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ASSESSING BLOOD SAFETY IN A TRIBAL DISTRICT OF GUJARAT: TRANSFUSION-TRANSMISSIBLE INFECTION BURDEN AMONG BLOOD DONORS

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ABSTRACT

Introduction: Blood transfusion is an essential component of modern healthcare but carries the risk of transfusion-transmissible infections (TTIs), which remain a significant global concern.

Aim: To determine the prevalence of TTIs among blood donors at a tertiary care centre.

Materials and Methods: A retrospective cross-sectional study was conducted at the Blood Centre of Zydus Medical College and Hospital, Dahod, Gujarat, from March 2024 to January 2025. A total of 8,500 voluntary blood donors were included. Donor screening involved medical history, physical examination, and laboratory testing for HIV, HBsAg, HCV, and syphilis using chemiluminescence immunoassay (CLIA). Data were analysed using descriptive statistics.

Results: Out of 8,500 donors, 96.98% were males and 3.02% females. Most donors belonged to the 18–30 years age group (54.94%). The overall prevalence of TTIs was 4.34%. HBsAg showed the highest prevalence (2.59%), followed by syphilis (1.11%), HIV (0.46%), and HCV (0.36%).

Conclusion: The study demonstrates a relatively low TTI prevalence, with hepatitis B as the predominant infection. Strengthening donor awareness and maintaining continuous epidemiological surveillance are essential for ensuring blood safety.

Keywords: Blood Donors, Blood Transfusion, Hepatitis B Surface Antigen, Hepatitis C Antibodies, HIV Infections, Syphilis, Seroprevalence, Transfusion-Transmissible Infections.

INTRODUCTION

Blood transfusion is a vital therapeutic intervention in modern medicine, widely used in emergency care, surgical procedures, obstetric management, oncology, and haematological disorders. It plays a crucial role in restoring circulating blood volume, improving oxygen-carrying capacity, and reducing morbidity and mortality [1].

Despite its benefits, transfusion carries the risk of transmitting infectious agents. Transfusion-transmissible infections (TTIs), including human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV), and syphilis, remain major concerns for blood safety worldwide [1,2]. The prevalence of these infections among blood donors reflects both the effectiveness of screening programs and the underlying epidemiology in the general population.

Advancements in screening technologies have significantly improved blood safety. Serological assays have largely been supplemented by more sensitive techniques such as chemiluminescence immunoassay (CLIA), which offers improved sensitivity, specificity, and automation. However, a residual risk persists due to the window period of infections, necessitating continuous strengthening of screening protocols [1].

Monitoring TTI prevalence among blood donors is essential not only for ensuring transfusion safety but also for providing valuable epidemiological insights. In developing regions, factors such as resource limitations, donor awareness, and variability in infrastructure influence the implementation of screening strategies. Therefore, periodic evaluation of TTI prevalence is crucial for guiding policy decisions and improving blood safety systems [5].

Objective

To determine the prevalence of transfusion-transmissible infections among voluntary blood donors at a tertiary care centre.



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MATERIALS AND METHODS

This retrospective cross-sectional study was conducted at the Blood Centre of Zydus Medical College and Hospital, Dahod, Gujarat, over a period of 11 months (March 2024 to January 2025).

A total of 8,500 voluntary, non-remunerated blood donors aged 18–65 years were included. Donors were selected according to National Blood Transfusion Council guidelines. Individuals with high-risk behaviour or those not meeting eligibility criteria were excluded.

All donors underwent pre-donation screening, including medical history, physical examination, and completion of a standardized questionnaire. Blood samples (3–4 mL) were collected and tested for HIV-1 and HIV-2 antibodies, hepatitis B surface

antigen (HBsAg), hepatitis C virus antibodies, and syphilis using chemiluminescence immunoassay (CLIA).

Ethical approval was obtained from the Institutional Ethics Committee (IEC No. ZMCH/IEC/015(05)-2024). Donor confidentiality was strictly maintained.

Data were analysed using descriptive statistics. The prevalence of each infection was calculated as the percentage of reactive samples among total donors.

RESULTS

A total of 8,500 blood donors were screened during the study period.

The majority of donors were male (96.98%, n=8,243), while females constituted 3.02% (n=257).

Table 1. Gender Distribution among Blood Donors

Gender	Number (n)	Percentage (%)
Male	8243	96.98
Female	257	3.02
Total	8500	100.00

Most donors belonged to the 18–30 years age group (54.94%), followed by 31–40 years (31.47%), 41–50 years (12.21%), and 51–60 years (1.38%).

Table 2. Age Distribution among Blood Donors

Age Group (years)	Number of Donors	Percentage (%)
18–30	4670	54.94
31–40	2675	31.47
41–50	1038	12.21
51–60	117	1.38
Total	8500	100.00

The overall prevalence of TTIs was 4.34% (369/8,500). The distribution of infections was as follows: HBsAg (2.59%), syphilis (1.11%), HIV

(0.46%), and HCV (0.36%). HBV was the most common infection, followed by Syphilis, HIV, and HCV.

Table 3. Seroprevalence of Transfusion-Transmissible Infections

Infection	Positive Cases (n)	Prevalence (%)
HIV	39	0.46
HBsAg	220	2.59
HCV	31	0.36
Syphilis	94	1.11
Total TTI Positivity	369	4.34

DISCUSSION

This study demonstrates an overall TTI prevalence of 4.34%, which is consistent with Indian studies reporting prevalence between 2–5% and comparable to data from Western India and metropolitan centres, while remaining lower than high-prevalence African regions [2, 3].

HBsAg was the most prevalent marker (2.59%), reflecting its higher endemicity in developing countries and its established role as a major cause of donor deferral [8]. This was followed by syphilis, HIV, and HCV in decreasing order of prevalence. Similar patterns have been reported in Indian blood

donor studies [3]. The observed HIV and HCV prevalence aligns with regional data, suggesting effective donor screening and selection practices [3,4]. Syphilis seroreactivity, although slightly higher than some reports, falls within global ranges and underscores the importance of confirmatory testing due to possible false positivity [5].

The predominance of male donors reflects sociocultural factors and physiological considerations such as anaemia and pregnancy-related deferrals among females. Similar gender distributions have been reported in other studies [6]. Additionally, donor type, particularly voluntary

donation, plays a more significant role in determining TTI risk than gender alone.

The majority of donors were from the 18–30 years age group, indicating a younger donor pool, which is generally associated with lower risk and higher eligibility for donation. Similar demographic patterns have been observed in Indian blood banks [11].

The relatively low prevalence of TTIs in this study can be attributed to stringent donor selection criteria, voluntary donation practices, and standardized screening protocols [7,8]. In such settings, maintaining accuracy in screening and minimizing unnecessary donor deferral are essential. Proper interpretation of reactive results and structured follow-up contribute to both transfusion safety and donor retention [1,5].

Limitations

This study is limited by its retrospective design and single-centre setting. The absence of nucleic acid testing (NAT) may underestimate infections during the window period. Additionally, donor type stratification and long-term trend analysis were not performed.

CONCLUSION

This study demonstrates a relatively low prevalence of transfusion-transmissible infections among voluntary blood donors, with hepatitis B being the most common infection. The findings reflect effective donor selection and screening practices. The predominance of young and male donors represents demographic characteristics rather than independent risk factors. Strengthening voluntary blood donation programs, ensuring accurate

screening, and maintaining continuous surveillance are essential for sustaining blood safety.

A robust blood transfusion system supported by stringent screening protocols and ongoing epidemiological monitoring remains fundamental to ensuring safe and effective transfusion services.

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