Infectious Disease Screening and Trends in Blood Donors in a Hospital based Blood Bank in Mumbai, Western India

Fulzele Parag Prabhakar[1], Yasmeen Khatib[2], Akanksha Gaajre[1], Richa Patel[1], Arsala Mulla[3], Surekha Khaire[3]

ABSTRACT

Introduction: Despite reduction in risk of transfusion-transmitted infections (TTIs) during the past three decades, they still remain a serious complication of transfusion worldwide. The aim of the study was to assess the sero-prevalence and its relation to demographic profile of the blood donor population.

Material and methods: This was a retrospective cross sectional study, which was carried out in the blood bank of Dr R N Cooper Hospital, Mumbai between January 2009 and June 2016. A total of 16899 blood donors were studied to determine the seroprevalence of Human immunodeficiency virus (HIV), Hepatitis C virus (HCV), Hepatitis B surface antigen (HBsAg), Malaria and Syphilis. A relation between seroprevalence to donor type (replacement donor versus voluntary donor), age and sex if any was studied.

Result: The present study showed the sero-prevalence of HIV, HBV, HCV, syphilis and malaria was 0.6% (97/16899), 1.8% (302/16899), 0.7% (116/16899), 0.22% (38/16899) and 0.017%(3/16899), respectively. The TTI prevalence in replacement donors was 5.1%(49/947) as compared to voluntary donors i.e. 3.1%(510/15952). Highest prevalence of TTI (37.56%) was within the age group of 2635 years. There was a declining trend for HIV and HBV infection, which was statistically significant (P<0.005) while there was no significant change in the trend of seroprevalence of HCV infection.

Conclusion: The current infectious disease pattern and trends in donor population can help in planning of future blood transfusion related health challenges. There is need for improvement and implementation of strict donor selection and sensitive screening tests which can minimize the risk of TTIs.

Keywords: Transfusion Transmitted Infections, HIV, HBV, HCV, Seroprevalence

INTRODUCTION

Despite reduction in the risk of transfusion-transmitted infections (TTIs) during the past three decades, they still remain a serious complication of blood transfusion worldwide. Blood donors can transmit an infection during its asymptomatic phase, so transfusions can contribute to an ever-widening pool of infections in the population. High prevalence of infectious diseases in donors not only carries the risk to the recipient, but also increases the overall cost of the transfusion product.

Depending upon the differences in disease epidemiology and financial resources between different countries, the WHO strategy for laboratory screening of blood recommends HIV, HBV, and syphilis screening of all donated blood and, when appropriate, screening for HCV, malaria, and Chagas disease.[1] Regional epidemiologic data guide the choice of infectious disease testing. The choice of screening assays by the blood bank or laboratory depends not only on the region's infectious disease epidemiology, but also on the quality and types of assays available. Transfusion-transmissible infectious agents are greatest threats to blood safety for transfusion recipients and pose a serious public health problem. The aim of the study was to assess the seroprevalence and its relation to demographic profile of the blood donor population. In India tests for HIV, HBV, HCV, Malaria and Syphilis are mandatory under Drugs and Cosmetic Act 1940 Rules 1945, (SCH. F, Part XII B).

MATERIAL AND METHODS

This was a retrospective cross sectional study, which was carried out in the Blood Bank of Dr R N Cooper Muncipal General Hospital, Mumbai between January 2009 and June 2016. The study was approved by the institutional ethics committee. Individuals who were included in the study were healthy men and non-pregnant non lactating women aged between 18 and 60 years, weighing ≥ 45 kg and with hemoglobin levels above 12.5 g/d1. Exclusion criteria included: current history of medication and those with a history of operation, serious illness, jaundice, blood transfusion, radiotherapy or any form of cancer therapy. These selection procedures are done routinely in the Blood Bank as per standard operating procedures. A total of 16899 apparently healthy blood donors aged between 18 to 60 years who presented for blood donation were studied for seroprevalence of HIV, HCV, HBsAg, Malaria and syphilis. A relation between seropositivity to donor type (Replacement donor versus voluntary donor), age and sex if any was studied. Statistical analysis was done to determine if the association between above variables was statistically significant. All the samples were screened for HBsAg, HIV (1 and 2), HCV by ELISA method using approved commercially available kits. Screening for VDRL was done by Rapid Plasma Reagin method and malarial parasite by peripheral smear examination.

STATISTICAL ANALYSIS

Statistical analysis was performed using SSPS software (Version 17.0) using chi square test and proportions. A *P* value of <0.05 was considered significant.

[1]Assistant Professor, [2]Associate Professor, [3]Junior Resident, Department of Pathology and Blood Bank, HBT Medical College and Dr R N Cooper, Hospital, Mumbai, Maharashtra, India

Corresponding author: Dr Fulzele Parag Prabhakar, Blood Bank, 'F' Wing, 1st Floor, Dr R N Cooper Hospital, Juhu, Vile Parle (West), Mumbai 400056, India

How to cite this article: Fulzele Parag Prabhakar, Yasmeen Khatib, Akanksha Gaajre, Richa Patel, Arsala Mulla, Surekha Khaire. Infectious disease screening and trends in blood donors in a hospital based blood bank in Mumbai, Western India. International Journal of Contemporary Medical Research 2017;4(2):569-572.

RESULTS

A total of 16899 blood donors were studied for analysis. The present study showed that the female donors were 11.4% (1930/16899) as compared to male donors which were 88.6% (14969/16899). Figure 1 shows the distribution of donors according to different age group. The mean age of donation was 31.30 years. (±9.565). The age profile of blood donors showed that, there were maximum numbers of donors in the age group between 26 to 35 years.

The study showed that O was the most common blood group (33.0%) in our center followed by B (32.1%), A (26.1%). AB was the least prevalent group (8.6%). 95.9% of the donor population was Rh (D) positive and the rest were Rh (D) negative (4.1%). In the present study majority were voluntary donors 15952 (94.4%) and rest were replacement donors i.e. 947 (5.6%). The overall sero-prevalence of antibodies against HIV, HBsAg, HCV, syphilis and malaria were 0.6% (97/16899), 1.8% (302/16899), 0.7% (116/16899), 0.22% (38/16899) and 0.017%(3/16899), respectively. The HIV-HBV and HBV-HCV co-infectious markers were present in 0.005% (1/16899) and 0.011% (2/16899) (Table 1, Figure-2).

The trends in the seroprevalences of HIV, HBsAg and HCV during the study period are shown in the (Figure-3). The seropositivity of HIV, HBsAg showed a significant declining trend (P<0.01) whereas there was no significant change in trend of HCV infection. (Figure-3)

When all infections were summed together the highest prevalence (37.56%) was seen among the age group of 26-35 years as compared to other groups and the difference was statistically significant. (Pearson chi square test P < 0.005). With respect to the individual TTIs, it was observed that the prevalence of HBV was highest within the age groups 26-35 years as compared to other TTIs. The difference of the prevalence of HBV as compared to other age groups was statistically significant (P>0.05) with highest prevalence in age group 26-35 years (Table 2, Figure 4).

In the present study prevalence of TTI in replacement donors was 5.1% (49/947) and in voluntary donation was 3.1% (510/15952). The TTI prevalence was more among replacement donors and the difference was highly statistically significant using Fischer's Exact T Test (P value < 0.005) (Table 3).

DISCUSSION

The age profile of blood donors showed that, maximum number of donors were between age group 26 to 35 years at our center. The present study showed that the percentage of female donors was only 11.4%. Data about the gender profile of blood donors show that globally 28% of blood donations are given by women but the range differ widely depending upon the country This demographic information of blood donors is important for formulating and monitoring recruitment strategies to increase the number of female donations.

The study showed that O was the most common blood group (33.0%) in our center followed by B (32.1%), A (26.1%). AB was the least prevalent group (8.6%). 95.9% of the donor population was Rh(D) positive and the rest were Rh(D) negative (4.1%). The findings were similar to the reported blood group trends in Asian population i.e. O > B > A > AB. Similar result was observed in a multicentric study in India by Agrawal et al in which they found prevalence of O (37.12%), A (22.88%), B (32.26%), AB(7.74%) and Rh (D) positive 94.61% and Rh (D) negative 5.39%.[2] The prevalence of HIV, HCV and HBV in

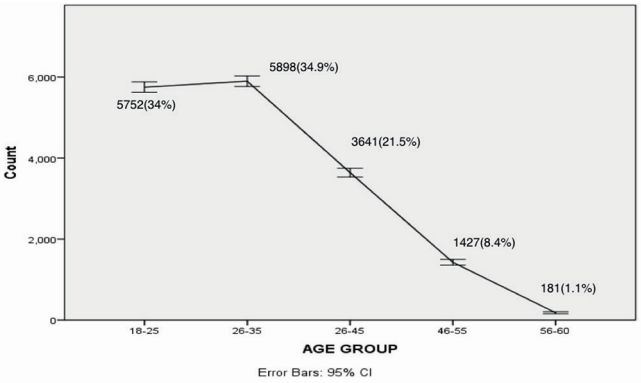


Figure-1: Distribution of donors according to different age groups

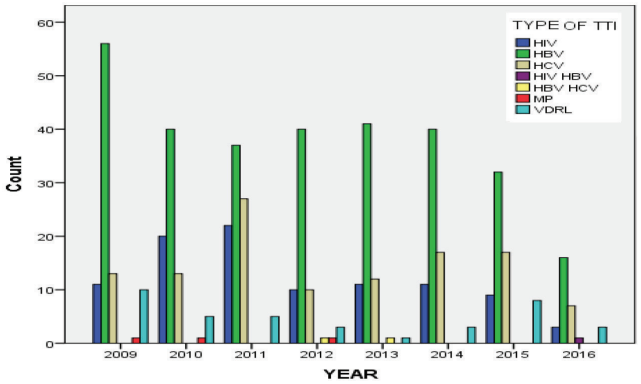


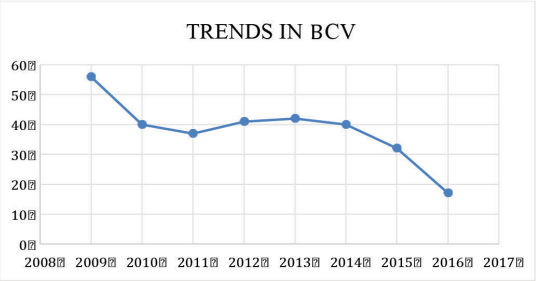
Figure-2: Yearwise distribution of the TTI among Blood donors.

Yearwise distrubution of TTI								
Year	**HIV**	**HBV**	**HCV**	**HIV HBV**	**HBV HCV**	**MP**	**VDRL**	**Total**
2009	11	56	13	0	0	1	10	91
2010	20	40	13	0	0	1	5	79
2011	22	37	27	0	0	0	5	91
2012	10	40	10	0	1	1	3	65
2013	11	41	12	0	1	0	1	66
2014	11	40	17	0	0	0	3	71
2015	9	32	17	0	0	0	8	66
2016*	3	16	7	1	0	0	3	30
Total	97	302	116	1	2	3	38	559
*Till June 2016								

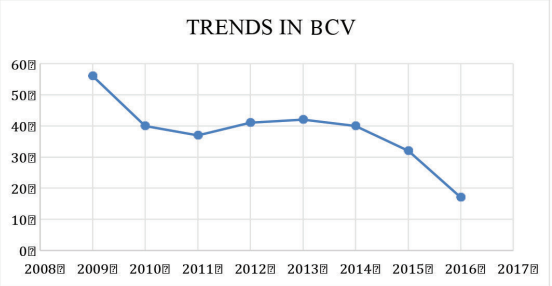
Table-1: Yearwise distribution of the TTI among Blood donors.

Indian donor population is estimated to be approximately 0.3%, 2% and 2–8% respectively, although the seroprevalence of HIV, HCV and HBV has shown a wide variation in various parts of the country.[3,4]

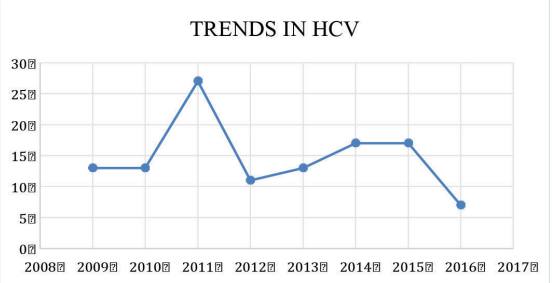
In the present study sero-prevalence of HIV, HBsAg, HCV, syphilis and malaria was 0.6% (97/16899), 1.8% (302/16899), 0.7% (116/16899), 0.22% (38/16899) and 0.017% (3/16899), respectively. The HIV-HBV and HBV-HCV co-infectious marker was present in 0.005% (1/16899) and 0.011% (2/16899).



(HIV- Chi square value 18.37, Degree of freedom 7, P value 0.01)



(HBV- Chi square value 14.08, Degree of freedom 7, P value 0.04)



(HCV- Chi square value 31.31 Degree of freedom 7, P value 0.06)

Figure-3: Trends in the Seroprevalences of HIV, HBV and HCV

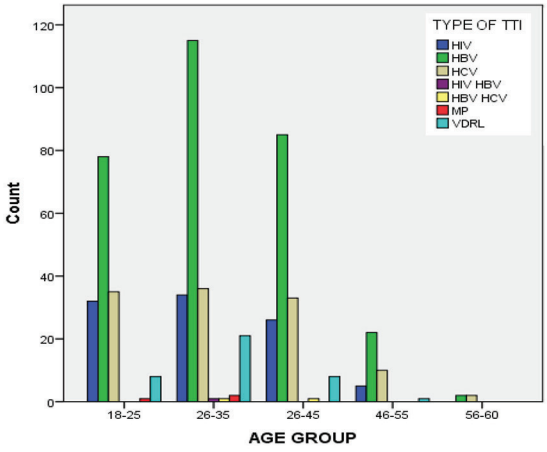


Figure-4: Age wise distribution of the TTI

In the present study, the prevalence of HIV was found to be 0.6% which is similar to the findings of Pahuja et al.[6] The present study revealed that the seroprevalence of HBV was 1.8% among the donors which is similar to findings by Arora et al[7], Chandra T et al[9] and Srikrishna et al.[10] The prevalence of HCV in present study was 0.7% which is similar to the findings by Negi et al[6], Pahuja et al[8], Chandra T et al[9], Srikrishna et al[10] and Sharma et al.[14] Seroprevalences of HIV, HBsAg, HCV, Syphilis and Malaria in different studies are shown in the Table 4. In the present study, almost similar values have been found as compared to other studies.

The seroprevalence of HIV, HBV, HCV and syphilis was highest in age group between 26-35 age groups indicating the different risk behaviours in different age groups. The policy followed by our blood bank was to accept both voluntary and replacement donor till mid 2014. A change over from voluntary plus replacement donation to 100% voluntary donation from mid 2014 at our center has resulted in considerable reduction in the number of seropositive donors. Our study has shown high seropositivity rates of TTI in replacement donors as compared to voluntary donors. A similar finding was noted in a study done by Makroo et al.[5] An adequate and reliable supply of safe blood can be assured by a stable base of regular, voluntary, unpaid blood donors. Globally, between 130–150 million people globally have chronic hepatitis C infection and there is currently no vaccine for Hepatitis C.[3] In comparison to trends in sero prevalence of HIV, HBV and HCV, there was declining trendfor HIV and HBV infection, which was statistically significant (P<0.005) while there was no significant change in the trend of seroprevalence of HCV infection. Similar trends were noted in study done by Makroo et al in which the trend for HIV and HBV was decreasing and trend in HCV infection was increasing.[5]

CONCLUSION

The current infectious disease pattern and trends in donor population can help in planning of future blood transfusion related health challenges. Encouraging female population as well voluntary blood donors for blood donation will increase the

Age group wise distrubution of TTI			
Age Group	**TTI Reactive**	**TTI Non Reactive**	**Total**
18-25	154	5598	5752
26-35	210	5688	5898
36-45	153	3488	3641
46-55	38	1389	1427
56-60	4	177	181
Total	559	16340	16899
Pearson Chi-Square test (Value 19.969, df 4, P value 0.001)			

Table-2: Age group wise distribution of TTI

TTI prevalence (Voluntary versus Replacement Donor)			
Donor	**TTI Reactive**	**TTI Non Reactive**	**Total**
Replacement	49	898	947
Volunteer	510	15442	15952
Total	559	16340	16899
Fisher's Exact Test	0.001		

Table-3: TTI prevalence (Voluntary Donor Vs Replacement Donor)

Seroprevalence of infectiousmarker from various studies						
	Year	**HIV**	**HBsAg**	**HCV**	**Syphilis**	**Malaria**
Present study	2016	0.6	1.8	0.7	0.22	0.017
Makroo et al[5] (New Delhi)	2015	0.24	1.18	0.43	0.23	-
Negi et al[6] (Uttarakhand)	2014	0.2	1.2	0.9	0.3	0.02
Arora et al[7] (Haryana)	2010	0.3	1.7	1	0.9	-
Pahuja et al[8] (Delhi)	2007	0.56	2.23	0.66	-	-
Chandra T et al[9] (Lucknow)	2009	0.23	1.96	0.85	0.001	-
Srikrishna et al[10] (Karnataka)	2009	0.23	1.96	0.85	0.001	-
Bhattacharya et al[11] (Kolkatta)	2007	0.28	1.46	0.31	0.72	-
Garg et al[12] (Jodhpur, Rajasthan)	2001	0.44	3.44	0.285	0.22	-
Nirali Shah et al[13] (Gujrat)	2013	0.154	0.887	0.101	0.22	-
Sharma et al[14] (Chandigarh)	1999-2002	0.16-0.3	1.55-0.99	0.4	0.66	-

Table-4: Seroprevalences of infectious markers from various studies

number of donors and safe donor pool. There is need for look back phenomenon and donor notification, donor counseling to prevent further transmission of the infection. Though the prevalence of HIV and HBV are decreasing still there is need for improvement and implementation of strict donor selection and sensitive screening tests which can minimize the risk of acquiring transfusion transmitted infections with special emphasis on HCV infection.

REFERENCES

1. Blood safety and availability, WHO, Fact Sheet, July 2016
2. Amit Agrawal et al, ABO and Rh (D) group distribution and gene frequency; the first multicentric study in India. Asian Journal of Transfusion Science. 2014;8:121-125.
3. Chandrashekar S: Half a decade of mini-pool nucleic acid testing: cost-effective way for improving blood safety in India. Asian J TransfusSci. 2014;8:35–38.
4. Agarwal N, Chatterjee K, Coshic P, et al.: Nucleic acid testing for blood banks: an experience from a tertiary care centre in New Delhi, India. TransfusApherSci. 2013; 49:482–484.
5. R.N. Makroo, Vikas Hegde, Mohit Chowdhry, Aakanksha Bhatia and N.L. Rosamma. Seroprevalence of infectious markers and their trends in blood donors in a hospital based blood bank in north India. Indian J Med Res. 2015;142:317-322.
6. Negi G, Gaur DS.Trends of transfusion transmissible diseases among blood donors at Uttarakhand, India.Indian J Community Med. 2014;39:183-6.
7. Arora D, Arora B, khetarpal A. Seroprevalence of HiV, HBV, HCV and syphilis in blood donors in southern Haryana. Indian J PatholMicrobiol. 2010;53:308-9.
8. Pahuja S, Sharma M, Baitha B, Jain M. Prevalence and trends of markers of hepatitis C virus, hepatitis B virus and human immunodeficiency virus in Delhi blood donors. A hospital based study. Jpn J Infect Dis. 2007;60:389-91.
9. Chandra T, kumar A, Gupta A. Prevalence of transfusion transmitted infections in blood donors: an Indian experience. Trop Doct. 2009;39:152-4.
10. Srikrishna A, Sitalakshmi S, Damodar P. How safe are our safe donors. Indian J PatholMicrobiol. 1999;42:411-6.
11. Bhattacharya p, Chandra pk, Datta s, Banerjee A, Chakraborty s, Rajendran k, et al. Significant increase in HBV, HCV, HiV and syphilis infections among blood donors in West Bengal, Eastern india 2004-2005: exploratory screening reveals high frequency of occult HBV infection. World J Gastroenterol. 2007;13:3730-3.
12. Garg S, Mathur DR, Garg DK: Comparison of seropositivity of HIV, HBV, HCV and syphilis in replacement and voluntary blood donors in western India. Indian Journal of Pathology and Microbiology. 2001;444:409-412.
13. Nirali Shah et al. Sero prevalence of HBV, HCV, HIV and syphilis among blood donors at a tertiary Care Teaching Hospital in Western India. 2013. Gujrat Medical journal. 2013;68: No. 2.
14. Sharma RR, Cheema R, Vajpayee M, Rao U, Kumar S, Marwaha N, Agnihotri SK. Prevalence of markers of transfusion transmissible diseases in voluntary and replacement blood donors.Natl Med J India. 2004;17:19-21.

Source of Support: Nil; **Conflict of Interest:** None

Submitted: 06-02-2017; **Published online**: 19-03-2017