

Prevalence of Major Transfusion-Transmissible Infections among Blood Donors at a Rural Tertiary Healthcare Teaching Hospital of North India

Purna Mahajan¹, Deepti Agarwal^{2*}, Swarn Kaur³, Kulwant Singh², Anjali Sindhu¹, Kanika Makkar¹

¹Post Graduate Resident, Department of Pathology, B.P.S. Government medical college, Khanpur Kalan, Sonipat, Haryana, India

²Associate Professor, Department of Pathology, B.P.S. Government medical college, Khanpur Kalan, Sonipat, Haryana, India

³Professor and Head, Department of Pathology, B.P.S. Government medical college, Khanpur Kalan, Sonipat, Haryana, India

*Corresponding author: Deepti Agarwal

| Received: 19.12.2018 | Accepted: 28.12.2018 | Published: 22.01.2019

DOI:10.21276/sjpm.2019.4.1.3

Abstract

Introduction: Transfusion of blood and its components is a life saving measure in various medical and surgical emergencies. Transfusion carries the risk of transmitting the life threatening transfusion transmissible infections (TTIs) agents like Human immunodeficiency virus (HIV), Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Syphilis and Malaria. **Aim & Objectives:** To estimate the prevalence of Major Transfusion-Transmissible Infections among Blood Donors at a rural tertiary healthcare teaching hospital of North India. **Materials and Methods:** The present study was conducted on 7405 blood donors who donated blood in the Blood Transfusion Department, BPS Government medical college for women, Khanpur Kalan, Sonipat over a period of one year. For testing purpose, ELISA kits of 4th generation for HIV I & II, while 3rd generation kits for HBsAg and HCV were used. Syphilis antigen was screened by Anti-TP Test and malaria was screened by the Pan Antigen Card Test. **Results:** Amongst a total of 7405 donors, 7235 (97.7%) were male donors and only 170 were (2.3%) female donors. There were 6987 (95.3%) voluntary donors whereas 418 (5.7%) replacement donors. The overall seroprevalence of 2.84 % (211 cases of TTI in 7405 donors) was observed. The prevalence of HIV, HBsAg, HCV, Syphilis and Malaria are 0.06%, 1.18%, 1.02%, 0.56% and 0% respectively. **Conclusion:** Voluntary donations are safer as compared to replacement ones and should be encouraged. Proper efforts in planned way should be made to increase the number of voluntary donors with a target of 100% and reduce replacement donations to a minimum.

Keywords: Blood Transfusion, Transfusion Transmissible Infections (TTI), National AIDS Control Organization (NACO), donors.

Copyright @ 2019: This is an open-access article distributed under the terms of the Creative Commons Attribution license which permits unrestricted use, distribution, and reproduction in any medium for non-commercial use (NonCommercial, or CC-BY-NC) provided the original author and sources are credited.

INTRODUCTION

A blood transfusion is the transfer of blood or blood products from one person (donor) into another person's bloodstream (recipient). Blood transfusion is an integral and life saving procedure of modern medicine. Transfusion of blood and its components, saves millions of lives all over the world and markedly reduces the morbidity and mortality. Disease transmission is one of the most dreaded complications of blood transfusion. The aim of any blood transfusion department is thus, to ensure safety, adequacy, accessibility as well as efficiency of blood supply at every level. A transfusion transmitted infection (TTI) is any infection identified in a recipient that is suspected to have been transmitted by blood or blood products at any point of time or any infection with the potential of being carried from person to person because of blood transfusion. According to National AIDS Control Organization (NACO) guidelines, mandatory tests should be carried out on donor's blood samples for

diseases including HIV, HBV, HCV, syphilis and malaria. The whole blood or components from any unit that tests positive for any of these infections is discarded.

Blood transfusion departments not only screen TTI but also give clue about the prevalence of these infections in healthy populations [1]. India has a population of more than 1.2 billion with 2.1 million Human Immunodeficiency Virus (HIV) positive [2], 43 million HBV positive and 15 million HCV positive persons [3]. The risk of transfusion transmission of these viruses may be alarming due to high seroprevalence of HIV, HBV, HCV, syphilis and malaria (0.12%, 0.92%, 0.3%, 0.21% and 0.05% respectively) among the blood donors [4]. The prevalence of TTIs in voluntary non-remunerated blood donors is generally much lower than among family/replacement [5] and paid donors [6].

The problem of TTI is directly proportionate to the prevalence of infection in the blood donor community. In India, HIV, Hepatitis B, Hepatitis C, syphilis and malaria are important causes of concern. Post transfusion hepatitis B and hepatitis C is a major problem in India because of low viraemia and mutant strain undetectable by routine ELISA.

Our study is to estimate the prevalence of Major Transfusion-Transmissible Infections among Blood Donors at a rural tertiary healthcare teaching hospital of North India.

MATERIALS AND METHODS

The present study was conducted on 7405 blood donors who donated blood in the Blood Transfusion Department, BPS Government medical college for women, Khanpur Kalan, Sonipat over a period of one year. All voluntary, replacement donors and those who donated blood in out-door blood donation camps were prospectively enrolled. The donors were then screened according to blood donor selection criteria and guidelines from drug and cosmetic act 1940 & NACO [7]. The blood donors who were unfit to donate blood according to standard blood donors selection criteria (As per the Drugs and Cosmetics Act, 1999) were excluded. Care was taken to eliminate professional and paid donors by taking history and with clinical examination of the donor. Basic information regarding age, sex, occupation, number of previous donations were obtained. After taking informed consent, blood was taken.

Samples were collected from blood bags were tested for five major infections transmitted by transfusion which included HIV I & II, Hepatitis B virus, Hepatitis C virus, Syphilis and Malaria. The sera were separated and analyzed based on WHO recommended testing strategies involving Enzyme-Linked Immunosorbent Assay (ELISA) [8]. The ELISA was validated by the acceptance criteria laid down by

the manufacturer for the absorbance of reagent blank as well mean absorbance of the positive and negative controls provided with the test kits. Known positive and negative samples were used randomly as external controls in each screening. The cut off value was calculated as per manufacturer's directions for reporting positive and negative results. Screening for Syphilis was carried out by using one step syphilis Anti-TP Test and Malaria was screened by the Pan Antigen Card Test. All samples with reactive results were repeated in duplicate before labelling them as seropositive.

RESULTS

Our study included 7405 donors, out of which 7235 (97.7%) were male donors and only 170 were (2.3%) female donors (Figure-1). There were 6987 (95.3%) voluntary donors whereas 418 (5.7%) replacement donors (Table-1). Amongst the voluntary donors 97.6% were males and 2.4% were females, whereas among replacement donors, 99.5% were males and 0.5% were females.

The median age of the donors was 28 years (range 18- 62 years). Majority (42.3%) of the donors were in the age group of 21-30 years, which were mostly voluntary donors.

The overall seroprevalence of 2.84% (211 cases of TTI in 7405 donors) was observed. Out of total 211 seropositive cases, 90.5% (191) were voluntary donors, whereas 9.5% (20) were replacement donors. The prevalence of HIV, HBsAg, HCV, Syphilis and Malaria observed was 0.06%, 1.18%, 1.02%, 0.56% and 0% respectively (Figure-2). The prevalence of HIV, HBsAg, HCV, Syphilis and Malaria among voluntary donors was 0.05%, 1.12%, 0.89%, 0.5% and 0 % respectively, while in replacement donors it was 0.01%, 0.06%, 0.13%, 0.05% and 0% respectively, (Table-3) depicting higher seroprevalence of TTIs amongst voluntary donors than replacement donors.

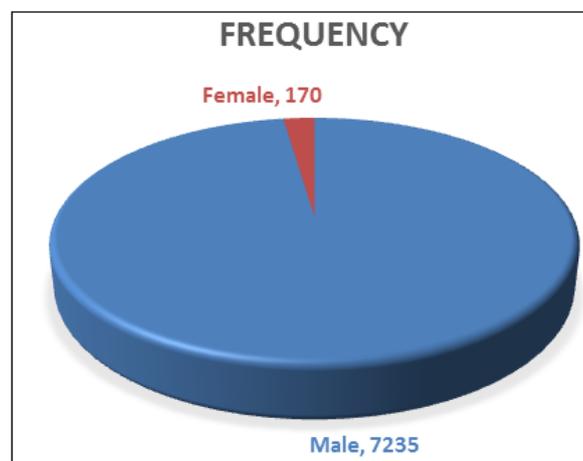


Fig-1: Distribution of blood donors in the study population according to Gender

Table-1: Distribution of blood donors in the study population according to type of donor

Type of donor	Voluntary	Replacement
Frequency	6987	418
Percentage	94.3%	5.7%

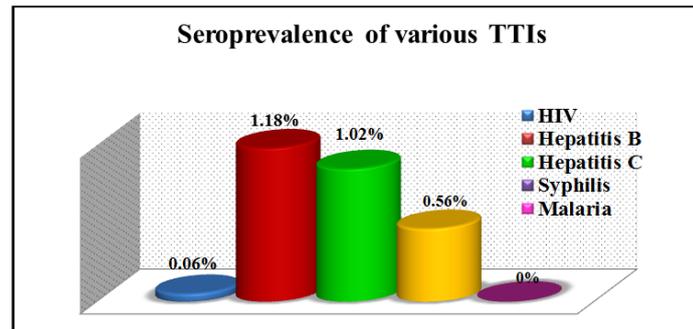


Fig-2: Seroprevalence of various Transfusion Transmitted Infections

Table-2: Relationship of Transfusion Transmitted Infection to type of donor

Transfusion Transmitted Infection	Voluntary	Replacement	Total
HIV	4	1	5
Hepatitis B	83	5	88
Hepatitis C	66	10	76
Syphilis	38	4	42
Malaria	0	0	0
Total	191	20	211

DISCUSSION

In the present study, total number of blood donors were 7,405. Among them 7235 (97.7%) donors were male donors and 170 (2.3%) donors were females. Various other studies by Agarwal *et al.*, [9] Arya DR *et al.*, [10] and Makroo *et al.*, [11] also revealed similar trends.

94.3% blood donors were voluntary donors and remaining 5.7% were replacement donors. So, majority of the donors were voluntary donors as we have most of the donations from outdoor camps and very few replacement donors. Similar predominance of voluntary donors was noted by Arya *et al.*, [10], Pallavi *et al.*, [12] and Shah *et al.*, [13] in their study. However, the number of replacement donors as compared to voluntary donors was higher in studies done by Makroo *et al.*, [11], Yadav *et al.*, [14] and Agarwal *et al.*, [9] This reflects presence of awareness about blood donation in general population in our area.

In the present study, median age of the donors was 28 years (range 18-62 years). Majority of the donors were in the age group of 21-30 years, 3132 (42.3%). In a study by Yadav *et al.*, [14] the donor population was mostly in the age group of 18-30 years (69.1%), which is comparable to our study. Hilda Fernandes *et al.*, [15] also showed similar results that 6,576 donors (68.5%) of the donors were between 18 to 30 years of age group.

Present study shows that, overall prevalence of Transfusion Transmitted Infections was 2.84%

(211/7405). Other studies, when compared showed an overall prevalence between 2.05% to 4.57%. The seroprevalence of TTI as observed in our donor population was relatively low as compared to other studies. Present study shows that prevalence of HIV, HBsAg, HCV and Syphilis and Malaria among voluntary donors were 0.05%, 1.12%, 0.89%, 0.5% and 0% respectively, while in replacement donors it was 0.01%, 0.06%, 0.13%, 0.05% and 0% respectively.

This variation may be attributed to the increased number of voluntary donations, difference in the sensitivities of ELISA kits used, effectiveness of donor screening to exclude donors with a history of high risk behaviour, pre-donation counselling and self-deferral by donors. On comparison with other studies, the following results were seen, as shown in Table-3.

Present study also showed an interesting case of co-infections among blood donors where one donor was found positive for HIV and Hepatitis C infections at the same time.

Many factors favor co infection including high degree of epidemiological similarity between their mode of transmission. In HIV infected persons an estimated 2-4 million have chronic HBV infection and 4-5 million have HCV co infection [21].

A study by Bhaumik *et al.*, also showed co-positivity for HIV and HBsAg in three donors [22]. Khagesan *et al.*, [23] showed, co infection in 8 (0.09%) donors, 3 cases of HBsAg and syphilis, and 1 case each of HIV and HBsAg, HBsAg and Syphilis. Kumari *et*

al., [24], showed 03 donors, co- infections with HBV and HIV.

Table-3: Comparison between various studies for sero-prevalence of transfusion transmissible infections

Studies	HIV	HBV	HCV	Syphilis	Malaria
Present study	0.06	1.18	1.02	0.56	0.00
Fernandes H <i>et al.</i> , [15]	0.06	0.34	0.06	0.11	0.01
Arya DR <i>et al.</i> , [10]	0.1	1.6	0.18	0.89	0.04
Makroo RN <i>et al.</i> , [11]	0.24	1.18	0.43	0.23	-
Yadav <i>et al.</i> , [14]	0.14	1.77	0.09	0.04	-
Agarwal <i>et al.</i> , [9]	0.14	0.89	0	1.2	0.1
Kumar <i>et al.</i> , [16]	0.26	1.03	1.53	1.74	0.006
Chatoraj <i>et al.</i> , [17]	0.13	0.99	0.19	0.62	0
P. Pallavi <i>et al.</i> , [12]	0.44	1.27	0.23	0.28	0
Gupta A <i>et al.</i> , [18]	0.28	2.03	0.21	0.12	0.03
Shah <i>et al.</i> , [13]	0.21	0.78	0.33	0.34	0
Singh <i>et al.</i> , [19]	0.37	1.79	1.16	0.05	0.01
Rawat <i>et al.</i> , [20]	0.32	1.61	0.73	1.62	0.06

CONCLUSION

Voluntary donations are safer as compared to replacement ones and should be encouraged. Proper efforts in planned way should be made to increase the number of voluntary donors with a target of 100% and reduce replacement donations to a minimum. Therefore, strict selection of blood donors and comprehensive screening of donor's blood using standard methods are highly recommended to ensure the safety of blood for recipient.

This trend suggests that for prevention of TTIs healthy voluntary blood donor recruitment and safe voluntary blood donor retention strategies should be strengthened at all levels in blood transfusion service.

REFERENCES

- Khan, Z. T., Asim, S., Tariz, Z., Ehsan, I. A., Malik, R. A., Ashfaq, B., & Hayat, A. (2007). Prevalence of Transfusion transmitted infections in healthy blood donors in Rawalpindi District, Pakistan—a five year study. *Int J Pathol*, 5(1), 21-25.
- UNAIDS, W. (2017). Global AIDS monitoring. *Geneva: UNAIDS*.
- Shaikh, M., & Bhople, K. S. (2015). Seroprevalence of Transfusion Transmitted infections in blood donors at a rural based tertiary care teaching hospital in India. *IOSR Journal of Dental and Medical Sciences*, 14(10): 29-32.
- NACO. (2017). Blood transfusion services, National AIDS Control Organization, India.
- Panda, M., & Kar, K. (2008). HIV, hepatitis B and C infection status of the blood donors in a blood bank of a tertiary health care centre of Orissa. *Indian Journal of Public Health*, 52(1), 43.
- Paid, V. S. (2006). Unpaid Donors (International forum). *Vox Sanguinis*, 90:63-70.
- National AIDS Control Organization (NACO, India). (2007). Standards for Blood Banks & Blood Transfusion Services. NACO, Ministry of Health and Family Welfare, Government of India, 9-34.
- World Health Organization. (2010). *Screening donated blood for transfusion-transmissible infections: recommendations*. World Health Organization.
- Agrawal, P., Jain, S., Surana, S. S., & Sujanani, S. (2017). Prevalence of Transfusion Transmitted Infections among Blood Donors at a Tertiary care Teaching Hospital in Southern Rajasthan. *Annals of Pathology and Laboratory Medicine*, 4(2), 137-141.
- Arya, D. R., Mahawar, N. L., Pachaury, R., Bharti, A., Sharma, L., & Kumar, H. (2016). Seroprevalence of transfusion transmitted infections among blood donors at a Tertiary Care Hospital Blood Bank in North India. *Indian Journal Health Science*, 9:77-81.
- Makroo, R. N., Hegde, V., Chowdhry, M., Bhatia, A., & Rosamma, N. L. (2015). Seroprevalence of infectious markers & their trends in blood donors in a hospital based blood bank in north India. *The Indian journal of medical research*, 142(3), 317.
- Pallavi, P., Ganesh, C. K., Jayashree, K., & Manjunath, G. V. (2011). Seroprevalence and trends in transfusion transmitted infections among blood donors in a university hospital blood bank: a 5 year study. *Indian Journal of Hematology and blood transfusion*, 27(1), 1-6.
- Shah, M., Shah, S., Gajjar, M., Bhatnagar, N., Soni, S., & Patel, V. (2016). Prevalence of HIV-I/II, HCV, HBsAg & Syphilis in Blood Donors Of Western Region In India. *National Journal of Integrated Research in Medicine*, 7(1), 12-15.
- Yadav, B. S., Varma, A. V., Singh, P., Kumar, R., & Bandi, P. K. (2016). Seroprevalence of Transfusion-transmitted infections (TTIs) in blood donors: A study from Central India. *International Journal of Medical Science and Public Health*, 5(6), 1158-1162.
- Fernandes, H., D'souza, P. F., & D'souza, P. M. (2010). Prevalence of transfusion transmitted

- infections in voluntary and replacement donors. *Indian Journal of Hematology and blood transfusion*, 26(3), 89-91.
16. Kumar, R., Gupta, S., Kaur, A., Jindal, A., & Sharma, H. (2015). Sero-prevalence and changing trends of transfusion transmitted infections among blood donors in a tertiary care hospital. *Indian Journal of Community Health*, 27(1), 25-29.
 17. Col, A. C. L., Col, R. B., & Brig, V. K. (2008). Infectious disease markers in blood donors. *Medical Journal Armed Forces India*, 64(1), 33-35.
 18. Sehgal, S., Shaiji, P. S., & Brar, R. K. (2017). Seroprevalence and Trends of Transfusion Transmissible Infections in Blood Donors in Andaman and Nicobar Islands-An Institutional Retrospective Study. *Journal of clinical and diagnostic research: JCDR*, 11(4), EC21.
 19. Singh, P., Daiya, M., Tandon, S. K., Bairwa, S. P., & Kalhan, S. (2017). Seroprevalence of Transfusion Transmitted Infections among Blood Donors in Delhi, India - A 3 Years Retrospective Study. *Annals of International Medical and Dental Research*, 3(3): 10-13.
 20. Rawat, A., Diwaker, P., Gogoi, P., & Singh, B. (2017). Seroprevalence & changing trends of transfusion-transmitted infections amongst blood donors in a Regional Blood Transfusion Centre in north India. *The Indian journal of medical research*, 146(5), 642.
 21. Alter, M. J. (2006). Epidemiology of viral hepatitis and HIV co-infection. *Journal of hepatology*, 44, S6-S9.
 22. Bhaumik, P., & Debnath, K. (2014). Prevalence of Blood-Borne Viral Infections among Blood Donors of Tripura. *Euroasian journal of hepato-gastroenterology*, 4(2), 79.
 23. Shrestha, A. C., Ghimire, P., Tiwari, B. R., & Rajkarnikar, M. (2009). Transfusion-transmissible infections among blood donors in Kathmandu, Nepal. *The Journal of Infection in Developing Countries*, 3(10), 794-797.
 24. Kumari, S., Kiran, A., Kumar, R., & Shrivastava, R. K. (2017). Prevalence of viral (HBV, HCV and HIV) co-infections among apparently healthy blood donors in Ranchi, Jharkhand, India. *International Journal of Research in Medical Sciences*, 5(6), 2674-2677.