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Seroprevalence of transfusion-transmitted infections among blood donors in a newly established medical college of Eastern India

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Abstract:

INTRODUCTION: Blood transfusion is essential for saving lives in millions of patients. However, blood transfusion also carries the risk of transfusion-transmissible infections (TTIs) if not properly screened.

AIMS AND OBJECTIVES: To study the seroprevalence of TTI among blood donors in a blood bank with special emphasis on hepatitis B and hepatitis C.

MATERIALS AND METHODS: It is a retrospective descriptive study for 5 years from January 2016 to December 2020. Data of all blood donors both voluntary and involuntary were analyzed to find out seroprevalence of TTIs.

RESULTS: Total 43775 donors were screened, and their data were analyzed. Out of these, total 182 (0.42%) donors were found to be seropositive for TTIs. Most of the donors were positive for hepatitis B (n = 122, 0.28%) and hepatitis C (n = 51; 0.12%); however, no donor was found to be positive for malaria.

CONCLUSION: In this study, we found a low prevalence rate of TTIs among blood donors. It may be due to effective screening and selection of donors as well as awareness among general public. Strict screening and regular testing are essential to keep blood transfusion safe and free from TTIs.

Keywords:

Blood bank, blood donors, blood transfusion, seroprevalence, transfusion-transmissible infections

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Introduction

Blood is an essential lifesaving element. Blood transfusion practices can be traced back since 1930.[1] Transfusion of blood and its components is an important mode of treatment modality in certain conditions such as hemolytic anemia, severe anemia, major trauma causing severe blood loss, and major surgeries.[2] However, blood transfusion is not free of its various risks; one of which is transfusion transmissible infections (TTI). Hence, safe blood transfusion practices are utmost important to prevent TTIs which include hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV), malaria, and syphilis. General lack of quality systems, poor or nonstandardized laboratory testing procedures, inadequate testing of donated blood, and inappropriate use of blood and blood components may contribute for unsafe blood transfusion services.[3] TTIs also a cause of threat health-care providers. Each unit of blood

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carries 1% risk of transfusion-associated problems, which also includes TTI.[4]

In India, screening of every unit of donated blood for TTIs is made mandatory by the government. Every unit of the donated blood must be screened for HBV, HCV, HIV, malaria, and syphilis in all blood banks.[5]

Our institution is a newly established medical college in the Western part of West Bengal, which caters patients not only from this part of West Bengal but also from part of Jharkhand. Previously, no study had been undertaken in this part of West Bengal regarding seroprevalence of TTIs among blood donors. It will also help us roughly to estimate the prevalence of TTIs among general asymptomatic population.

Keeping this in mind, the present study was undertaken with the objective to estimate the seroprevalence of TTIs among all blood donors in our blood bank with special emphasis on HBV and HCV.

Materials and Methods

This study was conducted at blood bank of a tertiary care center at West Bengal, India. It is a retrospective cross-sectional study, carried out in a blood bank of a newly established medical college from January 2016 to December 2020, i.e., for 5 years.

Study population

All blood donors whether voluntary or replacement, during the study period.

Inclusion criteria

Inclusion criteria of blood donors are aged between 18 and 60 years, hemoglobin concentration 12.5 g% or more, body weight 45 kg or more, no history of hepatitis B and hepatitis C infections and sexually transmitted diseases, and no history of jaundice for last 1 year.

Exclusion criteria

Donor's blood who were not undergone testing of TTIs due to hemolysis or other reasons are excluded from the study.

Ethical consideration

The study was approved by the institutional ethics committee before commencing the study vide letter no IEC/2021/02/001 dated: February 12, 2021.

Data collection procedure

The data were collected by studying all the registration book of blood donors from 2016 to 2020 maintained in the blood bank.

Data of all blood donors both voluntary and replacement were noted. Blood donors were requested to fill the donor card and a prestructured questionnaire was filled up. Information regarding age, sex, previous history of surgery, chronic illness, hospitalization, blood transfusion, jaundice, high-risk behavior, history of vaccination, etc., were recorded. After satisfaction of answers by blood bank medical officer and medical examination, donors were allowed to donate blood.

Method of testing for TTIs

Two milliliters of pilot samples was taken from each donor and serum was separated. Serum of all donors was tested for hepatitis B surface antigen (HBsAg), HCV antibodies (anti-HCV), HIV antibodies 1,2 (anti-HIV-1,2), rapid plasma reagin (RPR) for syphilis antibodies, and malaria parasite antigen test. HBsAg testing was done in serum using MERILISA enzyme immunoassay kit, anti-HCV test was done using Hepa-Scan enzyme-linked immune assay (ELISA) kit, and HIV screening was done using MERILISA HIV 1-2 Gen 3 enzyme immunoassay kit. Syphilis screening was done by RPR, Carbogen of Tulip Diagnostic (P) Ltd., while malaria screening was done using malaria dual antigen kit by standard diagnostics. The reactive cases of HBsAg, HCV, and HIV were retested before marked as reactive and discarded maintaining standard biomedical waste disposable procedure.

Results

A total of 43765 donors donated blood during the study period, i.e., January 2016 to December 2020. Out of these, voluntary donation comprised 26,803 and replacement donation comprised 16,962 [Table 1]. Among all donations, about 2/3rd (61.24) donations were voluntary and about 1/3rd (38.76) were replacement.

The total number of donors who were found to be positive for transfusion-transmissible infections (TTIs) was 181 out of 43,775 (0.42%) [Table 2]. The seropositivity for various TTIs was 122/43,775 (0.28%) for HBsAg, 51/43,775 (0.12%) for HCV, and 6/43,775 (0.01%) for HIV [Table 2]. Seropositivity for syphilis (venereal disease research laboratory) was 2/43,775 (0.004%) and we do not find any seropositivity for malaria (malarial parasite). Out of

Table 1: Total numbers of voluntary and replacement blood donations

Year	Total donation	Voluntary, *n* (%)	Replacement, *n* (%)
2016	6558	4087 (62.32)	2471 (37.68)
2017	8283	6145 (74.19)	2138 (25.81)
2018	8568	5657 (66.02)	2911 (33.98)
2019	10112	5836 (57.66)	4276 (42.24)
2020	10,244	5078 (49.56)	5166 (51.04)
Total	43765	26,803 (61.24)	16,962 (38.76)

Table 2: Prevalence of transfusion transmissible infections among blood donors

Diseases	Years					Total (*n*=43,765)
	2016 (*n*=6558)	2017 (*n*=8283)	2018 (*n*=8568)	2019 (*n*=10112)	2020 (*n*=10,244)	
HBsAg	15 (0.23)	16 (0.19)	33 (0.39)	31 (0.31)	27 (0.26)	122 (0.28)
HCV	5 (0.08)	6 (0.07)	13 (0.15)	8 (0.08)	19 (0.19)	51 (0.12)
HIV	0	0	1 (0.011)	2 (0.2)	3 (0.03)	7 (0.01)
VDRL	0	0	0	1 (0.001)	1 (0.001)	2 (0.004)
MP	0	0	0	0	0	0
Total	20 (0.30)	22 (0.39)	47 (0.55)	42 (0.41)	50 (0.49)	182 (0.42)

HBsAg=Hepatitis B surface antigen, HCV=Hepatitis C virus, VDRL=Venereal disease research laboratory, MP=Malarial parasite, HIV=Human immuno-deficiency virus

all TTIs, HBsAg is found to be most prevalent (0.28%), followed by HCV (0.12%), while no single seropositive case of malaria was found.

Discussion

Blood transfusion is an important life-saving procedure in today's medical practice, but also carries risk of various TTIs such as HIV and hepatitis B and C and can be fatal.[6] The overall prevalence of TTIs in apparently healthy blood donors in an area may be used to estimate their prevalence among general population in a particular area.[7] Pre-transfusion counseling is especially important as it can detect donors with high-risk behavior and can be rejected.

We found that majority of donors in our study are voluntary donors, e.g., 67.86% [Table 1]. Voluntary blood donation is the cornerstone for safe and adequate blood supply.[8] Increasing awareness about voluntary blood donation and organizing blood donation camps by various organizations causes the increased number of voluntary donations. This finding is comparable to other studies done by Rawat *et al*., Das and ML, Tambse *et al*., and Pu *et al*.[7,9-11] However, on the contrary, few studies from India show preponderance of replacement donors, which may be due to lack of awareness among people regarding importance of voluntary blood donation.[12-14] There was mild increase in replacement donors (51.04) compared to voluntary donors (49.56) in our study for 2020. COVID-19 pandemic and resultant lockdown leading decrease in voluntary blood donation camp may be the main reason behind this.

The prevalence of various TTIs in our study was found to be comparable or lower than many other Indian studies [Table 3].[7,13-19] In our study, 0.42% of donors were positive for any of the TTIs. Lower seropositivity of TTIs as comparable to other studies may be due to increase awareness in the society regarding voluntary blood donation and proper donor counseling procedure.

As most the previous Indian studies, seropositivity for HBsAg was the highest (0.28%) which is comparable to study done by Sharma *et al*.[14] In other studies, seroprevalence of HBsAg is much higher ranging from 0.91% to 1.61%.[7,13,15-19] However, two studies from India reported high prevalence of HBV seropositivity of 2.63% and 2.90%, respectively.[20,21] HBV is the most common cause of transfusion-related diseases (79%).[19] We have found comparatively less percentage of seropositivity for HBV. One reason for this may be due to very less prevalence of HBV infection in the general population in this region and proper donor screening. However, significant numbers of window period donations cannot be ruled out which may lead to decreased number of HBsAg-positive donor. Newer testing methods such as nucleic acid amplification testing (NAT) can be done for screening HBV seropositivity and HBV NAT positivity rate was much higher compared to studies done in Europe and the United States as found by Jain *et al*.[22] They also recommended that in our country where there is a significant number of blood donors were in window period for HBV, NAT must be introduced. Hepatitis B vaccination program among general population and introduction of sensitive detection tool like NAT may be used to detect and prevent this most prevailing TTI.

Hepatitis C is the next most common TTI in our study (0.12%). The seropositivity of HCV is comparable to the findings of many other Indian studies; the lowest prevalence is 0.149 to highest being 0.9%.[7,13-19] The variation of HCV seroprevalence in various studies from India may be due to use of different methods for testing and use of ELISA kits of different generation which have variable sensitivities and specificities.[7]

Few epidemiological studies on HBV and HCV have been conducted in India, most of them in various blood banks and on some specific subpopulations like people infected with HIV, sex worker, dialysis patients, intravenous drug users, prisoners, hemophiliacs etc., who are usually higher risk for blood borne and sexually transmitted infections.[23] In India, both HBV and HCV infections are common and present with variable numbers due to variation in ethnicity and geography.[9] As HBV and HCV are the major TTIs and have immense clinical and epidemiological importance, nationwide study on HBV and HCV is of utmost importance and should be conducted.

Table 3: Transfusion transmissible infections prevalence in various studies

Study	Area/place	Duration	HBsAg (%)	HCV (%)	HIV (%)	VDRL (%)	MP (%)
Patil *et al.*	Maharashtra, India	2011-2018	1.027	0.1409	0.131	0.001	0.01
Sharma *et al.*	Gujrat, India	2015-2018	0.29	-	0.03	0.04	-
Bhutia *et al.*	Sikkim, India	2013-2017	0.91	0.22	0.15	0.04	-
Rawat *et al.*	Delhi, India	2008-2014	1.61	0.73	0.32	1.62	0.06
Negi *et al.*	Uttarakhand, India	2000-2010	1.2	0.9	0.2	0.3	0.002
Omhare *et al.*	Kanpur, India	2014-2015	1.45	0.33	0.068	0.15	0.007
Mandal R *et al.*	Darjeeling, India	2010-2012	1.24	0.62	0.42	0.65	-
Karmakar *et al.*	Kolkata, India	2011	1.41	0.59	0.60	0.23	NA
Present study	West Bengal, India	2016-2020	0.28	0.12	0.01	0.004	-

HBsAg=Hepatitis B surface antigen, HCV=Hepatitis C virus, VDRL=Venereal disease research laboratory, MP=Malarial parasite, NA=Not available, HIV=Human immuno-deficiency virus

In our study, HIV seropositivity was seen 0.01%, which is lower than many other Indian studies, where seropositivity for HIV ranging from 0.03% to 0.6%.[7,13-19] HIV is one of the dreaded infections which can transmitted through blood transfusion. As per the WHO, transfusion of one unit of infected blood with HIV can lead to death in children and adults after 2 years and 3–5 years.[5] There may be several reasons for low prevalence of HIV in our blood bank such as strict pre-donation counseling and exclusion of high-risk individuals, low prevalence of HIV in our region and missing of donors in window period. If blood donors came mainly from low risk targeted public, the possibility of window period transmission can be minimized.

The seropositivity for syphilis was seen 0.004% among all donors, which is also comparable to other Indian studies.[7,13-19] Syphilis is a sexually transmitted disease, which is likely to be associated with increased risk of HIV infection and hence increasing the risk of the morbidity and mortality.[15]

The National AIDS Control Organization issues guidelines that donor affected with malaria should be deferred from donation for at least next 3 months.[18] We do not find any seropositive case for malaria. Effective treatment, proper history taking regarding fever, and effective screening may be reason behind nonprevalence of malaria.

Conclusion

"Blood saves lives" was the theme for 2000 AD of the World Health Organization. However, this could only be possible if the transmitted blood is free from TTIs. Voluntary blood donation is associated with reduced prevalence of TTIs. Increasing awareness among general public regarding voluntary blood donation and organizing more blood donation camps increases voluntary blood donation. Strict screening, counseling, and use of proper testing procedures to detect TTIs are necessary to reduce the incidence of TTIs.

Hence, we recommend regular, voluntary blood donation to ensure decrease of TTIs. Then also, a minimal risk of TTIs exists in the window period. Proper donor counseling and use of more sensitive testing techniques like NAT may be useful in this scenario.

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Conflicts of interest

There are no conflicts of interest.

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