



Seroprevalence of HBV, HCV and HIV infection among blood donors at a tertiary care center in Eastern India-

Time to introduce molecular methods for follow up management of all seropositive donors

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Abstract

The important transfusion transmitted viruses in India are, human immunodeficiency virus (HIV-I/II), hepatitis B virus (HBV) and hepatitis C virus (HCV) . The seroprevalence of these infections varies among blood donors belonging to different parts of the world and determines the magnitude of Transfusion Transmitted Infection (TTI). Thus, a retrospective cross sectional observational study was conducted by reviewing the records from January 2015 to December 2017 in a Blood Bank of a tertiary care center to determine the seroprevalence and trends of HIV, HBV, HCV infections among the healthy blood donors in Eastern India. A total of 30622 people donated blood during the study period. Males formed the majority of the donor population accounting for 89.576 % (27430/30622) while females accounted for 10.423% (3192/30622) of donations. Majority of the donors were replacement donors (27253/30622= 89%) . The overall prevalence of transfusion-transmitted infection was 2.060 % (631/30622). The seropositivity for HBsAg, HCV, and HIV was 1.652%, 0.267%, and 0.140% respectively. Amongst all the seropositive sera for TTI, the seroprevalence of HBV

infection was highest (80 %) and the seroprevalence of HCV & HIV infection was 13 % & 7 % respectively. The present study clearly documents the higher seroprevalence of HBV and HIV but lower prevalence of HCV infection in this part of eastern India in comparison to the national average. It also indicates lower participation of voluntary donors and female donors. Promoting the culture of voluntary donors, recruitment of female blood donors, vaccination of susceptible population against HBV infection, confirmatory test for seropositive sera by molecular methods, counselling the seropositive donors about the infection and advising them to take treatment at the designated centers are recommended.

Keywords- TTI, seroprevalence, HBV, HCV, HIV, blood donation, molecular methods.

Introduction

Blood and blood products transfusion is a life-saving intervention and globally, millions of lives are saved through this procedure but, if screening is not performed properly, it can also act as a vector for transmitting harmful infectious diseases caused by viruses, parasites and bacteria to the recipient (1). These constitute the transfusion transmissible infection (TTI). In the recent

years, there has been advancement in modern health care services resulting in enhanced use of blood and blood products for several conditions. The indications for blood and blood product transfusion vary in various parts of world. In developed countries, blood transfusion is most commonly used as supportive therapy in cardiovascular and transplant surgery. It is also indicated in massive trauma and as therapy for solid and hematological malignancies. On the contrary, in developing countries, it is generally used to treat complications related to pregnancy and severe childhood anemia (3).

A TTI is any infection that is transmissible from person to-person through parenteral administration of blood or blood products and includes Human immunodeficiency virus (HIV), Hepatitis B virus (HBV), Hepatitis C virus (HCV), Treponema pallidum (syphilis), malaria, Chagas disease and the human T-cell lymphotropic viruses I/II (HTLV). Amongst them, important transfusion transmitted viruses are, human immunodeficiency virus (HIV-I/II), hepatitis B virus (HBV) & hepatitis C virus (HCV) (2). There is greater risk of transmission of these viral infections during transfusion therapy, as large volumes of blood or blood components are given to patients during the procedure, and therefore, even a blood unit with a low viral load may cause infection in the recipient. Thus, it becomes important to effectively screen all blood donations and all components derived from these donations.

As per WHO (2013)reports, a total of 112.5 million blood donations were made in the 180 countries during the reporting period with 16.7 million donations made from the South East Asia Region (3). Out of 180 countries worldwide, routine screening for TTIs is not being carried by 39 countries. In low-income countries only 53% of donated blood is screened using basic tests, which is far below the global average of 89% and 97% in high-income countries

TTI is a serious threat in developing countries, where the prevalence of this infection is higher and the donor selection and screening procedures are less stringent. Transfusion of contaminated blood and blood products have resulted in the transmission of up to 3% of HIV infections worldwide (8). About 350 million people have chronic hepatitis B virus (HBV) infection worldwide and it is a cause of concern, as it is easily transmitted by blood products (17, 18, 19, 20). The prevalence of HBV infection varies greatly in different parts of the world and World Health Organization (WHO) has classified HBV prevalence into high endemicity (>8 %), intermediate (2–7 %) and low endemicity (<2 %) (10, 5). About 125 million People have been infected with hepatitis C virus (HCV)(9).

Though provision of sufficient, safe and timely supplies of blood and blood products and prevention of transmission of transfusion-transmissible infections is major public health responsibilities but still constitutes a major public health challenge for many countries. National AIDS Control Organization (NACO) under the Ministry of Health and Family Welfare, and National Blood Transfusion Council (NBTC) are the nodal agencies monitoring the functioning of blood transfusion services and blood safety at the national level. State AIDS Control societies (SACS) and State Blood Transfusion Councils (SBTCs) regulate the supply of safe blood and blood products at state level(5). In 2007, NACO, developed standards for blood banks and blood transfusion services in our country and recommended mandatory testing of all donated blood units for HIV, HBV, HCV, Syphilis and Malaria. As per guidelines, only non-reactive blood and blood components should be released for clinical or manufacturing of other components. All seropositive donations are removed from the quarantined useable stock. Seropositivity for one of the TTI's rendered 1.8 million blood units unfit for transfusion in 2013. In low-

income countries, TTIs still remains the biggest cause of discarding the blood(6).

The seropositivity of TTI among blood donors in the year 2015 for HIV was (0.136%), Hepatitis C (0.326%), Hepatitis B(0.939%), Syphilis (0.182%) and Malaria (0.039%). The blood banks with component facility reported a higher positivity of HIV (0.141), HCV (0.363) and HBV (0.969) infection. Majority of states in India reported lower seropositivity than the national average but certain states like Manipur, Mizoram, Meghalaya, Bihar, Jharkhand, Arunachal Pradesh, Odisha and others showed higher seropositivity for one or more of the TTIs with respect to the national average(5) .

Therefore, we conducted a study to assess the seroprevalence of HBV, HCV and HIV among blood donors at a tertiary care center in Eastern India.

Material and methods

Study area

The data was collected from the blood bank of tertiary care center in Eastern India, which is equipped with component separation facilities. It serves the need of blood and blood products of people coming from local community as well as different regions of Bihar and other neighboring states.

Study design

It was blood bank based retrospective, cross sectional observational study of blood donors' records from January 2015 to December 2017 at the blood bank of a tertiary care center in Eastern India .

Study population

Blood donors from the local community, different regions of Bihar and other neighbouring states.

Test method

Records of blood samples screened for HBV, HCV and HIV infections in the IGIMS Blood Bank during 3 years were studied and analyzed. Hepatitis B was screened by using ASPEN® HBsAg rapid test strip, based on

qualitative, solid phase, two site sandwich immunoassay for the detection of HBsAg in the plasma/serum, having sensitivity 99.9% and specificity 99%. HepatitisC was screened by using Alere Trueline Rapid test kit for HCV antibodies, based on the rapid immunochromatographic assay for qualitative detection of antibodies specific to HCV in human plasma/serum, having the sensitivity of 99% and specificity 100%. HIV was screened by TRUSTline HIV 1/2Ab Rapid Test- cassette, based on Lateral flow chromatographic immunoassay for detection of antibodies to HIV 1 and 2, having sensitivity 100% and specificity 99.79%. All tests were done according to manufacturer instructions.

Result

A total of 30622 people donated blood during the 3 year study period. Males formed the majority of the donor population accounting for 90 % (27430/30622) while females accounted for 10 % (3192/30622) of donations (Figure-1). Majority of the donors were replacement donors (27253/ 30622= 89%). If we see year wise total donation there was increasing trend of donations in IGIMS blood bank (Table-2) .The overall prevalence of transfusion-transmitted infection was 2.060 % (631/30622) (Table-1). The seropositivity for HBsAg, HCV, and HIV was 1.652% (506), 0.267%(82), and 0.140% (43) respectively. Amongst all the seropositive sera for TTI, the seroprevalence of HBV infection was highest (80 %) and the seroprevalence of HCV & HIV infection was 13 % & 7 % respectively (Figure-2).

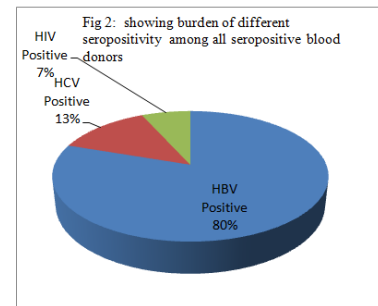
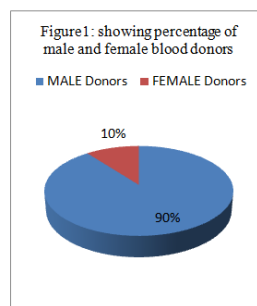


Table 1: showing total number of cases screened, total seropositive and seronegative cases among blood donors

Total case screened for HBV,HCV and HIV	Total Seronegative cases	Total Seropositive cases
30622	27430 (90%)	631(10%)

Table 2: showing year wise blood donations and seropositive cases

Year	Total donations (Male + Female)	HBsAg positive	HCV positive	HIV positive
2015	8130 (7300+830)	129	26	05
2016	9628 (8731+897)	152	34	17
2017	12864 (11399+1465)	225	22	21

Discussion

Keeping the safety concerns of huge number of blood collections and transfusions being done and regional variations in our country, a retrospective, cross sectional, observational study was conducted by reviewing the records of blood donations from January 2015 to December 2017 in the Blood Bank of a tertiary care center in Eastern India. Data of all blood donations screened for TTI during the above mentioned period was included in the study and was analyzed.

To the best of our knowledge very few studies have been done to evaluate the seroprevalence of HBV, HCV and HIV infections among blood donors done in this part of Bihar. In this context, the current study becomes highly relevant as it gives a platform for future investigation to ascertain the viral load of patients with seropositive sera

and treat them accordingly. It also provides baseline information so that the patients with true seropositive sera are counseled not to donate blood in future and to take treatment in the designated centers.

In this study, it was found that, a total of 30622 people donated blood during the study period. Males (27430) formed the majority of the donor population accounting for (90 %) while females (3192) accounted for (10 %). Sinha et al (11) and Arora et al (12) in their study also noted that majority of donors were males. There is an urgent need of motivating females to donate voluntarily. The overall prevalence of transfusion-transmitted infections in our study was 631/30622 (2.060 %). Our result is in conformity with works by Das B K *et al* (13) & B S Yadav *et al* (14) who reported the prevalence of 1.6% & 2.05% respectively. In our study the seropositivity for HBsAg, HCV, and HIV was 1.652%, 0.267%, and 0.140% respectively. Pahuja *et al* (15) in their study reported the prevalence of HBV, HCV & HIV was 2.23%, 0.66% & 0.56%, respectively from 2002-2005 which is quite higher than our data. However, it well correlates with the fact that there has been decrease in trend of TTI over the years. Bommanahalli *et al* (16) also reported similar findings. The seroprevalence of HBsAg (1.652%) was found to be higher compared to the national average of HBV (0.969). Similar finding has been observed in study done by NACO and other centers. (5) Our result is in conformity with the studies done by several workers viz Quadri SA *et al*, Allain JP *et al* and Candotti D *et al*. (19, 20, 21).

The present study clearly documents the higher seroprevalence of HBV and HIV but lower prevalence of HCV infection in this part of eastern India in comparison to the national average. It also indicates lower participation of voluntary donors and female donors.

Implication of the study

Since data on seroprevalence of HBV, HCV and HIV is lacking in our state, this study could be a bench mark for the state. This can be used as a guiding tool for doctors and paramedics working in various blood banks of the state for prevention of transmission of HBV, HCV, and HIV infection to blood /blood product recipients and health care professionals in particular. This data can be used by BSACS and BSTC to spread awareness among blood donors about TTI. The policy makers can formulate plans to introduce testing of seropositive sera by molecular methods for confirmation and also to determine viral load to initiate appropriate management of donors with seropositive sera. Donors with true seropositive sera may be advised not to donate blood in future and counseled to seek further treatment at designated centers.

Conclusion

The present study clearly documents the higher seroprevalence of HBV and HIV but lower prevalence of HCV infection in this part of eastern India in comparison to the national average. It also indicates lower participation of voluntary donors and female donors. Promoting the culture of voluntary donors, recruitment of female blood donors, vaccination of susceptible population against HBV infection, confirmatory test for seropositive sera by molecular methods, counselling the seropositive donors about the infection and advising them to take treatment at the designated centers are recommended. It is also important to make people aware of TTI and efforts should be made to ensure safe blood and its products to the recipients.

Future policy

Government should provide facilities in the blood bank to confirm the seropositive sera by molecular methods and also to determine the viral loads in true seropositive cases so that management of such cases can be initiated without delay.

Limitation of the study

The study was based on records of blood bank at IGIMS, Patna. Confirmatory tests and viral load determination of seropositive cases was not done. Regional variation inside the state could not be assessed.

Author's contribution

Dr Nidhi Prasad was the principal investigator who gave significant input in the development of this article . Dr. Shailesh Kumar has contributed by giving the Blood Bank data and other related information. Dr Vidyut and Dr Rajkishore were involved in analyzing the data and completion of this manuscript.

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Conflict of interests

The authors declare that they have no conflict of interests..

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