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COMPARATIVE STUDY ON THE PREVALENCE OF TRANSFUSION-TRANSMITTED INFECTIONS AMONG BLOOD DONORS AT A TERTIARY CARE HOSPITAL, IN THE EASTERN PART OF GUJARAT

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ABSTRACT Blood transfusion plays a vital role in modern healthcare, but it can also transmit infectious diseases from donors to recipients. Transfusion-transmitted infections (TTIs) like HIV, HBV, HCV, and Syphilis are still significant concerns for blood safety. In this retrospective observational study, we looked at how common TTIs are among blood donors at Zydus Blood Centre in Dahod, Gujarat, between January 2023 and July 2025. We screened 20,635 donor blood samples using third-generation ELISA and CLIA tests for HIV-1 & 2 antibodies, HBsAg, Anti-HCV antibodies, and Treponema pallidum antibodies. Among all donors, 884 (4.18%) tested positive for at least one TTI. HBV was the most common infection, found in 2.5% of donors and making up almost 59% of all positive cases. Syphilis was next at 1.12%, followed by HCV at 0.31% and HIV at 0.28%. Most positive donors were male (98.53%), and most cases were in the 18 to 40 age group. The findings highlight the persistent burden of TTIs in the region, particularly HBV and syphilis, which may be associated with limited awareness, inadequate vaccination coverage, and restricted access to healthcare in rural and tribal populations. Continuous surveillance, improved donor screening, enhanced public health education, and increased HBV vaccination coverage are necessary to improve transfusion safety. Adoption of advanced screening techniques such as nucleic acid testing (NAT) in the future may further reduce the risk of TTI transmission.

KEYWORDS : TTIs, ELISA, Blood Donors, Hepatitis B.

INTRODUCTION

Blood transfusion is an essential component of modern healthcare and plays a crucial role in saving lives in various medical conditions such as trauma, surgery, anemia, and hematological disorders. However, it is important to ensure that the blood being given is safe. This is done through careful checks to find and prevent infections that may be passed from the donor to the recipient by blood or blood products. Some of the diseases that are commonly spread in this way include HIV, Hepatitis B, Hepatitis C, and Syphilis. These infections can be dangerous for patients as well as exert pressure on blood donation systems that work hard to keep the blood supply safe. [1,2]

In India, it is very important to keep the donation of blood safe, as there is a lot of variety in the population, differences in the way people get their healthcare, and differences in levels of knowledge about health. Even though the National AIDS Control Organization (NACO) and the National Blood Transfusion Council (NBTC) have ruled out some specific rules for checking blood donors and testing their blood, it can still lead to the transmission of some infectious diseases. This is especially true in rural areas and tribal areas. For instance, in Dahod, a district of Gujarat with a largely tribal population in Gujarat, an outbreak of such diseases could be due to the low access to healthcare, low levels of education, and certain cultural factors that could predispose the people to get infected. [2,3]

Serological tests, particularly Enzyme-Linked Immunosorbent Assay (ELISA), are currently the primary screening tools used in blood banks across India for detecting TTIs. ELISA is widely used due to its cost-effectiveness and reliable sensitivity for detecting transfusion-transmitted infections. But it's important to continue monitoring how well these tests are working in order to ensure that blood transfusions are safe.[1,4]

The results obtained from this study are aimed at establishing a sense of epidemiological trends in TTIs in Dahod and the importance of continuous surveillance, better donor selection, and advanced diagnostic testing to increase transfusion safety.

Objectives

1. To determine the prevalence of HIV, HBV, HCV, and Syphilis among blood donors at Zydus Blood Centre, Dahod, between 2023 and July 2025.
2. To analyze the comparative frequency of each TTI in the donor population.
3. To assess the effectiveness of ELISA for TTIs.
4. To provide epidemiological data useful for policy-making, awareness, and preventive measures in blood safety.

MATERIALS AND METHODS

This retrospective observational study was carried out at Zydus Blood Centre, Dahod, Gujarat, over a period from January 2023 to July 2025. Blood donors who met the eligibility criteria per NBTC guidelines were included in the study. Donors were screened through pre-donation questionnaires, clinical examinations, and informed consent was obtained.

A total of 20,635 donor blood samples were tested using third-generation ELISA kits and CLIA testing. The following markers were tested:

- HIV 1 & 2 antibodies
- HBV (Hepatitis B surface antigen)
- Anti-HCV antibodies
- Treponema pallidum (Syphilis antibodies)

Reactive samples were retested for confirmation using the same ELISA method. No additional confirmatory tests (like NAT) were performed due to budget constraints.[5,6] Data were collected and analyzed using descriptive statistics to report frequencies and percentages.

All essential biosafety precautions and infection control procedures were strictly followed during the collection and examination of blood samples. Before permitting volunteer and replacement blood donors to donate blood at the blood bank, they were counselled and assessed according to standard operating procedures.

Inclusion Criteria

The study selected blood donors who met specific health and safety standards and were at no risk of transmitting TTIs. Donors qualified if they had no recent, past, or current history of hepatitis, chronic illnesses, sexually transmitted infections, surgeries, asthma, high-risk behaviours (such as unprotected sex), or pregnancy. Participants had to be in good physical condition, aged between 18 and 65 years, weighing more than 45 kg, and with haemoglobin levels above 12.5 g/dL.

Exclusion Criteria

Participants who did not meet the criteria for blood donation were excluded from this study.

RESULT

The study was conducted between January 2023 till July 2025; a total of 20,635 blood donors were screened for TTIs at Zydus Blood Centre, Dahod. Among them, 884 donors were found reactive for at least one TTI, indicating an overall TTI prevalence of 4.18%.

The distribution of TTIs among the reactive donors was as follows:

- HBV (Hepatitis B): 524 donors (2.54% of total donors)

- Syphilis: 235 donors (1.13%)
- HCV (Hepatitis C): 66 donors (0.31%)
- HIV: 59 donors (0.28%)

Table 1: Distribution of TTI Reactivity Among Donors

Total Donors	20,635
Total Reactive Donors	884
HIV Positive	59
HCV Positive	66
Syphilis Positive	235
HBV Positive	524

HBV was the most prevalent TTI, followed by Syphilis, HCV, and HIV.

Table 2: Percentage Distribution of TTI Reactivity

Infection	Number of cases	% of Total donors	% of Total Reactive donors
HIV	59	0.28%	6.7%
HCV	66	0.32%	7.5%
Syphilis	235	1.13%	26.6%
HBV	524	2.54%	59.2%
Total	884	4.27%	100%

Table 3. Sex-based Distribution of TTI Reactivity

Sex	No. of donors	Percentage
MALE	871	98.53%
FEMALE	13	1.47%
TOTAL	884	100%

Among the 884 TTI reactive donors, the majority belonged to the 18-40 years age group, accounting for 728 donors (82.37%). The 40-65 years age group comprised 156 donors (17.63%). Thus, indicating that most TTI- reactive cases were observed in the younger donor population.

Hepatitis B infection was the most prevalent among all TTIs, accounting for nearly 59.2% of all reactive cases. Syphilis was the second most common infection, comprising 26.6% of reactive donors. HCV and HIV together accounted for 14.2% of the cases.

The relatively higher prevalence of HBV and Syphilis in this region could be attributed to poor public awareness, insufficient vaccination coverage, and a lack of preventive practices, especially in tribal and rural populations. The lower seropositivity rates of HIV and HCV suggest some level of effectiveness in national programs for these infections.

These findings reflect the need for continued public health interventions, robust screening programs, and enhanced blood safety measures.[3,4,7]

DISCUSSION

This study provides important insights into the prevalence and distribution of TTIs among blood donors in Dahod, Gujarat—a region that remains underrepresented in national data. The overall seroprevalence of 4.18% is consistent with other studies conducted in semi-urban and tribal areas of India, where access to healthcare and awareness is comparatively limited [1,3,8].

Hepatitis B emerged as the most common infection, with a prevalence of 2.5%. This finding is consistent with studies from other Indian states where HBV is found to be the dominant TTI [1, 2, 3]. Despite national vaccination programs for HBV, gaps in immunization coverage and community awareness, especially among the adult population, remain significant contributors to the persistence of HBV in rural areas. Community-level health campaigns and school-based vaccination programs may be critical in reducing HBV transmission.

Syphilis, with a seroprevalence of 1.13%, was the second most prevalent infection. Although treatable, syphilis remains a public health issue due to inadequate access to testing and treatment, and societal stigma surrounding sexually transmitted infections. The persistence of Syphilis in blood donors calls for stronger sexual health education, pre-donation counselling, and perhaps even point-of-care rapid tests in rural settings [3, 8]. The syphilis reactivity among blood donors in Gujarat varies across studies but generally shows low prevalence from 0.04% to 0.60% compared to the reactivity of donors with syphilis at Zydus blood centre, Dahod, which is 1.13%.

HCV and HIV, although showing lower prevalence (0.32% and 0.28%, respectively), are still significant due to their chronic nature and long window periods. These rates are lower than national urban averages, possibly indicating some success of awareness campaigns and national programs. Nonetheless, even a single unit of infected blood poses significant danger to the recipient.

ELISA continues to be the primary screening tool for TTIs in most Indian blood banks due to its cost-effectiveness. However, its inability to detect infections during the window period remains a limitation. Advanced techniques such as Nucleic Acid Testing (NAT) can significantly reduce this window period, improving transfusion safety [6,9]. However, NAT implementation requires infrastructure and funding, which may not be feasible in smaller centres like Dahod.

CONCLUSION

This study reveals a significant prevalence (4.18%) of transfusion-transmitted infections among blood donors at Zydus Blood Centre, Dahod. Hepatitis B remains the most common infection, followed by Syphilis, HCV, and HIV. These results emphasize the need for improved awareness, public health interventions, and technological advancements in blood screening.

The results of this study emphasize the need for:

- Enhanced public education on TTIs
- Improved HBV vaccination coverage
- Promotion of voluntary blood donations over replacement donations
- Consideration of NAT-based screening in the long term

In conclusion, the prevalence of TTIs in Dahod reflects the broader challenges faced by India's public health system in addressing blood safety in underserved populations.[1,2,3,4,6,8,9]

Policies focusing on rural health education, vaccination drives, and the phased adoption of NAT can significantly improve transfusion safety in such regions. The majority of the Transfusion Transmitted Infections were found among the age group 18-40 years males, and amongst them, it's more commonly seen in the people who have migrated here for work.

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