

Prevalence and Trends of Blood Transfusion Transmitted Infections: Comparative Study between the Blood Bank of a Private and Government Medical College in South Karnataka

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DOI: [10.36348/SJPM.2019.v04i10.002](https://doi.org/10.36348/SJPM.2019.v04i10.002)

| Received: 04.10.2019 | Accepted: 12.10.2019 | Published: 29.10.2019

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Abstract

Background: Transfusion of blood and blood components can save millions of lives worldwide each year and its safety is the subject of real concern. Transfusion associated transmission of some of the life threatening infections has demanded screening of blood for Human immunodeficiency virus (HIV), Hepatitis B virus (HBV), Hepatitis C virus (HCV), Syphilis and Malaria. **Aims & Objectives:** To assess the prevalence of transfusion transmitted infections (TTI) among the donors. To analyse the trends of TTI in private and government settings. **Materials and method:** This is a cross-sectional descriptive study. Blood donor data over a period of 9 years from 2010 to 2018 from Blood bank of Adichunchanagiri Institute of Medical Sciences, Mandya and Blood bank of Shimoga institute of medical sciences, Shimoga was included in the study. All the donors including voluntary and replacement donors during the study period were included in the study. **Results:** Total number of voluntary and replacement donors in a Private medical college blood bank were 11225 and 4853, whereas that in a Government medical college blood bank were 50931 and 9736. Prevalence of various TTI in a private and government medical college was as follows – HIV (0.15%, 0.18%), HBV (0.67%, 1.07%), HCV (0.09%, 0.09%), Syphilis (0.02%, 0.004%) and Malaria (00%, 00%). **Conclusion:** Donor criteria should be followed strictly and effective screening facilities should be used to reduce the incidence of blood transfusion transmitted infections.

Keywords: Transfusion transmitted infection, Voluntary donors, replacement donors, HIV, HBV, HCV, Malaria, Syphilis.

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INTRODUCTION

Transfusion of blood and blood components is a specialized modality of patient management, saving millions of lives worldwide each year and reducing morbidity [1].

It is well known that blood transfusion is associated with a large number of complications, some are only trivial and others are potentially life threatening, demanding for meticulous pre-transfusion testing and screening particularly for transfusion transmitted infections (TTI). These TTI are a threat to blood safety [2].

In 1986, the first case of HIV infection was detected in India among female sex workers in Chennai. The first case of HIV infection resulting from blood transfusion was reported in the United states in late 1982. Because of the danger of transfusion associated

AIDS, the Drugs and Cosmetics Act has made Human immunodeficiency virus (HIV) screening test mandatory [3, 4].

Blood transfusion services thus should ensure safety, adequacy, accessibility and efficiency of blood supply at all levels [5]. Transfusion departments are responsible to screen, monitor and control infections transmitted by blood transfusion. Blood transfusion departments are important in screening donors for TTI and it also gives clue about the prevalence of these infections in healthy populations [2].

MATERIALS AND METHOD

It is a cross sectional descriptive study with the use of secondary (retrospective) data collected from the donor records pertaining to the study period at the Blood bank, Adichunchanagiri Institute of Medical Sciences, Mandya and Blood bank, Shimoga institute of

Medical sciences, Shimoga; after seeking permission from the Departmental head. All samples were screened for Human Immunodeficiency Virus (HIV), Hepatitis B virus (HBV), Hepatitis C virus (HCV), Syphilis and Malaria. In Private Medical college blood bank serological assays for HIV-1&2 (fourth generation), HBV and HCV were done by using Enzyme linked immunosorbant assay (ELISA) with test kits from J. Mitra Diagnostics; Rapid plasma reagin (RPR) test was done for Syphilis using test kit from Beacon Diagnostics private limited; stained thick and thin peripheral blood smears were examined for detection of Malaria parasite. In Government Medical college blood bank serological assays for HIV-1& 2, HBV and HCV were done by using ELISA third generation with test kits from Meril Diagnostics private limited; RPR test was done for Syphilis using test kit from Tulip

Diagnostics private limited; stained thick and thin peripheral blood smears were examined for detection of Malaria parasite. The prevalence rate of individual infection was recorded and change in the trend was studied. Finally difference in the prevalence and trends of infection between the two blood banks were analysed.

RESULTS

Data collected from 2010 to 2018 found gradual increase in total number of donor both in Private and Government medical college. In Private medical college blood bank total number of donors were 16,078 and in Government medical college blood bank it was 60,667 (Table 1, 2).

Table-1: Total Blood Collection in Private Medical College

Year	Total donors	Voluntary donors	Replacement donors
2010	1533	767	766
2011	1375	493	882
2012	1618	1085	533
2013	1781	1015	766
2014	1683	946	737
2015	1950	1156	794
2016	1783	1642	141
2017	2810	2576	234
2018	1545	1545	0
Total	16078	11225(69.8%)	4853(30.2%)

Table-2: Total Blood Collection in A Government Medical College

Year	Total donors	Voluntary donors	Replacement donors
2010	5249	2111	3138
2011	5308	2514	2794
2012	6569	5293	1276
2013	5882	5235	647
2014	6757	5982	775
2015	7183	6627	556
2016	7433	7314	119
2017	8211	7875	336
2018	8075	7980	95
Total	60667	50931(83.9%)	9736(16.1%)

In Private as well as Government Medical college blood bank, over a period of nine years the number of voluntary donors have increased whereas replacement donors have decreased in number. Prevalence of TTI in private medical college blood bank showed decreasing trend in case of Syphilis infection. In case of HIV infection there was a gradual decline in seroprevalence till 2013, which increased

slightly in 2014 and again dropped down in 2018. HCV infection showed an increase in the seroprevalence when comparing the starting and closing year of the study period, but the trend shows varying results in each year. HBV infection went on decreasing accompanied by two peaks one in 2012 and other in 2018. Malaria was not detected in the donors over a period of 9yrs (Table-3).

Table-3: Prevalence of TTI in Blood Donors of Private Medical College

Year	Total donors	HIV	HBV	HCV	Syphilis	Malaria
2010	1533	04(0.26%)	17(1.1%)	00(0%)	00(0%)	00(0%)
2011	1375	04(0.29%)	09(0.65%)	02(0.14%)	02(0.14%)	00(0%)
2012	1618	02(0.12%)	13(0.8%)	00(0%)	00(0%)	00(0%)
2013	1781	02(0.11%)	15(0.84%)	03(0.17%)	01(0.05%)	00(0%)
2014	1683	05(0.29%)	12(0.71%)	00(0%)	00(0%)	00(0%)
2015	1950	00(0%)	13(0.66%)	00(0%)	00(0%)	00(0%)
2016	1783	03(0.17%)	11(0.61%)	06(0.33%)	00(0%)	00(0%)
2017	2810	03(0.11%)	12(0.11%)	02(0.07%)	00(0%)	00(0%)
2018	1545	01(0.06%)	06(0.39%)	02(0.13%)	00(0%)	00(0%)
Total	16078	24(0.15%)	108(0.67%)	15(0.09%)	3(0.02%)	00(0%)

HIV – Human Immunodeficiency Virus, HBV – Hepatitis B virus, HCV – Hepatitis C virus.

In a government medical college, total number of donors went on increasing till 2012, with decreased blood donation in 2013 followed by subsequent increase and maximum number was seen in 2017. Seroprevalence of TTI shows decreasing trend for Syphilis with two donors in 2010 and one donor in 2012 being tested positive for Syphilis. Malaria was not

detected in the study period. Prevalence of HBV infection started reducing from 2010 to 2012, thereafter there has been a rise and dip, which did reduce in the year 2018. Prevalence of HIV shows a gradual decrease, with a peak in 2015. Decreasing trend is also seen with HCV infection with 2 peaks in 2011 and 2017 (Table-4).

Table-4: Prevalence of TTI in Blood Donors of Government Medical College

Year	Total donors	HIV	HBV	HCV	Syphilis	Malaria
2010	5249	25(0.47%)	101(1.92%)	06(0.11%)	02(0.03%)	00(0%)
2011	5308	19(0.35%)	72(1.35%)	16(0.3%)	00(0%)	00(0%)
2012	6569	15(0.22%)	67(1.01%)	05(0.07%)	01(0.01%)	00(0%)
2013	5882	04(0.06%)	76(1.29%)	03(0.05%)	00(0%)	00(0%)
2014	6757	08(0.11%)	61(0.9%)	03(0.04%)	00(0%)	00(0%)
2015	7183	15(0.2%)	75(1.04%)	05(0.06%)	00(0%)	00(0%)
2016	7433	13(0.17%)	65(0.87%)	03(0.04%)	00(0%)	00(0%)
2017	8211	07(0.08%)	71(0.86%)	11(0.13%)	00(0%)	00(0%)
2018	8075	06(0.07%)	62(0.76%)	4(0.04%)	00(0%)	00(0%)
Total	60667	112(0.18%)	650(1.07%)	56(0.09%)	3(0.004%)	00%

HIV – Human Immunodeficiency Virus, HBV – Hepatitis B virus, HCV – Hepatitis C virus.

Table-5: Overall Prevalence of TTI

Year	Private Medical College	Government Medical College
2010	1.36%	2.55%
2011	1.23%	2.01%
2012	0.92%	1.33%
2013	1.17%	1.41%
2014	1.01%	1.06%
2015	0.66%	1.32%
2016	1.12%	1.08%
2017	0.60%	1.08%
2018	0.58%	0.89%

Trends in Prevalence of HIV

In a Government medical college blood bank the prevalence of HIV shows a gradual decrease, with a peak in 2015. In a Private medical college blood bank

the prevalence of HIV infection went on declining till 2013, which increased slightly in 2014 and again dropped down in 2018; whereas in 2015 none of the donors were tested positive for HIV (Fig-1).

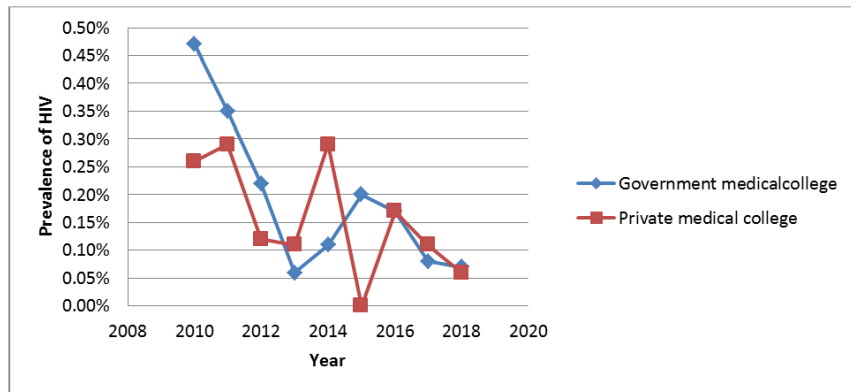


Fig-1: Trends in prevalence of HIV

Trends in Prevalence of Hepatitis B

HBV infection prevalence went on decreasing in a Private medical college blood bank, accompanied by two peaks one in 2012 and other in 2018. Prevalence

of HBV infection in a Government medical college blood bank, started reducing from 2010 to 2012, thereafter there has been a rise and dip, finally reducing in 2018 (Fig-2).

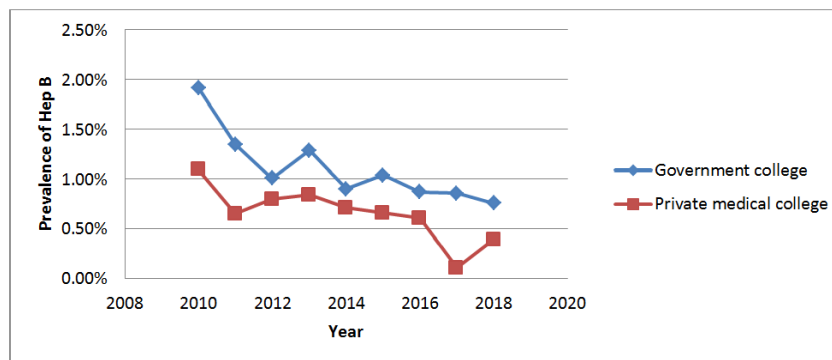


Fig-2: Trends in prevalence of Hepatitis B

Trends in Prevalence of Hepatitis C

In a Private medical college blood bank, HCV infection showed varying seroprevalence, with no donors being tested positive for HCV in the year 2010,

2012, 2014 and 2015. Government medical college blood bank shows a decreasing trend with HCV infection accompanied by two peaks in 2011 and 2017 (Fig-3).

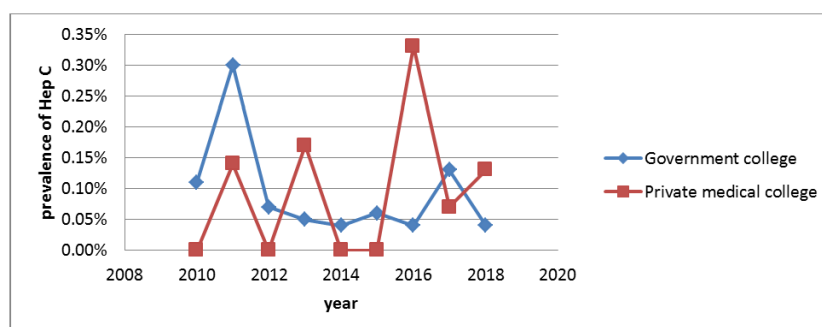


Fig-3: Trends in prevalence of Hepatitis C

Trends in prevalence of Syphilis

In a Private medical college, two donors in 2011 and one donor in 2013 tested positive for Syphilis. In a Government medical college, two donor in 2010

and one donor in 2012 were tested positive. In both the medical colleges respectively, rest of the study period showed none of the donors to be positive (Fig-4).

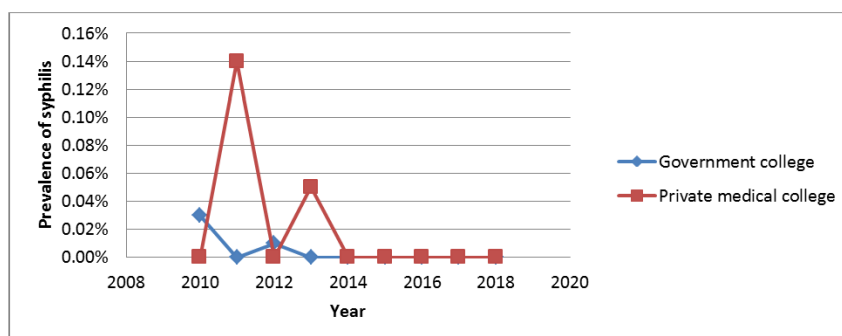


Fig-4: Trends in prevalence of Syphilis

Trends in overall prevalence of TTI

There has been significant decline in overall prevalence of TTI in Government medical college

blood bank, whereas in a private medical college blood bank the reducing trend has been gradual (Fig-5).

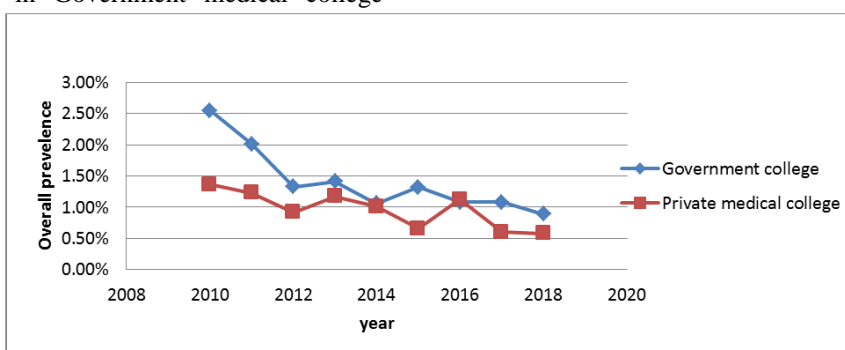


Fig-5: Trends in prevalence of TTI

DISCUSSION

The use of unscreened blood poses threat to the patient by exposing them to many transfusion transmitted infections including Hepatitis B Virus (HBV), Hepatitis C virus (HCV), Human Immunodeficiency Virus (HIV), syphilis, and some others [6]. There is about 1% of chance of all transfusion associated problems including TTI, with every unit of blood. Though the risk of TTI has reduced in our country but the problem still lingers [7, 8]. Hence, meticulous pre-transfusion testing and screening should be performed.

In the present study, none of the donors were tested positive for Malaria in both the blood bank. Bharti K S *et al.*, [10] in the study period of 13yrs also showed that Malaria was not detected in any of the donors. Both in Private Medical college blood bank and Government Medical college blood bank majority donors were detected to have Hepatitis B infection with a prevalence of 0.67% and 1.07% respectively. Teklemariam Z *et al.*, [6] and Siraj N *et al.*, [9], observed in their study that Hepatitis B infection was common among the donors with a prevalence of 4.4% and 2% respectively. Decreasing trend for Hepatitis B infection was seen in both the blood bank. Similar finding was also observed by Chandra T *et al.*, [11] with a prevalence of 2.94% for Hepatitis B infection in 2008 and 1.33% in 2012. In contrast to our observation, study done by Sharma D C *et al.*, [12] showed an increasing

trend of prevalence in Hepatitis B infection with 0.87% prevalence in 2004 and 1.96% in 2008. Decreasing trend in prevalence of Hepatitis B infection might be due to improved awareness in general population, better screening procedures and an active HBV vaccination programme; whereas increasing trend may be due to use of common syringes in the medical treatment in some rural areas.

Prevalence of HIV infection in the present study, in Private Medical college was 0.15% and in Government Medical college it was 0.18%; also a decreasing trend of prevalence was noted for HIV. Rawat A *et al.*, [13] in their study showed a prevalence of 0.32% for HIV along with its decreasing trend of infection. Lower prevalence of HIV was seen in a study done by Agarwal V K *et al.*, [14] (0.1%) and Gupta N *et al.*, [15] (0.08%). High prevalence of 1.32% for HIV was shown by Fasola F A *et al.*, [16] in their study which was conducted in Nigeria. Declining trend has been due to awareness among the people regarding modes of spread and consequence of the disease; as well as preventive measures are being effectively used.

In the present study, overall prevalence of HCV in Private Medical college was 0.09%, ranging from 0% in 2010 to 0.13% in 2018; whereas in Government Medical college the prevalence was 0.09% ranging from 0.11% in 2010 to 0.04% in 2018. Decreasing trend of HCV infection as shown by

Government Medical college correlated well with study done by Bharti K S *et al*¹⁰ and Sharma D C *et al.*, [12]. Increasing trend of HCV infection was observed in a study done by Siraj N *et al.*, [9] ranging from 0.3% in 2010 to 2.1% in 2016. Mullis C E *et al.*, [17] in their study also observed a rising trend of HCV infection among the African population, which they attributed to the high false positive misclassification. Difference in the seroprevalence of HCV observed in various studies occurred as the testing methods and the generation of ELISA test kits used were different.

Seroprevalence for Syphilis was low in present study, with 0.02% in Private Medical college and 0.004% in Government Medical college and both colleges showed decreasing trend of infection. Decreasing trend of Syphilis infection was also showed by Chandra T *et al.*, [11] with a prevalence of 0.01% in replacement donors and 0.008% in voluntary donors. Kumar R *et al.*, [18] in their study showed high prevalence rate of 1.74% for Syphilis.

In the present study, the overall prevalence showed a decreasing trend; in Private Medical college (1.36% to 0.58%) and in Government Medical college (2.55% to 0.89%). Decreasing trend was also observed by Col. J Philip *et al.*, [19] (2.4% to 1.2%); whereas increasing trend was seen by Sharma D C *et al.*, [12] (2.25% to 4.09%). Decreasing seroprevalence rate is the result of effective safety measures taken both in the general population as well as in the field of transfusion medicine. However, important initiatives are yet to be taken and should be standardized worldwide for taking blood safety to a higher level. These should include increase in the activity of voluntary counselling and testing centres, improving counselling programmes for those engaged in high-risk activities, increasing regular voluntary and non-remunerated donations as well as using effective test kits. In the present study, though the number of donors in Private and Government Medical college showed a significant difference but the prevalence of HBV, HIV, HCV and Syphilis showed a decreasing trend. In both the colleges number of voluntary donors have increased and replacement donors have reduced over the 9 yrs study period. Studies have shown that high seroprevalence is seen in replacement donors as compared to the voluntary donors [9, 21-23]. In Private Medical college there was variation in HCV prevalence through these 9 years. Type of population catered, awareness programmes carried out, number of voluntary blood donations conducted and different test kits used are the reason for the difference in seroprevalence seen in the Private and Government Medical college.

CONCLUSION

Our study showed that most of the donors were voluntary donors both in Private and Government Medical college. Decreasing trend of seroprevalence was seen, which does suggests improved awareness

among the donor population. In order to ensure safe blood transfusion practices, a nationally coordinated blood transfusion service should be established and make its efficiency reach a higher level. All blood should be tested for TTI's and to reduce its incidence, strict donor selection criteria should be implemented and sensitive screening tests should be used.

Funding: No funding sources.

Conflict of interest: None declared.

Ethical approval: Institutional ethical clearance has been obtained.

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