



SEROPREVALENCE OF TRANSFUSION TRANSMITTED INFECTIONS AMONG BLOOD DONORS AT A TERTIARY CARE HOSPITAL BLOOD BANK IN WESTERN RAJASTHAN INDIA

Mahawar N. L., Sonam Alha., Dev raj Arya., Arun Bharti and Shailendra Vashishtha

Department of Immunohaematology and Transfusion Medicine, S.P. Medical College and A. G. of Hospitals, Bikaner, Rajasthan, India

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ABSTRACT

Background: Transfusion-transmitted infections threaten the safety of patients requiring blood transfusion, which in turn imposes serious challenges for the availability of safe blood components that are still affordable in health care systems with limited resources. Strict criteria are followed while selecting a donor so that proper blood free of all pathogens is available for recipient.

Aim: To study seroprevalence of transfusion-transmitted major infections [HIV, hepatitis B virus (HBV), hepatitis C virus (HCV), syphilis, and malaria] among blood donors at a Tertiary Care Government Hospital Blood Bank in Western Rajasthan (North India) and to compare positivity of these markers in voluntary and replacement donors.

Subjects and Methods: This study was conducted over a period of 2 years (July 2015 to June 2017). A total number of donors screened during this period were 55498. Samples were tested for HIV, HBV, HCV, syphilis, and malaria. Samples were Retested if found positive by third generation ELISA tests [HIV, hepatitis B surface antigen (HBsAg), HCV]. Comparative analysis was done using Chi-square for linear trend. Comparison between prevalence rates among voluntary and replacement donors was done using Chi-square tests using primer of biostatistics.

Results: Out of total 55,498 donors, 52,575 (94.73 %) were voluntary and 2,923 (5.27 %) were replacement donors. Male donors predominated, 54,875 (98.88 %) male and female 623 (1.12 %). The prevalence of TTI in blood donors was 2.21%. Average seropositivity of HIV, HBsAg, anti-HCV, syphilis, and malaria was 0.05%, 1.14%, 0.13%, 0.87%, and 0.01% among all donors. Significant difference ($P < 0.001$) in the seropositivity of HIV, HBsAg, HCV, and syphilis were seen between voluntary and replacement donors. Seroprevalence of HIV, HBsAg, HCV, syphilis, and malaria was 0.04%, 1.10%, 0.10%, 0.79%, 0.01%, and 0.24%, 1.85% 0.55%, 2.36%, and 0% in voluntary and replacement blood donor, respectively.

Conclusion: Prevention of TTIs should be the main goal right now. The majority of donors in our country are voluntary, relatives or friends, who are apparently healthy, but transmission of TTIs during serologically negative window period is still a threat to blood safety. Therefore stress should be given on more strict donor screening strategy to decrease TTI cases. Voluntary donations are safer as compared to replacement ones and should be encouraged.

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INTRODUCTION

Blood donation saves the lives of millions of people worldwide; however, the patients are at a potential risk of contracting transfusion-transmitted infections (TTIs), which in turn impose serious challenges to the Health care system for the availability of safe and affordable blood components.

According to the World health organization (WHO), safe blood is a universal right¹.

Blood transfusion is an integral part of medical treatment, and transmission of infectious diseases through donated blood is an alarming situation. Blood transfusion carries the risk of transmitting major infections such as hepatitis, HIV, syphilis, and malaria. In minority cases, viral infections such as cytomegalovirus, herpes virus, and Epstein-Barr virus along with toxoplasmosis and brucellosis may be transmitted². Apparently healthy donor can transmit an infection during

*Corresponding author: Mahawar N. L

Department of Immunohaematology and Transfusion Medicine, S.P. Medical College and A. G. of Hospitals, Bikaner, Rajasthan, India

asymptomatic phase, further increasing the prevalence of various infections in general population³. The prevalence of TTIs in voluntary donors is lower than among replacement⁴ and paid donors⁵⁻⁶. Therefore, TTI risk is reduced in blood collected from low risk population⁷.

Estimated adult HIV prevalence in India is 0.2–0.3%⁸, and up to 40 million of 350 million hepatitis B chronic carriers worldwide are in India⁹. Hepatitis B surface antigen (HBsAg) prevalence varies from 1% to 13%, with an average of 4.7%¹⁰. HCV carriers in India are around 12–13 million¹¹.

In pursuit of global blood safety, the World Health Organization (WHO) recommends that all blood donations should be screened for evidence of infection prior to the release of blood and blood components for clinical or manufacturing use¹². According to WHO guidelines, the screening of all blood donations should be mandatory for HIV, HBV, HCV and syphilis. Transfusion-transmissible infections (TTIs) have been drastically reduced in countries where routine serologic screening of donors is implemented¹³⁻¹⁴. Nevertheless, there are still risks of TTIs due to the limitations of virus detection techniques. The median prevalence rate of TTIs in blood donations in middle- and low income countries is much higher than that in high-income countries¹⁵. TTIs remain a significant threat to blood safety, causing grave concerns in many developing countries.

The aim of the present study was to find out prevalence of transfusion transmitted infections (TTI) in voluntary and replacement donors reported at blood bank attached to Government Medical College Hospital in Western Rajasthan (North India).

SUBJECTS AND METHODS

The present retrospective study was done over a period of 2 years (July 2015 to June 2017) at associated group hospital blood bank, S.P. Medical College, Bikaner; which is a Tertiary Care Hospital in North India and caters patients from Western Rajasthan, Punjab, Haryana, U.P, M.P. & Bihar. Donors were carefully screened and counseled (pretest) by trained personnel after complete medical examination and satisfactorily answering the donor questionnaire¹⁶.

Voluntary blood donors (VBD) give blood without incentive for the cause either in the form of money or in kind which could be considered a substitute for money¹⁷. Replacement blood donors (RBD) donate blood as a replacement for blood units to be supplied for their relative/known patients. Blood donation is not accepted from paid/professional donors at our centre.

A total 55,498 blood units were collected during July 2015 to June 2017(2 years period) in voluntary blood donation camps and at blood bank. About 2 ml of blood samples were collected in pilot test tubes at the time of bleeding and screened for anti-HIV 1 and 2, HBsAg, and anti-HCV, using commercially available third-generation ELISA test kits, for syphilis was done by card test (for both IgM and IgG), and for malaria antigen was done by rapid malaria test. All these tests were performed by trained personnel under supervision of medical officer in well-equipped TTI laboratory at blood bank, and standard protocol prescribed by manufacturer of the test kits was followed strictly. Known positive and negative samples

were used randomly as external controls in each screening. All reactive samples were retested before being labeled as seropositive. Positive blood units were discarded according to standard protocol by autoclaving and sent for incineration afterward. Comparative analysis of data was done using Chi-square for trend and prevalence rates were also compared among VBD and RBD using Chi-square test. Seropositive donors were contacted telephonically to report for post test counseling and advised to consult in Medicine Department and STD Clinic in the same hospital for further management. Results were compared by statistical calculation in primer of biostatistics.

RESULTS

Total 55,498 donors including 52,575 (94.73 %) voluntary and 2,923 (5.27 %) replacement donated during Blood study period. Voluntary blood donation camps were held average 75-80 per year in Bikaner city and nearby Rural and Urban areas. Replacement Blood donors are mostly from Bikaner city, surrounding districts, nearby areas of Punjab, Haryana, MP and UP. Male donors predominated, 54,875 (98.88 %) were male and 623 (1.12 %) were female (TABLE 1).

Table 1 Gender wise distribution of blood donors according to voluntary or replacement status

	M	F	Total	Percentage
V	51959	616	52575	94.73%
R	2916	7	2923	5.27%
Total	54875	623	55498	
Percentage	98.88%	1.12%		

Total 1226 donors were seropositive for either of TTIs, which was 2.21%. Average seropositivity of HIV, HBsAg, anti-HCV, syphilis, and malaria were 0.05%, 1.14%, 0.13%, 0.87%, and 0.01% among all donors respectively (TABLE 2).

Table 2 Seropositivity among blood donors

TTI'S	Total (1226)	Percentage
HIV	29	0.05%
HBSAg	633	1.14%
HCV	72	0.13%
VDRL	485	0.87%
MP	7	0.01%

The prevalence of HIV among RBD was 0.24%, whereas in VBD 0.04% (TABLE 3).

Table 3 HIV positivity among voluntary and replacement blood donors

HIV Status	Voluntary	Replacement	Total
Positive (%)	22 (0.04)	7 (0.24)	29 (0.05)
Negative	52553	2916	55469
Total	52575	2923	55498

$$\chi^2 = 17.04 \quad p < 0.0001$$

HBsAg positivity among RBD was 1.85% whereas in VBD 1.10 % (TABLE 4).

Table 4 HBsAg positivity among voluntary and replacement blood donors

HBsAg Status	Voluntary	Replacement	Total
Positive (%)	579 (1.10)	54 (1.85)	633 (1.14)
Negative	51996	2869	54865
Total	52575	2923	55498

$$\chi^2 = 12.64 \quad p < 0.0001 \quad \text{HBsAg: hepatitis B surface antigen}$$

HCV positivity among RBD was 0.55% whereas in VBD 0.10% (TABLE 5). Positivity for Syphilis was 2.36% in RBD and 0.79% in VBD (TABLE 6).

Table 5 HCV Positivity in voluntary and replacement blood donors

HCV Status	Voluntary	Replacement	Total
Positive (%)	56 (0.10)	16 (0.55)	72 (0.13)
Negative	52519	2907	55426
Total	52575	2923	55498

$\chi^2 = 37.95$ $p < 0.0001$ HCV: HepatitisC virus

Table 6 Syphilis positivity in voluntary and replacement blood donors

Syphilis Status	Voluntary	Replacement	Total
Positive (%)	416 (0.79)	69 (2.36)	485 (0.87)
Negative	52159	2854	55373
Total	52575	2923	55498

$\chi^2 = 74.53$ $p < 0.0001$

Malaria positivity among RBD was 0% and 0.01% in VBD (TABLE 7). Significant difference ($P < 0.05$) in the seropositivity of HIV, HBsAg, HCV, and syphilis were seen between voluntary and replacement donors while in malaria it was not significant ($p > 0.05$).

Table 7 Malaria positivity in voluntary and replacement blood donors

Malaria Status	Voluntary	Replacement	Total
Positive (%)	7 (0.01)	0 (0)	7 (0.01)
Negative	52568	2923	55491
Total	52575	2923	55498

$\chi^2 = 0.049$ $p = 0.824$

Table 8

Place	HIV (%)	HBsAg (%)	HCV (%)	Syphilis (%)	Malaria (%)	Author
Ludhiana ²⁰	0.08	0.66	1.09	0.85	-	Gupta <i>et al.</i>
Bahnपुरa, M.P. ²¹	0.51	2.90	0.57	0.23	-	Sawke <i>et al.</i>
Hariyana ²²	0.30	1.7	1.0	0.9	-	Arora <i>et al.</i>
Andhra Pradesh ²³	0.39	1.41	0.84	0.08	-	Bhawani <i>et al.</i>
Baroda ²⁴	0.30	0.85	0.21	0.25	-	Patel <i>et al.</i>
Mangalore ²⁵	0.06	0.34	0.06	0.11	-	Fernandes <i>et al.</i>
Lucknow, U.P. ²⁶	0.23	1.96	0.85	0.01	-	Chandra <i>et al.</i>
Kolkata ²⁷	0.32	1.55	0.35	0.35	-	Das BK <i>et al.</i>
Delhi ²⁸	0.56	2.33	0.66	-	-	Pahuja <i>et al.</i>
Present Study	0.05	1.14	0.13	0.87	0.01	Sonam <i>et al.</i>

DISCUSSION

Transfusion of blood and blood components are life saving measures and help people world wide. At the same time, blood transfusion is an important mode of transmission of infection to the recipients. In developing countries the prevalence of TTI is much higher and quite far from attaining a zero risk level at the present moment. Ensuring safe blood transfusion requires a number of standardized processes from recruitment of voluntary non-remunerated donors to delivery of safe blood to the recipient. Stringent screening of donors for transfusion transmissible infections is crucial to ensure safe supply of blood and blood components.

Blood transfusion services not only screen the blood donor but also give a clue about the rate of prevalence of TTD in asymptomatic healthy young adults. It can be considered as a reliable tool for statistical estimation of these infections in the general population. According to some authors, blood donors may not be considered as representative of general population.

The prevalence rate may be under or overestimate due to their different gender, age, area of residence, and other characteristics¹⁸. It can suggest to make strategies to identify, recruit, and retain VBD from low-risk population, as blood donors with high-risk group such as history of jaundice, injectable drug abuse, and multiple sexual partners have been screened out by donor questionnaire at our center and also in blood donation camps. Blood transfusion is an important preventable modality of spread of TTI. Accurate estimation of risk of TTIs is essential for monitoring of blood safety and efficacy of currently employed screening programs as discussed by NACO guidelines¹⁷. It has been found that prevalence of various TTD varies with different geographical regions¹⁹.

The HIV prevalence of (0.05%) over a period of 2 years is lower as compared to other Indian studies.^{20,21,22,23,24,25,26,27,28} The prevalence of HBV (1.14%) is lower than other studies except Gupta *et al.*²⁰ Patel *et al.*²⁴ and Fernandes *et al.*²⁵ The prevalence of HCV (0.13%) is lower than other studies except Fernandes *et al.*²⁵ In this study, the prevalence of syphilis was found to be 0.85% which was higher in comparison to other studies except Arora *et al.*²² The prevalence of malaria in our study was 0.01%.

CONCLUSION

Blood is still one of the main sources of transmission of hepatitis B, hepatitis C, HIV, and syphilis. The majority of donors in our country are voluntary, relatives or friends, who are apparently healthy, but transmission of TTIs during serologically negative window period is still a threat to blood safety. Hence, strict selection of blood donors with the emphasis on getting voluntary donors and comprehensive screening of donors for TTIs using standard methods are highly recommended to ensure the safety of blood for recipient.

Prevention of TTIs should be the main goal right now. 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. Professional/paid blood donors were excluded in our study by avoiding them for blood donation as they were unsafe. Voluntary donors were found to be safer as compared to replacement donors. We have observed significant difference in VBD and RBD.

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