

## TRENDS IN SEROPREVALENCE OF TRANSFUSION TRANSMISSIBLE INFECTIONS AMONGST THE BLOOD DONORS IN TERTIARY CARE CENTRE

Neha Kathpal<sup>1</sup>, Surekha B. Hippargi<sup>2</sup>, Ankur Kumar<sup>3</sup>

<sup>1</sup>Postgraduate, Department of Pathology, Shri B.M. Patil Medical College Hospital and Research Centre, Vijayapur, Karnataka.

<sup>2</sup>Professor, Department of Pathology, Shri B.M. Patil Medical College Hospital and Research Centre, Vijayapur, Karnataka.

<sup>3</sup>Postgraduate, Department of Pathology, Shri B.M. Patil Medical College Hospital and Research Centre, Vijayapur, Karnataka.

### ABSTRACT

#### BACKGROUND

Blood transfusion carries the potential risk of transfusion transmissible infections (TTIs) making it the most dreaded complication of blood transfusion. The objective was to study the trends in seroprevalence of HIV, HBV, HCV, Syphilis and Malaria amongst the blood donors.

#### METHODS

Study was done over a period of 5 years. Blood donors' data was collected from the blood bank of our institution. Serum samples were tested for HIV-antibody, HCV-antibody and HBsAg using ELISA and Malarial parasite antigen and syphilitic anticardiolipin antibodies by rapid diagnostic tests (RDT).

#### RESULTS

During the study, a total of 20584 blood donors were screened, out of which 369 blood units were found to be seropositive accounting for a seroprevalence of 1.8%. Seroprevalence of HIV, HBV, HCV, Syphilis and Malaria were 0.20%, 1.34%, 0.22%, 0.06% and 0% respectively. Out of total screened donors, voluntary donors were 79.4% and remaining 20.6% were replacement donors. An overall decreasing trend was noted in seroprevalence of TTIs over the past five years ( $p < 0.05$ ). Individually, HIV and HCV which showed statistically significant decreasing trend ( $p < 0.05$ ) while HBV continued to show higher seroprevalence.

#### CONCLUSIONS

The prevalence of TTIs has decreased considerably after mandatory testing of blood Units for TTIs. Strict guidelines and their implementation for donor selection and their screening using sensitive tests is the need of the hour in order to reduce the incidence of TTIs.

#### KEYWORDS

Transfusion Transmissible Infection, HIV, HBV, HCV, Syphilis, Malaria, Seroprevalence.

**HOW TO CITE THIS ARTICLE:** Kathpal N, Hippargi SB, Kumar A. Trends in seroprevalence of transfusion transmissible infections amongst the blood donors in tertiary care centre. J. Evid. Based Med. Healthc. 2019; 6(23), 1632-1636. DOI: 10.18410/jebmh/2019/329

#### BACKGROUND

Blood is an essential element of the human body. It has no substitutes and without it life is not possible.<sup>1</sup> WHO theme for 2000 AD was "Safe blood starts with me, blood saves lives".<sup>1</sup> Blood and its component form a substantial part of patient management treatment protocols in the present scenario but at the same time has life threatening hazards also as it carries the risk of transfusion transmitted infections (TTIs).<sup>2</sup> The demand for safe blood and its products has only increased with increase in population, urbanization and life expectancy.<sup>3</sup>

Financial or Other, Competing Interest: None.

Submission 20-05-2019, Peer Review 28-05-2019,

Acceptance 06-06-2019, Published 10-06-2019.

Corresponding Author:

Dr. Neha Kathpal,

Postgraduate, Department of Pathology,

Shri B.M. Patil Medical College Hospital and Research Centre, Vijayapur, Karnataka.

E-mail: nehamedical26@gmail.com

DOI: 10.18410/jebmh/2019/329



TTIs can be caused by various microorganisms, the major globally prevalent TTIs are human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV), syphilis and malarial parasite. As per guidelines it is mandatory to screen blood donors for HIV, HBV, HCV, Syphilis and Malaria. Screening strategies include starting from the medical history, clinical examination and screening for the markers of infections which are hepatitis B surface antigen (HBsAg), malarial antigens such as histidine and antibodies to HIV and HCV, and Syphilis.<sup>4,5</sup>

The evaluation of the data of the prevalence of these TTIs amongst the blood donors permits an assessment of epidemiology, acquisition of the infection and consequently the safety of the collected donations.<sup>6</sup>

Blood and its components can only be deemed safe, when they are tested using sensitive screening tests to exclude these infectious agents. Although the screening strategies have drastically improved the safety quotient, transmission is still possible due to low sensitivity of test during window period, immune silent carriers and immunologically variant viruses.<sup>4</sup>

So, this study was under taken to find out the trends in seroprevalence of transfusion transmissible infections amongst the blood donors at our institution.

## METHODS

All the blood donors, who fulfil standard blood donor selection criteria from the period 1st July 2013- 30th June 2018 (5-year retrospective) at the blood bank of our institution were subjected to the present study. The study included 20, 584 blood donors. Retrospective blood donor's data was collected from the blood bank of our institution.

Method- These blood donors' samples were analysed for TTIs using ELISA 3rd generation (ELISA ERBA chemical kit) for antibodies to HIV and HCV and for HBsAg. For testing syphilis ALERE TRUeline Rapid TP Card was used. For malarial parasite antigen Rapid card (ALERE TRUeline) test was used.

## RESULTS

Total of 20584 apparently healthy adult donors were screened for TTIs (HIV, HBsAg, HCV, Syphilis and Malaria) during the study period of 5 years. Among these donors, 16345 (79.4%) were voluntary donors and rest 4239 (20.6%) were replacement donors. Demographic characteristics showed that out of total donors 19847 (96.4%) were males and 737 (3.6%) were females.

Out of total 20, 584 screened blood donors, 369 (1.8%) were seropositive for TTIs. 277 (1.35%) of these donors were positive for HBV, 45 (0.22%) were for HCV, 42 (0.20%) were for HIV, 12 (0.06%) were for syphilis and none of the donor was seropositive for malaria. Seven of these donors showed co- infection, out of which, four showed HCV-HBV, two HIV-HBV and one HIV-Syphilis co-infection. The overall seroprevalence of TTIs over the five years is shown in Figure 1.

Table 1 shows age wise distribution of TTIs. Most common age group to be seropositive in the present study was 26-35 years of age (55.05%) and least common age group was >46 years.

Gender wise distribution showed that out of 369 seropositive donors, only 12 female donors were seropositive but considering lower number of total female donors this finding was statistically insignificant. Among total seropositive donors, 284 were replacement and 85 were voluntary donors accounting for the seroprevalence of 6.7% and 0.52% respectively.

A decreasing trend was noted in seroprevalence of TTIs over the past five years from 2.23 in 2013- 2014 to 1.02 in 2017-2018 which was found to be statistically significant with a p value of <0.05. (Figure 2)

Trend in seroprevalence of individual TTIs over five-year period is shown in Figure 3. The high seroprevalence of HBV can be seen compare to the other TTIs. A decreasing trend was noted in the seroprevalence of HBV, HIV, HCV and Syphilis over the five years. However, the decreasing trend was statistically significant only in HIV and HCV with a p value of <0.05.

## DISCUSSION

India is the 2<sup>nd</sup> most populous nation in the world, having a current population of 1.3 billion with 2.1 million HIV, 50 million HBV and 15 million HCV positive cases. The prevalence of TTIs in Indian blood donors ranges from 2-7% in HBV, 0.22-0.32% in HIV, 0.5%-1.5% in HCV, 0.14-1% in syphilis and 0.01-0.09% in Malaria. This seroprevalence data varies widely according to high risk- low risk areas, socioeconomic conditions and types of donor.<sup>7-10</sup>

In the present study out of the total 20584 donors, majority were males (96.4%). The overall turnout of female donors was low which might be due to the fact that females in India are generally anaemic and underweight hence, unable to meet the donor selection criteria. This gender difference in the present study was consistent with other studies by Giri PA et al<sup>10</sup> and D.C Sharma et al.<sup>11</sup>

Voluntary, unpaid, healthy regular donors are the safest and they form the life-line of a blood transfusion service, as they ensure safe and adequate supply of blood and blood products. In a country like India, where comprehensive laboratory tests are not possible, voluntary blood donation should be switch over to 100%. In the present study, majority of the donors were voluntary (79.4%). This was in concordance with study done by Deshpande et al (79.3%).<sup>12</sup> Increase in voluntary donation in the present study may be due to better implementations of the national programs launched by NACO, Government of India and department of Health as well as awareness about voluntary donation in general population.<sup>13</sup>

The five year seroprevalence of TTIs was found to be 1.8% which was in concordance with study done by Yadav UC et al (1.75%)<sup>14</sup> and Dobariya GH et al (1.34%)<sup>15</sup> while higher seroprevalence was seen in study by Kulkarni et al (4.5%).<sup>16</sup> This could be attributed to a greater number of replacement donors in the latter study.

In the present study, among the replacement donors, HBV was the most sero-prevalent TTI at 4.93% and Malaria was least prevalent (0%). All TTIs showed higher seroprevalence in replacement donors compared to voluntary donors, similar to other studies shown in Table 2.

Though the prevalence of HIV is low (0.3%) in India, as per 2016 estimates, India still has the third largest burden of people living with HIV. By the end of 2016 there were 2.1 million people living with HIV. The prevalence of HIV in the present study was found to be 0.20% which is similar to studies done by Jasani et al (0.25%),<sup>17</sup> Mythreyee et al (0.19%),<sup>18</sup> and NACO Karnataka data for Vijayapura district (0.24%).<sup>19</sup> The trend in HIV seroprevalence in the present study, has significantly declined from 0.33% in 2013-2014 to 0.02% in 2017-2018, which is similar to study by D.C. Sharma et al<sup>11</sup> and Makroo et al.<sup>4</sup> The reasons for this are not clear but may be due to improved pre-donation counselling of voluntary blood donors, deferral of donors with high risk behaviour, successful post donation counselling of sero-reactive donors and increase in number of voluntary blood donors in comparison of replacement donors.

Worldwide, Hepatitis B is a common life-threatening disease caused by HBV. India occupies the intermediate endemicity zone (2-7%) having prevalence of an average of 4% and with a disease burden of about 50 million.<sup>7</sup> In the present study, the major infection among the TTIs was Hepatitis B accounting for the seroprevalence of 1.34% which was in concordance with NACO Karnataka data for Vijayapura district (1.18%).<sup>19</sup>

High prevalence was reported in studies done by Arora et al<sup>20</sup> and Kulkarni et al<sup>16</sup> with seroprevalence of 1.7%, 3.2% respectively. Whereas a low prevalence of HBV of 0.71% and 0.98% were reported in studies done by Leena MS et al<sup>21</sup> and Dobariya GH et al.<sup>15</sup>

The cause of high seroprevalence in general population is attributed to many factors like high titre of infectious virus, immunologic variants, many immune silent carriers and false negativity during window period. Finally, factors like non-adherent, costly, long term treatment modality and the lack of widespread vaccination programme also contribute to it.

Routine screening of HBV in blood banks is done by detection of hepatitis B surface antigen (HBsAg) in blood which can't differentiate between active infection and chronic carrier state. Also, HBsAg cannot be detected during the window period whereas more sensitive markers like anti-HBc and HBV DNA can be positive during the window period and hence it can be used to increase the sensitivity of the screening tests.

According to WHO, 71 million individuals are living with chronic HCV infection globally accounting for 1% of population.<sup>6,22</sup> India has an estimated prevalence of 0.5 to 1.5% accounting for 15 million HCV positive people.<sup>11, 14</sup> The prevalence of HCV in the present study was found to be 0.22% which is similar to studies done by Deshpande et al (0.22%),<sup>12</sup> Jasani et al (0.16%)<sup>17</sup> and NACO Karnataka data (0.22%).<sup>19</sup> A much higher level of seroprevalence has been reported in studies done by Sundaramurthy et al (0.56%),<sup>2</sup> Arora et al (1.0%)<sup>20</sup> and Sastry JM et al (0.41%).<sup>23</sup> The trend in HCV seroprevalence in the present study, has significantly declined from 0.33% in 2013-2014 to 0.04% in 2017-2018. Similar finding were noted by D.C. Sharma et al<sup>11</sup> which also showed a decreasing trend in HCV infection. This can be attributed to increased awareness among general population and improved donor screening.

The seroprevalence rates of syphilis varies extremely in different subpopulation of India. Various studies have shown prevalence rate ranging from 5.4% to 8.2% amongst STD clinics, 0.84% to 0.98% in antenatal groups and as high as 21.9% in long distance truck drivers.<sup>24</sup> The prevalence rate among Indian blood donors ranges from 0.85% to 3%.<sup>10</sup> Thus, it serves chiefly as a surrogate test to recognize donors with potentially high-risk behaviour. The prevalence of Syphilis in the present study was 0.06%, which is in concordance with studies done by Giri P A et al (0.07%)<sup>10</sup> and NACO Karnataka data (0.07%),<sup>19</sup> while studies done by Leena MS et al (0.1%)<sup>21</sup> and Jasani et al (0.9%)<sup>17</sup> showed much higher rate of seroprevalence.

Malaria is one of the most common parasitic infection that is transmitted by blood. In 2016, India was one out of

the five countries that contributed 85% of all the estimated vivax Malaria cases worldwide.<sup>25</sup> The rate of transfusion-transmitted malaria is estimated to be 0.25 cases per 1 million blood units. In the present study none of the blood donors were found to be positive for the malarial parasite antigen, accounting for 0% seroprevalence. This finding was similar to various other studies done by Sastry JM et al (0%),<sup>23</sup> Pallavi P et al (0%)<sup>26</sup> and NACO Karnataka data (0%).<sup>19</sup> This lower prevalence rate of malaria in blood donors might be due to deferral of blood donors in their preliminary health check-up during blood donation process. Table 3 shows the prevalence rate of TTIs compared to studies from different parts of India.

In the present study out of total screened blood donors seven donors were having co-infection, accounting for 0.03% of seroprevalence which is in concordance with study done by Sastry JM et al (0.04%)<sup>23</sup> and Kaur et al (0.05%).<sup>27</sup> The present study has limitation of use of less sensitive ELISA 3<sup>rd</sup> generation test for TTIs screening. The latest more sensitive methods such as NAT, PCR as well as incorporation of 4<sup>th</sup> generation ELISA and routine anti-HBc screening can uncover the latent infections in the window period and can actually provide the true estimate of seroprevalence.<sup>28</sup>

## CONCLUSIONS

In the present study, the overall prevalence of TTIs and their trend in the last 5-years has decreased considerably. This is a reassuring sign, indicating growing awareness among general population about blood donation. But, seroprevalence of TTIs was found to be significantly more in replacement donors, hence, a healthy voluntary donor base is the need of the hour which can be achieved by increasing public awareness and knowledge, thus influencing donor behaviour and attitude towards voluntary blood donation. Stringent and comprehensive donor screening, sensitive and standard laboratory screening tests should be used to decrease the risk of TTIs. NAT is recommended to reduce the risk of TTI during window period to accomplish near zero risk. These steps will ensure safe blood for patient management and in turn for the welfare of the community.

Age (Years)	HIV	HBV	HCV	Syphilis	Total
18-25	10	83	11	2	106
26-35	27	145	25	10	207
36-45	5	41	9	0	55
46 and above	0	8	0	0	8

**Table 1. Age Wise Distribution of Seropositive Donors**

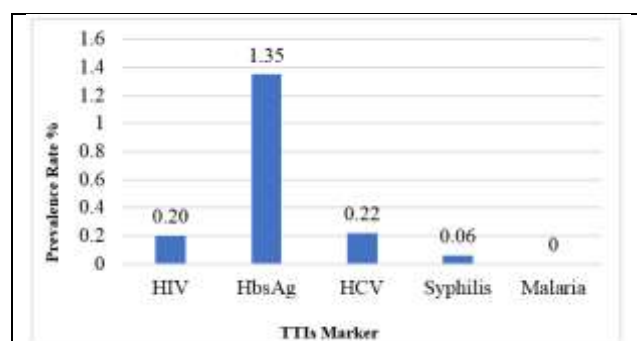
Studies	HIV V R	HBV V R	HCV V R	Syphilis V R	Malaria V R
Gupta et al <sup>28</sup>	0.51% 1.53%	1.22% 2.59%	0.34% 0.51%	0.27% 0.85%	- -
Kaur et al <sup>27</sup>	0.15% 0.44%	0.65% 1.07%	0.3% 0.5%	0.19% 0.48%	- -
Present Study	0.06% 0.75%	0.42% 4.93%	0.04% 0.89%	0% 0.28%	0% 0%

**Table 2. Comparison of Sero Prevalence of TTIs in Voluntary & Replacement Donors with Other Studies**

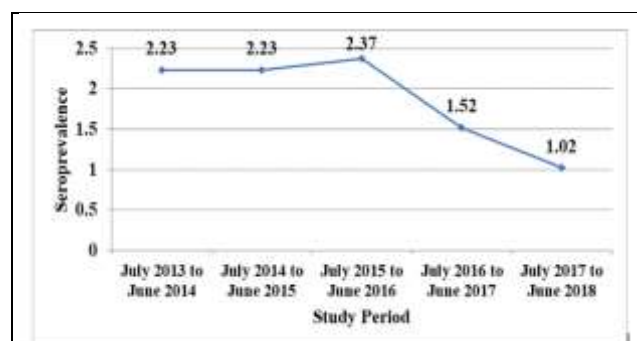
V- Voluntary R- Replacement

Studies	Study Period	Total Donors	HIV	HBV	HCV	Syphilis	Malaria
Jasani et al <sup>17</sup>	2006 - 2011	10386	0.25%	1.35%	0.16%	0.9%	-
Arora et al <sup>20</sup>	2002 - 2006	5849	0.3%	1.7%	1.0%	0.9%	-
Leena MS et al <sup>21</sup>	2004-2010	6939	0.27%	0.71%	0.14%	0.1%	0.129%
Sastry JM et al <sup>23</sup>	2008-2013	13078	0.28%	1.23%	0.41%	0.008%	0%
NACO Karnataka <sup>19</sup>	2015	776915	0.13%	0.94%	0.22%	0.07%	0%
NACO Vijayapura <sup>19</sup>	2015	10528	0.24%	1.18%	0.12%	0.05%	0%
Dobariya GH et al <sup>15</sup>	2011-2015	40971	0.081%	0.98%	0.098%	0.16%	0.024%
Present Study	2013-2018	20584	0.20%	1.34%	0.22%	0.06%	0%

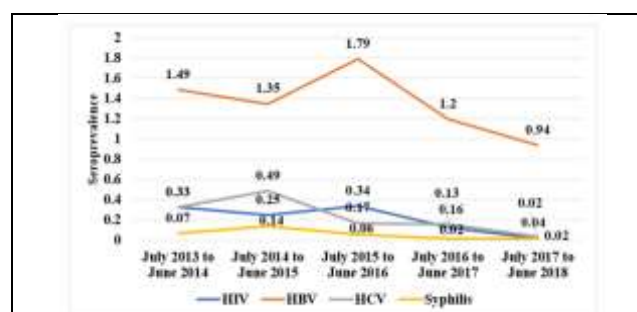
**Table 3. Prevalence Rate of TTIs in Different Studies of India**



**Figure 1. The Overall Seroprevalence of TTIs Over Five Years**



**Figure 2. Shows the Trend of All TTIs in 5-Year Period**



**Figure 3. Shows the Trend of Individual TTIs in 5-Year Period**

## REFERENCES

- [1] Bharatwaj RS, Vijaya K, Rajaram P. A descriptive study of knowledge, attitude and practice with regard to voluntary blood donation among medical undergraduate students in Pondicherry, India. J Clin Diagnostic Res 2012;6(4):602-604.
- [2] Sundaramoorthy R, Arunagiri R, Ganesan V, et al. Seroprevalence of transfusion transmissible infections among blood donors by chemiluminescent assay in a tertiary care centre. J Infect Dev Ctries 2018;12(1):31-36.
- [3] Manikandan S, Srikumar R, Ruvanthika PN. A study on knowledge, attitude and practice on blood donation among health professional students in Chennai, Tamil Nadu, South India. Int J Sci Res Publ 2013;3(3):1-4.
- [4] Makroo RN, Hegde V, Chowdhry M, et al. Seroprevalence of infectious markers & their trends in blood donors in a hospital based blood bank in north India. Indian J Med Res 2015;142(3):317-322.
- [5] World Health Organization. Blood donor selection guidelines on assessing donor suitability for blood donation. World Health Organization 2012.
- [6] Okoroiwu HU, Okafor IM, Asemota EA, et al. Seroprevalence of transfusion-transmissible infections (HBV, HCV, syphilis and HIV) among prospective blood donors in a tertiary health care facility in Calabar, Nigeria; an eleven years evaluation. BMC Public Health 2018;18(1):645.
- [7] Ray G. Current scenario of hepatitis B and its treatment in India. J Clin Transl Hepatol 2017;5(3):277-296.
- [8] NACO Annual Report 2016-17. NACO 2017.
- [9] Assessment of Blood Banks of India. New Delhi: NACO, NBTC, Ministry of Health & Family Welfare 2016.
- [10] Giri PA, Phalke DB, Deshpande JD, et al. Seroprevalence of transfusion transmissible infections among voluntary blood donors at a tertiary care teaching hospital in rural area of India. J Family Med Prim Care 2012;1(1):48-51.
- [11] Sharma DC, Rai S, Bharat S, et al. 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(2):24-32.
- [12] Deshpande RH, Bhosale S, Gadgil PA, et al. Blood donors status of HIV, HBV, HCV and syphilis in this region of Marathwada, India. JKIMSU 2012;1(2):111-116.
- [13] Voluntary blood donation programme-An operational guideline. New Delhi: NACO, Ministry of health & Family Welfare 2007.
- [14] Yadav UC, Sharma DC, Arya A, et al. Prevalence of transfusion transmitted infections among blood donors in Madhya Pradesh, a Central State of India. Int Blood Res Rev 2018;8(1):1-10.
- [15] Dobariya GH, Raja KA, Unagar CA, et al. Prevalence and trends of transfusion transmitted infections

- among blood donors of blood bank attached to government hospital of South Gujarat, India. 2016;4(9):4123-4127.
- [16] Kulkarni N. Analysis of the seroprevalence of HIV, HBsAg, HCV and syphilitic infections detected in the pretransfusion blood: a short report. *Int J Blood Transfus Immunohematol* 2012;2:1-3.
- [17] Jasani J, Patel V, Bhuva K, et al. Seroprevalence of transfusion transmissible infections among blood donors in a tertiary care hospital. *Int J Biol Med Res* 2012;3(1):1423-1425.
- [18] Mythreyee M, Jayachandran C, Amudhan M, et al. Low prevalence of transfusion-transmissible infections among voluntary blood donors in South India. *J Infect Dev Ctries* 2011;5(5):410-412.
- [19] A Report on the Assessment of Blood Banks in India (Internet). NACO and NBTC, Ministry of Health and Family Welfare, Government of India 2016. [http://naco.gov.in/sites/default/files/Assessment of Blood Banks in India - 2016.pdf](http://naco.gov.in/sites/default/files/Assessment%20of%20Blood%20Banks%20in%20India%20-%202016.pdf)
- [20] Arora D, Arora B, Khetarpal A, et al. Seroprevalence of HIV, HBV, HCV and syphilis in blood donors in Southern Haryana. *Indian J Pathol Microbiol* 2010;53(2):308-309.
- [21] Leena MS, Mohd S. Trend and prevalence of transfusion transmitted infections among blood donors in rural teaching institute, south India. *J Pathol Nepal* 2012;2(3):203-206.
- [22] WHO. Hepatitis C: fact sheet (Internet). 2018. Available from: <http://www.who.int/news-room/fact-sheets/detail/hepatitis-c>
- [23] Sastry JM, Agawane SU, Harke VA. Retrospective study of the five-Year Prevalence and Trends of transfusion transmitted infections (TTIs) among blood donors at a charitable hospital blood bank in Pune, India. *Int J Healthc Biomed Res* 2014;2(3):193-200.
- [24] Punia P, Singh D, Bala K, et al. Recent trends of seroprevalence of syphilis in patients attending a tertiary care centre in North India. *Int J Curr Microbiol App Sci* 2017;6(11):882-886.
- [25] WHO. Key points: World malaria report 2017. WHO 2017. <http://www.who.int/malaria/media/world-malaria-report-2017/en/>
- [26] Pallavi P, Ganesh CK, Jayashree K, et al. Seroprevalence and trends in transfusion transmitted infections among blood donors in a University Hospital blood bank: a 5 year study. *Indian J Hematol Blood Transfus* 2011;27(1):1-6.
- [27] Kaur G, Basu S, Kaur R, et al. Patterns of infections among blood donors in a tertiary care centre: a retrospective study. *Natl Med J India* 2010;23(3):147-149.
- [28] Gupta PK, Kumar H, Basannar DR, et al. Transfusion transmitted infections in armed forces: prevalence and trends. *Med J Armed Forces India* 2006;62(4):348-350.