

Seroprevalence of HBV, HCV and HIV infections in blood donors in voluntary and replacement donors in a tertiary care hospital in Western Uttar Pradesh, India

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Abstract

Background: The World Health Organization recommends universal and quality-controlled screening of blood donations for the major transfusion-transmissible infections (TTIs): human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV) and syphilis. The magnitude of transfusion-transmitted infections (TTI) varies from country to country depending on TTI's load in that particular population. The present study was undertaken to determine the relative proportion of voluntary donors (VDs) and replacement donors (RDs) and also, to estimate and compare the seroprevalence and changing trends of TTIs amongst VDs and RDs in a tertiary care medical hospital in north India. **Methods:** This retrospective study was based on the records of all voluntary and replacement donations which were collected from January 2016 to August 2018 in a tertiary care medical college and hospital in Bareilly, Uttar Pradesh, India. **Results:** Of the total 7908 donations, 2268 (28.6%) were voluntary and 5640 (71.4%) were replacement donation. The overall seroprevalence of TTI was 158 (1.9%) out of total 7908 donations, with prevalence of hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV), were 1.0, 0.8 and 0.1 percent, respectively. Furthermore, the TTIs were more frequently encountered in RDs in comparison to VDs. **Conclusions:** The potential risk of TTIs can be curtailed to a large extent by increasing in public awareness regarding voluntary blood donation, donor screening using stringent criteria, counselling and use of highly sensitive and specific tests.

Keywords: HBV, HCV, HIV, Seroprevalence, VD, RD

Introduction

Blood transfusion implies the process of receiving blood or blood products into one's circulation intravenously. Transfusions are used for various medical conditions to replace lost components of the blood. Early transfusions used whole blood, but modern medical practice commonly uses only components of the blood, such as red blood cells, white blood cells, plasma, clotting factors, and platelets. Red blood cells contain hemoglobin and increase iron levels by improving the amount of oxygen found in the body.

White blood cells, are not commonly used during transfusion but are related to the immune system and to fight infections. Plasma is the liquid part of the blood which acts as a buffer and contains proteins and important substances needed for the bodies overall

health. The platelets are in charge of blood clotting and prevent the body from bleeding. Blood transfusion is a life-saving intervention and millions of lives are saved each year globally through this procedure; however, unsafe transfusion leads to many life-threatening complications and increases the possibility of transfusion-transmitted infections (TTIs) [1]. Globally, more than 81 million units of blood are donated each year [2]. General risks associated with blood transfusions can be divided into acute, delayed and storage lesions

TTIs belong to delayed transfusion reactions. Transfusion transmissible infections can be classified as viral, bacterial and parasitic infections. The most commonly encountered transfusion infection is of viral origin. Most commonly encountered TTIs are human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV), syphilis and malaria.

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World wide about 350 million and 125 million people have chronic hepatitis B virus (HBV) infection and hepatitis C virus (HCV) respectively, putting viral HBV and HCV infection among the world's greatest infectious disease problems. These diseases are therefore regarded as important candidates for public health measures aimed at prevention, early diagnosis and treatment. [3] Blood product contamination, while rare, is still more common than actual infection.

The reason platelets are more often contaminated than other blood products is that they are stored at room temperature for short periods of time. Contamination is also more common with longer duration of storage, especially if that means more than 5 days.

Sources of contaminants include the donor's blood, donor's skin, phlebotomist's skin, and containers. Contaminating organisms vary greatly, and include skin flora, gut flora, and environmental organisms. There are many strategies in place at blood donation centers and laboratories to reduce the risk of contamination. A definite diagnosis of transfusion-transmitted bacterial infection includes the identification of a positive culture in the recipient (without an alternative diagnosis) as well as the identification of the same organism in the donor blood.

Preventing the transmission of infectious diseases through blood transfusion in developing countries is difficult given that the resources required are not always available even when policies and strategies are in place. These strategies have been extremely effective but transmission of diseases still occurs, primarily because of the inability of the test to detect the disease in the preseroconversion or 'window' phase of their infection, high cost of screening, a lack of funds and trained personnel, immunologically variant viruses, non-seroconverting chronic or immuno silent carriers and inadvertent laboratory testing errors.

Transfusion Transmitted Infections (TTI) is still a major concern to patients, physicians and policy makers who wish to see a risk free blood supply. The present study

Results

A total of 7908 donations were collected during the study period of 2 years 8 months (January 2016-August 2018) and comprised 2268 (28.6%) voluntary and 5640 (71.4%) replacement donations (Table I). The overall seroprevalence of TTI in donors was 158 (1.9%) out of total 7908 donations, with prevalence of hepatitis B virus (HBV), hepatitis C virus (HCV) and human immunodeficiency virus (HIV), were 1.0, 0.8 and 0.1 percent respectively (Table 2).

Further on analysing TTIs amongst VDs and RDs as shown in Table 3, amongst donors, HBV turned out to be the most prevalent TTI and the seropositivity for VD and RD were comparable in year wise category with marked difference note in 2017 HCV cases, with 0.7% seropositivity in VD and 1.8 % in RD. Conversely, prevalence of HBV in 2018 in VD was 1.8%, compared to 0.4 % in RD.

was conducted to find out the percentage of voluntary and replacement donors (VDs and RDs) and also, to estimate and compare the seroprevalence and changing trends of TTIs, HBV, HCV and HIV infection amongst VDs and RDs during a 2 year 8 month period (Jan 2016-August 2018) in tertiary care medical college hospital in north India.

Estimating the prevalence of TTIs, namely HBV, HCV and HIV antibodies or antigen, among blood donors can reveal the magnitude of problem of unnoticeable infections in healthy-looking members of the general population and also help in formulating the strategies for the management of a safe blood supply. Also it gives us a guide to the magnitude of some sexually transmitted infections in the community [4,5].

Material & Methods:

Type of Study: Retrospective study

Place of Study: Tertiary care medical college hospital in Bareilly, Northern India, from January 2016 to August 2018

Sampling Methods: All records including TTI records, donor registers, completely filled donor forms, which included the type of donation (voluntary/ replacement), the patient's details, pre-donation questionnaire, counselling details and medical examination findings available for each case were analysed. The samples from all blood donations were screened for HIV 1-2, HBsAg, HCV, syphilis and malaria.

Samples were collected in vacutainers at the time of blood donation and screened for HIV 1-2, HBs Ag and HCV using fourth-generation enzyme-linked immunosorbent assay (ELISA) technique, using kits manufactured by Avantor (Bene Sphera, USA) and steps performed according to kit inserts. All samples with reactive results were repeated in duplicate before labelling as reactive.

Statistical Methods: All Data were collected for TTI- HBV, HCV and HIV and analysed.

Table-1: Blood donation year wise.

Year	Total donations	Total voluntary donations, n (%)	Total replacement donations, n (%)
2016	1898	580(30.5%)	1318(69.5%)
2017	3404	1144(33.6%)	2260(66.4%)
2018	2606	544(20.8%)	2062(79.2%)
Total	7908	2268(28.6%)	5640(71.4%)

Table- 2: Prevalence of HBV, HCV, HIV in blood donors.

Year	Total donation	HBV, T	HCV, T	HIV, T
2016	1898	26	28	2
2017	3404	36	16	8
2018	2606	20	20	2

T, total number of sero-reactive units; HIV, human immunodeficiency virus; HCV, hepatitis C virus; HBV, hepatitis B virus

Table-3: Comparison of seroprevalence of human immunodeficiency virus, hepatitis B virus and hepatitis C virus in voluntary and replacement donors.

Year	HBsAg		HCV		HIV	
	VD	RD	VD	RD	VD	RD
2016	8(1.3%)	18(1.3%)	04(0.7%)	24(1.8%)	0(0%)	2(0.1%)
2017	12 (1.0%)	24(1.0%)	02(0.1%)	14(0.6%)	4(0.3%)	4(0.1%)
2018	10(1.8%)	10(0.4%)	4(0.7%)	16(0.7%)	0(0%)	2

HIV, human immunodeficiency virus; HCV, hepatitis C virus; HBsAg, hepatitis B virus surface antigen, VD, Voluntary Donor, RD, Replacement Donor

Discussion:

Blood transfusion is a therapeutic procedure, as there is no genuine substitution. But contaminated blood transfusion can transmit infectious diseases and can be fatal instead of saving life [6,7]. Transfusion of blood and blood products is a life saving measure and helps innumerable people worldwide. At the same time however, blood transfusion is an important mode of transmission of infection to the recipients.

The risk of TTI has declined dramatically in high income nations over the past two decades, primarily because of extraordinary success in preventing HIV and other established transfusion transmitted viruses from entering the blood supply. But the same may not hold good for the developing countries. The national policy for blood transfusion services in our country is of recent origin and the transfusion services are hospital based and fragmented. WHO recommends collection of blood from voluntary regular non-remunerated donors who have a lower risk of TTIs compared to family replacement and commercial donors. [8-10] A WHO

report state that viral load is much higher with infected blood transfusion compared to other modality of transmission. [11] This lead to death in about 2 years in children and 3-5 years in adults. HIV detection by ELISA method has window period of 2-8 weeks. During this time, person remains falsely negative. Nucleic acid test help to identify reactive samples earlier, but their cost is prohibitory in routine use. In this scenario, the most effective way to minimize HIV transmission is reduce the blood usage at minimum by rational use of blood and taking donation from safer donor groups like VDs.

The prevalence of TTIs amongst blood donors in a high level healthcare institution with organised blood banking and transfusion services can be assumed to be a valuable tool for statistical computation of these infectious agents in the general population. In the present study, VDs constituted 28.6% of all donors only. This is in accordance with other studies [12-14] and can be accounted for lack of awareness amongst general population about voluntary blood donation.

Certain types of behaviours increase the risk of contracting HBV and HCV infections; for example, use of contaminated needle during acupuncture, intravenous drug abuse, ear piercing and tattooing, heterosexuals or homosexuals sexual activities (especially for HBV) infants born to infected mothers, healthcare providers, subjects undergoing haemodialysis and patients with haemoglobinopathy. (It was previously shown that HBV can be transmitted sexually and vertically from mother to new born baby. This is due to the exposure to infectious blood and body fluid.

It was also previously shown that HBsAg can be found in all body secretions and excretions. However, only blood, vaginal and menstrual fluids, and semen are infectious. HBV can stay active in the environment for up to seven days. Hence, blood contaminated household objects can pose a risk for transmission. Sharing these objects such as toothbrushes or razors can transmit the virus within the family. Lack of education about the method of transmission may help the spread of infection.

Because of shared modes of transmission, co-infection with HIV, HBV and HCV is a significant occurrence, particularly in areas where these viruses are endemic and even amongst apparently healthy subjects like blood donors.[15] WHO recommends an integrated strategy to improve blood transfusion safety by establishment of well organized blood transfusion services, blood collection from voluntary non-remunerated donors, screening of blood for at least four major TTIs with quality assured system and rational use of blood.[15] As per National AIDS Control Organization (NACO), 3.5% of HIV infection is attributed to blood transfusion.[16]

In our study, HIV seropositivity was seen in 0.1 per cent donors which was comparable to other studies reporting a prevalence of 0.1% [17] and 0.08 % [18]. The HBV seroprevalence was found to be 1.0 percent, which is in accordance with other studies, showing prevalence, ranging from 1.25 to 1.96 per cent has been reported in other studies [19].

In our study, HBV was the most prevalent TTI, implying a need for an organized programme for hepatitis B vaccination and use of a highly sensitive technique for its detection like NAT. Hepatitis C showed overall seroprevalence of 0.8 per cent. There was wide variation in HCV seroprevalence in different studies from India, ranging from 0.1 to 1.5 percent [19,20] due to the use of different methods for testing and use of different generation of ELISA test kits, having different sensitivities and specificities.

Conclusion

Our results showed that TTIs pose a serious threat to safe blood transfusion and were seen in both VD and RD types of donors, with lower to comparable prevalence in VD compared to RD. **Recommendations:** Donor screening using implementation of strict selection criteria as per the guidelines laid down for blood banks in the gazette notification by the Government of India and with use of highly sensitive and advanced techniques for detection of TTIs, it is possible to decrease the incidence of seropositivity of transfusion-transmitted infections and improve the blood product safety.

As the proportion of VD still falls much lower compared to RD, there is an urgent need to create public awareness regarding voluntary donation and its benefits.

Contribution of Authors

- Dr Tandra Chadha- Manuscript Writing, Data Compiling, Literature Review, Final Approval.
- Dr Shashikant Adleka- Manuscript Editing, Literature Review, Final Approval

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