Original Article

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A Study of Transmission Transmitted Infections (TTI) Prevalence in a Large Sample of 25,000 Blood Donors at a Tertiary Care Center

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ABSTRACT

Introduction: Blood transfusion increases the risk of acquiringtransfusion transmitted infections (TTI).We report the seroprevalence of hepatitis B (HBV), hepatitis C(HCV), Human Immunodeficiency Virus (HIV), syphilis and malaria along with combined infections in 2 years

Material and methods: A two-year retrospective study of 25,000 healthy blood donors.

Results: Prevalence of HIV, HBsAg, HCV and syphilis were 3.24%, 0.82%, 0.42%, 0.82% respectively. Twenty five (%) of these had co infection (>2TTIs).Of the 25 blood donors with co infections, fifteen were HIV seroreactive ,out of these nine were seroreactive with HBsAg , two were seroreactive with HCV and four with syphilis (VDRL).One donor was positive for HBsAg , HCV and HIV. Among ten HIV seronegative blood donors HBsAg and HCV seroreactivity was present in seven donors followed by HBsAg and STS in three.

Conclusion: Seroprevalence of HCV is steady after 2006 as no effective vaccine is available against HCV infection. High prevalence of HBsAg may be attributed to vaccine mutants or concealing of information by replacement donors. High prevalence of co-infection (0.1%) emphasizes the need for highly sensitive donor screening techniques, NAT, educational programs to enable detection of TTIs and decreasing transmission.

Keywords: *Co Infections, Seroprevalence, Transfusion Transmitted Infections*

Introduction

Blood transfusion service (BTS) are an integral and indispensable part of the healthcare system. The priority objective of BTS is to ensure safety , adequacy , accessibility and efficiency of blood supply at all levels [1].Transfusion of blood and blood components, as a specialized modality of patient management saves millions of lives worldwide each year and reduces morbidity . It is well known that blood transfusion is associated with a large number of complications, some are only trivial and others are potentially life threatening, demanding for meticulous pretransfusion testing and screening. Use of unscreened blood transfusion keeps the patient at risk of acquiring many transfusion transmitted infections (TTI) like hepatitis viruses (HBV, HCV), human immune deficiency viruses (HI V), syphilis, malaria etc. Transfusion departments have always been a major portal to screen, monitor and control infections transmitted by blood transfusion. Blood transfusion departments not only screen TTI but also give clue about the prevalence of these infections in healthy populations [2].

The past several decades have witnessed great advantage in techniques of detecting these TTIs. Developed countries have decreased the risk of TTIs to a major extent with the advent of nucleic acid amplification technique (NAT). Despite this dramatic progress, India is far from achieving a “zero risk” blood supply. Amongst the infections, HIV and hepatitis are the commonest to occur in the window period which is often negative. With the advent of component single donor bag for two to three recipients, there is possibility of one positive infecting two-three persons. [3, 4]In the present study we attempted to assess the prevalence of markers of HCV, HIV and HBV.

We report the seroprevalence of hepatitis B(HBV), hepatitis C(HCV), Human Immunodeficiency Virus (HI V), syphilis and malaria along with combined infections over a period of 2 years from 2010 to 2012 in a tertiary care hospital . Such studies give insight for the safety of blood transfusion and an accurate assessment of known risks versus benefits of blood transfusion [5].

Materials and Methods

In this retrospective study, we reviewed records of 25,000 healthy blood donors over a period of two years (2010-2012) from the records of blood bank. In our study majority of donors were replacement donors who were

either relatives or friends of the patient concerned .Donors were selected and screened thoroughly, as per the guidelines of WHO manual of transfusion medicine [6]. Professional blood donors and those with previous history of jaundice were excluded. All the 25,000 donor serum samples were screened for HBV, HCV and HIV. Hepatitis surface antigen (HBS Ag) was screened using third generation ELISA kits (Monalisa; BioRad), with reported sensitivity and specificity of 100% each (as per manufacturer's manual). HCV was screened using third generation ELISA kits (HCV microlisa) with reported sensitivity and specificity of 100 and 97.4% respectively.HIV was screened by third generation ELISA kits(HIV monalisa; Biorad) with reported sensitivity and specificity of 100% each. Tests were performed according to manufacturer`s instructions.

Results

A total of 25,000 apparently healthy donors were screened during the study period. (Figure1)

Among them 97.84% were males and 2.16% were females. 64.78% were replacement donors while 35.22% were voluntary donors. The overall prevalence of HIV, HBsAg, HCV and syphilis were 3.24%, 0.82%, 0.42%, 0.82% respectively (Figure 2)

No blood donor tested showed positivity for malarial parasite. Twenty-five (%) of these had confection (>2TTIs). Of the 25 blood donors with co-infections, fifteen were HIV seroreactive, of which nine were seroreactive with HBsAg, two were seroreactive with HCV and four with syphilis (VDRL). There was one donor who was positive for HBsAg, HCV and HIV. Among the ten HIV seronegative blood donors HBsAg and HCV seroreactivity was present in seven donors followed by HBsAg and STS in three (Table 1,2)

Discussion

Blood transfusion is a significant route of transmission of infectious diseases. Among all viral infections, HIV and Hepatitis are lethal. In the present study, an analysis of donor profile and estimations of prevalence of HIV, HCV and HBV along with syphilis, malaria and co infections are attempted.

Replacement donors constitute the largest group of blood donors in India [7] and the same was found in our study. In a study by Singh et al. [8]82.4% of their donors were replacement donors while Kakkar et al. [9] had 94.7%.

The seroprevalence of HCV in our study was 0.82%. Garg et al [10] reported an HCV prevalence of 0.28% in blood donors in western India. In India compulsory HCV testing was started in 2001-2002.It was found that in the studies done in Delhi before 2006,the seroprevalence of HCV showed a wide range of 0.5 to 2.2% [8,11-15], lowest prevalence found in 2004-2005. While the studies after 2006 showed seroprevalence of 0.22 to 0.26% [16-18]. The wide variation of HCV seroprevalence in different

Table 1: Shows Pure and Mixed Infections in Various Categories.

Category	Pure infection	%age	Mixed infection	%age
HBsAg	791	97.53%	20	2.47%
HCV	197	95.63%	9	4.37%
STS	99	93.40%	7	6.60%
HIV	189	92.65%	15	7.35%

Table 2: Shows Various Coinfections Found in Donors.

Category	Count
HBsAg+HCV	7
HbsAg+STS	3
HbsAg+HIV	9
HCV+STS	0
HCV+HIV	2
STS+HIV	4
HbsAg+HCV+STS	0
HbsAg+HCV+HIV	1
HbsAg+STS+HIV	0
HCV+STS+HIV	0

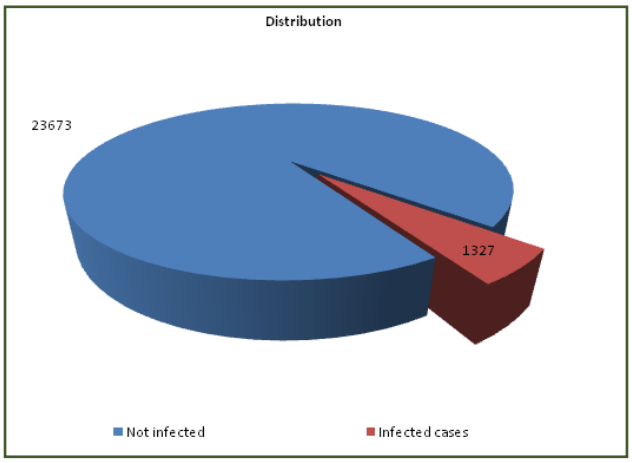

Fig. 1: Shows out of 25000 healthy donors, 23673(94.6%) were not infected and 1327 (5.3%) were infected.

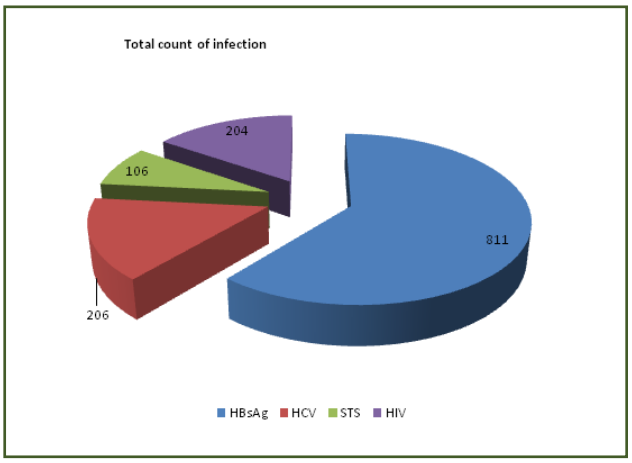

Fig. 2:Shows various infections in donors.

studies in India[19-21]might be due to use of different generations of ELISA test kits, having different sensitivities and specificities. The above data infers that after 2006 prevalence has decreased although it is almost steady. The decrease in prevalence till 2006 was due to effective screening, literacy rate and level of awareness in donors but as it is steady after 2006 it shows that it is a potential threat to the safety of blood. The cause of which can be attributed to it is that no effective vaccine is available for immunization against HCV infection.

Prevalence of HBsAg in our blood donor population was found to be relatively higher (3.24%). India has been placed in the intermediate zone of prevalence of hepatitis B by World Health Organization (2-7%) [22]. Prevalence rate of 1-2% was reported in 2001[23], 1.8% in 2004[21], 2.7% in 2003[24] and 1.66% in 2008[15]. HBsAg prevalencein Punjab blood donors was 1 .7% [14], while Rajasthan had 3.44% [10] and Delhi had 2.23% [13]. In Karnataka, coastal area [25] had 0.62%, Jammu had 0.66%[27]and Bangalore [26] had 1.86% HBV seropositivity . On the other hand, the prevalence of HBV infection is lower in the United States and Western Europe (0.1–0.5%) and is reported to be higher, 5–15% in South East Asia and China [10]. The data regarding HBsAg infection among blood donors infers that there was no particular trend and except for few studies, remaining had high prevalence, i.e.,>1.6 %. India is still in the intermediate prevalence zone for HBsAg and has been estimated to be home to over 40 million HBsAg carriers [16]. Despite the fact that a safe and effective vaccine has been available since 1982[28], the HBsAg prevalence in India remains high. This is mainly because despite giving hepatitis B vaccination, there are various mutants which might be responsible for increasing trends. Other cause of increasing prevalence of HBV infection may be due to fact that replacement donors conceal information about their health during donor selection to get the blood for their patient thus compromising blood safety.

As this prevalence was obtained from ELISA and not the HBcAg or NAT and could not detect mutants, exact prevalence might be much higher, so assays to detect these mutants should be used for detection.

For HIV, India is next to South Africa and Nigeria in terms of overall number of people living with HIV. The Indian National AIDS Control Organization suggested an overall prevalence of 0.91% (2005) and 0.25% in Delhi [29]. West India has reported a prevalence of HIV of 0.47% [30] while that in Punjab is 0.26% [14]. Sonawane et al [31] reported a prevalence of 1.83% in rural population. The present study showed an HIV seroprevalence of 0.82%. A WHO report states thatthe viral dose in HIV transmission through blood is so large that one HIV positive transfusion leads to death, on an average, after 2 years in children and after three to 5 years in adults [32]. Hence, safe transfusion practices like avoidance of single donorsand practices of autologous blood transfusion should be encouraged [8].

Sexually transmitted infections arewidespread in developing countries and constitute amajor public health problem. The VDRL reactivityin our study was 0.42%, a comparatively low value when compared to 1.6% noted by SriKrishna et al. [26] and 2.6% by Singh et al. [8] in Delhi. Arora [32] have reported a 0.9% ofVDRL reactivity while Bhattacharya [33] found0.72% reactivity. Syphilis has also acquired a newpotential for morbidity and mortality through associationwith increased risk ofHIV infection, thus making safe blood more difficult to get. Although in our study no correlation was found in co infection with HIV.

Data on the prevalence of >2 TTIs is limited. In HIV-positive donors, HBsAg was positive in 12.2%while VDRL was reactive in 11.8% [34]. The seroprevalence of hepatitis virus in patients infected with HIV showed that 9.9% of patients were HBsAg-positive, 6.3% were HCV-positive and about 1% had dual infection with HBV and HCV [35]. However, this study enrolled patients who received antiretroviral therapy and not blood donors. Mathai et al. [36] found that of 31,942 donors screened over a 6-year period, mixed infections were seen in only 10 donors (0.03%). We found that 25 of 25000 donors had co-infection (0.1%). As is evident, the prevalence of more than one TTI is very low. Studies on the prevalence of hepatitis viruses in patients with HIV have shown the HIV and HBV/HCV co-infection rate to be 12%–15% [37–39]. However, studies from India show that this varies with the geographical region with rates of 9%–30% for HBV and 2%–8% for HCV [40–43].We encountered HIV and HBV in 9 of 25 (36%) and HCV in 2 of 25 (8%) co-infections. Many factors favor mixed infections including a high degree of epidemiological similarity between the HIV and hepatitis viruses. They have similar routes of transmission, risk factors such as high risk sexual behavior and a higher prevalence with other sexually transmitted diseases such as syphilis. It is important to detect these as >2 TTIs would pose a greater threat to the recipient of the infected blood. We found a higher rate of VDRL seroreactivity than that in other studies [44].This may be because we did not use any other test to confirm the presence of syphilis. Syphilis infection can increase the susceptibility to HIV infection. For its part, HIV can alter the clinical course of syphilis, increase the likelihood of relapse, and confound the diagnosis of neurosyphilis. In a study done to analyze the association of HIV infection with hepatitis B and syphilis in blood donors, of the 60 Western blot confirmed HIV-positive blood samples, none were positive for HBsAg and 4 were positive for syphilis [45]. In contrast, we found an association of both syphilis and hepatitis B with HIV in blood donors. This reflects the trend in the general population [37-39]. This emphasizes the need for highly sensitive donor screening techniques to enable the detection of TTIs. These pose a definite risk to the recipient of the blood. Due to a similarity in risk factors and routes of transmission, public awareness and education would go a long way in curbing the prevalence of these infections and increasing blood safety. In the West, the practice of donor self-exclusion helps in the deferral of high risk donors. However, due to low socioeconomic status and lack of awareness, the implementation of donor self-exclusion is difficult in India. Voluntary donations are safer as compared to replacement ones and should be encouraged. Efforts should be made to increase the number of voluntary donors and reduce replacement donations to a minimum.

Conclusion

With the advent of nucleic acid amplification techniques (NAT), western countries have decreased the risk of TTI to a major extent [10]. This will decrease the window period and hence decrease the incidence of TTI. But the cost-effectiveness of NAT is poor [3]. The NAT has added benefits but its high financial cost is of concern, especially in economically restricted countries like India. Along with advanced technology such as NAT for donor screening, other factors suchas public awareness, vigilance of errors, educational and motivational programs, help in decreasing the infection [10].

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