

Seroprevalence of Transfusion Transmitted Diseases in a Tertiary Care Hospital of Northern India: A Five Year Retrospective Study

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ABSTRACT

Introduction: Although transfusion of blood and its components is life saving but it may also pose a threat to life as with every unit of blood there is 1% chance of transfusion associated problems which include the transfusion of transmitted diseases as well. The Ministry of Health and Family Welfare (Government of India) under The Drug and Cosmetic Act, 1945 (amended from time to time) mandates the screening of blood donations against five major infections- Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Syphilis and Malaria.

Aim: To estimate the prevalence of Transfusion Transmitted Infections (TTIs) among blood donors in a tertiary care hospital.

Materials and Methods: This is a retrospective five year study from February 2016 to January 2021. The study was undertaken at TS Misra Medical College and Hospital, Lucknow, Uttar Pradesh, India. The sample size included 5420 blood donors. The data concerning type of donors, gender and results of screening

tests were obtained from blood bank register/records. Donor selection was based on history of present and past illness and also included a pre-donation questionnaire. Serum samples were screened for Hepatitis B Surface Antigen (HBsAg), antibodies to HIV Type 1 and 2 and antibodies to HCV using Microwell Enzyme Linked Immuno Sorbent Assay (ELISA) Test. For syphilis and malaria detection, membrane based immunoassay and sandwich immunoassay techniques were used respectively.

Results: Out of a total of 5420 blood donations over a period of five years, there were 5298 male donors and 122 female donors. There were 5368 replacement donors and 52 voluntary donors. The prevalence of HIV, HBsAg, HCV, syphilis and malaria was 0.16%, 0.77%, 0.11%, 0.53% and 0%, respectively.

Conclusion: Voluntary blood donations, stringent screening measures, advanced screening techniques, strict donor selection are essential features for decreasing the prevalence further and also would ensure blood safety.

Keywords: Blood donors, Replacement, Screening, Syphilis, Voluntary

INTRODUCTION

Safe blood transfusion practices are important to prevent TTIs which include HIV, HBV, HCV, syphilis and malaria [1]. Meticulous pre transfusion testing and screening of blood is very essential to avoid the mild or life threatening complications of transfusion [2]. Although stringent screening and testing practices are being implemented, various factors and problems like the 'window period' asymptomatic carriers, false negative results and technical errors still remain [3]. Blood transfusion departments screen the TTIs and also reflect the prevalence of these infections in the whole population [4]. Every unit of blood transfused carries 1% risk of transfusion associated problems which also include TTIs [5].

As no previous study related to seroprevalence of TTIs has been carried out among blood donors in and around TS Misra Medical College and Hospital, located in the area of Indo-Gangetic plain, this study would help us roughly estimate the prevalence of such infections among general asymptomatic population.

The present study aimed at estimating the prevalence of TTIs among blood donors in a tertiary care hospital and analysing the trends of TTIs over the study period.

MATERIALS AND METHODS

This was a retrospective study conducted over a period of five years from February 2016 to January 2021 in TS Misra Medical College and Hospital, Amausi, Lucknow which is a tertiary care hospital in Northern India. The records were analysed from blood bank register from October 2021 to December 2021. A total of 5420 blood donors of both sexes were included in the study.

The donors were requested to answer a questionnaire to determine their eligibility for blood donation. The self made questionnaire

included information related to any acute or chronic illness of patient, any tattooing, ear piercing, injections or vaccinations taken, drug history, history of surgery or blood transfusion etc. A written informed consent was taken from all donors.

The study involves an analysis of available data for which informed consent had been obtained at the time of blood collection. The study maintains confidentiality of patient who is seropositive. The current study was approved by Ethical Committee of hospital.

Inclusion criteria: All the replacement and voluntary donors attending the blood bank were included in the study. Individuals qualified for study were between 18 and 65 years of age with body weight above 45 kg and haemoglobin greater than 12.5 gm/dL, complying with other National AIDS Control Organisation (NACO) guidelines of blood pressure, temperature, pulse etc., and with no significant medical or surgical history [6].

Exclusion criteria: High risk group patients i.e., those suffering from chronic ailments, professional blood donors, drug abusers, pregnant women, dialysis patients and rejected donors were excluded.

Study Procedure

After blood donation the samples were obtained for serological testing. Two millilitres of pilot sample was taken in plain vacutainer from each donor and serum was separated. In the blood bank each donor blood sample was screened for five infections- HIV, HBV, HCV, syphilis and malaria.

HIV: Screening was done using microwell ELISA test for the detection of antibodies to HIV-1 and HIV-2 in human serum/plasma. Microlisa HIV test is an enzyme immunoassay based on indirect ELISA.

Hepatitis B: Screening was done using microwell ELISA test for the detection of HBsAg in human serum/plasma. HEPALISA is a solid phase ELISA based on 'Direct Sandwich' principle.

Hepatitis C: Screening was done using microwell ELISA test for the detection of antibodies to anti-HCVs to viral proteins in human serum/plasma.

Syphilis: Screening was done using syphilis rapid test device which is a qualitative membrane based immunoassay for the detection of *Treponema pallidum* antibodies in serum/plasma.

Malaria: Screening was done using rapid, qualitative, two site sandwich immunoassay utilising whole blood for the detection of *Plasmodium falciparum* specific Histidine Rich Protein (Pf HRP-20) and *Plasmodium vivax* specific parasite Lactate Dehydrogenase (pLDH).

STATISTICAL ANALYSIS

Data analysis was done with the help of Statistical Package for the Social Sciences (SPSS) version 19. Qualitative data were analysed with the help of frequency and percentage table. Prevalence was calculated with respect to gender and type of donor. The association among various study parameters was assessed with the help of chi-square test. The p-value <0.05 was considered statistically significant.

RESULTS

This study consisted of 5420 donors over a period of five years. A total of 5368 were replacement donors and 52 were voluntary donors [Table/Fig-1].

Type of donors	Number of donors	Percentage
Replacement	5368	99.04%
Voluntary	52	0.96%
Total	5420	100%

[Table/Fig-1]: Types of blood donors included in the study (N=5420).

Among the 5368 replacement donors, 5254 were males and 114 were females and among 52 voluntary donors, 44 were males and 8 were females. On the whole, total number of male donors was 5298 (97.7%) and total number of female donors was 122 (2.25%) [Table/Fig-2]. During the five year period it was seen that maximum donors were males and replacement donation was the most common type. The statistical significance was determined with respect to type of donor by calculating p value using chi square test (χ^2 -41.161, $p < 0.001$).

The total number of seropositive units was 86 (1.58%). The year wise distribution of total donors and seropositive cases has been shown in [Table/Fig-3].

The overall seroprevalence of HIV, HBsAg, HCV and syphilis were 0.16%, 0.77%, 0.11%, 0.53%, respectively. [Table/Fig-4] shows frequency of seropositivity of TTIs in blood donors.

DISCUSSION

Transfusion of blood and its components is a specialised modality to manage patients and save millions of lives worldwide and reduce morbidity [7]. However, unfortunately blood transfusion is also a potential source of transmission of TTIs [8].

S. No.	Authors and references	Area	Time period	HIV	HBsAg	HCV	Syphilis	Malaria
1.	Adhikary M et al., [1]	West Bengal	5 yr	0.01%	0.28%	0.12%	0.004%	0
2.	Chandekar S et al., [2]	Maharashtra	5 yr	0.26%	1.3%	0.25%	0.28%	0
3.	Divyashree BN et al., [3]	Andhra Pradesh	7 yr	0.14%	0.82%	0.02%	0.13%	0.03%
4.	Dhruva G et al., [4]	Gujarat	1 yr	0.074%	0.68%	0.074%	0.065%	0.037%
5.	Mhetre S and Kulkarni M [5]	Maharashtra	3 yr	0.14%	2.41%	0.46%	0.19%	0
6.	Arya D et al., [17]	Rajasthan	5 yr	0.10%	1.6%	0.18%	0.89%	0.04%

Gender	Number of donors	Percentage
Males	5298	97.7%
Females	122	2.3%
Total	5420	100%

[Table/Fig-2]: Gender of the donors included in the study (N=5420).

Year	Total number of donors	HIV	HBsAg	HCV	Syphilis	Malaria
Feb'16-Jan'17	1404	01	05	01	05	0
Feb'17-Jan'18	816	01	07	01	03	0
Feb'18-Jan'19	1112	02	10	01	13	0
Feb'19-Jan'20	1709	04	18	03	06	0
Feb'20-Jan'21	379	01	02	00	02	0
Total	5420	09	42	06	29	0

[Table/Fig-3]: Year wise distribution of seropositive donors.

Transfusion transmissible infections (TTI)	Number of seropositive donors	Percentage
HIV	09	0.16%
HBsAg	42	0.77%
HCV	06	0.11%
Syphilis	29	0.53%
Malaria	00	0
Total	86	1.58%

[Table/Fig-4]: Frequency of seropositivity of TTIs in blood donors.

In the present study, the replacement donors (99.04%) were much more than voluntary donors (0.96%). In the study by Mondal R et al., only 3.7% voluntary blood donors were found [8]. This is also in accordance with study by Kakkar N et al., (94.7%), Pahuja S et al., (99.48%), Yadav BS et al., (92%) and Warsi S et al., (92.9%) [9-12]. In our study, we concluded that it was all the replacement donors who were infected and no voluntary donors carried infection, so awareness for voluntary blood donation among the population of this area should be increased and more camps should be organised. It has been shown that replacement donors constitute the largest group of blood donors in India which may be attributed to the low level of awareness among the general population [13].

In the present study, bulk of the donor population was males (97.7%). This is in concordance with study by Chavan SK and Chavan KB who mentioned 97.3% male donors in their study [14]. This may be attributed to less awareness, anaemia and low body weight of females. In this study, 1.58% of the donors were positive for any transfusion transmitted diseases. Varying degrees of seroprevalence has been reported in different studies. Our percentage positivity was lower than studies by Kaur D and Agarwal P (2.19%) and Karmakar PR et al., (3.22%) and was higher than studies by Adhikary M et al., (0.42%) and Divyashree BN et al., (1.14%) [1,3,15,16].

Seroprevalence of HIV, HBsAg, HCV, syphilis and malaria in the study was found to be 0.16%, 0.77%, 0.11%, 0.53% and 0%, respectively. This has been compared with studies conducted in different parts of India in [Table/Fig-5] [1-5,17,18]. The seroprevalence of TTIs in the study was comparable to many other Indian studies [Table/Fig-5] [1-5,17,18]. The seropositivity of HBsAg was highest (0.77%) in

7.	Manhas A et al., [18]	Haryana	6 month	0.91%	1.3%	2.22%	1.66%	0
8.	Present study	Uttar Pradesh	5 yr	0.16%	0.77%	0.11%	0.53%	0

[Table/Fig-5]: Prevalence of seropositivity in studies conducted in various parts of the country [1-5,17,18].

this study. Most of the studies mentioned in [Table/Fig-5] have also shown the highest prevalence of HBsAg [1-5,17,18]. Many studies have emphasised the use of highly sensitive detection methods like Nucleic Acid Amplification Testing (NAT) [12] and also hepatitis B vaccination programs to be introduced in the general population to prevent this commonest TTI [1].

The second most common TTI in this study was syphilis (0.53%) followed by HIV (0.16%) and HCV (0.11%). No cases of malaria were found in the study population.

Limitation(s)

A major limitation of this study was selection of donor population from a single centre. Majority of donor pool was male population, so prevalence cannot be generalised to female population. The use of rapid card testing for syphilis and malaria can give a false negative result. All TTIs such as Leishmaniasis and Toxoplasmosis have not been covered.

CONCLUSION(S)

The present study shows a higher prevalence of hepatitis B compared to other TTIs. Also, the greater number of male donors and larger number of replacement donors have been noted in the area. Measures such as bringing awareness of the diseases among individuals of population, ensuring a high vaccination rate and encouraging voluntary blood donation should be implemented in the area for control and prevention of these infections. Apart from implementation of stringent blood screening for supply of safe blood and blood products, introduction of more sensitive techniques like Nucleic Acid Amplification Test (NAT) should be introduced which may facilitate early detection of virus and reduce chance of window period transmission of infection.

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