Original Article

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Seroprevalence of Transfusion Transmissible Infections (TTIs) in Blood Donors: A 5 Year Study

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Abstract

Objective: Blood transfusion is an important mode of transmission of infections to recipients. With every one unit of blood transfusion there is 1% chance of transfusion related complications including Transfusion Transmissible Infections (TTIs). This study was designed to determine the prevalence of Human Immunodeficiency virus (HIV), Hepatitis B, Hepatitis C and syphillis infections among blood donors. *Materials and Methods:* Total number of 26617 units of blood were collected from healthy voluntary donors and tested for HIV I & II Hepatitis B surface Antigen, Hepatitis C and Syphilis. This study was done during the period of 2011 to 2015 at SBHGMC hospital blood bank, Dhule. *Results:* It was observed that 33(0.12%) tested positive for HIV, 360(1.35%) were positive for HBsAg,17 (0.06%) were positive for HCV and 13(0.05%) were positive for syphilis. Total 423 Units (1.59%) of blood were discarded due to presence of infective agents. *Conclusions:* Strict quality control, selection of donors by proper counseling and training of blood transfusion personnel including deferring of suspected donors may help in improving the blood safety.

Keywords: Voluntary; Replacement; Transfusion Transmissible Infections.

Introduction

Blood transfusion, an integral part of medicine and surgery, also carries the risk of transfusion-transmissible infections (TTI) like Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Human Immunodeficiency Virus (HIV), Syphilis, malaria and infrequently toxoplasmosis, brucellosis and viral infections like Cytomegalo Virus (CMV), Epstein Barr Virus and Herpes [1]. Infections such as HIV, HBV, HCV are of great concern because of their prolonged viraemia and carrier or latent state [2]. According to WHO cataloguing, globally there are 34 million people were living with HIV at the end of 2011[3]. Approximately 30% of the world's population or about 2 billion persons have serological evidence of either a current or past infection with HBV [4]. The global prevalence of HCV is around 2% with 170 million people[5]. An increase in TTI has also been reported in India . India is already carrying a burden of 50 million of HBV carriers[6] and 2.27 million of HIV cases[7]. In India prevalence rate of HCV is approximately 1.8%- 2.5% [5]. Measuring their severity and to hold back the transmission to minimum, WHO has recommended pre-transfusion blood test for HIV, HBV, HCV and Syphilis as mandatory [8].

Preventing the TTI in developing countries is difficult as the resources required are not always available even when policies and strategies are in place. These strategies have been extremely effective but transmission of diseases still occurs, primarily because of the inability of the test to detect the disease in the pre-seroconversion or 'window' phase of their infection [9]. Although blood transfusion can be life-saving, there is an associated risk of an error in the entire process of the transfusion chain, right from the selection of the donors to the testing of patients and we are far from achieving a zero risk status Only continual improvement, careful donor selection, proper selection of the sensitive screening tests, adequate quality control measures and effective inactivation procedures can ensure the elimination,

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or at least reduction, of the risk of acquiring transfusion transmitted infections [10].

The present study aimed to estimate the prevalence of HIV, HBV, HCV and Syphilis infections among blood donors so as to increase the awareness of infection related complications of blood transfusion in the community.

Materil and Methods

The present study was conducted in Shri Bhausaheb Hire Government Hospital and Blood Bank Dhule. A total of 26617 donors were analyzed for the prevalence of TTI over a period of 5 years from Jan 2011 to December 2015. The voluntary donors included donors from the various camps organized by blood bank from time to time in and around the city, walk in donors, students and employees of the institution and neighbouring colleges. The replacement donors primarily consisted of friends, family members or close relatives of the patient. A detailed pre-donation questionnaires were included in the donor registration form. Information regarding risk factors, past history of surgery, prior hospitalization, history of blood transfusion and donation, occupation, high risk behavior, history of vaccination, was recorded. Pre-donation counselling regarding procedure of blood donation, post donation care and the outcome of donation i.e. TTIs test was also done. Hemoglobin estimation which is very helpful to exclude the professional donors was also performed. The blood samples were screened for detecting infection of HIV, HBV, HCV all by 3rd generation ELISA methods using NACO approved commercially available kits. Screening for syphilis was done by Rapid Plasma Reagin (RPR) method. Tests were performed according to the manufacturers instructions. All the reactive samples were tested in duplicate before labeling them seropositive. The donated blood was discarded whenever the pilot donor sample was found positive for any TTI.

Result

Of the 26617 consecutive blood donors included in the study, 4338(16.30%) were replacement donors, whereas 22279(83.70 %) were voluntary donors [Table 1]. Out of the total donors 19897(74.75%) were male while 6720(25.24%) were female donors. Number of male donors were more than female donors in all 5 years [Table 2]. Out of the 26617 blood donors, 423(1.59%) were tested reactive for TTI. The gender distribution of donors who were positive for TTI is summarized in [Table 3]. The overall seroprevalence of HIV, HBV, and HCV and syphilis were found to be 0.12%, 1.35 %, 0.06%, 0.05% respectively [Table 4].

In the present study HBsAg positive cases were the most common TTI among the positive donations and syphilis was the least positive among these donations.

Trend over the five years showed that HBV prevalence declined from 1.42% in 2011 to 1.16% in 2015. There was decrease in prevalence of HIV from 0.20% in 2011 to 0.07% in 2015. Fluctuations were seen in prevalence of HCV. Prevalence of syphilis declined from 0.09% in 2011 to 0.00 in 2015.

Table 1: Distribution of voluntary and replacement collection among total blood donors

Year	Total no of donors	Voluntary collection		Replacement collection	
		NO	%	NO	%
2011	5482	3884	70.85	1598	29.15
2012	5704	4762	83.48	942	16.52
2013	5141	4340	84.42	801	15.58
2014	4761	3783	79.46	978	20.54
2015	5529	5510	99.65	19	0.35
TOTAL	26617	22279	83.70	4338	16.30

Table 2: Distribution of male and female donors among total blood donors

Year	Total no of donors	Male donors		Female donors	
		NO	%	NO	%
2011	5482	4101	74.80	1381	25.19
2012	5704	4318	75.70	1386	24.29
2013	5141	3928	76.40	1213	23.59
2014	4761	3540	74.35	1221	25.64
2015	5529	4010	72.52	1519	27.47
TOTAL	26617	19897	74.75	6720	25.25

Table 3: Distribution of male and female donors among positive cases

Year	Positive cases	Voluntary		Replacement	
		Male	Female	Male	Female
2011	97	90	1	06	0
2012	96	86	2	08	0
2013	85	80	0	05	0
2014	76	70	0	06	0
2015	69	65	0	04	0
Total	423	391	3	29	0

Table 4: Prevalence of TTI among blood donors in the year 2011-2015

Year	Total no of donors	HIV Positive cases		HBs Ag Positive cases		HCV Positive cases		Syphilis Positive cases		Total positive cases	
		No	%	No	%	No	%	No	%	No	%
2011	5482	11	0.20	78	1.42	03	0.05	05	0.09	97	1.77
2012	5704	08	0.14	78	1.36	06	0.10	04	0.07	96	1.68
2013	5141	05	0.09	76	1.47	02	0.03	02	0.03	85	1.65
2014	4761	05	0.10	64	1.34	05	0.10	02	0.04	76	1.60
2015	5529	04	0.07	64	1.16	01	0.02	00	00	69	1.24
TOTAL	26617	33	0.12	360	1.35	17	0.06	13	0.05	423	1.59

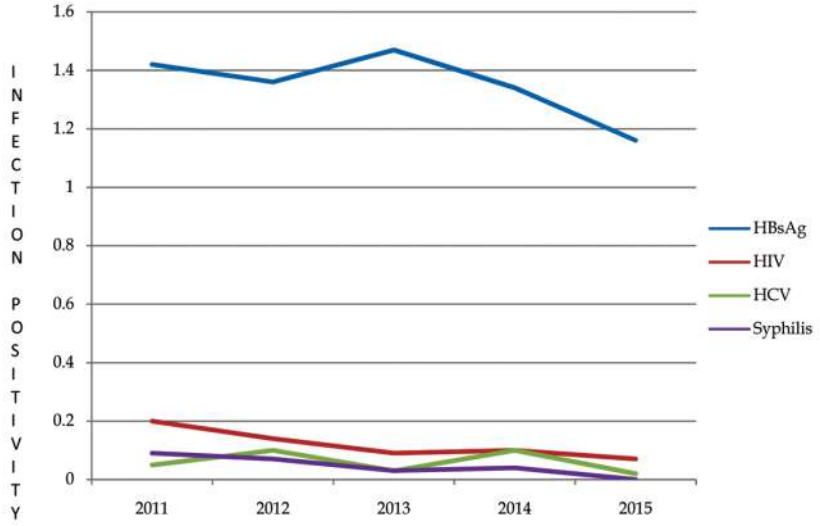

Fig. 1: Yearly prevalence rate of TTIs in Blood Donors at a hospital blood bank from 2011-2012

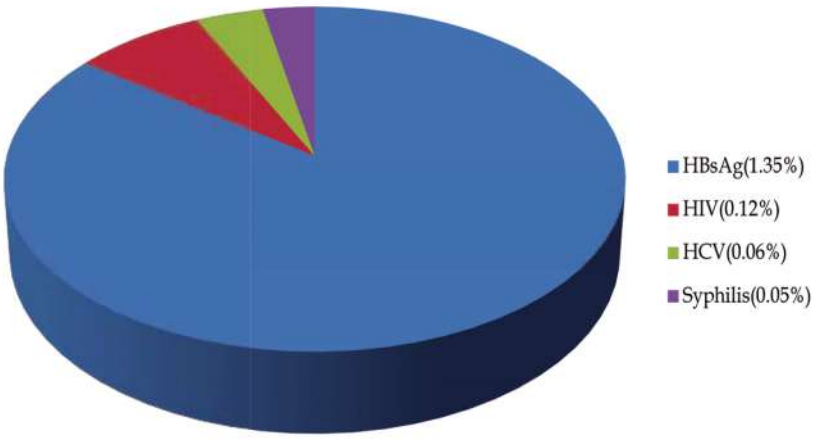

Fig. 2: Pie chart showing the number of TTIs among total donors

Discussion

Of the 26617 consecutive blood donors included in the study, 16.30% were replacement donors, whereas 83.70% were voluntary donors. There was drastic decrease in replacement donors in 2015 as strict emphasise was given to voluntary collection.

Percentages of female donors have been low for all the 5 years. Similar trend has been noted in earlier reports also [11,13]. This could be due to high incidence of anaemia in the Indian women especially in the child bearing age. Though they are likely to be disqualified while being screened for blood donation; efforts should be made to improve the numbers of female donors by spreading awareness among female population.

In the present study overall prevalence of TTI is 1.59% which is higher than other studies [9,11] and lower than study of Gupta N et al [12] but correlates well with study conducted by Shastri

Jayagauri, et al [14]. This may be due to variation in the population or may reflect an increased burden of infection in the community. Low prevalence may actually suggest the underestimation of prevalence by currently used screening tests which can't detect cases during the window period. Our study shows 1.35% prevalence for Hepatitis B which is lower as compared to other study [15]. Seroprevalence of HBV in blood donors is different in various countries. It is reported as 0.1-0.5 in normal population in the United States and Western Europe, whereas the prevalence rate of 5 to 20% has been reported in Far East and in some tropical countries [16]. In the present study though the seroprevalence of HBsAg is declining from 2011 to 2015; it is greater than other TTI. However, screening of blood donors for HBsAg does not totally eliminate the risk of HBV infection through blood transfusion [17] since the absence of this marker in the serum does not exclude the presence of HBV DNA [18]. It is possible that, donors with occult HBV infection, who lacked detectable HBsAg but whose exposure to HBV infection was indicated by a positive anti-HBc and HBV DNA, are a potential source of HBV infection [19].

In India there are around 2 to 3 million HIV infected people with the prevalence of 0.31% among adults [20] . In our study, the overall seroreactivity was 0.12% for HIV which is slightly lower than the national average. Declining HBs Ag and HIV prevalence probably reflects greater awareness and wider acceptance of health care measures and use of disposable syringes. Amongst various studies conducted in India lowest (0.06%) prevalence of HCV has been shown by Hilda Fernandes et al, 2010 [11] and the higher one (1.09%) has been shown by Gupta N, et al 2004[12] . In our study the overall prevalence of HCV was 0.06% but there were fluctuations from 2011 to 2015. Our study showed syphilis positive rate of 0.05% which correlates well with the study conducted by Piyush et al [9] and lower than the other studies conducted in various parts of India [9,11,14] . A very low prevalence rate in our study may also be attributed to strict screening criteria while selecting donors.

A total number of 423 units of blood were discarded due to presence of infection. Though the seroprevalence of TTIs is lower and decreasing , donor counselling before donation, and reporting the results of the tests after donation with follow-up counselling to prevent further transmission of the infection are the most important aspect on which we all need to work hard. Encouraging younger members of the population who have not had blood transfusions to donate blood may also decrease the chances of transmission of TTIs.

Screening of blood bank donors for TTI do not totally eliminate the risk of infection as currently used methods can't detect cases during the window period. Routine anti-HBc (Antibody to core Antigen) screening of blood donors could possibly prevent some transfusion-transmitted HBV infections from blood donors. Certain studies have used more sensitive methods such as Polymerase chain reaction (PCR) and Nucleic Acid Testing (NAT) that can uncover latent infections in the window period and may actually suggest underestimation of prevalence by currently used screening tests in our study. This implies that screening for TTIs needs to be upgraded across blood banks in India.

Conclusion

Overall prevalence of all four TTIs in our blood bank was 1.59%. Thus the present study concludes that in view of the current prevalence rate of TTIs, stringent measures need to be taken for blood donor screening by using more sensitive methods that could detect the agents of TTIs even during the window period. Programs about voluntary blood donation and transfusion transmitted disease awareness should be conducted frequently. Further transmission of the infection in the community can be prevented by reporting the results of the tests and follow-up counselling with treatment.

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