

Original Research Article

HIV, HBsAg and HCV prevalences among voluntary blood donors in Mumbai: trends over a decade

Shilpa Laxmikant Narayankar, Vikas Chandrahas Maindad*

Department of Pathology, Grant Government Medical College Mumbai, Maharashtra, India

Received: 05 April 2019

Accepted: 04 May 2019

***Correspondence:**

Dr. Vikas C. Maindad,

E-mail: vikasmaindad@gmail.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: With over 93 million donations made every year worldwide, blood transfusion continues to save millions of lives each year and improve the life expectancy and quality of life of patients suffering from life threatening conditions. At the same time, blood transfusion is an important mode of transmission of infection to the recipient. The present study was conducted to estimate the prevalence of HIV, HBV and HCV infections in voluntary blood donors at a tertiary care teaching hospital in Mumbai over a decade.

Methods: All voluntary donors reporting to the blood bank were screened for HIV, HBsAg and HCV by using the appropriate enzyme linked immunosorbent assay. The study was designed for duration of ten years between January 2008 to December 2017. Medical reports of the donors were accessed from the blood bank records and analyzed.

Results: A total of 8928 voluntary blood donors were screened. Amongst the blood donors, seropositivity of HBV (6% to 1.52 %) was highest followed by HIV (2.5% to 0.15%) then HCV (1.85% to 0.37%).

Conclusions: Decreasing trends with low prevalence observed in the study is an encouraging sign supporting the growing awareness of these life-threatening diseases.

Keywords: Blood donors, HBsAg, HCV, HIV, Prevalence

INTRODUCTION

India has the third largest HIV epidemic in the world. In 2017, HIV prevalence among adults (aged 15-49) was an estimated 0.2%. This figure is small compared to most other middle-income countries but because of India's huge population (1.3 billion people) this equates to 2.1 million people living with HIV. Overall, India's HIV epidemic is slowing down.¹ Between 2010 and 2017 new infections declined by 27% and AIDS-related deaths more than halved, falling by 56%. However, in 2017, new infections increased to 88,000 from 80,000 and AIDS-related deaths increased to 69,000 from 62,000.¹ India is the second largest global pool of chronic HBV infection. Based on the prevalence of hepatitis B carrier state in the general population, countries are classified as

having high (8% or more), intermediate(27%),or low (less than 2%) HBV endemicity.² India is at the intermediate endemic level of hepatitis B, with hepatitis B surface antigen (HBsAg) prevalence between 2% and 10% among the populations studied.³ Currently India harbours an estimated 10 -15 million chronic carriers of HCV, which is a major cause of liver related mortality and morbidity of the country.⁴ The prevalence of Hepatitis C Virus (HCV) infection in the general population is estimated to be around 0.5-1.5%.⁴

According to World Health Organization it is mandatory to screen pre-transfusion blood test for TTIS namely HIV, hepatitis B, hepatitis C viruses, syphilis and malaria. All these infectious disease screening must be negative in order to release the blood unit for

transfusion.⁵ Blood transfusion reduces morbidity in many clinical diseases and conditions but there is a potential risk of TTIs associated with it. This makes vigilant screening of blood a mandatory process. Trends and prevalence of infections among healthy individuals may be monitored and estimated by screening of TTIs among blood donors.⁶ Trend analysis of TTIs is useful in evaluating the efficacy of the currently employed screening procedures. This enables policy makers to suggest strategies for ensuring safe blood.

METHODS

A retrospective hospital record-based study was conducted at the blood bank of a tertiary care teaching hospital in Mumbai, Maharashtra India. The ethics committee of the institute approved the study. This research involves human participants and written consent was taken before blood collection. Data were collected for a period of 10 years from January 2008 to December 2017. Sera of voluntary blood donors from various localities and of different age groups was screened for anti-HIV, HBsAg and anti-HCV. A total of 8928 voluntary blood units were collected and studied.

Inclusion criteria

All voluntary blood donors were screened as per WHO criteria and NACO guidelines for blood donor selection.

Exclusion criteria

Enrolled donors who failed to meet donor selection criteria were deferred from blood donation.

Informed consent was taken from all the eligible donors' prior blood donation and testing of HIV, HBsAg and HCV. Blood from pilot samples were centrifuged and the sera were separated and analyzed. Two kits were used based on WHO recommendation of two different testing strategies involving third generation enzyme-linked immunosorbent assay (ELISA) and/or simple or rapid assays for surveillance. Samples were analyzed for

antibodies to HIV and HCV and surface antigen to HBV, by ELISA technique. The validity of the test is assured as per the given criterion and the results were computed. All reactive samples and blood units were labelled as seropositive, disinfected and discarded.

RESULTS

In the present study, out of total 8928 voluntary blood donors, 8031 (90%) were males and 897 (10%) were females which show predominance of males as compared to females for the ten studied years (Table 1). The prevalence of HIV, HBsAg and HCV among voluntary blood donors in the study population is showed in (Table 2). The highest prevalence of HIV was 2.5% in 2008 while lowest was 0.0% in 2010. The highest prevalence of HBsAg was 5.99% in 2008 while lowest 0.84% was noted in 2015. In 2009 and 2010 prevalence of HCV was 2.3%, while lowest 0.0% was noted in 2015.

Figure 1 showing declining trends of seroprevalence for HIV and HCV from 2008 to 2017, while HBsAg shows some spikes but overall prevalence is declining. Age wise distribution pattern of seroreactive blood donors in the study population shown in (Table 3).

Table: 1 Distribution of voluntary blood donors in the study population.

Year	Voluntary donors	Male	Female
2017	1317	1133 (86.02%)	184 (13.97%)
2016	1295	1159 (89.49%)	136 (10.50%)
2015	710	619 (87.18%)	91 (12.81%)
2014	687	613 (89.2%)	74 (10.77%)
2013	1084	965 (89.035)	119 (10.97%)
2012	1024	934 (91.22%)	90 (8.780%)
2011	754	701 (92.98%)	53 (7.02%)
2010	438	413 (94.3%)	25 (5.70%)
2009	702	645 (91.89%)	57 (8.11%)
2008	917	849 (92.59%)	68 (7.41%)
Total	8928	8031 (90%)	897 (10%)

Table 2: Prevalence of seroreactivity among voluntary blood donors in the study population.

Year	No. of donors	Reactive for anti-HIV	Reactive for HBsAg	Reactive for anti-HCV
2017	1317	02 (0.15%)	20 (1.52%)	5 (0.37%)
2016	1295	10 (0.77%)	33 (2.55%)	6 (0.46%)
2015	710	01 (0.14%)	06 (0.84%)	0 (0.0%)
2014	687	03 (0.30%)	21 (3.05%)	3 (0.43%)
2013	1084	18 (1.66%)	31 (2.86%)	18 (1.66%)
2012	1024	11 (1.07%)	44 (4.3%)	9 (0.88%)
2011	754	15 (1.98%)	33 (4.37%)	11(1.45%)
2010	438	00 (0.0%)	08 (1.82%)	10 (2.3%)
2009	702	07 (0.99%)	14 (1.99%)	16 (2.3%)
2008	917	23 (2.50%)	55 (5.99%)	17 (1.85%)
Total	8928	90 (1.00%)	265 (3.00%)	95 (1.06%)

Table 3: Age wise distribution pattern of seroreactive blood donors in the study population.

Age (years)	Reactive for anti-HIV	Reactive for HBsAg	Reactive for anti-HCV
< 20	9 (10%)	21 (7.92%)	3 (3.15%)
21-30	28 (31%)	113 (42.64%)	49 (51.57%)
31-40	36 (40%)	77 (29%)	18 (18.94%)
41-50	12 (13.33%)	44 (16.6%)	17 (17.9%)
51-60	5 (5.55%)	10 (3.77%)	8 (8.42%)
Total	90	265	95

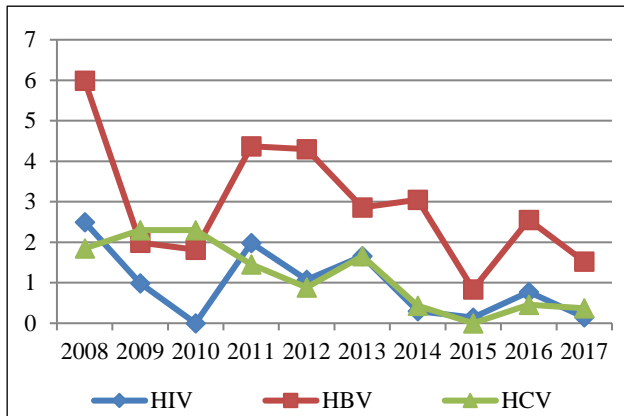


Figure 1: Trends of HIV, HBV and HCV prevalence over a decade.

The highest prevalence of hepatitis B (42.64%) and Hepatitis C (51.57%) was noted within the age group 21-30 years, while highest prevalence of HIV (40%) was noted in the age group of 31-40 years. Sex distribution pattern of seroreactive voluntary blood donors shown in (Table 4). Females contributed 10% of voluntary donation in our study and their total seroprevalence rate was 4.67%. Prevalences of HIV, HBV and HCV were more in males as compared to females.

Table 4: Distribution of seroreactive blood donors according to the sex.

Sex	Reactive for anti-HIV	Reactive for HBsAg	Reactive for anti-HCV	Total seroreactivity
Males (8031)	86 (95.56%)	257 (97%)	86 (90.52%)	429 (95.33%)
Females (897)	4 (4.44%)	8 (3.0%)	9 (9.5%)	21 (4.67%)
Total (8928)	90	265	95	450

DISCUSSION

With over 93 million donations made every year worldwide, blood transfusion continues to save millions of lives each year and improve the life expectancy and quality of life of patients suffering from life threatening

conditions. At the same time, blood transfusion is an important mode of transmission of infection to the recipient.⁷ In the present study, voluntary blood donors shows male predominance (90%) which correlates with Sachdeva et al (92%) and Inamdar et al (98.5%).^{5,8} Bala et al stated that women experience up to 70% more deferrals from donation than men, because of higher frequencies of anemia, other health problems and of adverse reactions.⁹

A WHO report states that the viral dose of HIV transmission through blood is so large that one HIV positive transfusion leads to death, on an average, after two years in children and after three to five years in adult.¹⁰ In our study, prevalence of HIV varies from 2.5% to 0.15% showing declining trend over a decade. Similar declining trend of HIV prevalence has been noted in studies conducted by Sachdeva et al, Rawat et al, Giriyan et al, and Inamdar et al in various regions of India shown in (Table 5).^{5,11,12,8}

HIV prevalence in India is estimated at 0.22% (0.16%-0.30%) in 2017.¹³ The adult HIV prevalence at national level has continued its steady decline from an estimated peak of 0.38% in 2001-03 through 0.34% in 2007, 0.28% in 2012 and 0.26% in 2015 to 0.22% in 2017. Among the States/UTs, in 2017, Maharashtra has the highest estimated number of PLHIV (3.30 Lakhs, 2.53-4.35) followed by Andhra Pradesh (2.70 Lakh, 2.00-3.58), Karnataka (2.47 Lakh, 1.91-3.23), Telangana (2.04 Lakh, 1.49-2.77), West Bengal (1.44 Lakh, 1.03-1.91), Tamil Nadu (1.42 Lakh, 0.93-1.97), Uttar Pradesh (1.34 Lakh, 1.01-1.77) and Bihar (1.15 Lakh, 0.83-1.58).¹³

India is at the intermediate endemic level of hepatitis B, with hepatitis B surface antigen (HBsAg) prevalence between 2% and 10% among the populations studied.³ The infectious risk of transmission of hepatitis B through transfusion of a pint of blood declared negative to HBs Ag was 9.89%±2.25% at a confidence level of 95%.¹⁴ In our study, the prevalence of Hepatitis B was ranging from 6% to 1.52% showing a declining trend with few spikes over a decade. Sachdeva et al and Ghosh et al, reported declining trend in their study while Giriyan et al and Rawat et al showed a plateau phase in HBV prevalence shown in (Table 6).^{5,15,12,11} Prevalence of Hepatitis B was highest in the age group of 21-30yrs (42.64%) followed by 31-40yrs (29%) in our study which is accordance with

Inamdar et al.⁸ In India, 89% of the cases of Hepatitis B occur among sexually active persons aged 20-49years.¹⁶

The estimated prevalence of HCV in India is 0.5%-1.5%.¹⁷ In our study, prevalence of Hepatitis C varies

from 1.85% to 0.37% showing a declining trend over a decade which is similar to findings by Sachdeva et al and Ghosh et al shown in (Table 7).^{5,15} The seroprevalence rate of HCV among the blood donor population in India is 0.53 to 5.1%.¹⁸

Table 5: Comparison of HIV Prevalence among blood donors' studies in India. (Various studies from North, South and East India show declining prevalences of HIV).

Year	Present study (2019) Mumbai	Sachdeva et al ⁵ (2016) Chandigarh	Rawat et al ¹¹ (2017) Delhi	Giriyan et al ¹² (2018) Hubballi	Inamdar et al ⁸ (2018) Telangana
2017	0.15	-	-	-	0.1
2016	0.77	-	-	-	0
2015	0.14	-	-	0.1	0.2
2014	0.30	0.03	0.25	0.24	-
2013	1.66	0.03	0.30	0.27	-
2012	1.07	0.05	0.29	0.47	-
2011	1.98	0.07	0.29	0.37	-
2010	0.0	0.17	0.29	0.6	-
2009	0.99	0.13	0.33	0.3	-
2008	2.5	0.34	0.53	0.4	-

Table 6: Comparison of HBsAg prevalence among blood donors' studies in India (various studies from North, South and East India show declining trend of prevalence of HBsAg with few deviations).

Year	Present study (2019) Mumbai	Sachdeva et al ⁵ (2016) Chandigarh	Rawat et al ¹¹ (2017) Delhi	Giriyan et al ¹² (2018) Hubballi	Inamdar et al ⁸ (2018) Telangana	Ghosh et al ¹⁵ (2018) Assam
2017	1.52	-	-	-	0.5	-
2016	2.55	-	-	-	0.2	-
2015	0.84	-	-	1.76	0.6	-
2014	3.05	0.33	1.60	1.9	-	-
2013	2.86	0.41	1.45	2.0	-	0.71
2012	4.3	0.43	1.80	2.1	-	0.62
2011	4.3	0.44	1.57	2.2	-	0.64
2010	1.82	0.57	1.63	2.26	-	0.86
2009	2	0.33	1.54	1.8	-	1.07
2008	6	0.95	1.71	1.56	-	-

Table: 7 Comparison of HCV prevalence among blood donors' studies in India (various studies from North, South and East India show declining trend of prevalence of HCV).

Year	Present study (2019) Mumbai	Sachdeva et al ⁵ (2016) Chandigarh	Rawat et al ¹¹ (2017) Delhi	Giriyan et al ¹² (2018) Hubballi	Inamdar et al ⁸ (2018) Telangana	Ghosh et al ¹⁵ (2018) Assam
2017	0.37	-	-	-	0.1	-
2016	0.46	-	-	-	0	-
2015	0.0	-	-	0.17	0	-
2014	0.43	0.02	0.82	0.1	-	-
2013	1.66	0.15	0.86	0.25	-	0.15
2012	0.88	0.05	0.80	0.37	-	0.13
2011	1.45	0.09	0.63	0.5	-	0.23
2010	2.3	0.42	0.67	0.3	-	0.33
2009	2.3	0.47	0.59	0.1	-	1.13
2008	1.85	0.34	0.69	0.1	-	-

In many developing countries, women do not come forward for blood donation or for health camps due to many socio-cultural inhibitions, ignorance and fear for donating blood.¹⁹ Irrespective of the size of sample and type of study population the prevalence of HIV, HBsAg and HCV in females is significantly lower than males. Similar finding was noted in our study.

Amongst the blood donors, seropositivity of HBV (6% to 1.52 %) was highest followed by HIV (2.5% to 0.15%) then HCV (1.85% to 0.37%). Decreasing trends with low prevalence observed in the study is an encouraging sign supporting the growing awareness of these life-threatening diseases.

All blood banks are empanelled by the government and all authorized centers have been instructed to follow blood safety guidelines as listed by the National Aids Control Organization (NACO). Stricter control over the quality of blood and its products has been done to ensure that only non-reactive blood and blood components are released for clinical use. The accurate estimation of residual risk of transfusion transmissible infectious diseases are essential for monitoring the safety of blood supply and the evaluation of the potential effect of screening tests and the risk reduction procedures under implementation.

This study has several limitations. The ideal condition to conduct a seroprevalence study is by taking sample of general population. As blood donors are specifically selected based on extensive questionnaire, strict selection criteria and physical examination and only apparently healthy individuals with lowest risk of TTIs were allowed to donate blood, our study sample does not represent general population. Further, the donor pool was predominantly composed of male population. We acknowledge the limitation of not using advanced methods like NAAT (Nucleic Acid Amplification Techniques) which are needed for detection of window period in HIV due to non-availability in our blood bank.

CONCLUSION

Present study reveals that over a decade, trend analysis for risks of TTIs has shown a decreasing trend. Substantial risk of transfusion-transmissible infections is still prevailing with the current blood transfusion services in our community and ensuring primary prevention of transfusion transmissible infections has a long way to go. Improvements must be made in donor selection criteria and screening for infectious diseases in order to provide a safe blood supply. Blood can save lives; however, it also carries the potential to transmit life-threatening infections. Sensitive screening tests and a mandatory quality assurance system are essential to maintain blood safety. Transfusion safety begins with healthy donors.

ACKNOWLEDGEMENTS

Authors would like to thank all voluntary blood donors of Abdulla Fazalbhoy blood bank, Cama and Albles Hospitals Mumbai.

Funding: No funding sources

Conflict of interest: None declared

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

REFERENCES

1. AVERT Global information and education on HIV and AIDS. HIV and AIDS in India, 2017. Available at: <https://www.avert.org/professionals/hiv-around-world/asia-pacific/india>. Accessed on 18 January 2019.
2. Puri P. Tackling the hepatitis B disease burden in India. *J Clin Exp Hepatol.* 2014;4(4):312-9.
3. Singhal V, Bora D, Singh S. Hepatitis B in health care workers: Indian scenario. *J Lab Physicians.* 2009 Jul-Dec;1(2):41-8.
4. Bhattacharya PK, Roy A. management of hepatitis c in the Indian context: an update. *J Liver.* 2015;4:187.
5. Sachdeva A, Gupta A, Sharma B, Sharma D, Sharma N. Seroprevalence trends of transfusion transmitted infections among blood donors in a tertiary care hospital of Himachal Pradesh, India. *Int J Res Med Sci.* 2016 Nov;4(11):5002-6.
6. Shrestha AC, Ghimire P, Tiwari BR, Rajkarnikar M. Transfusion-transmissible infections among blood donors in Kathmandu, Nepal. *J Infect Dev Ctries.* 2009;3(10):794-97.
7. Chaurasia R, Zaman S, Das B, Chatterjee K. Screening donated blood for transfusion transmitted infections by serology along with NAT and response rate to notification of reactive results: an Indian experience. *J Blood Transf.* 2014; 2014.
8. Inamdar PD, Anuradha B. Seroprevalence of transfusion transmissible infections among blood donors at tertiary care hospital in southern Telangana-A 3 year cross sectional study. *Indian J Microbiol Res.* 2018;5(4):446-50.
9. Bala SS, Handoo S, Jallu AS. Gender Differences in Blood Donation among Donors of Kashmir Valley. *J Dental Med Sci.* 2015;14(2):116-9.
10. Pailoor K, Keshava SM, Rai P, D'Cunha O, Lakshmi C. A retrospective study of screening of common transfusion transmitted infections in the blood bank of a tertiary care centre. *J Blood Disorders Transf.* 2015;6:267.
11. Rawat A, Diwaker P, Gogoi P, Singh B. Seroprevalence and changing trends of transfusion-transmitted infections amongst blood donors in a regional blood transfusion centre in north India. *Indian J Med Res.* 2017;146(5):642-5.

12. Giriyan SS, Sindhushree N. Seroprevalence of HIV, HBV, HCV and syphilis among blood donors in KIMS blood bank Hubballi, Karnataka, a tertiary care hospital. *International J Microbiol Res.* 2018;10(3):1020-23.
13. National AIDS Control Organization. HIV Facts and Figures, 2017. Available at: naco.gov.in/hiv-facts-figures. Accessed 5 October 2018.
14. Noah DN, Njouom R, Bonny A, Pirsou, Meli J, Sida MB. HBs antigen prevalence in blood donors and the risk of transfusion of hepatitis B at the central hospital of Yaounde, Cameroon. *Open J Gastroenterol.* 2011;1:2327.
15. Ghosh R, Kumar NH. Seroprevalence of HBV and HCV among healthy blood donors in a tertiary care hospital of northeast India: a 5-year retrospective study. *Int J Curr Microbiol App Sci.* 2018;7(7):531-6.
16. Makroo RN, Chowdhry M, Bhatia A, Arora B, Rosamma NL. Hepatitis B core antibody testing in Indian blood donors: A double edged sword! *Asian J Transfus Sci.* 2012;6(1):10-3.
17. Barman B, Bora K, Lynrah KG, Lyngdoh WV, Jamil M. Hepatitis C virus and its genotypes in chronic liver disease patients from Meghalaya, Northeast India. *Indian J Med Microbiol.* 2018;36:376-80.
18. Gupta S, Kumar R, Kaur A. prevalence of hepatitis c virus seropositivity among blood donors in a tertiary care hospital. *Int Res J Medical Sci.* 2015;3(2):22-4.

Cite this article as: Narayankar SL, Maindad VC. HIV, HBsAg and HCV prevalences among voluntary blood donors in Mumbai: trends over a decade. *Int J Res Med Sci* 2019;7:2009-14.