

Seroprevalence of Transfusion Transmissible Infections Among Voluntary Blood Donors at a Tertiary Care Teaching Hospital in Rural Area of India

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ABSTRACT

Background: Blood transfusion is a life-saving measure in various medical and surgical emergencies. Transfusion medicine, apart from being important for the medical treatment of each patient, also has great public health importance. **Objectives:** The present study was conducted to estimate the prevalence of transfusion transmitted infections in voluntary blood donors at a rural tertiary care teaching hospital in western Maharashtra, India. **Materials and Methods:** All voluntary donors reporting to the blood bank were screened for HBsAg, Hepatitis C Virus (HCV), HIV and Syphilis by using the appropriate enzyme-linked immunosorbent assay. HIV infection was confirmed using a standard immunoblotting technique. Hepatitis B Virus (HBV) was tested for surface antigen (HBsAg) and HCV by the immunochromatographic method. The Venereal Disease Reference Laboratory (VDRL) test was used for estimation of syphilis infection. The study was designed for a duration of two years between January 2009 to December 2010. Medical reports of the donors were accessed from the hospital records and analyzed. **Results:** A total of 5661 voluntary blood donors were screened, of which 5394 (95.28%) were males and 267 (4.72%) were females. The overall seroprevalence of HBV and HCV were 1.09% and 0.74% respectively; for HIV and syphilis the seroprevalence was estimated to be 0.07% for each. **Conclusion:** Blood is still one of the main sources of transmission of infections. HIV, hepatitis B, hepatitis C viruses and syphilis are prevalent among voluntary donors in rural India.

Keywords: Seroprevalence, transfusion transmissible infections, voluntary blood donors

Introduction

India is the second most populous nation in the world. The Indian subcontinent is classified as an intermediate Hepatitis B Virus (HBV) endemic (HBsAg carriage 2-7%) zone and has the second largest global pool of chronic HBV infections.^[1] India has a population of more than 1.2 billion with 5.7 (reduced to 2.5) million Human Immunodeficiency Virus (HIV) positive, 43 million HBV positive and 15 million HCV positive persons. The risk of transfusion transmission of these viruses may be alarming due to high seroprevalence of HIV, anti-HCV, and HBsAg (0.5%, 0.4%, and 1.4%, respectively) among blood donors.^[2] Safety assessment of the blood supply, the quality of screening

procedures and the risk of transfusion transmitted infectious diseases (TTIs) in any country can be estimated by review and analysis of the records of blood donors for screening procedures and the prevalence of serological markers of infectious diseases. Blood transfusion has been used since 1930 for various indications.^[3] Transfusion therapy is a well-established treatment in various medical and surgical procedures.^[4] Transfusion medicine, apart from being important for the medical treatment of each patient, also has a great public health importance worldwide.^[5] After the introduction of the blood banks and better storage techniques, it became more widely used.^[6] Blood is one of the major sources of transmission of hepatitis B, hepatitis C, HIV, syphilis, and many other diseases.^[5,7] Discovery of these hazards brought a dramatic change in attitude of physicians and patients about transfusion of blood.^[8] It is mandatory to test each donor's blood for syphilis by a Venereal Disease Reference Laboratory (VDRL), and for HBsAg, anti-HCV, and anti-HIV.

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In July 1989, consequent to the reports of high seroprevalence in commercial blood donors, mandatory screening of blood and blood products for HIV antibodies was initiated by Indian National AIDS Control Origination (NACO).^[9] The objective of this study is to estimate the seroprevalence of transfusion transmitted infections among voluntary blood donors at a rural tertiary healthcare teaching hospital in western Maharashtra. This knowledge might give us the idea of disease burden of the society and the basic epidemiology of these diseases in the rural community.

Materials and Methods

A retrospective hospital record-based study was conducted at the blood bank of a rural tertiary care teaching hospital in Maharashtra, India. Data were collected for a period of 2 years from January 2009 to December 2010. Sera of civilian residents from various localities and of different age groups, who donated blood voluntarily was screened for HIV, HBsAg, HCV, and syphilis. A total of 5661 blood units were collected and studied. The ethics committee of the institute approved the study. No professional or honorary donor was bled. Exclusion criteria for blood donation were current history of medication, recent history of having undergone a surgical procedure, serious illness, previous blood transfusions, weight <50 kg, age <18 and >60 years, pregnant and lactating women.

Data collection

The outcome variable was serological status of the selected individual, whether positive or negative for any TTIs, which was determined from a blood sample.

Sample collection and laboratory testing

Five milliliter blood each was collected from subjects into plain, sterile bottle following informed consent. Blood samples were centrifuged and the sera were separated and analyzed. Two kits were used based on WHO recommendation of two different testing strategies involving enzyme-linked immunosorbent assay (ELISA) and/or simple or rapid assays for surveillance. Samples were analyzed for antibodies to HIV 1 and 2, HBsAg and HCV by ELISA. Test for syphilis was done by VDRL. Any serum found reactive by the first assay was retested using a second assay based on different antigen preparations and/or different test principle using the anti-HIV test, HBsAg which is an immunochromatographic sandwich assay and HCV by the anti-HCV test. The validity of the test is assured as per the given criterion and the results were computed.

Statistical analysis

The data entry was carried out using Microsoft Office Excel worksheet and percentage and proportions for each variable was calculated. The chi-square test and Fisher's exact test were used as a test of significance.

Results

In the present study, out of total 5661 voluntary blood donors, 5394 (95.28%) were males and 267 (4.72%) were females which shows predominance of males as compared to females for the two studied years [Table 1].

The prevalence of HBsAg, anti-HCV, VDRL, and anti-HIV among voluntary blood donors in the study population is showed in Table 2. The overall seroprevalence of HBV and HCV was 1.09% and 0.74% respectively, while the prevalence of VDRL and HIV was 0.07%. The highest prevalence was observed for HBV followed by HCV, syphilis and HIV in decreasing order.

All infections summed together the highest prevalence (55.75%) was within the age group 21-30 years, followed by 36.28% within the age group 31-40 years, with the lowest prevalence was observed with in the age group of <20 years (1.76%) and ≥51 (0.88%) [Table 3].

With respect to the individual TTIs, it is observed that the prevalence of HBV was highest within at the age groups <20 years (100%), HCV within the age group between 31 and 40

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

Year	Total	Male	Female
2009	2724	2598 (95.37)	126 (4.63)
2010	2937	2796 (95.19)	141 (4.81)
Total	5661	5394 (95.28)	267 (4.72)

Figures in parenthesis indicate percentage

Table 2: Prevalence of HBsAg, anti-HCV, VDRL, and anti-HIV among voluntary blood donors in the study population

Year	Total no. of blood donors	HBsAg		HCV		VDRL		HIV	
		No.	%	No.	%	No.	%	No.	%
2009	2724	25	0.91	15	0.55	02	0.07	01	0.03
2010	2937	37	1.25	27	0.91	02	0.06	03	0.10
Total	5661	62	1.09	42	0.74	04	0.07	04	0.07

HBsAg: Hepatitis B surface antigen; HCV: Hepatitis C Virus; VDRL: Venereal disease research laboratory; HIV: Human immunodeficiency virus

Table 3: Distribution of blood donors with transfusion transmitted infections according to the age

Age (years)	HBsAg*		HCV**		Syphilis***		HIV****		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
≥20 [#]	02	100.0	00	00	00	00	00	00	02	1.76
21-30 [#]	35	55.55	21	33.33	03	4.76	04	6.34	63	55.75
31-40 [^]	22	53.65	18	43.90	00	00	01	2.43	41	36.28
41-50 [^]	03	50.00	02	33.33	01	16.66	00	00	06	5.30
≥51 [^]	00	00	01	100.0	00	00	00	00	01	0.88
Total	62	54.86	42	37.16	04	3.53	05	4.42	113	100.0

HBsAg: Hepatitis B surface antigen; HCV: Hepatitis C Virus; HIV: Human immunodeficiency virus;

* $\chi^2=0.102$, d.f=1, P value=0.749 (not significant). ** $\chi^2=1.097$, d.f=1, P value=0.295 (not significant).

Fisher's exact test P value=0.635 (not significant). *Fisher's exact test P value=0.392 (not significant).

[#],[^]Data pooled and the Chi-square test reapplied

years (43.90%), syphilis within the age group between 41 and 50 years (16.66%) and HIV between 21 and 30 years (6.34%). The difference of the prevalence of transfusion transmitted diseases among different age groups was statistically not significant ($P>0.05$).

As mentioned in Table 4 that the prevalence of hepatitis B and syphilis was higher among males as compared to females (58.09% and 3.80%) respectively, while for hepatitis C, it was higher among females as compared to males (62.50%), the difference of prevalence by sex was statistically significant ($P<0.05$).

Discussion

Blood transfusion is an integral and life-saving procedure of modern medicine, but simultaneously it carries the risk of transmitting the life threatening transfusion transmissible infectious. HIV, hepatitis B, and hepatitis C are major public health problems in developing countries. They are transmitted parenterally, vertically, or through high-risk sexual behaviors and can cause fatal acute and chronic life-threatening disorders. Blood transfusion is a potential route of transmission of these TTIs.^[10,11] Screening of blood is now mandatory for many diseases and is undertaken routinely in blood banks. Transmission of TTIs during the serologically window period still poses a threat to blood safety in environments where there is high rate of TTIs. HBV and HCV are the two established causes of post transfusion hepatitis. The prevalence of TTIs among the Indian blood donors is reported to be ranging as follows; HBV – 0.66% to 12%, HCV – 0.5% to 1.5%, HIV – 0.084% to 3.87%, and syphilis – 0.85% to 3% respectively.^[12]

The present study revealed seroprevalence of HBV at 1.09% among the donors which is similar to findings by Chatteraj *et al.*,^[12] Kaur *et al.*,^[13] and Singh B *et al.*,^[14]. Variable results of 0.66%,^[15] 2.45%,^[7] 3.44%,^[16] 5.86%,^[17] 25%^[18] have also been reported in various other studies. Seroprevalence of HBV among blood donors differs. The major route of HBV transmission is parenteral and it is most infective among blood-borne viruses and chronic carrier state is associated with chronic liver disease, cirrhosis and hepatocellular carcinoma.

HCV infection is an evolving public health problem globally. For hepatitis C, the estimated prevalence in this study was 0.74%, similar to that reported by the other studies 0.79%,^[12] 0.88%^[19]

and 0.78%^[13]; whereas a few studies reported much lower level of prevalence such as 1.09%,^[15] 1.57%,^[20] 2.8%,^[21] and 6.21%^[17] and a yet another set of studies reported it to be at higher levels of 0.28%^[16] and 0.50%.^[14] Transmission of HCV is primarily through blood exposure and majority of the infected persons progress to chronic infection and chance of cirrhosis and hepatocellular carcinoma is more as compared to HBV. Blood is one of the main sources of transmission of Hepatitis C; hence, donor selection is of paramount importance.

In the present study, the prevalence of HIV was found to be 0.07%. Similar findings by Gupta *et al.*,^[15] and Tiwari *et al.*,^[22] reported 0.084% and 0.054% prevalence of HIV among blood donors, whereas lower seroprevalence of 0.0%^[17] and higher seroprevalence of 0.13%,^[12] 0.19%,^[23] 0.26%,^[13] 0.47%,^[16] 3.8%^[24] and 11.7%^[18] have been reported.

For syphilis, the seroprevalence was found to be 0.07% in the present study, which was much lower than reported by other studies 0.85%^[15] and 1.2%.^[17]

Regarding sex, the study found that blood transfusion transmitted diseases are more prevalent among males than females, the difference of prevalence by sex was statistically significant ($P<0.05$), which was comparable to other studies.^[7,17] A sex-wise difference in seroprevalence might be due to differences in the risk behavior.

Availability of safe blood for transfusion is a must for the recipients and the community as well. This can be achieved by vigorous screening of donors and donated bloods. Effective control strategies including a sensitive and stringent screening of all blood donors, public awareness programs, and institution of adequate public health measures are urgently needed. It may be possible through proper donor selection and education, uniform implementation of laboratory screening tests, and adequate supply of blood through voluntary blood donations along with restriction of donation by professional donors.

Limitations

Most of the previous studies were from urban areas; this report is first of its kind from rural area of western Maharashtra, India. The major limitation of the study is that there is no previous data available from this rural area for comparison and analysis of trends. Hence, we hereby recommend for future studies to look into trends for TTIs from this area.

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 this study found that these diseases are prevalent among donors. Hence, strict selection of blood donors with the emphasis on getting voluntary donors and comprehensive screening of donors for TTIs using standard

Table 4: Distribution of blood donors with transfusion transmitted infections according to the sex

Sex	Hepatitis B*		Hepatitis C**		Syphilis***		HIV ****		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Male	61	58.09	37	35.23	04	3.80	03	2.85	105	92.92
Female	01	12.50	05	62.50	00	00	02	25.00	08	7.08
Total	62	54.86	42	37.16	04	3.53	05	4.42	113	100.0

HIV: Human immunodeficiency virus; *Fisher's exact test P value=0.0219 (significant). **Fisher's exact test P value=0.0453 (significant). ***Fisher's exact test P value=1.0000 (not significant). ****Fisher's exact test P value=0.0400 (significant)

methods are highly recommended to ensure the safety of blood for recipient.

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