for HBsAg (SD HBs Ag ELISA 3.0), HCV (SD HCV ELISA 3.0), Syphilis (MEDIFF TPHA), and HIV testing.

Statistical Analysis

An Excel spreadsheet was used to carefully arrange the acquired data. Following extensive cleaning and recoding procedures, SPSS version 25.0 was used to conduct a thorough analysis of the data. The number of seropositive samples annually was used to establish the prevalence of TTI. Statistical investigations also included evaluating year-by-year changes in these patterns using the chi-square (χ^2) test. Statistical significance was defined as a p-value of less than 0.05.

Results

Male donors made up 95.6% of all participants, while female donors made up just 4.4%, according to the researchers. In terms of blood donor types, family donors accounted for 81% of the total, while donors who donated voluntarily made up 19%. Table 1 displays the patients' initial features.

Table 1. Baseline Characteristics of Patients

Characteristics	Value
Age (in years)	43.9±7.3
Male Participants	20,000 (95.6%)
Female Participants	931 (4.4%)
Category of Blood Donors	
Family Donor	16,954 (81%)
Voluntary Donor	3977 (19%)
Donors detected in the Years.	
2021	4275 (20.4%)
2022	5652 (27%)
2023	5755 (27.5%)
2024	5249 (25.1%)

Data were presented as mean±SD or n (%)

Transfusion-transmitted infection seroprevalence among patients is shown in Table 2. Infections with HBsAg were found in 102 patients (0.48%). Thirteen individuals (0.06%) had HCV infection. No patients had malaria, syphilis, or HIV.

Table 2. Seroprevalence of Transfusion-Transmitted Infections

Types of TTIs	Value
Human Immunodeficiency Virus (HIV)	00 (0%)
Hepatitis B Virus (HBsAg)	102 (0.48%)
Hepatitis C Virus (HCV)	13 (0.06%)
Syphilis	00 (0%)
Malaria	00 (0%)

Data was presented as n (%)

Table 3 shows the seropositivity of transfusion-transmitted infections in various years of the study. The data was not found to be significant among TTIs in various years, with p-value of 0.24.

Table 3. Seropositivity of Transfusion Transmitted Infections in various years of the study

Years	Number of Donors	Positive TTIs	Negative TTIs	Chi-square Value	P-value
2021	4275	24 (0.11%)	4251 (20.3%)	4.12	0.24
2022	5652	22 (0.10%)	5630 (26.9%)		
2023	5755	38 (0.18%)	5717 (27.3%)		
2024	5249	31 (0.14%)	5218 (24.9%)		

Data was presented as n (%)

The P-value was considered significant at <0.05

Discussion

The results of this study revealed that between the ages of 18 and 64, the majority of study participants were male and donated mainly to their relatives.

This finding is consistent with other research done in several nations, including Tanzania, India, and Ethiopia, which are nearby [6, 7, 8, 9]. Due to cultural and societal traditions that frequently limit the participation of women in the donation of blood because of worries about their reproductive and health roles, there is a notable gender gap among donors of blood donors, and most of them are men. Because relatives

believe they must donate on behalf of their loved ones, most replacement (family) donors donate at blood banks. The small number of volunteer donors may also be a result of the public's ignorance about the significance of voluntary blood donation.

Overall, transfusion-transmissible infectious agents, including 0.05% HIV, 0.92% Syphilis, 0.03% HCV, and 2.0% HBsAg, are shown to be 2.99% prevalent in Somalia [10, 11]. Because of the various ways in which they might spread, especially through unprotected sexual contact and mother-to-child transmission following childbirth, HBV and

syphilis are more prevalent than HIV and HCV [12, 13]. Lack of knowledge and accessibility to healthcare frequently make this rapid spread worse, particularly in areas where cultural factors affect how people seek medical attention. Compared to HIV, people are generally less afraid of syphilis and hepatitis. This opens up a window of opportunity for these diseases to spread.

The seroprevalence of HIV, syphilis, HCV, and HBsAg dropped from 4.27 percent in 2016 to 1.98 percent in 2022 over 7 years. Of the 1087 cases, 66.7% had hepatitis B, 30.8% had syphilis, 1.6% had HIV, and 0.9% had hepatitis C. Numerous investigations conducted in the area revealed a similar downward tendency [10, 14]. There are several reasons for the drop in the seroprevalence of TTIs during seven years. This decrease may have been caused by increased knowledge and instruction regarding blood safety precautions, strict donor screening procedures, efficient testing technology use, and improved healthcare facilities. The prevalence of TTI infections has significantly decreased over time, according to the study. Other investigations carried out in neighboring Ethiopia have noted similar patterns [15, 16].

Conclusion

The study concludes that the prevalence of transfusion-transmitted infections is medium and has been declining over time. Infections with HBsAg were found to be prevalent, followed by syphilis, HIV, and HCV. Due to social norms that restrict women's participation and the lack of voluntary donations, the disparity between genders in blood donation and the prevalence of replacement donors underscores the difficulties in attaining more equitable involvement.

Limitations

This study's retrospective methodology limited our capacity to provide information on various things that affected the results, even with the large sample size. Likewise, the study's single-center design limits how broadly its conclusions may be applied to other areas or demographics. Another further constraint may be linked to the intrinsic limitations of the tests employed in this investigation, particularly their dependence on serological approaches instead of nucleic acid-based methodologies.

Recommendations

The study suggests putting in place focused measures, such as thorough campaigns of public health, procedures for screening of donors, and blood transfusion practices followed safely, to lower the prevalence of transfusion-transmitted diseases. These initiatives would be strengthened by promoting frequent, unpaid voluntary blood donors, guaranteeing a safer blood supply for everybody.

Generalizability

The findings of this study are generalizable to similar blood donation centers in semi-urban and rural regions of India, particularly those with comparable donor demographics and healthcare infrastructure.

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Conflict of Interest

The authors declare no conflict of interest.

Author Contributions

All authors contributed to the study design, data collection, analysis, interpretation, and manuscript preparation. The principal investigator supervised the project and approved the final version of the manuscript.

Data Availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request and with permission from the institution.

List of Abbreviations

TTIs- Transfusion Transmitted Infections
WHO- World Health Organization
HIV- Human Immunodeficiency Virus
HBsAg- Hepatitis B virus
HCV- Hepatitis C Virus

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