

Seroprevalance of hepatitis B Virus, human immunodeficiency virus and hepatitis C virus among blood donors: a retrospective study

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Abstract

Background: Screening of life threatening transfusion-transmissible infections (TTIs), like Human Immunodeficiency Virus (HIV), Hepatitis B and Hepatitis C Virus (HBV and HCV) in blood donors is important to maintain transfusion safety. **Objective:** To determine the prevalence of HBV, HIV and HCV in blood donors in Blood Bank of our hospital. **Material and Methods:** A retrospective analysis of 37,090 blood donors' records was carried out over a period of five years from 2010 to 2014. **Results:** Of the 37,090 donors, seroprevalence of HBV, HIV and HCV was 1.5%, 0.6% and 0.2% respectively. **Conclusion:** Transfusion Transmitted Infections (TTIs) are important consideration for safe blood transfusion. The precise estimate of prevalence of viral infections in a group will help to monitor transfusion safety measures.

Key words: Human immunodeficiency virus (HIV), Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Seroprevalence, Blood Donors.

Introduction

Blood transfusion carries risk of transmitting infections like HIV, Hepatitis, Syphilis, Brucellosis, Malaria and other viral infections. With every unit of blood transfusion there is 1% chance of transfusion associated problems including transfusion-transmitted infections (TTIs) [1]. Screening of transfusion transmitted infections is pre requisite before blood transfusion. Hepatitis B (HBV) and Hepatitis C viruses (HCV) are the most common causes of chronic liver disease in the world.

Both viruses induce chronic hepatitis, which may progress to cirrhosis and eventually to hepatocellular carcinoma [2]. Over the past three decades, the risk of transfusion transmitted infections has been dramatically reduced by the introduction of routine donor laboratory screening of blood-borne pathogens [3,4]. However, small risks of infection transmission persist due to several factors such as genetic variation of infectious agents, presence of an immunologically silent carriage, laboratory errors, and variations in the window period of an infectious agent as well as limitations in screening test [5]. Poor health education and lack of awareness in

developing nations also results in the reservoir of infections in the population. World Health Organisation (WHO) recommended that all blood donations should be screened for infection prior to use. Hence, it is extremely essential to be cautious about the possible spread of these diseases in the course of blood transfusion.

Material & Methods

Setting, duration and type of study: A retrospective study was undertaken in the Blood Bank, Navodaya Medical College, Hospital and Research Centre, Raichur over a period of five years from 2010 to 2014.

Sample size and Data collection: Data of 37,090 blood donors' screening test for HIV, Hepatitis B and Hepatitis C virus was retrieved from various documents maintained by blood bank authority.

Sample Methods: In the blood bank, sera were separated and all the blood bags were screened for HIV, HBV and HCV by ELISA (Enzyme-linked immunosorbant assay) method. The data was analysed for calculating frequency of seropositivity of HIV, Hepatitis B and Hepatitis C infections among them.

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Inclusion Criteria: All blood donations collected during this period were included. The donors were either voluntary or replacement donors. The male and female donors between the age group of 18 to 60 years having weight more than 45 kg were included.

Exclusion Criteria: Donors with history of febrile or debilitating illness, weight loss, jaundice, hepatic or cardiovascular or pulmonary derangement, malignancy, epilepsy, bleeding diathesis, past blood transfusion, recent blood donation, consumption of prohibited drugs,

surgical intervention, age under 18 or over 60 years, pregnancy or lactation were excluded.

Data analysis: The data entry was carried out using Microsoft Office Excel worksheet and percentage and proportions for each variable was calculated.

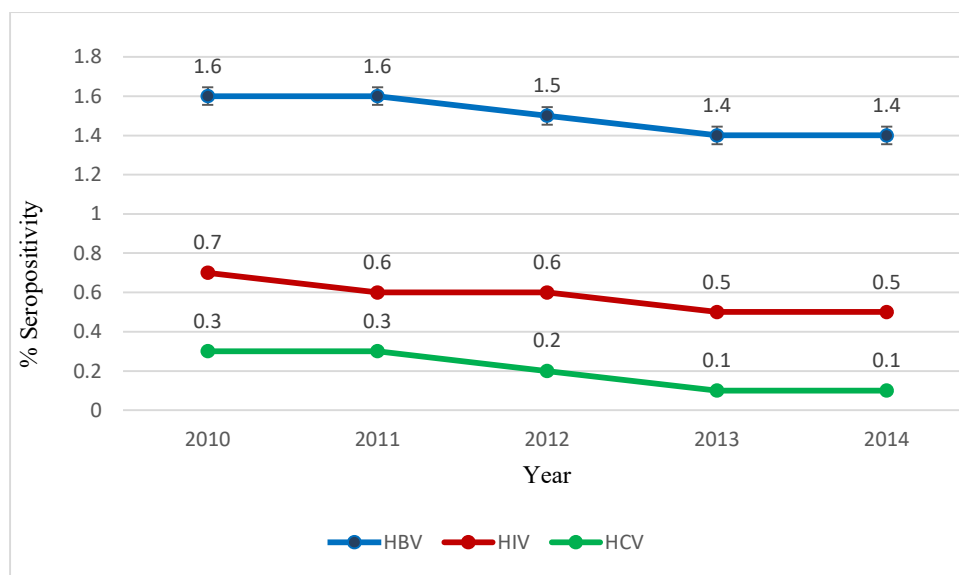
Ethical Considerations and permissions: Ethical clearance was obtained from the institutional ethical committee. The written, informed consent from the donors was taken at the time of donation.

Results

A total of 37,090 blood donors were recorded, out of which overall seroprevalence of HIV, HBV and HCV was found in 855 cases (2.3%). The prevalence of HBV, HIV and HCV was 1.5%, 0.6% and 0.2% respectively, maximum being HBV (Table 1).

Table-1: Year wise distribution of HBV, HIV and HCV seropositivity.

Year	Year wise Total no. of Blood donors	Year wise Total no. of seropositive donors	HBV Positive cases	HIV Positive cases	HCV Positive Cases
2010	6710	178 (2.6)	108 (1.6)	50 (0.7)	20 (0.3)
2011	6975	178 (2.5)	113 (1.6)	44 (0.6)	21 (0.3)
2012	7151	166 (2.3)	107 (1.5)	43 (0.6)	16 (0.2)
2013	7933	162 (2.0)	112 (1.4)	41 (0.5)	9 (0.1)
2014	8321	171 (2.0)	117 (1.4)	45 (0.5)	9 (0.1)
Total	37090	855 (2.3)	557 (1.5)	223 (0.6)	75 (0.2)



Graph-1: Percentage of seropositivity of HBV, HIV and HCV among blood donors

From above graph 1, it is evident that seroprevalence of all TTI's went on progressively decreasing from the year 2010 to 2014. The declining trends is a good signal as the risk of acquiring infections due to transfusion is decreased.

Discussion

Blood transfusion has been used since 1930 for various indications [6]. Transfusion therapy is a well-established treatment in various medical and surgical procedures [7]. Transfusion medicine, apart from being important for the medical treatment of each patient, also has a great public health importance worldwide [8]. After the introduction of the blood banks and better storage techniques, it became more widely used [9].

Blood is a scarce and life-saving resource; however blood transfusion can be a source for transmitting life threatening infections if screening is not carried out properly. HIV, HBV and HCV infections are important blood-borne and transfusion transmitted infections throughout the world including India. Clerical errors like release of unsuitable blood units, accidental transfusion of autologous blood to another recipient and errors in testing also contribute to transfusion induced transmission of harmful agents [10]. 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. So, it is necessary to measure how much they are spread in our country. In a vast country like India, a survey of blood transmissible diseases in the country as a whole is very difficult.

Individual epidemiological surveys are one of the primary methods to determine the prevalence of TTI and may help us to understand the seriousness of the problem and the changing trends. So, we did this study in our Blood Bank. Knowledge of the prevalence of the TTIs among the blood donors helps in determining the safety of blood products and gives an idea of the epidemiology of these diseases in the community [11]. It also guides to develop and implement efficient strategies for ensuring safety in blood transfusion. In general, the diagnosis of HBV, HCV, HIV and syphilis is based on the presence of the corresponding antigens or antibodies in blood serum [12]. HBV and HCV are the two established causes of post transfusion hepatitis [13]. 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%, respectively [14].

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 [15] causing death due to chronic hepatitis, cirrhosis liver and hepatocellular

carcinoma [12]. The prevalence of HBV in our study sample was 1.5%, the highest among the recorded TTIs in this study which was comparable with study conducted by Singh et al (1.8%)[16], Sri Krishna et al (1.8%)[17], Arora et al (1.7%)[18] and Bhattacharya et al (1.4%)[12].

For HIV, India is second only to South Africa in terms of overall number of people living with HIV. The Indian National AIDS Control Organization (NACO) suggested an overall prevalence of 0.22% (2017) in India [19]. In the present study we calculated the prevalence of HIV to be about 0.6%. There are several reports of prevalence of HIV in India as less as 0.084% to as high as 3.87% [14]. There was significant decrease in prevalence of HIV seropositivity over the five year period of the study, which was comparable with another study by Singh et al (0.8%)[16], Pahuja et al (0.56%) [20], Sri Krishna et al (0.44%)[17] and Pallavi et al (0.44%)[21]. A WHO report states that the 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 [18]. Hence, safe transfusion practices like avoidance of single donors and practices of autologous blood transfusion should be encouraged [22].

Hepatitis C infection is an evolving global health problem. The wide variations of HCV seroprevalance in different studies in India might be due to the use of different generation of ELISA test kits, having different sensitivities and specificities [21]. Overall prevalence of HCV in our study was 0.2% which was comparable with study by Pallavi et al (0.2%)[21], Garg et al (0.2%) [23] and Bhattacharya et al (0.3%)[12]. In Indian scenario, the prevalence of HCV is higher at Ludhiana (0.78%) [24]. With the advent of nucleic acid amplification techniques (NAT), western countries have decreased the risk of TTIs to a major extent [20]. 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. Along with advanced technology such as NAT for donor screening, other factors such as public awareness, vigilance of errors, educational and motivational programs, help in decreasing the infection [20].

Overall there is decline in seroprevalence of transfusion transmissible infections may be due to more public awareness through education and media, use of newer generation kits having improved sensitivity and specificity, proper donor selection and education as per NACO guidelines.

Conclusion

On comparing the data of five years, a decreasing trend in seroprevalence of HIV, HBV and HCV was observed. In developing countries such as India, the use of NAT technique for screening of blood donors is difficult because it is not cost effective.

Hence, applying strict selection criteria for selection of blood donors and screening of them for transfusion transmitted infections using standard and more advanced methods kits with improved specificity & sensitivity are highly recommended to ensure the safety of blood for recipient.

Contribution of Authors

- Indrani N. Banasode-Played a major role in designing the study, collecting data, organizing data and preparing the manuscript.
- Ashraf A. Zubair- Contributed to data compilation, organizing data, comparison with other studies and preparing manuscript.

What this study adds to the existing knowledge?

The precise estimates of prevalence of viral infections in a group will help to monitor transfusion safety, to analyze the effects of current safety measures and to assist in developing public health policy. Improvements in donor history questionnaire and testing methodologies to screen blood donors have proved to be successful.

However, residual transmission of infectious agents during the window period and new emerging pathogens still occurs. Hence, effective proactive approach has to be developed to minimize the technical and financial burden of screening individual blood donors.

Findings: Nil; **Conflict of Interest:** None initiated

Permission from IRB: Yes

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