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Study of Transfusion transmittable Infections: Seroprevalence among blood donors in a tertiary care Hospital of central India

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Introduction: Transfusion-transmissible infectious agents such as hepatitis B virus (HBV), human immunodeficiency virus (HIV), hepatitis C virus (HCV) and syphilis are among the greatest threats to blood safety for transfusion recipients and pose a serious public health problem. This cross-sectional study was undertaken with the aim of determining the seroprevalence of HIV, HCV, hepatitis B surface antigen (HBsAg) and syphilis and correlates the findings with sex and age to ascertain the associations if any in the occurrence of the pathogens. **Material and Methods:** Microwell ELISA (Enzyme Linked Immunosorbent Assay) test for the detection of Hepatitis B surface Antigen (HBsAg), antibodies to HIV types 1 and 2 & antibodies to HCV were determined using kits manufactured by J. Mitra & Co. Pvt. Ltd. For syphilis and Malaria detection test strip manufactured by Aspen & Co. were used. **Result:** A total of 1510 apparently healthy prospective blood donors aged between 18 and 60 years who presented for blood donation at L N Medical College & J.K. Hospital Blood Bank were studied. The male:female ratio was 6:1. Of the prospective blood donors, 21 (28.8%) had serological evidence of infection with at least one infectious marker. The overall seroprevalence of HBsAg, HIV, HCV and syphilis was found to be 18.6%, 3.1%, 6.0% and 1.1%, respectively. **Discussion:** The high seroprevalence of blood-borne pathogens among prospective blood donors in Bhopal (Central India) calls for mandatory routine screening of blood donors for HBV, HIV, HCV, Syphilis and Malaria.

Keywords: Transfusion-transmissible diseases, HIV, Hepatitis B, HCV, Syphilis, Malaria, Blood Donors

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Introduction

Blood safety is major concern globally going by the increasing incidence of transfusion transmittable infections (TTIs). Safe transfusion of blood and blood components saves millions of lives, but unsafe transfusion practices put millions of people at risk of TTIs. Blood is one of the major sources of transmission of infectious diseases viz. HIV, HBV, HCV, syphilis, and many other infections in India. With an estimated population of 1.21 billion, India has the world's third largest population suffering from HIV/AIDS. The estimated adult HIV prevalence was 0.31% in 2009[1]. India has intermediate endemicity of hepatitis B with HBsAg prevalence of 2- 10% among the study population. It has been estimated that up to 40 million people out of the 350 million hepatitis B chronic carriers worldwide resides in India [2]. HCV is a leading cause of chronic liver diseases, viz., hepatic fibrosis, cirrhosis, end-stage liver disease and hepatocellular carcinoma (HCC). In India, there are about 12-13 million HCV carriers and modeling data predict that the burden of disease could soon increase substantially [3].

Despite implementation of various screening assays for detection of TTIs, occasional cases of post-transfusion infections are common. Majority of these problems are due to prevalence of asymptomatic carriers in the society as well as due to blood donations during the window period of infections. The hazards of transfusion were minimized by proper selection of donors and screening for infectious diseases by a high sensitivity screening assay. World Health Organization (WHO) recommends an integrated strategy to improve blood transfusion safety by establishment of well-organized blood transfusion services, prioritization of blood donation from voluntary non-remunerated donors, screening of donated blood for at least four major TTIs with quality assured system, rational use of blood and implementation of effective quality control systems [4]. The objective of this study was to determine the seroprevalence of HIV, HBV, HCV, and syphilis infections in blood donors of a tertiary care Hospital in Bhopal, India.

Material and Methods

Study subjects: A total of 1510 apparently Healthy prospective blood donors aged between 18 and 60 years, who presented for blood donation at L.N. Medical College and J.K Hospital Blood Bank between January 2013 to December 2013 were studied. The biodata of all donors were obtained by careful interview. Care was also taken to make sure that no donor was used more than once and those who had a history of recent ill health, had received a blood transfusion or who had donated blood within the 3 months prior to this study were excluded. All the blood donors were offered pre- and post-donation counseling and informed consent was obtained. Criteria for exclusion of donors included age less than 18 years or more than 60 years, body weight less than 45 kg, hemoglobin level less than 12.5 g/dl, history of jaundice, sickle cell disease, hypertension or current fever.

Sample collection: 350 ml of blood is collected, in CPDA-SAGM bags manufactured and supplied by J-Mitra, using complete aseptic precautions and under strict guidelines of NACO.

Serological analyses: Microwell ELISA (Enzyme Linked Immunosorbent Assay) test for the detection of Hepatitis B surface Antigen (HBsAg), antibodies to HIV types 1 and 2 & antibodies to HCV were determined using kits manufactured by J. Mitra & Co. Pvt. Ltd. For syphilis and Malaria detection test strip manufactured by Aspen & Co. were used.

The study was a cross-sectional survey so follow-up samples were not obtained from reactive donors for retesting. The manufacturers' standard operating procedures were strictly followed for the performance of all the tests.

Results

Table 1: Distribution of donors according to gender within different age groups

Age (Years)	Male	Percentage	Female	Percentage
18-30	580	42.9	81	50.6
31-40	478	35.6	54	33.7
41-50	253	18.9	21	13.2
51-60	39	2.4	04	2.5
Total	1350	100.0	160	100.0

Table 1 shows that 1,350 (89.4%) of the 1,510 blood donors were male and 160 (10.6%) were female, giving a male to female ratio of 8.4:1. The highest number of male blood donors (n= 580; 42.9%) and female donors (n=81; 0.6%) were found to be within the 18-30 year-old age group.

Table 2: Prevalence of seropositivity for markers of transfusion- transmissible infections

Marker	Number (%)
HBsAg	17 (1.12)
HCV	2 (0.13)
HIV	3 (0.20)
VDRL	4 (0.26)
Malaria	1 (0.07)

Table 2 shows that the seroprevalences of HBsAg, HCV, HIV, Syphilis and Malaria were 1.12%, 0.13%, 0.20%, 0.26%, and 0.07% respectively. All 3 donors who tested positive for HIV had HIV type 1

Discussion

This study was undertaken to study the prevalence of infectious disease markers in the donor population attended in the blood bank in the tertiary care hospital based on dual testing strategy. Since we have hospitalbased blood bank, majority of the blood units are collected from the replacement donors and very few are voluntary donors. Since the transfusion transmittable diseases screening was carried out for transfusion safety, we followed the WHO [5] and NACO [6] testing strategy to maximize safety of the blood for transfusion.

In our study, the overall sero-reactivity based on enhanced chemiluminescence assay, was 0.25% for HIV and 0.7% for HCV. In 2009, it was estimated that 2.4 million people were living with HIV in India, which equates to a prevalence of 0.3% [7]. Mukhopadhya [8] reported the HCV prevalence in blood donors in different parts of India range from 0.5% to 1.85%. Meena *et al*, [9] revealed that the prevalence of HCV infection among blood donors showed a significant increasing trend from 0.18% in 2005 to 0.82% in 2009. Their study was based on the sero-reactivity in anti HCV ELISA-based assay.

Community data on HBsAg and antibody to hepatitis B surface antigen (anti-HBs) positivity in the Indian population are scarce. In 2 such recent studies that included about 7653 and 730 healthy individuals, the HBsAg positivity rate was reported to be 2.9% and 2.1%, respectively, and that of antibody to hepatitis B core antigen (anti-HBc) was reported to be 19.5% and 16.5%, respectively [10, 11]. Thus, most studies among blood donors, pregnant women and the general population indicate an HBsAg carrier frequency of 2%–4% and antiHBs positivity of around 18%–20%.

Quality control of donor screening in India is another area where more efforts are needed. In a study from New Delhi, 6% of HBsAg-negative units of blood from various blood banks in Delhi were found to be HBsAg positive on re-testing using a sensitive micro-ELISA technique [12].

Unless 80% of the target population is vaccinated, the impact on horizontal transmission may be obtunded (in countries where HBV vaccination has decreased the carrier frequency and disease burden, at least 80% of the target population has been vaccinated [13].

Although all the blood donors were apparently healthy, the 1.12% seroprevalence of HBsAg found in this study indicates that some donors may go on to develop chronic hepatitis, cirrhosis, and some may even progress to develop hepatocellular carcinoma [14]. Early treatment of these apparently healthy seropositive individuals were encouraged.

It was observed in this study that 1.1% of the prospective blood donors had syphilis infection. This 1.1% seroprevalence of syphilis in our study is lower than the 7.0 % sero-reactivity reported in a study conducted by Arpita Jain et al [15]

It has been reported that testing donor samples can identify early syphilis infection [16]. Transfusion syphilis being a nosocomial infection, can easily be acquired in centers where blood is not screened for syphilis or stored before use as in the case of fresh whole blood transfusion [17]. Despite the fact that *Treponema pallidum* cannot survive in properly stored blood and the inescapable cost implications of syphilis testing of blood donors particularly in resource-poor settings, it must be noted that the emphasis of blood transfusion should be on two fundamental objectives – safety and protection of human lives [18]. Syphilis screening of donated blood, no matter what the incidence is in the donor population, has been considered to have value as a 'lifestyle' indicator as individuals exposed to syphilis may also have been exposed to other sexually transmitted diseases and therefore should not donate [16,19]. Thus one of the greatest values of this test at present is as a surrogate marker for lifestyles known to be associated with a high risk of transmitting HIV and hepatitis. In other words it is not the transmission of syphilis that is so worrisome, but being a sexually transmitted disease, its presence points toward donor's

Indulgence in high risk behaviors and consequently higher risk of exposure to infections such as HIV and hepatitis viruses [20].

It is important to point out that the results obtained in this study do not reflect the prevalence of markers of transfusion-transmissible infections in the unselected general population because blood donors are a pre-selected group and all of them are within the sexually active age group. Further studies aimed at determining the epidemiology of transfusion transmissible infections among the general population will be of value in determining the population prevalence

Conclusion

Decreased rate of sero-positivity among the blood donors in our study was due to proper screening and questioner done by the blood bank staff before taking the donation and also due to discouraging of commercial blood donors. Thus proper screening of donors by a complete and comprehensive questioner is an essential part of blood bank staff training which can reduce the economic and social burden.

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