



Research Article

Incidence of HIV Seropositive in Healthy Blood Donors at Tertiary Care Hospital Blood Center, Bangur Hospital, Pali (Raj.): A One Year Observational Study In 2024

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ABSTRACT

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Received: 04-02-2025

Accepted: 06-03-2026

Published: 23-03-2026

Background: Transfusion-transmitted infections (TTIs) pose a significant threat to the safety of patients requiring blood transfusions. These infections not only increase morbidity and mortality among recipients but also present serious challenges to ensuring the availability of safe blood components, particularly in healthcare systems with limited resources. In India, the HIV incidence among the uninfected population was reported to be 0.05 per 1,000 population in 2023 (NACO), underscoring the ongoing need for vigilance in blood safety practices. The need to maintain high standards of blood safety while keeping blood products affordable places considerable strain on blood transfusion services. To minimize the risk of TTIs, strict donor selection criteria are rigorously implemented, including detailed medical history assessment, physical examination, and mandatory screening for transfusion-transmissible pathogens. These measures are essential to ensure that the blood supplied to recipients is as safe as possible and free from infectious agents.

Aims/Objective: To study trends of HIV Seropositive incidence in Healthy Blood Donors at tertiary care hospital blood center of Govt. Bangur Hospital, Pali (Rajasthan) and to compare positivity of this marker in Voluntary and Replacement donors.

Material and Methods: This observational study was conducted over a period of one year (2024) at the Blood Centre attached to Government Medical College & Bangur Hospital, Pali (Rajasthan), in coordination with the Rajasthan State AIDS Control Society (RSACS). A total of 11,450 blood donors were screened during the study period. Serum samples were tested for transfusion-transmitted infections, including HIV, hepatitis B surface antigen (HBsAg), hepatitis C virus (HCV), syphilis, and malaria. Samples that tested positive on initial screening were retested using fourth-generation ELISA assays for HIV, HBsAg, and HCV, and further confirmed by nucleic acid amplification testing (NAAT).

Statistical Analysis: Statistical analysis was performed using standard bio statistical methods. Data were entered into Microsoft Excel and analyzed using SPSS V.26. Categorical variables were expressed as frequencies and percentages. The association between HIV seropositivity and donor type (voluntary vs replacement) was analyzed using the Chi-square test. For gender-wise comparison, Fisher's exact test was applied due to the presence of cells with expected counts less than five. A p-value of less than 0.05 was considered statistically significant.

Result: A total of 11,450 blood donors were screened for HIV during the study period, of whom 9 donors were found to be HIV seropositive, yielding an overall incidence of 0.08%. Donor type-wise analysis showed that voluntary donors accounted for 9,715 donations, with 6 HIV-seropositive cases (0.06%), whereas replacement donors comprised 1,735 donations, among whom 3 were HIV seropositive (0.17%). Although the incidence of HIV seropositivity was higher among replacement donors compared to voluntary donors, the difference was not statistically significant ($\chi^2 = 1.12$, $p = 0.291$). Gender-wise analysis of HIV

seropositivity revealed that out of a total of 11,450 blood donors screened, 9 donors were found to be HIV seropositive, giving an overall incidence of 0.08%. Male donors constituted 10,862 of the total donors, among whom 9 were HIV seropositive, resulting in an incidence of 0.08%. None of the 580 female donors tested positive for HIV, yielding an incidence of 0%. The association between gender and HIV seropositivity was not statistically significant, as determined by Fisher's exact test ($p = 1.00$)

Conclusion: Prevention of transfusion-transmitted infections remains a major priority in blood transfusion services. Although the overall incidence of HIV seropositivity among blood donors was low, detection of HIV-positive cases among apparently healthy donors highlights the continued risk of transfusion-related HIV transmission. Early identification through sensitive screening methods such as fourth-generation ELISA and confirmatory NAAT improves blood safety and enables timely referral to Integrated Counselling and Testing Centres (ICTCs) for early treatment, thereby reducing morbidity and preventing serious complications. Strengthening donor screening and surveillance is essential to ensure safe blood transfusion practices.

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Medical and Pharmaceutical Research

Keywords: HIV Seropositive, healthy blood donors.

INTRODUCTION

Blood can save millions of lives, and young people are the hope and future of a safe blood supply in the world.[1] Blood transfusion is crucial for health care systems, which contributes to rise in life expectancy and quality of life of people experiencing acute critical illness or chronic diseases.[1] Nowadays health care providers manage serious hemorrhagic complications after surgery, delivery or major accidents,[2,3,4,5] severe blood disorders,[6] and oncologic conditions[7,8] demanding blood transfusion. I

HIV infection resulting from blood transfusion has been documented repeatedly since the first case report from the United States in late 1982[5]. The problems of transfusion associated acquired immuno deficiency syndrome resulted in a notification in 1989 under the Drugs and Cosmetics Act which made the test for HIV mandatory[6]. Several methods are available for the detection of HIV which detect the presence of anti-HIV antibody or the HIV antigen or both. Recently, nucleic acid based tests which are either PCR or transcription mediated amplification to detect the viral nucleic acid have been introduced for blood donor screening[7]. The specialized rapid assays and the Western blot are two commonly used assays which differentiate between HIV-1 and HIV -2.

Procured blood from voluntary non remunerated blood donors (VNRBD) is the most potent way to ensure safe and adequate blood supply.[1] Against an annual demand of 12 million units, in India, 9 million units were collected, of which 70% was from voluntary blood donors while the remaining 30% was from family or replacement donors. According to the protocol specified by the Government of India, 25% of all blood collected by a blood bank had to be kept aside as buffer stock to be used only in case of an emergency. However, out of India's 2433 blood banks, only 20% were able to maintain the buffer stock.[3] Blood scarcity is frequently encountered in health-care settings and is attributable to an imbalance between the increasing demand for safe blood and blood products on the one hand and failure to organize regular blood supply due to Transfusion-transmitted infections threaten the safety of patients requiring blood transfusion, which in turn imposes serious challenges for the availability of safe blood components that are still affordable in health care systems with limited resources. Strict criteria are followed while selecting a donor so that proper blood free of all pathogens is available for recipient.

Transfusion-transmitted infections (TTIs) pose a significant threat to the safety of patients requiring blood transfusions. These infections not only increase morbidity and mortality among recipients but also present serious challenges to ensuring the availability of safe blood components, particularly in healthcare systems with limited resources. In India, the HIV incidence among the uninfected population was reported to be 0.05 per 1,000 population in 2023 (NACO), underscoring the ongoing need for vigilance in blood safety practices. The need to maintain high standards of blood safety while keeping blood products affordable places considerable strain on blood transfusion services. To minimize the risk of TTIs, strict donor selection criteria are rigorously implemented, including detailed medical history assessment, physical examination, and mandatory screening for transfusion-transmissible pathogens. These measures are essential to ensure that the blood supplied to recipients is as safe as possible and free from infectious agents.

AIMS & OBJECTIVE

To study trends of HIV Seropositive incidence in Healthy Blood Donors at tertiary care blood center of Govt. Bangur Hospital, Pali (Rajasthan) and to compare positivity of these marker in Voluntary and Replacement donors.

SUBJECTS & METHODS

The donor blood samples were collected at the time of blood donation from the primary bag and tested for the presence of HIV using enzyme linked immunosorbent assay (ELISA). Till 2004, a third generation ELISA kit (Ortho HIV1/2, Clinical Diagnostics, Johnson & Johnson, USA) using fully automated ARIO walk away system, was used. It detected the presence of anti-HIV antibodies in the serum of blood donors. From 2005 till January 2009, all tests were done using the fourth generation ELISA kit (Genscreen HIV1/2, Bio-Rad, USA) on a fully automated platform EVOLIS which detected the presence of HIV-1 P24 antigen and anti-HIV antibodies. From February 2009 onwards, the kits used were Genscreen ULTRA HIV Ag-Ab Assay from Bio-Rad. All samples tested positive by ELISA were repeat tested in duplicate using the same ELISA kit and using the same sample obtained from the donor at the time of blood donation. If the donor was found repeatedly reactive, the sample was subjected to Western blot testing using the HIV 2.2 Genelab Kit, Singapore. All Western blot results were interpreted using the WHO criterion⁸.

MATERIAL AND METHODS

This observational study was conducted over a period of one year (2024) at the Blood Centre attached to Government Medical College & Bangur Hospital, Pali (Rajasthan), in coordination with the Rajasthan State AIDS Control Society (RSACS). A total of 11,450 blood donors were screened during the study period. Serum samples were tested for transfusion-transmitted infections, including HIV, hepatitis B surface antigen (HBsAg), hepatitis C virus (HCV), syphilis, and malaria. Samples that tested positive on initial screening were retested using fourth-generation ELISA assays for HIV, HBsAg, and HCV, and further confirmed by nucleic acid amplification testing (NAAT).

RESULT

A total of 11,450 blood donors were screened for HIV during the study period, of whom 9 donors were found to be HIV seropositive, yielding an overall incidence of 0.08%. Donor type-wise analysis showed that voluntary donors accounted for 9,715 donations, with 6 HIV-seropositive cases (0.06%), whereas replacement donors comprised 1,735 donations, among whom 3 were HIV seropositive (0.17%). Although the incidence of HIV seropositivity was higher among replacement donors compared to voluntary donors, the difference was not statistically significant ($\chi^2 = 1.12$, $p = 0.291$). Gender-wise analysis of HIV seropositivity revealed that out of a total of 11,450 blood donors screened, 9 donors were found to be HIV seropositive, giving an overall incidence of 0.08%. Male donors constituted 10,862 of the total donors, among whom 9 were HIV seropositive, resulting in an incidence of 0.08%. None of the 580 female donors tested positive for HIV, yielding an incidence of 0%. The association between gender and HIV seropositivity was not statistically significant, as determined by Fisher's exact test ($p = 1.00$).

Table 1: Distribution of HIV Seropositivity Among Voluntary and Replacement Blood Donors

Donor Type	Total	HIV Seropositive	Incidence(95%CI)	P-value
Voluntary	9715	6	0.062% (0.02%-0.13%)	0.291
Replacement	1735	3	0.173% (0.04%-0.50%)	
Total	11450	9	0.079% (0.04%-0.15%)	

Table 2: Distribution of HIV Seropositivity Among Female and Male Blood Donors

Gender	Total	HIV Seropositive	Incidence (95%CI)	P-value
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	t a l	ive		
Female	580	0	0%	1.000
Male	10862	9	0.083% (0.04%-0.16%)	
Total	11442	9	0.079% (0.04%-0.15%)	

COMPARISON OF INCIDENCE OF HIV SEROPOSITIVE IN ALHA ET AL. (2019) AND OUR STUDY

With reference to the previously published study by Alha et al. (2019), the incidence of HIV seropositivity among blood donors was reported as 0.072% (102 cases among 140,930 donors). In comparison, our study observed an HIV incidence of 0.079% (9 cases among 11,450 donors). The difference in HIV incidence between the previously published study and our study was not statistically significant (Chi-square test, $p = 0.81$), indicating comparable HIV seroprevalence rates in both studies.

DISCUSSION

The first documented HIV infection in India was among a cohort of sex workers in the southern State of Tamil Nadu, in 1986^{9,10}. The virus since then has been spreading rapidly across the country. States with a high prevalence of HIV include Maharashtra, Tamil Nadu, Karnataka, Andhra Pradesh, Manipur, and Nagaland^{1,9}. Within these high-prevalence areas, the HIV epidemic reflects the diverse social, cultural, religious, and sexual practices^{11,12}. There are “hot spots,” where commercial sex work is common, such as in coastal Andhra Pradesh, northern Karnataka, and southern Maharashtra¹. Epidemiology of HIV-2 is much varied. Ever since its first occurrence from Senegal, West Africa in 1986¹³, many cases of HIV-2 have been reported from various parts of the world especially in the West African countries^{14,15}. Several reports of HIV-2 infection have been received from Portugal, Mozambique, Angola, South-Western India and Brazil, all areas with former ties to Portugal^{14–16}. We did not find any HIV-2 seropositive donors.

The indeterminate results using this WHO criterion for Western blot interpretation were 4 per cent. The switch from third to fourth generation assays resulted in a decreased rate of false positivity and hence, increased specificity. The specificity increased from 98.57 per cent (207 out of 210 were repeat reactive) to 99.33 per cent (299 out of 301 showing repeat reactivity). The prevalence of HIV among our blood donor population was found to be 0.247 per cent using serological tests (third and fourth generation ELISA).

The prevalence of HIV reported in Indian blood donors ranges from 0.084-3.87 per cent¹⁷. A study conducted on blood donors at a tertiary care centre of the Armed forces revealed seropositivity rates of 0.12 per cent in 2003, 0.17 per cent in 2004 and 0.10 in 2005, with an overall seropositivity of 0.13 per cent¹⁷. Four major blood banks in the capital jointly reported an overall HIV seroprevalence of 3.1 per thousand donors. HIV-1 constituted the major bulk (89.0%), HIV-2 was detected only in two cases (1.4%) and HIV-1/2 in 9.6 per cent of the samples¹⁸. In our previous study which compared the trends of HIV infection in blood donors of Delhi, the HIV seropositivity rates per 1000 samples screened among voluntary donors were 0.63, 0.45, 1.9, 3.03, and 3.87 in 1989, 1990, 1991, 1992, and 1993, respectively. Among replacement donors, these rates were 0.46, 0.50, 1.9, 5.24, and 7.48, respectively. Among professional donors, these rates were 1.50, 0.90, 1.3, 3.28, and 3.76, respectively¹⁹.

The presence of HIV-2 has been reported from south-western part of India⁴, whereas no data are available from the northern part of the country. We, in the present study failed to demonstrate any case of HIV-2. Among the 4,31,300 blood donors screened for HIV at a tertiary care hospital of south India, 350 (0.81%) were positive for HIV. Of these, 304 (0.704%) were positive for HIV-1, while 46 (0.106%) were positive for the HIV-2. Thakral et al²¹, showed a 0.16 per cent seropositivity of HIV-2, while Singh and colleagues²² demonstrated HIV-2 seropositivity rates of 0.54 per cent among blood donors of Delhi. Kannangai et al⁴ showed a very low frequency of HIV-2 infection (0.003%). There have also been reports of HIV-1 and -2 dual infections predominantly from the southern States of India⁴. A high prevalence of HIV-2 was also seen in a

group of high risk individuals in a study conducted in Mumbai²³. The rate of mono-infection with HIV-2 was 4 per cent and that of dual infection was 20 per cent²³.

According to NACO, more men are HIV positive than women. Nationally, the prevalence rate for adult females is 0.29 per cent, while that for males is 0.43 per cent. The findings of higher infectivity among men in the reproductive age group, in the present study are in concurrence with the findings of other studies on blood donors¹⁶. Heterosexual promiscuity seems to be the only cause of higher seropositivity in males. In our study, only 2.6 per cent females were tested positive for HIV as compared to males who were in majority (97.4%).

CONCLUSION

Prevention of transfusion-transmitted infections remains a major priority in blood transfusion services. Although the overall incidence of HIV seropositivity among blood donors was low, detection of HIV-positive cases among apparently healthy donors highlights the continued risk of transfusion-related HIV transmission. Early identification through sensitive screening methods such as fourth-generation ELISA and confirmatory NAAT improves blood safety and enables timely referral to Integrated Counselling and Testing Centres (ICTCs) for early treatment, thereby reducing morbidity and preventing serious complications. Strengthening donor screening and surveillance is essential to ensure safe blood transfusion practices.

So prevention of TTIs should be the main goal right now. The majority of donors in our country are voluntary, relatives or friends, who are apparently healthy, but transmission of TTIs during serologically negative window period is still a threat to blood safety. Therefore stress should be given on more strict donor screening strategy to decrease TTI cases. Voluntary donations are safer as compared to replacement ones and should be encouraged.

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