

A retrospective study on seroprevalence of Transfusion Transmitted Infections in blood donors at Dhiraj Hospital, Vadodara

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Abstract

Background: Transfusion of blood and its components help in saving lives but it can also be a life-threatening hazard. Prevention of transmission of infectious diseases through blood transfusion in developing countries is difficult, since the resources available are limited.

Methods and Material: A retrospective study was undertaken to determine the seroprevalence of TTI among the blood donors who donated blood to Dhiraj Hospital Blood Bank between January 2015 and December 2019. The TTI reports of the donors was obtained from the blood donor data records.

Each blood unit was tested by ELISA method for HIV, Hepatitis B and Hepatitis C virus. Syphilis was tested by Rapid Plasma Reagin (RPR) card test. Malaria was tested by antigen rapid diagnostic test.

As is the practice in the Blood Bank, all positive samples were subject to repeat test for confirmation, before the seropositive blood unit is discarded

The information extracted from the Dhiraj Hospital blood bank database also included donor Id, Age, Sex, Residential address, donation type, donation frequency.

Results: The data analysed in the study consisted of a total 20,711 blood donations, of which 2728 (13.1%) were voluntary and 18,288 (86.9%) were replacement donation.

The seroprevalence rate of HIV was 0.1, that of HBV was 1.4, HCV 0.1, syphilis was 0.5 and Malaria was 0.3 among all the blood donors. The TTIs were more frequently found in replacement donors in comparison to volunteer donors.

Conclusions:

Ø The prevalence of TTI is higher in replacement blood donors than voluntary blood donors, hence collection of blood from replacement donors should be at least reduced, if not totally eliminated.

Ø Stringent criteria need to be used for selection of blood donors.

Ø Potential Voluntary blood donors need to be identified and motivated to donate blood regularly.

Key-words: Blood donor, Seroprevalence, Transfusion transmitted infections.

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Introduction

Transfusion of blood and its components is an important intervention in current medical practice. However, such interventions not only carry a potential

risk of immune-hypersensitivity reaction, but also a potential risk of transmission of TTI like Human Immunodeficiency Virus 1 and 2, Hepatitis B Virus, Hepatitis C Virus and syphilis.

It is estimated by some reports that the risk of transfusion transmitted infection in developing countries is about 1%¹.

As per the WHO, it is recommended that all blood donors and units should be compulsorily tested for HIV 1 and 2, HCV, HBV and Syphilis infections in order to limit the risk of transmission of TTI².

The incidence and prevalence of TTI has significantly decreased in countries which have adopted the WHO recommendations and also introduced newer and more sensitive screening test.

However, in the lower income countries, the risk of TTI continues to remain high³.

The practice of excessive reliance on rapid testing kits for screening blood donors for TTI has largely contributed to the increased risk of transmission of TTI in these countries. This practice of reliance on rapid testing kits has been even questioned by an International QC survey⁴.

Moreover, the low sensitivity of these rapid kits to detect the TTI during the window period or in a low-level carrier state also adds to the problem.

The risk factors for TTI in blood donors, are the high prevalence of TTI in general population, sourcing of blood largely from replacement donors, inadequate screening facilities and excessive reliance on rapid testing kits rather than EIA or NAT for screening.

There is an added risk of septic transfusion due to bacterial contamination during the procedure of blood collection and processing, if proper aseptic precautions are not taken⁵.

The above situation highlights the need for utilizing the epidemiological data available on TTI and utilize it for risk assessment and selection of blood donor for collection of blood.

Many countries have studied the seroprevalence of TTI among their blood donors. This study was

undertaken to define the prevalence of the Hepatitis B Virus surface antigen (HBsAg), anti-HCV, anti-HIV, and anti-TP among donor population of Dhiraj Hospital Blood Bank.

Materials and Methods

The study was undertaken to define the seroprevalence rates of the various TTI in the blood donor of Dhiraj Hospital Blood bank during the 5 years period from January 2015 and December 2019.

Study area:

The data utilized in the study was extracted from the Blood Bank of Dhiraj Hospital database.

The data pertained to results of serological Tests for HIV, HBV, HCV and Syphilis that were performed in the TTI Laboratory of the Dhiraj Hospital Blood bank in accordance with the national testing policy and guidelines

Study design:

The retrospective study analyzed the results of TTI of the blood donor who donated between January 2015 and December 2019, obtained from blood bank data records to find out seroprevalence of TTI in the blood donors

The information extracted from the Dhiraj Hospital blood bank database also included donor Id, Age, Sex, Residential address, donation type, donation frequency

The results of HBV, HCV, HIV, Syphilis tests as well as the overall incidence of TTI were expressed as seropositivity rates.

Study population:

The study data included all blood donors who donated blood to the Dhiraj Blood Bank between January 2015 and December 2019 which included both voluntary and replacement donors. Donors were selected for blood donation as per the pre-set criteria of Dhiraj Blood Bank.

Statistical Analysis

The data retrieved from Dhiraj Hospital Blood Bank Database was presented as number of seropositive samples per year and utilized to calculate the prevalence

rate of various TTI like anti-HIV, HBsAg, anti-HCV and anti-TP expressed as percentages.

Study selection Criteria:

Inclusion criteria:

- 1) All volunteer and replacement donors.
- 2) All donors fit into pre-set criteria of Dhiraj Blood Bank.

Exclusion criteria:

- 1) Deferred patients

Results

Chart below shows 2.2% of donors found positive for TTI infection between January 2015 to December 2019.

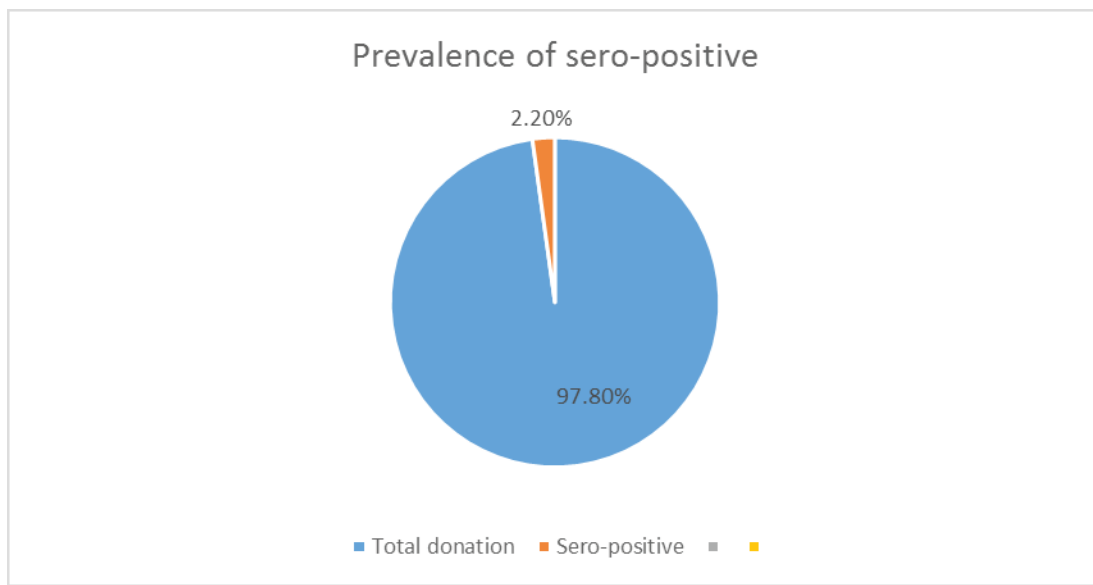


Table 1: Socio-Demographic characteristics of blood donors who donated blood to the Dhiraj blood bank from January 2015 to December 2019.

Characteristic		Nos.	Percentage
Sex	Male	20184	97.4%
	Female	527	2.6%
Age	18-30	6172	29.8%
	30-40	7766	37.5%
	40-50	5012	24.2%
	50-60	1761	8.5%
Donor type	Volunteer	2728	13.1%
	Replacement	18288	86.9%
Blood Type	O	9361	45.2%
	B	5509	26.6%
	A	4577	22.1%
	AB	1264	6.1%
Rh Type	Rh Positive	18432	89.01%
	Rh Negative	2279	10.99%
Total Donors		20711	

Socio-demographic characteristics of the donors:

The TTI data of the 20,711 blood units/blood donors whose blood was collected by the Dhiraj Hospital between January 2015 and December 2019 were analysed and the demographic features of blood donors is presented above in the table 1.

Majority of the blood donors were males (97.4%), while only 2.6 % were females. The age of the blood donors ranged from 18 to 60 years. The highest number

of blood donors belonged to the age group of 30 to 40 years.

Majority 86.9 % of the blood donors were replacement donors, while the number of voluntary blood donors was lower.

The blood group of the blood donors studied was type O in 45.2%, type B in 26.6%, type A in 22.1% and type AB in 6.1%. Most of the blood donors i.e.89.01% were Rh Positive and only 10.99% were Rh negative.

Table 2: Number and rate of Transfusion Transmitted Infections (TTI) among the donors by year (January 2015 - Dec 2019)

Year	Donations	HIV +ve	HBsAg +ve	HCV +ve	VDRL +ve	MP +ve	Total (%)
2015	4037	4	61	3	32	0	100(2.4%)
2016	4913	12	67	0	19	3	101(2.0%)
2017	4878	7	56	3	46	0	112(2.2%)
2018	3384	6	57	5	3	4	75(2.2%)
2019	3500	3	64	14	6	1	88(2.5%)
Total	20711	32(0.1%)	305(1.4%)	25(0.1%)	106(0.5%)	7(0.03%)	476(2.2%)

Seroprevalence of TTI among the donors:

The Table 2 presents the results of TTI tests of a total of 20,711 blood donors. The seropositivity rates for each of the TTIs were HBV 1.4 %, HCV 0.1 %, HIV 0.1 %, Syphilis 0.5 % and Malarial Parasite 0.03%.

The HBV was observed to be the most prevalent TTI all through the five-year study period. Of the total blood units tested, about 2.2 % of all the donors had at least one TTI, while 0.1% had multiple infections.

In our 5 year study, the incidence of TTI was the highest in 2019(2.5%) and lowest in 2016(2.0%). Our study data also shows that the incidence of TTI is higher in male donors than in female donors. Further our study also noted that the incidence of TTI is more in Replacement donors as compared to Voluntary donors.

Discussion

India has over the years, managed to reduce the TTI in blood donors significantly with the introduction of modern screening tests and strict enforcement of proper guidelines and protocols. However, the prevalence of transfusion transmitted viruses among blood donors continues.

Transfusion transmitted infections (TTIs) are a matter great concern with regards to the safety of the blood transfused to recipient patients.

The risk of transmitting a TTI through blood transfusion has declined over the years in the developed world. However, in the developing countries each blood unit still has a 1 % risk of transmitting a TTI

A voluntary donor is one who is self-motivated to donate blood regularly without any inducement, while a replacement donor donates blood only when a near or dear one is in need of blood.

Thus, replacement donors (RD) should be motivated and proper guidance and knowledge of blood donation should be given to them to promote more voluntary blood donation.

On comparing our study with other similar studies, it has found that seroprevalence of HBV is highest among all the TTIs.

The seroprevalence of HCV as reported by Indian studies varies from a high of 1.09 % (Gupta et al,2004) to a low of 0.2% (Diwan R et al 2012)

Sexually transmitted infections are more in developing countries compared to developed countries and constitute a major public health issue.

A reliable source of safe blood for a blood bank is a Voluntary blood donor, but the voluntary blood donation in India is less than desired, probably due to the lack of information and the myths associated with it.

In order to increase voluntary blood donation, it is necessary/essential to create awareness about it among the local community/population. This would help in minimizing the risk of TTI.

The risk of TTI is higher with blood procured from replacement/professional donor masquerading as replacement donor. Therefore, it is best to avoid taking blood from replacement donors or accept it only in emergency situations

Blood transfusion should not cause any harm to recipients, therefore blood unit should be fully screened for infection like HIV, HBV, HCV etc and also checked for bacterial contamination.

Unsafe blood remains a major threat to the recipient. The risk of infection is relatively higher in HB than with the other TTIs, although its prevalence has reduced after introduction of hepatitis B surface antigen (HbsAg) testing and after its inclusion as a routine screening test.

The rapid testing kits utilized for screening of blood for TTI are unable to detect the presence of virus during

the “Window Period”

Many countries now use kits for detect antibodies directed against HBV core antigen or HBV NAT testing to detect chronic HBV carrier state with a low viral load. The Nucleic Acid

Nuclei Acid Amplification Techniques NAAT is currently recommended for the early detection of the TTI viruses as it targets the Viral RNA /DNA regions/ genome. This also reduces the Window Period.

Conclusion

The increase in the prevalence of seropositivity for HCV and HBsAg in both replacement and voluntary donors is a cause of worry. A large number of replacement donors have been found to have HIV, HBV, HCV, Malaria and Syphilis infections.

Hence, it is recommended that stringent criteria be used for selection of blood donors and also standardization of the testing methods used for the screening of the blood unit to ensure blood safety.

The practice of testing the blood units using Nucleic Acid amplification techniques has helped the western countries to decrease the risk of transmission of these infections and therefore needs to be widely adopted.

Moreover, it is also important to promote voluntary blood donation activity by identifying and motivating potential voluntary blood donors from within the local community.

Ethical Clearance- Taken from institutional ethical committee.

Source of Funding- Self funded.

Conflict of Interest – Nil.

References

- [1]. World Health Organisation, Global status report on blood safety and availability, 2016.
- [2]. Tagny CT, Diarra A, Yahaya R, Hakizimana M, Nguessan A, Mbensa G, et al. Characteristics of blood donors and donated blood in sub-Saharan francophone Africa. *Transfusion*. 2009;49:1592–9
- [3]. Song Y, Bian Y, Petzold M, Ung C. Prevalence and trend of major transfusion-transmissible

- infections among blood donors in Western China, 2005 through 2010. *PLoS One*. 2014;9(4):e94528. <https://doi.org/10.1371/journal.pone.0094528>.
- [4]. Laperche S, Boukatou G, Kouegnigan L, Nebie Y, Boulahi MO, Tagny CT, et al. Transfusion safety on the African continent: an international quality control of virus testing in blood banks. *Transfusion*. 2009;49:1600–8.
- [5]. Bloch EM, Vermeulen M, Murphy E. Blood transfusion safety in Africa: a literature review of infectious disease and organizational challenges. *Transfus Med Rev*. 2012;26(2):164–80.