

Prevalence of Transfusion Transmissible Infections among Blood Donors in a tertiary care Hospital of Mysuru District – A six years study.

ABSTRACT

Introduction: Blood transfusion remains a substantial source of transmissible infection in India. The prevalence of transfusion transmissible infections (TTIs) like HIV, HBV, HCV, syphilis and malaria in blood donation is important for evaluating blood safety and potential risks to the population.

Aims: To determine the prevalence of HIV, HBV, HCV, [Syphilis-syphilis](#) and [Malaria-malaria](#) among blood donors in a tertiary care hospital.

Study design:

Place and Duration of Study: A retrospective review of donors record over a period of 6 years between 2009 to 2014 was done at the regional blood transfusion centre (RBTC) in a tertiary care hospital of Mysuru, Karnataka, India.

Methodology: A total of 50,279 healthy donors were screened for HIV, HBV, HCV, [Syphilis-syphilis](#) and [Malaria-malaria](#). Screening for HIV, HBV and HCV was done by ELISA. Screening for [Syphilis-syphilis](#) and [Malaria-malaria](#) was done by Rapid Plasma Reagin (RPR) method and rapid immunochromatographic test respectively.

Results: Among 50,279 donors screened, 768 (1.52%) were positive for the TTI. The overall prevalence of HIV, HBV, HCV and syphilis among the blood donors in the present study was 0.26%, 0.96%, 0.15% and 0.13% respectively. No blood donor showed positivity for malarial parasite. 43.35% of seropositive donors were in the age group of 26 to 35 years followed by 27% in 18 to 25 years age group.

Conclusion: Continuous improvement and implementation of strict donor selection criteria, sensitive screening tests and establishment of strict guidelines for blood transfusion can ensure the elimination, or at least reduction, of the risk of acquiring transfusion transmitted infections.

Keywords: Transfusion-transmissible infections, Human immunodeficiency virus (HIV), Hepatitis B virus (HBV), Hepatitis C virus (HCV), Syphilis, Malaria.

1. INTRODUCTION (Arial, Bold, 11 font, left aligned, caps)

Transfusion medicine has a great public health importance worldwide. Blood transfusion has been used since 1930 for various indications and the demand for blood and its components is likely to increase in the future [1]. 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 Organisation (NACO) [2]. Indian guideline mandate routine screening of blood and its component for five most common transmissible infections in all the blood banks. These include HIV, HBV, HCV, syphilis and malaria [3]. The magnitude of the TTIs varies from country to country depending on the incidence of these infections in that particular population from where blood units are sourced. Majority of the problems are due to the prevalence of asymptomatic carriers in the society, as well as blood donations during the window period of infections [4, 5]. These unsafe blood transfusions are very costly from both human and economic points of view. Hence, implementation of effective donor selection criteria and quality of screening tests are important and critical in preventing transmission of these infections. Screening for TTIs also gives clue about the prevalence of these infections in healthy populations and is the greatest challenges to transfusion medicine in developing countries like India.

With this background the objective of the present study was to assess the prevalence of transfusion transmissible infections (TTIs) among blood donors in a tertiary care hospital.

2. MATERIAL AND METHODS

A retrospective review of donors record over a period of 6 years between 2009 to 2014 at ~~department~~ Department of Transfusion Medicine of a tertiary care hospital serving Mysuru district was carried out. Strict donor selection criteria were followed to eliminate professional donors. A predonation questionnaire was included in donor registration form followed by medical and surgical history with clinical examination. A written informed consent was taken from each donor before the blood donation. Blood samples from the donated unit were tested for HIV, HBV, HCV, Syphilis-syphilis and Malaria-malaria. Antibodies to HIV 1 and 2 were tested by ELISA method using 4th generation kits manufactured by Tulip diagnostics. Hepatitis B surface antigen (HBsAg) for HBV and antibody to Hepatitis C virus (HCV) were tested by ELISA using 3rd generation kits by Tulip diagnosticsDiagnostics. Screening for syphilis was done by Rapid Plasma Reagin (RPR) method. One step, rapid immunochromatographic test was done for detection of plasmodium falciparum and plasmodium vivax antigen.

Statistical analysis: Data collected was entered in MS-Excel 2010 and analyzed using the same software. Descriptive statistical measures like percentage, mean and standard deviation were applied.

3. Results

A total of 50,279 blood donors donated the blood during the study period. Of these, 49,753 (98.95%) were males and 526 (1.04%) were females which shows predominance of males as compared to females for the six studied years (Table 1). Among the total number of blood donors screened, 768 (1.52%) were positive for TTI's (Table 2). None of the screened female donors were positive for any TTI's. The prevalence of HIV, HBV, HCV and syphilis in the present study was 0.26%, 0.96%, 0.15% and 0.13% respectively (Table 2). None of the blood samples showed positivity for malarial parasite. Among the seropositive donors, 333 (43.35%) were in the age group of 26 to 35 years followed by 212 (27.60%) in 18 to 25 years age group (Table 3).

Table 1 : Yearly gender wise distribution of blood donors in the present study

Year	Total samples tested	Males	Females
2009	9361	9253	108
2010	8244	8210	34
2011	8313	8266	47
2012	8360	8260	100
2013	7107	6988	119
2014	8894	8776	118
Total	50279	49753 (98.95%)	526 (1.04%)

Table 2 : Prevalence of HBV, HIV, HCV and ~~Syphilis~~-syphilis among blood donors in the present study.

Year	Samples tested	Positive samples	HBV	HIV	HCV	Syphilis
2009	9361	157	78	35	31	13
2010	8244	183	129	31	09	14
2011	8313	111	75	15	05	16
2012	8360	134	83	27	09	15
2013	7107	87	55	18	02	12
2014	8894	96	67	09	12	08
Total	50279	768	487	135	68	78
		(1.52%)	(0.96%)	(0.26%)	(0.13%)	(0.15%)

Table 3 : Prevalence of ~~Transfusion-transfusion~~ Transmitted-transmitted Infections-infections among different age groups.

Age (years)	18-25 (%)	26-35(%)	36-45(%)	46-55(%)	Total
HIV	31(22.9)	56(41.4)	34(25.1)	14(10.37)	135
HBV	134(27.5)	220(45.1)	81(16.6)	52(10.6)	487
HCV	21(30.8)	23(33.8)	13(19.1)	11(16.1)	68
Syphilis	26(33.3)	34(43.5)	12(15.3)	6(7.6)	78
Total	212 (27.60%)	333 (43.35%)	140 (18.23%)	83 (10.80%)	768

4. DISCUSSION

Transfusion transmissible infections (TTIs) are the common serious hurdles of blood transfusion. TTIs like HIV, HBV, HCV and ~~Syphilis~~-syphilis are the major public health problems in developing countries [6]. 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 for the transmission of these infections [1]. The present study focuses on the blood donors as they are the highly selective population motivated towards social services. Results obtained from screening donors for TTIs cannot be generalised to the prevalence of these infections in general population. However, it can be used to

monitor the trend of these infections in apparently healthy adult population. Though, multiple stringent strategies targeted to prevent transfusion-transmitted diseases are followed while screening the donors, very few countries are successful in reducing the incidence of these infections. On the contrary, it is not the same in developing countries like India where policies are fragmented and the screening resources are scarce [6].

The majority of the donors in the present study were males (98.95%) with a very small percentage (1.04%) of female donors (Table 1). This is comparable to the studies done by Pahuja et al. [7], Karmakar PR et al. [8] and Shrestha AC et al. [9] noting more than 90% of the male donors. In contrast, a study in China showed higher rate of female donors (44.5%) which was attributed to increased knowledge regarding the blood donation [10]. Though present study result showing low percentage of female donors is comparable to other studies done in India, it highlights that increased awareness has to be generated to ~~motivate~~ motivated females towards blood donation.

The prevalence range of anti-human immunodeficiency virus (HIV), hepatitis B surface antigen (HBsAg), anti-hepatitis C virus (HCV) and syphilis positivity in Indian blood donors is 0.084-3.87%, 0.66-12%, 0.5-1.5% and 0.85-3% respectively [1, 11]. The prevalence of HIV, HBV, HCV and ~~Syphilis~~ syphilis in the present study was 0.26%, 0.96%, 0.13% and 0.15% respectively (Table 2). The overall seroprevalence of TTIs in the present study was 1.52% which is comparable to the study done in Mangalore, Karnataka by Lathamani et al. reporting TTIs of 0.82% [12]. However, the present study seroprevalence is low when compared to the studies done by Chaurasia ~~R~~ et al. and Karmakar et al. noting 2.5% and 2.79% respectively [5, 8]. Serosurveys are one of the primary methods to determine the prevalence of TTIs. The assessment helps in determining the safety of blood products and also gives an idea of the epidemiology of these diseases in the community.

In the present study, the seropositivity was high (43.35%) among the age group of 26-35 years and a small fraction 10.80% were in the age category of 46 - 55 years. The 18-25 years age group showed the second highest clustering of TTIs with 27.60% positive rates (Table 3). This is comparable to the study done by Karmakar et al. [8] who noted more than two-third seropositivity (69.36%) in the age group of 21-40 years of age. The WHO theme for ~~world World blood Blood donor Donor day Day~~ 2015 focuses more on recruitment of young donors as they are the main source of safe blood. Though the present study showed slightly high prevalence of TTIs in the age group of 18 to 25 years, the seropositivity was low in young donors less than 21 years but was largely distributed among donors more than 21 years [Table 4]. The same trend was noted by Karmakar et al. showing low seropositivity in the 18-20 years age group [8]. This observation needs to be highlighted by capturing the uncorrupt behavior of young population and motivate them for blood donation. Once these young individuals enter the donor population there can also be the possibility of reduction in TTI prevalence since they are counselled before blood donation about the possible routes of transmission of these infections. Hence, predonation counselling plays a very important role in educating the young donors about the risk factors of HIV, ~~Hepatitis~~ hepatitis and sexually transmissible diseases and also reducing the risk of TTI.

Table 4 : Distribution of Transfusion Transmitted Infections among 18 - 25 age group.

Age (years)	18	19	20	21	22	23	24	25	Total
									18-25
HIV	-	1	02	07	04	05	07	05	31
HBV	3	5	19	17	20	18	19	33	134
HCV	1	-	05	-	-	07	04	04	21

Syphilis	-	1	02	03	01	05	06	08	26
Total	212								

UNDER PEER REVIEW

The prevalence of HIV in the present study was 0.26%, which is comparable to the studies done by Chaurasia R et al. and Makroo et al. reporting 0.27% and 0.25%, respectively [5, 13]. In contrast, low prevalence of HIV was observed in studies done by Giri et al. (0.07%), Shrestha (0.12%) and Chatteraj A et al. (0.13%) [1, 9, 11]. Compared to present study, studies done by Karmakar et al., Pahuja et al. and Raut et al. have reported higher HIV seropositivity among blood donors of 0.60%, 0.56% and 0.53%, respectively [8, 7, 4]. Seropositivity in the present study was higher (41.4%) among donors aged between 26 and 35 years. This finding is similar to study results done-performed in Kathmandu where the seropositivity for HIV was high among 21 to 30 years of age group [9]. Nationally, the prevalence rate of HIV for adult males in active sexual age group is 0.43% which is in concurrence with the findings in the present study and other studies on blood donors [13]. Heterosexual promiscuity seems to be the only cause of higher seropositivity in males who usually visit the “hot spots” areas where commercial sex work is common, such as in coastal Andhra Pradesh, Northern Karnataka and Southern Maharashtra [13]. Hence predonation counselling of blood donors and seeking the history of high risk behavior aids in preventing the infective donors entering the blood donation.

India is still in the intermediate prevalence zone for the HbsAg and has been estimated to be a home for over 40 million HbsAg carriers [14]. Despite of the fact that safe and effective vaccine has been available since 1982; the HbsAg prevalence in India is still high. This is because of the fact that hepatitis B vaccination is not a part of our National Immunization Programme in India [7]. Supporting this fact, among all the TTI's reported Hepatitis-hepatitis B was the most prevalent infection. Seroprevalence of HBsAg in blood donors of present study was 0.99% which is comparable to the studies done by Giri et al. (1.09%) and Chatteraj et al. (0.99%) [1, 11]. However, low prevalence rate was noted by Shrestha et al. (0.47%) and Lathamani et al. (0.53%) [9, 12]. Relatively higher prevalence rate was shown in Delhi (2.23%) by Pahuja et al. [7]. In 2015, the 67th World Health Assembly (WHA) reaffirmed the global commitment to prevent and control viral hepatitis through the passage of resolution WHA 67.6, which calls for raising public awareness, improving surveillance, strengthening preventive interventions and increasing access to care and treatment services [15]. Despite these gains, prevention and control of hepatitis remains a major challenge in many developing countries.

The Seroprevalence for Hepatitis-hepatitis C in our study was 0.13% which is comparable to the studies done by Raut et al. and Chatteraj et al. documenting HCV seroprevalence of 0.14% and 0.19%, respectively [4, 11]. A study done in Mangalore, Karnataka by Lathamani et al. noted very low seropositivity of 0.09% [12]. Higher seroprevalence was reported by studies done by Giri et al. (0.74%), Pahuja et al. (0.66%) and Shrestha et al. (0.64%) [1, 7, 9]. Similarly, high seropositivity of 0.59% was noted in kolkatta by Karmakar et al. [8] and 0.54% in Delhi by Chaurasia et al. [5]. The worldwide prevalence of hepatitis C virus infection is estimated by the World Health Organization (WHO) to be approximately 3% corresponding to 130–150 million infected persons [16]. As transmission of HCV is through blood exposure and in majority of cases progresses to chronic infections, chances of cirrhosis and hepatocellular carcinoma are more than HBV. Hence, diagnosis of this infection has evolved remarkably, progressing from the simple detection of anti-HCV antibodies by ELISA to molecular methods. The latest development is the qualitative determination of HCV-RNA which allows early diagnosis and detection of viremia and provides products for viral genotyping [16].

The seropositivity for syphilis in the present study was 0.15%. Similar findings were noted by Karmakar et al. (0.23%), while Giri et al., Raut et al. and Lathamani et al. reported lower prevalences of 0.07%, 0.03% and 0.09%, respectively [8, 1, 4, 12]. Higher prevalence of 0.62% was documented from tertiary care hospital of the armed forces by Chatteraj et al. [11]. Though very few cases of transfusion-transmitted syphilis have been described for over four decades, there is mandatory transfusion screening for syphilis. The absence of transmission is in part ascribed to a low prevalence of syphilis in the blood donor population, the concomitant use of antibiotics in a high proportion of transfusion recipients, allied with poor survival of *Treponema pallidum* during refrigerated storage of blood products [17].

None of the donor was found positive for malarial parasite. This may be due to the fact that infection with malarial parasite results in development of fever and weakness. Because of the prominent signs and symptoms majority of the infected persons will not visit the blood donation camp/centre and even if they

come, will be readily excluded by medical fitness examination and counselling [4]. Raut et al. and ~~chattoraj-Chattoraj~~ et al. have also not found any of the donors positive for malaria [4, 11].

The greatest threat to the safety of the blood supply is the donation of blood by seronegative donors during the infectious window period when the donors are undergoing seroconversion. Such people represent new, or incident infections. Although new techniques of testing will bring us closer to the goal of zero risk, it is unlikely that any test or combination of tests will be 100 percent effective in detecting window-period infections. It is also important to recognize that new, direct viral-detection tests will supplement existing screening assays rather than replace them [18]. A considerable portion of this improvement is due to the introduction of nucleic acid testing (NAT), rather than relying solely on measuring pathogen-specific humoral immune responses in the donor. This will decrease the window period and hence decrease the incidence of TTI. But the cost-effectiveness of NAT is poor. The NAT has added benefits but its high financial cost is of concern, especially in economically restricted countries [5]. Currently, no technology exists to completely detect all window period donations. No matter how sensitive NAT becomes, we will never be able to completely close the exposure-to-seroconversion window period. The general public and media might believe that with the advancement in testing technologies zero risk blood products are currently available. This generalization is far from reality as judged by our current experience with new testing methodologies [5].

5. CONCLUSION

There is a need for increased awareness for safe blood which can be obtained by motivating young donors. Also, ~~With-with~~ the implementation of strict donor selection criteria, use of sensitive screening tests and establishment of strict guidelines for blood transfusion are highly recommended to reduce the incidence of TTI and ensure the safety of blood for recipient.

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CONSENT

All authors declare that written informed consent was obtained from the donors for testing of HIV, HBV, HCV, ~~Syphilis-syphilis~~ and ~~Malaria-malaria~~ and analyzing the data for research purpose. A copy of the written consent is available for review by the Editorial ~~officeOffice~~/Chief Editor/Editorial Board members of this journal."

ETHICAL APPROVAL (WHERE EVER APPLICABLE)

All authors hereby declare that all procedures~~s~~ have been examined and approved by the institutional ethics committee.

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