

## Original Research Article

# Sero-prevalence of transfusion transmissible infections among 59,434 blood donors over a period of 5 years in a tertiary care institute in Himachal Pradesh

Shivani Sood<sup>1\*</sup>, Sandeep Malhotra<sup>1</sup>, Gurpreet K. Taggar<sup>1</sup>, Pranav Sood<sup>2</sup>

<sup>1</sup>Department of Immuno-Haematology and Blood Transfusion, Indira Gandhi Medical College, Shimla, Himachal Pradesh, India

<sup>2</sup>Civil Hospital, Rohru, Shimla, Himachal Pradesh, India

**Received:** 16 November 2025

**Revised:** 13 December 2025

**Accepted:** 19 December 2025

### \*Correspondence:

Dr. Shivani Sood,

E-mail: shivanisood343@rediff.com

**Copyright:** © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

## ABSTRACT

**Background:** Blood transfusion is the cornerstone of modern health services. Each blood component transfused has a potential risk of transfusion transmissible infections. Frequent assessment of the prevalence of these infections among blood donors is essential to assess the risk and to improvise the testing methods accordingly. This study was undertaken in Department of Immuno-hematology and Blood Transfusion, Indira Gandhi Medical College (IGMC), Shimla to assess the sero-prevalence and trends of human immunodeficiency virus (HIV), hepatitis B surface antigen (HBsAg), and hepatitis C virus (HCV), among blood donors who donated blood from 2020 till 2024.

**Methods:** Enzyme-linked immunosorbent assay (ELISA) testing for HIV, HBsAg and HCV was carried out on all blood samples from voluntary and replacement blood donors and results were recorded in Microsoft Office Excel sheet.

**Results:** Out of 59,434 blood units collected, 558 units tested positive for HIV, HBsAg and HCV. The individual seropositivity rates were 0.44% (263 cases) for HCV, 0.41% (241 cases) for HBsAg, 0.08% (50 cases) for HIV. There were 2 cases of co-infections of HBsAg with HCV, 1 case of co-infection of HIV with HBsAg and 1 case of co-infection of HIV with HCV. A rising trend of HIV and dual sero-positivity among blood donors was noted in the study.

**Conclusion:** The alarming rise in the prevalence of transfusion transmissible infections (especially dual positivity) among blood donors stresses upon the need for strict adherence to donor selection criteria and using better screening technologies like chemiluminescence immunoassay (CLIA) and nucleic acid amplification testing (NAT) to detect window phase infective blood.

**Keywords:** HIV, HBsAg, HCV

## INTRODUCTION

The World Health Organization (WHO) recommends the quality-assured screening of all donated blood.<sup>1</sup> As per the National AIDS Control Organization (NACO) guidelines, it is mandatory to test all the donor samples for human immunodeficiency virus (HIV) 1 and 2, hepatitis B, hepatitis C, syphilis and malaria before issuing the blood for the patients.<sup>2</sup> Among these transfusion transmissible infections (TTI), HIV, hepatitis B and hepatitis C pose a

major threat for the patients because of asymptomatic course of these infections and tendency to escape detection during window period in blood donors in initial stages.<sup>3</sup>

The magnitude of this problem is directly related to the prevalence of these infections among blood donors. Continuous evaluation of the burden of TTIs in blood donors is extremely important as it helps in assessing the risk of TTI by blood transfusion and enhancing donor selection strategies accordingly.<sup>4</sup>

This study was undertaken to evaluate the sero-prevalence of HIV, hepatitis C virus (HCV), and hepatitis B surface antigen (HBsAg) among blood donors in Himachal Pradesh over a period of 5 years.

## METHODS

### Setting

This is a cross-sectional study conducted in the Department of Immunohaematology and blood transfusion on all the blood units collected in the blood center and in blood donation camps.

### Duration

Data was collected over a period of 5 years from January 2020 till December 2024 at Indira Gandhi Medical College, Shimla, Himachal Pradesh

### Sample size calculation

Total sample size has been determined by all voluntary and replacement blood donors who donated blood during this period.

### Inclusion criteria

All voluntary and replacement blood collected during this period has been included in the study. Only those persons who qualified the donor selection questionnaire as per the national guidelines and departmental standard operating procedure and found to be fit on medical examination were selected for blood donation.

### Exclusion criteria

Those people who could not qualify the donor questionnaire criteria or found to be unfit on medical examination were deferred and thus not included in the study.

### Methodology

Basic demographic information regarding age, sex, occupation, number of previous donations along with the post donation testing data was compiled from the hospital records. 5 ml of blood was collected from all the blood donors and allowed to clot.

Samples were centrifuged at 3000 rpm for 3 minutes for separating serum. Enzyme linked immunosorbent assay (ELISA) testing was done on all the donor blood samples for screening for HBsAg, HIV, and HCV.

For HIV testing, 4th generation Microlisa- HIV-1 p24 antigen and antibodies to HIV-1 and HIV-2 in human serum/plasma (J. Mitra & Co. Pvt Ltd.) were used. For HCV testing, 3rd generation HCV Microlisa test (J. Mitra

and Co. Pvt Ltd.) was used. For HBsAg, Hepalisa for detection of HBsAg in human serum/plasma (J. Mitra and Co. Pvt Ltd.) was used. The positive blood units were discarded and donor was notified and sent to the microbiology department for confirmation. If the samples were again positive, donor was sent to the appropriate department for further management. All tests were performed as per manufacturer instructions and standard operating procedures of the department.

### Data analysis

All the collected data was recorded in Microsoft excel.

## RESULTS

Total voluntary and replacement blood donors during this period were 59,434. All the blood units collected were tested for transfusion transmissible infections (HIV, HCV, HBsAg). Total 558 cases were found to be positive for HIV, HCV, and HBsAg over a period of 5 years. The overall sero-prevalence of HIV, HCV, and HBsAg during this period of 5 years was 0.94% (558 cases). Out of the 558 cases, 521 cases (93.37%) were males and 37 (6.6%) were females. Maximum number of cases were in the age group of 18-30 years accounting for 303 (59.30%) of the total cases. 154 cases (27.60%) were in the age group of 31-40 years, 81 cases (14.52%) between 41-50 years and 20 cases (3.58%) were between 51-60years (Table 1).

**Table 1: Age group wise distribution of cases found positive for HIV, HBsAg and HCV.**

Age group (years)	No. of cases (%)
18-30	303 (59.30)
31-40	154 (27.60)
41-50	81 (14.52)
51-60	20 (3.58)

The individual sero-positivity rates during this period of 5 years were 0.44% (263 cases out of 59,434 donors) for HCV, 0.41% (241 cases) for HBsAg, 0.08% (50 cases) for HIV. There were 2 cases of co-infections of HBsAg with HCV, 1 case of co-infection of HIV with HBsAg and 1 case of co-infection of HIV with HCV. In 2020, 94 cases (0.85%) were detected, while in 2021, 74 cases (0.66%) were detected.

From 2022 till 2024, there has been a gradual increase in the number of cases from 109 cases (0.89%) in 2022 to 142 cases (1.18%) in 2024. Also, the cases of dual positivity have also been seen in 2023 and 2024 with 2 cases in each year. HCV was the most prevalent infection in 2021 and 2023, while in 2020, 2022 and 2024. HBsAg was the most common infection as shown in the Table 2.

A comparison of prevalence of HIV, HBsAg and HIV among blood donors in various regions of India is presented in Table 3.

**Table 2: Yearly sero-prevalence of (HIV, HCV, HBsAg) in blood donors.**

Year	Total blood collected	HCV (%)	HBsAg (%)	HIV (%)	HBsAg +HCV (%)	HIV+HBs Ag (%)	HIV+HCV (%)	Total (%)
2020	11,124	38 (0.34)	49 (0.44)	7 (0.06)	0	0	0	94 (0.85)
2021	11,242	37 (0.33)	33 (0.29)	4 (0.04)	0	0	0	74 (0.66)
2022	12,274	48 (0.39)	53 (0.43)	8 (0.07)	0	0	0	109 (0.89)
2023	12,761	81 (0.63)	42 (0.33)	14 (0.11)	1 (0.01)	0	1 (0.01)	139 (1.01)
2024	12,033	59 (0.49)	64 (0.53)	17 (0.14)	1 (0.01)	1 (0.01)	0	142 (1.18)
<b>Total</b>	59,434	263 (0.44)	241 (0.41)	50 (0.08)	2	1	1	558 (0.94)

**Table 3: A comparison of prevalence of HIV, HBsAg and HIV among blood donors in various regions of India.**

Study	Region	Study Period	HIV (%)	HBsAg (%)	HCV (%)
Bagde et al <sup>14</sup>	Chattisgarh	2012-2017	0.31	0.75	0.065
Singh et al <sup>15</sup>	Delhi	2014-2016	0.09	1.18	0.69
Paudel et al <sup>7</sup>	Puducherry	2017-2023	0.03	0.93	0.00
Chauhan et al <sup>16</sup>	Gujarat	2018-2020	0.52	0.68	0.11
Shah et al <sup>17</sup>	Gujarat	2016-2020	0.047	0.31	0.036
Pattanashetti et al <sup>13</sup>	Karnataka	Jan 2012–Mar 2018	0.05	0.58	0.02
Cherukat et al <sup>8</sup>	Puducherry	Aug 2015–Feb 2017	0.31	2.19	0.51
Mondal et al <sup>12</sup>	West Bengal	Apr 2015–Mar 2018	0.14	0.45	0.66
Sharma et al <sup>18</sup>	Madhya Pradesh	2009-2013	0.13	3.51	0.24
Shrivastava et al <sup>9</sup>	Madhya Pradesh	2001-2016	0.2	1.8	0.42
Saini et al <sup>3</sup>	Haryana	2015-2019	0.26	1.02	1.53
Venkatraman et al <sup>10</sup>	Puducherry	2012-2016	0.07	2.15	0.15
Patel et al <sup>11</sup>	Gujarat	2018-2022	0.09	0.76	0.14
<b>Present study</b>	Himachal Pradesh	2020-2024	0.08	0.41	0.44

## DISCUSSION

Safe blood transfusion services are essential for effective, high-quality healthcare system. However, contaminated blood transfusion is a potential source of TTIs and can be fatal instead of saving life.<sup>5</sup> Transfusion Transmitted Infections is still a major concern to patients, physicians and policy makers who wish to see a risk-free blood supply. With every unit of blood, there is 1% chance of transfusion associated problems including TTI. The risk of TTI has declined dramatically in high income nations over the past two decades, but the same may not hold true for the developing countries.<sup>6</sup>

In our study, the maximum number of cases were in the age group of 18-30 years accounting for 303 (59.30%) of the total cases. These results are similar to the results of Paudel et al, Cherukat et al, Shrivastava et al, Saini et al, Venkatraman et al and Patel et al.<sup>3,7-11</sup>

However, Singh et al found maximum seroreactivity in 61-65 years age group, Mondal et al in 38-47 years age group and Pattanashetti et al in 26-35 years age group.<sup>12-14</sup> These differences could be due to different geographic locations of these studies and may be due different age groups of people who are actively involved in blood donation in different regions.

In our study, 521 cases (93.37%) were males and 37 (6.6%) were females. These results are consistent with the studies conducted by Bagde et al, Pattanashetti et al, Cherukat et al and Shrivastava et al.<sup>8,9,14,15</sup> In the study conducted by Venkatraman et al, 99% of the cases were males TTI in while in the study conducted by Mondal et al, 100% cases were males and no female having TTI was detected.<sup>10,13</sup>

In our study, sero-positivity rate for HCV was 0.44% followed by HBsAg which had a sero-positivity rate of 0.41% followed by HIV having a sero-positivity rate of 0.08%. These results are similar to the the results of the studies conducted by Saini et al and Mondal et al. In their studies also, the most prevalent TTI was HCV, followed by HBsAg and further followed by HIV.<sup>3,13</sup>

Another very significant finding in our study is the constant rise in the sero-prevalence of HIV from 0.04% cases in 2021 to 0.14% cases in 2024. Also there has been 1 case of co-infection of HIV with HCV in 2023 and 1 case of co-infection of HIV with HBsAg in 2024.

In the studies conducted by Cheruk et al, Bagde et al, Singh et al, Paudel et al, Chauhan et al, Shah et al, Patanashetti et al, Sharma et al, Venkatraman et al, Srivastava et al and Patel et al, HBsAg was found to be the most prevalent TTI.<sup>3,7-11,14-18</sup> In all these studies except those by Bagde et al and Chauhan et al, second most prevalent TTI was HCV.

However, in the studies conducted by Bagde et al and Chauhan et al, HIV was the second most prevalent TTI followed by HCV.<sup>15,16</sup>

These differences could be due to difference in the study period; the donor population and screening methods used in the study. The possible reasons for the discrepancy in the total sero-prevalence of TTIs between various studies could be variation in the total sample size, in the nature of the study population, research method used, time period, the test kits on the market, storage, and validation of the test kits.

In the present study, 94 cases (0.85%) of TTI were detected in 2020 while 74 cases (0.66%) were detected in 2021. From 2022 till 2024, there has been a gradual increase in the number of cases from 109 cases (0.89%) in 2022 to 142 cases (1.18%) in 2024. Also, the cases of dual positivity have also been seen in 2023 and 2024 with 2 cases in each year. This is an alarming sign as positivity in healthy donor population is a reflection of the rising prevalence of the disease in the youth. A possible reason could be the rising intra venous drug addiction and men who have sex with men (MSM) in society and requires further studies.

## CONCLUSION

Extensive donor selection criteria and screening procedures helps in improving the blood safety. Employing better screening technologies like CLIA and NAT can detect a greater number of window phase infective blood. A system for regular follow up of donors found positive for transfusion transmissible infections should be strengthened so that they can be counselled, treated and their re-entry in donor pool can be prevented. Frequent assessment of the sero-prevalence of these infections among blood donors is important for formulating effective prevention and control strategies.

*Funding: No funding sources*

*Conflict of interest: None declared*

*Ethical approval: The study was approved by the Institutional Ethics Committee*

## REFERENCES

- World Health Organization. Screening Donated Blood for Transfusion-Transmissible Infections. 2010. Available at: <https://www.who.int/publications-detail-redirect/screening-donated-blood-for-transfusion-transmissible-infections-recommendations>. Accessed on 12 July 2025.
- National AIDS Control Organization. Standards for Blood Banks and Blood Transfusion Services. New Delhi: Ministry of Health and Family Welfare Government of India. 2007. Available at: <https://naco.gov.in/sites/default/files/Standards%20for%20Blood%20Banks%20and%20Blood%20Transfusion%20Services.pdf>. Accessed on 10 October 2025.
- Saini N, Garg S, Kumar R, Jain R, Sachdeva P. Seroprevalence and trends of transfusion transmissible infection in blood donors: a study from tertiary care hospital in Punjab. *Int J Acad Med Pharm.* 2024;6(2):807-9.
- Kebede E, Getnet G, Enyew G, Gebretsadik D. Transfusion transmissible infections among voluntary blood donors at Dessie blood bank, Northeast Ethiopia: Cross-Sectional Study. *Infect Drug Resist.* 2020;13:4569-76.
- Rawat A, Diwaker P, Gogoi P, Singh B. Seroprevalence & changing trends of transfusion-transmitted infections amongst blood donors in a Regional Blood Transfusion Centre in north India. *Indian J Med Res.* 2017;11:642-5.
- Mengjiao L, Yushan X, Yan L, Dawei C, Xiaojun Z, Yongjun W, et al. Prevalence of transfusion-transmitted infections in hospitalized patients before transfusion and volunteer blood donors in Zhejiang Province, China. *Infect Dis Now.* 2024;54(2):104861.
- Paudel P, Sinha P, Jayakumar P. Seroprevalence of transfusion-transmitted infections among blood donors in a tertiary care hospital in and around Koodapakkam, Puducherry, India. *Hematol Transfusion Int J.* 2024;12(2):37-40.
- Cherukat J, Kulkarni R, Basavarajegowda A. Seroprevalence of Transfusion Transmitted Infections among Blood Donors in a Tertiary Care Hospital in Puducherry. *J Primary Care Specialties.* 2022;3:8-12.
- Shrivastava M, Mishra S, Navaid S. Time Trend and Prevalence Analysis of Transfusion Transmitted Infections among Blood Donors: A Retrospective Study from 2001 to 2016. *Indian J Comm Med.* 2023;48:274-80.
- Venkatraman J, Bhavani J. Study of transfusion transmitted infections among blood donors in a Tertiary care Hospital in Puducherry. *Indian J Pathol Oncol.* 2017;4(2):293-6.
- Patel SK, Mehta RP, Chilani AH, Mistry KJ, Pandya DP, Nayak RC. Seropositivity and Trends of Transfusion Transmitted Infections among Blood Donors: Five Years Cross-sectional Study on 20,392 Blood Donors in a tertiary care hospital of Ahmedabad, Gujarat. *India J Clin Diagn Res.* 2024;18(2):6-11.
- Mondal R, Koley S, Aggarwall, Kumar N. Seroprevalence of transfusion transmitted infections among the blood donors and the trends of TTI in last three years in a tertiary care teaching hospital in Durgapur. *J Evidence Based Med Healthcare.* 2019;6(5):252-6.
- Pattanashetti M, Karumbaiah K, Priyadarshini M. Seropositivity of Transfusion Transmitted Infections among Blood Donors in Hilly Region of Karnataka, India. *Nat J Lab Med.* 2021;10(2):5-8.
- Bagde S, Tiwari A, Behera T, Bombeshwar V, Indoria C. Seroprevalence and trends in transfusion transmitted infections in blood donors: a 6-year

- experience in a tertiary care hospital. *Tropic J Pathol Microbiol.* 2020;6(1):18-22.
15. Singh P, Daiya M, Tandon SK, Puja, Bairwa S, Kalhan S. Seroprevalence of Transfusion Transmitted Infections among Blood Donors in Delhi, India - A 3 Years Retrospective Study. *Ann Int Med Dent Res.* 2017;3(3):10-3.
  16. Chauhan S, Solanki P. A study of transfusion transmissible infections in blood donors in blood bank of north Gujarat. *Indian J Pathol Oncol.* 2021;8(1):55-8.
  17. Shah R, Patel D. Correlation of ABO-Rh blood group and transfusion transmitted infections (TTI) among blood donors. *IP Arc Cytol Histopathol Res.* 2022;7(4):229-32.
  18. Sharma D, Rai S, Bharat S, Iyenger S, Gupta S, Jain B. A 10 years comparative study to assess trends in seroprevalence of transfusion transmitted infections among blood donors at Gwalior, India. *Open J Blood Dis.* 2014;4:24-32.

**Cite this article as:** Sood S, Malhotra S, Taggar GK, Sood P. Sero-prevalence of transfusion transmissible infections among 59,434 blood donors over a period of 5 years in a tertiary care institute in Himachal Pradesh. *Int J Res Med Sci* 2026;14:164-8.