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Trend of Seroprevalence of Transfusion Transmissible Infections among Donors of a Blood Bank in a Tertiary Care Centre in Kolkata

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Abstract
Objectives: *The present study has been carried out to assess the prevalence of Transfusion Transmissible Infections (TTIs) within blood donors at a tertiary care institution in Kolkata, India.*
Methods: *The present study is a five year (2012–2017) retrospective study. Data was accumulated and analysed from blood bank records of all donors who were screened for various TTIs using both Rapid Test and ELISA Methods.*
Results: *Total 15,541 blood donors were examined, comprising of 14,102 (90.74%) male donors and 11,446 (73.65%) voluntary donors. Cumulative seroprevalence of HIV, HBV, HCV were 0.08%, 0.75%, 0.13% respectively; with no malaria-infected donor. The overall seroprevalence in present study is relatively low as compared to other studies.*
Conclusions: *The present study concluded that the seroprevalence of HBV was higher than HIV, HCV and Malaria in the last five years.*
Keywords: *Blood donors, HBV, HCV, HIV, Kolkata, Transfusion transmissible infections.*

Introduction

Transfusion of blood and blood components save millions of lives all over the world, each year and also reduces morbidity. But at the same time, blood transfusion is associated with a number of complications. With each unit of blood transfused, there is an increased risk of transmission of Transfusion Transmitted Infections (TTIs) which includes Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Malaria and many more infections. The present study has been carried out to assess the prevalence of Transfusion Transmissible Infections (TTIs) within blood donors and recommends way ahead.

Materials and Methods

This study was carried out at a blood bank in a tertiary care institution in Kolkata, India. 2 types of blood donors viz. voluntary donors and replacement donors have been identified. A voluntary blood donor donates blood without hoping for any benefit from the donation. Replacement donors are those donors who donate

blood for patients and are mostly family members, close relatives and friends of recipient. Donors were screened by doctors by asking them to answer the donor's questionnaire. They were also physically examined and their hemoglobin (Hb%) was estimated. Total 40,287 blood units from the selected healthy donors were collected over a period of five years (01 April 2012 to 31 March 2017). The donors were both Voluntary Donors (VD) and Replacement Donors (RD). The Voluntary Donations were obtained from walk in donors and in voluntary blood donation camps organized in various nearby areas. A written consent from the donor was taken prior to donation. 3 ml blood in plain vial and 2 ml blood in EDTA (Ethylene Diamine Tetra Acetic Acid) vial were taken from the satellite bag. All samples were screened for Hepatitis B Surface Antigen (HbsAg), Human Immunodeficiency Virus (HIV), Hepatitis C Virus (HCV) and Malaria. All tests were performed with commercially available ELISA kits and Rapid Card Methods as mentioned below.

Table 1: Tests performed and their specifications

Tests Performed	Specifications
HIV Antibodies Detection	• Rapid Immunochromatography Test for HIV 1 & 2 (Qualpro diagnostics) • SD HIV 1/2 ELISA 3.0(Third generation Anti- HIV 1/2 Elisa test) (Bio Standard Diagnostics Private Ltd).
HbsAg Antigen Detection	• Rapid card (Orchid Biomedical Systems) • SD HbsAg ELISA 3.0(Enzyme Immunoassay for the detection of HBsAg) (Bio Standard Diagnostics Private Ltd.)
HCV Antibodies Detection	• Rapid Immunochromatography Test for HCV (Qualpro diagnostics) • SD HCV ELISA: The third generation Anti-HCV ELISA Test (Bio Standard Diagnostics Private Ltd.)
Malaria	• Rapid test for Malaria (Card method) – Pv/Pf (Zephyr Biomedicals): one step rapid immunochromatographic test for P. Falciparum & P. Vivax.

The specific instructions as indicated by Manufacturer were strictly followed. Tests were carried out on all reactive samples for a second time before labeling them seropositive. As per the guidelines of National AIDS Control Organisation (NACO), the blood units were discarded whenever the pilot donor samples were found positive for any TTI.

The donor exclusion criteria included are: age under 18 or over 60 years, recent blood donation, history of fever, weight loss, jaundice, hypertension hepatic or cardiovascular or pulmonary derangement, malignancy, epilepsy, bleeding diathesis, consumption of prohibited drugs, surgical intervention, pregnancy or lactation.

Results

Total 15,541 healthy donors were screened during the period from 01 April 2012 to 31 March 2017. Most of the donors were aged 35 years or less. Total 11,446 (73.65%) voluntary donors and 4095 (26.34%) replacement donors have been observed. The donors were mostly males 14,102 (90.74%), while females constituted only 1439 (9.25%) of the study population (Table 2).

Table 2: Distribution of blood donors with TTI according to sex

Sex	HIV		HbsAg		Anti Hep C		Total
	No of Person	%	No of Person	%	No of Person	%	
Male	10	76.92	115	98.29	20	95.23	145
Female	03	23.07	02	1.70	1	4.7	6

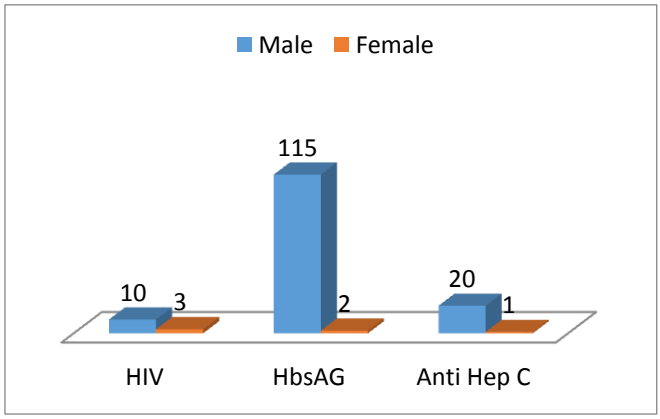

Fig 1: Representation of distribution of blood donors with TTI according to sex

Overall 151 seropositive donors (13 HIV, 117 HbsAG, 21 HCV) were identified corresponding to a summed-up seroprevalence of 0.97 %. Seroprevalence of HIV, HBV and HCV among studied donors were 0.08%, 0.75% and 0.13% respectively. No malaria infected donor was observed (Table 3).

Table 3: Prevalence of HIV, HbsAg, anti HCV and MP among donors in the study population

Year	Total no of donors	HIV		HbsAg		HCV		MP	
		No of Person	%	No of Person	%	No of Person	%	No of Person	%
2012	1357	6	0.44	20	1.47	5	0.07	0	0
2013	2967	3	0.10	28	0.94	15	0.50	0	0
2014	3376	2	0.05	22	0.65	1	0.02	0	0
2015	3097	0	0	22	0.71	0	0	0	0
2016	3458	0	0	20	0.57	0	0	0	0
2017	1286	2	0.15	5	0.38	0	0	0	0
Cumulative Total	15541	13	0.08	117	0.75	21	0.13	0	0

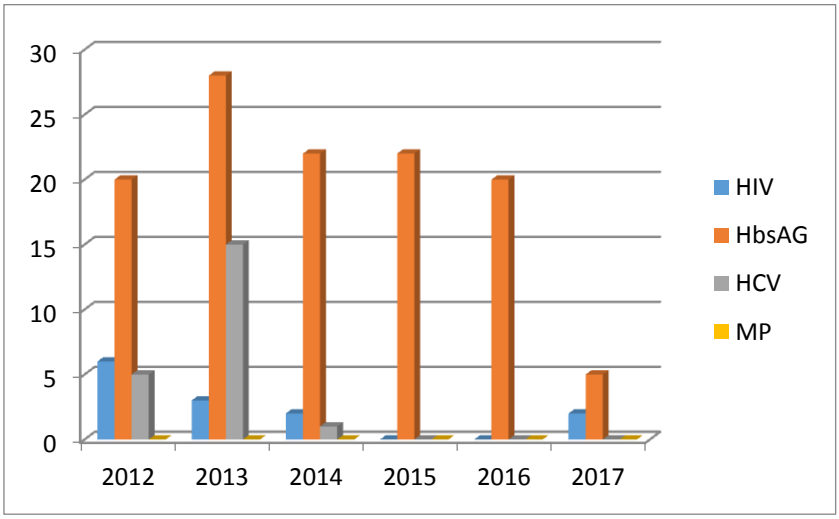

Fig 2: Representation of prevalence of HIV, HbsAG, anti HCV and MP among donors in the study population

Altogether the highest prevalence for each TTI was observed in the 26-35 years age group, followed by the 36-45 years age group. Seropositivity among discussed donors dipped lowest for the >45 years age group.

Table 4: Distribution of blood donors with TTI according to age

Age in years	HIV		HbsAg		HCV	
	No of Person	%	No of Person	%	No of Person	%
18-25	03	23.07	23	1.96	03	14.28
26-35	08	61.53	42	35.89	07	33.33
36-45	02	15.38	49	41.88	08	38.09
46-55	00	00	03	2.56	03	14.28

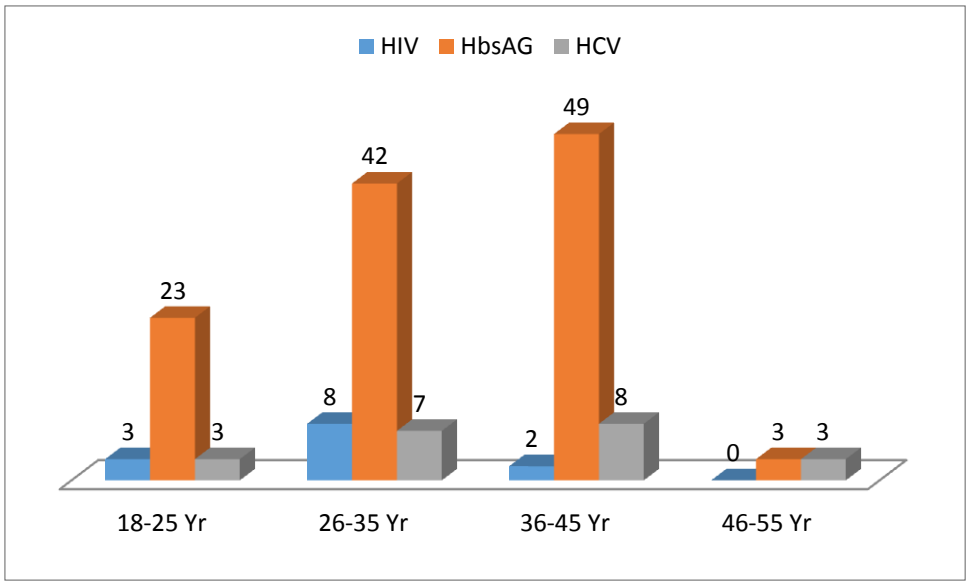

Fig 3: Representation of distribution of blood donors with TTI according to age

Discussion

With each blood transfusion the chances of infection increases. The risk of TTI has decreased over the past two decades, because of development of newer techniques for screening of blood and its components and increased awareness among the people.

In the present study, among the total blood donors, voluntary donors (VD) constituted 73.65%, while replacement donors(RD) were 26.34%. This is comparable to the study carried out by Hilda Fernandes et al[1]. In a study undertaken by Gupta PK et al[2], voluntary donations (61.9%) were more than replacement donations (38.1%). 73.98% of donors were voluntary donors in a study by R. Mandal[3]. In yet another study by Fessehaye N et al[4], a total of 29,501 units of blood were collected from 23,385(79%) voluntary blood donors and the rest 6,116(21%) units were collected from family replacement donors. In contrast, a predominance of RD was observed in a study by R.N. Makroo et al [5]. Replacement donations [174,939 (96.93%)] represented the majority whereas, only 5,538 (3.06%) donations were from the voluntary donors. Proper awareness among people and periodical voluntary blood donation camps should be carried out so that healthy donors can donate blood.

The overall seroprevalence of HIV, HBsAg and HCV are 0.08, 0.75 and 0.13 respectively in the present study. This is comparable to the study by Negi G et al [6] where the seroprevalence was found to be 0.2, 1.2, 0.9, and 0.002% for HIV, Hepatitis B surface Antigen (HBsAg), Hepatitis C virus (HCV) and Malarial Parasite (MP), respectively. Another study carried out in Kolkata by Karmakar PR et al [7] showed a similar pattern of prevalence. In their study, Seroprevalence was highest for hepatitis B (1.41%) followed by human immunodeficiency virus (0.60%) and hepatitis C (0.59%). In a study from Mysore, the overall prevalence of HIV, HbsAg and HCV were 0.44, 1.27, 0.23 and 0.28%, respectively [8]. In another study carried out in South India, seropositivity for HIV was (0.5%), HBV (1.2%),

HCV (0.85%) and peripheral blood smear for malaria were negative in all the donors [9]. In the study carried out by R.N Makroo [5] in North India, the overall seroprevalences of HiV, HBsAg and HCV were 440 (0.24%); 2,138 (1.18%); 790 (0.43%) respectively which follows a similar trend as our study. In a study carried out in Western India, the seroprevalence of HIV, HBV and hepatitis C were observed to be 0.21%. 0.78% and 0.33% respectively [10]. In a study carried out in Bangladesh [11], the seropositivity for HIV was (0.6%), HBV (2.19%) and HCV (0.25%).The seroprevalence of HBV and HCV was highest in African countries as compared to others continents, predominantly the West African region with a range of 10.0% to 14.96% and 1.5% to 8.69%, respectively. However, HIV and syphilis infection show a significant declining pattern through successive years globally [12].

Majority (90.74%) of the donors in our study are males which is comparable to the other studies. In a study conducted by Dharmesh Chandra Sharma et al [13], Male to Female donor's ratio was 96.2% (117,369) and 3.8% (4637) respectively.

Surveillance of seropositive cases is one of the ways to determine the seroprevalence of TTI among donors. The survey helps in assessing the safety of blood products and also gives an idea of the prevalence of these infections in the community. 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 0.26% (2015) in India with highest prevalence of HIV in Manipur (1.15%), followed by Mizoram. The prevalence of HIV in various parts of India is different with high rate in western and southern parts[11]. In Western India, like Gujarat and Goa has reported an HIV seroprevalence of 0.4- 0.42%. In the states like Andhra Pradesh & Telangana prevalence is 0.66%, Karnataka 0.45%. Maharashtra, Chandigarh, Tripura and Tamil Nadu have shown estimated adult HIV prevalence greater than the national prevalence (0.26%). While Odisha, Bihar, Sikkim, Delhi, Rajasthan and West Bengal have shown an estimated adult HIV prevalence in the range of 0.21– 0.25%. All other States/UTs have levels of adult HIV prevalence below 0.20% [14]. Hepatitis B prevalence is highest in the WHO Western Pacific Region and the WHO African Region, where prevalence is 6.2% and 6.1% respectively of the adult population is infected. In the WHO South-East Asia Region the prevalence is 2.0%. Despite the fact that a safe and effective vaccine has been available since 1982, the overall HbsAg prevalence in India remains high. This is because hepatitis B vaccination is not a part of our national immunization programme. The WHO Eastern Mediterranean Region shares the greatest burden of HCV prevalence (2.3%) of population (15 million people) whereas the prevalence in the WHO South-East Asia Region is 0.5% of population (10 million people). WHO's Global Health Sector Strategy on viral hepatitis aims to test 90% and treat 80% of people with HBV and HCV by 2030 [15]. There is no co infection between HIV and other infections noted in our study.

A questionnaire should be strictly formulated and implemented. The donors who are found affected should be treated appropriately. With the advent of Nucleic Acid Amplification Techniques (NAT), the risk of TTI in the western countries have decreased. In a study conducted by Mishra K K et al [16], 79532 seronegative donations were tested by NAT leading to 51 positive sample (44 Hep B, 5 HIV 1 and Hep C positive). Though the NAT is highly specific and has benefits but its cost is high especially for developing countries like India.

Conclusion

The present study concluded that the seroprevalence of HBV was higher than HIV, HCV and Malaria. However, it is opined that there are instances of risk of TTI with the existing serological tests, which are carried out on the donors' blood. Therefore, need exists to implement more specific test viz. NAT to eliminate all probable TTIs completely and cost-

effectively. With the implementation of strict donor selection criteria, use of sensitive and specific screening tests and establishment of strict guidelines for blood transfusion, it is possible to reduce the incidence of TTI. Other factors such as public awareness, vaccination of the entire population, strict vigilance of paid donors, educational and motivational programs help in decreasing the infections.

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