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Original Research Article

Seroprevalence of markers of transfusion transmissible infections among blood donors at a tertiary care hospital blood bank: a 5 year retrospective study

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ABSTRACT

Background: Transfusion transmitted infections (TTIs) can be caused by various microorganisms present in the blood of apparently healthy donors. The recipient may get infected after being transfused with the unsafe blood. It is mandatory to screen the blood for HIV 1 and 2, HBV, HCV, Syphilis and Malaria. This study was undertaken to investigate the seroprevalance of Transfusion transmitted infections among blood donors at our tertiary care centre and to compare our study with other studies conducted at different hospitals of the country as well as outside.
Methods: A retrospective review of blood donor records was made over a period of 5 years with effect from January 2014 to December 2018 at blood bank, department of Blood Transfusion and Immunohaematology, SKIMS, Soura, Srinagar. Both voluntary and replacement blood donors were selected after taking proper history and examination were included in the study. Serum samples were screened for HIV 1 & 2, HBV (HBsAg) and HCV using ELISA with 3rd generation kits.
Results: A total of 56325 blood donors were screened. Out of total 55346 (98.2%) were males and 979 (1.73%) were females. Among them 38969 (69.1%) were replacement donors and 17356 (30.8%) were voluntary donors. The seroprevalance of HBV (HBsAg), HCV and HIV 1and 2 was 0.24%, 0.17% and 0.01% respectively and overall seroprevalance of TTIs was 0.43%.
Conclusions: Continuous improvement and implementation of newer techniques like NAT and chemilumenescence for testing of blood for TTIs will reduce the risk of acquiring these infections.

Keywords: Chemilumenescence, Seroprevalance**,** Transfusion transmitted infections

INTRODUCTION

Blood transfusion is a lifesaving intervention but at the same time it poses serious public health problems when it is infected. It is the key component of modern health care and therefore it is of utmost importance to ensure safety and efficacy of blood and blood components. Every year millions of people are exposed to avoidable, life threatening risk through the transfusion of unsafe blood.[1] There are many viruses, parasites and bacteria which can be transmitted through blood transfusion. Among these important TTIs are Bacteria: Treponema Pallidum, Yersinia Enterocolitica etc. Viruses: HIV 1 and 2, HBV, HCV, Parvovirus B19, CMV etc.[2] Parasites: Plasmodium sp, Filaria, Babesia Microti etc. Emerging prions.[3] Transfusion transmitted diseases such as HIV 1 and 2, HBV and HCV are among the greatest threats to blood safety for transfusion to the recipients.[4] So transfusion as a main way for blood borne infections continues to cause serious problems in developing countries and less serious

in developed countries due to the implementation of advanced techniques for screening of donated blood.[5] The economic cost of failure to control the transmission of the infections includes increased requirements of medical care, high level of dependency and heavy burden on already overstretched health and social services on national economy.[6-8]

Acquisition of infections during the window period from the blood donors can be a serious threat to the safety of collected blood which is transfused to the recipient. These TTIs can cause prolonged viremia also causes fatal chronic or life threatening disorders.

Screening of blood donors first started in 1947.[9] To prevent spread of TTIs through blood transfusion, Government of India has made mandatory to screen donated blood for HBV (since 1971), HIV (since 1989) and HCV (since 2001).[10-12] The strategies used to reduce the transfusion transmitted infections includes improving donor selection through proper and careful selection of donor, testing the donor blood for specific antibodies against the infectious agents, using autologous transfusion but the transmission still occurs because of inability to detect the disease during the window period of infection. Donor screening and predonation counselling should be like that the donor should get a chance of self-exclusion if he/she has any history of high risk behavior.

The present study was undertaken to estimate the prevalence of transfusion transmitted infections (HIV 1and 2, HBV (HBsAg), HCV) among blood donors at our tertiary care hospital over a period of 5 years.

METHODS

A retrospective review of blood donor records was made over a period of 5 years with effect from January 2014 to December 2018 in the department of Blood Transfusion and Immunohaematology, Sher-e- Kashmir Institute of Medical Sciences (SKIMS), Soura, Srinagar. Donors who fulfill inclusion criteria specified by Drugs and Cosmetics Act, 1940 and Rules, 1945 were selected and written informed consent was taken from them.[13] These comprises of both voluntary and replacement donors who donated blood in the department as well as outside at camps.

A total of 56325 donors has donated blood, ranging from 18-65 years of age. About 2-3ml blood was collected in the red top vial and 2 ml in EDTA (ethylene diamine tetra acetic acid) vial. Red top vial samples were taken for TTIs screening. Serum was taken for screening of HIV (Human immunodeficiency virus) 1 and 2, HBV (Hepatitis B virus) (HBsAg) and HCV (Hepatitis C virus) using ELISA with the 3rd generation kits. All the tests were performed with commercially available ELISA kits and Rapid card method according to the manufacturer's instructions with adequate controls.

Inclusion criteria

All clinically and apparently healthy donors between 18-65 years of age having weight more than 45 kgs and haemoglobin level greater than 12.5 g/dl with no history of any medical or surgical illness or any high risk behavior were included in the study.

Exclusion criteria

Individuals having any history of high risk behavior are excluded from the study.

All reactive samples were tested again using the same ELISA kit. Samples showing repeat test reactivity on both samples were considered positive. All the donors who were positive for viral markers were counselled and referred for further management to respective departments.

Data was analysed using Statistical Package for Social Sciences (SPSS) window version 17. Data was expressed as percentage and presented in tabular and diagrammatic forms.

RESULTS

Out of the total 56325 blood donors who has donated blood over a period of 5 years with effect from January 2014 to December 2018, 55346 (98.2%) were males and 979 (1.73%) were females with a ratio of 56.5:1. Among them 38969 (69.1%) were replacement donors and 17356 (30.8%) were voluntary donors (Table 1).

Total blood donations were 11336 in the year 2014. Among all 37 (0.32%) were Hepatitis B surface antigen positive, 17 (0.14%) were anti-Hepatitis C Virus positive and 2(0.01%) were anti-HIV 1and 2 positive.

Thus, overall seroprevalance of TTIs in 2014 was 56 (0.49%). During the year 2015, blood donations were 11277 and the prevalence of HBV, HCV and HIV (1and2) was 27 (0.23%), 21 (0.18%) and 1 (0.008%) respectively with overall prevalence of 49 (0.43%). 11135 donors have donated blood during the year 2016.

The prevalence rates of HBV, HCV were 29 (0.26%),30 (0.26%) and no donor was found reactive for HIV with overall prevalence of 0.52%. In 2017, total donations were 11419 and the rates of seroreactivity of different TTIs were HBV 30 (0.26%), HCV 15 (0.13%) and HIV 2(0.01%) having an overall prevalence of 0.41%. During the year 2018, 11158 blood donations were received and the seroprevalance of HBV, HCV and HIV were 17 (0.15%), 17 (0.15%) and 2 (0.01%) respectively. The overall prevalence of HBV, HCV and HIV (1and2) during the study period was 140 (0.24%), 100 (0.17%) and 07 (0.01%) respectively having overall seroprevalance of 247 (0.43%). All the reactive donors were males. Transfusion transmitting infections trends

was shooted in the year 2016 from 0.43% to 0.52% thereafter trends of TTIs decreases over years. The year wise distribution of seroprevalance of these infections is shown in table 2.

Table 1: Distribution of blood donors' year wise.

Year	Male donors	Female donors	Voluntary donors	Replacement donors	Total donations
2014	11185	151	4573	6763	11336
2015	11107	170	2361	8916	11277
2016	10938	197	2693	8442	11135
2017	11171	248	3953	7466	11419
2018	10945	213	3776	7382	11158
Total	55346	979	17356	38969	56325

Table 2: Year wise distribution of HBV, HCV and HIV (1 and 2).

TTIs	2014 (N=11336)	2015 (N=11277)	2016 (N=11135)	2017 (N=11419)	2018 (N=11158)	Total (N=56325)
HBV	37 (0.32%)	27 (0.23%)	29 (0.26%)	30 (0.26%)	17 (0.15%)	140 (0.24%)
HCV	17 (0.14%)	21 (0.18%)	30 (0.26%)	15 (0.13%)	17 (0.15%)	100 (0.17%)
HIV1 and 2	2 (0.01%)	1 (0.008%)	0	2 (0.01%)	2 (0.01%)	07 (0.01%)
Total (n)	56 (0.49%)	49 (0.43%)	59 (0.52%)	47 (0.41%)	36 (0.32%)	247 (0.43%)

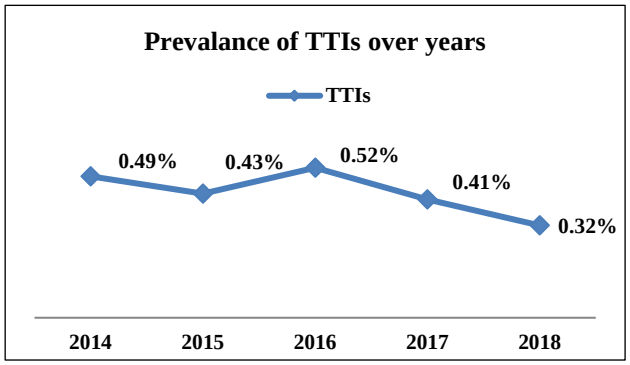

Figure 1: Year wise distribution of HBV, HCV and HIV (1 and 2).

DISCUSSION

Majority of the problems are due to prevalence of asymptomatic carriers in the society, as well as blood donations during the window period of infections. Transfusion transmissible infections (TTI) is a major challenge to the blood transfusion service all over the world. The problem of TTI is directly proportional to the prevalence of infection in the blood donor's community. Patients requiring blood transfusion are more prone to acquire HBV, HIV and HCV.[14] HBV is highly contagious and easily transmitted from one individual to another by transfusion during birth, by unprotected sex and by sharing needles. Due to the nature of blood born virus, HCV is widely recognized as a major causative agent for post-transfusion non-A, non-B hepatitis. Other less common routes of transmission are sexual intercourse and mother to child transfer.[15] In case of HIV, transmission during window period is possible even if each unit is tested for HIV antibodies. The possibility of window period transmission would be minimized if blood is collected from low risk targeted general public.[16] However, blood safety remains an issue of major concern in transfusion medicine. However, HBV and HIV can also be transmitted from person to person contact, especially HBV, which is transmittable from tears, urine, etc. According to the WHO report, viral dose in HIV transmission through blood is so large that one HIV-positive transfusion leads to death on an average after 2 years in children and 3-5 years in adults. HBsAg seroprevalence in India is high in spite of a safe and effective vaccine has been available. Sexually transmitted infections constitute a major public health problem and are widespread in developing countries. The residual transmission risk of HBV infection through a transfusion is higher due to a long window period between initial HBV infection and the detection of HBsAg during which the virus is transmissible.[17] Selection of donors with low TTI risk and effective laboratory screening is the very important part in blood bank processing which has reduced the risk of transmission to very low levels.[18] This study shows the prevalence rates of HBV (0.24%), HCV (0.17%) and HIV 1and 2 (0.012%). The low prevalence of transfusion transmitted infections rate in this study may be attributed to increased number of voluntary donors donating blood and also following strict screening criteria at our blood bank. Majority of the donors (98.2%) were males, which is comparable to the study done by

Kulkarni et al, Rao, et al, and Arora et al, a similar study was conducted by Qureshi et al, at the same institute over a period of 10 years (2003-2012).[19-21] He studied the prevalence of HBV and HCV among blood donors. At that time, prevalence of HBV was 0.48% and HCV was 0.20%. Our study prevalence rates of HCV was similar to the study conducted by Mahapatra S et al, (0.17%) and Kalpana et al, (0.11%). Prevalence rate of HBV was less in our study when compared to other studies conducted in various parts of our country. The seroprevalance rates of HIV 1 and 2 of our study was also less when compared with other studies. The trends of seropositivity was Prevalence rates of different TTIs markers among blood donors conducted in different areas of our country are shown in Table 3.

Table 3: Prevalence rates of TTIs markers among different studies in India.

Studies	HBV	HCV	HIV 1and 2
Malik S et al,[22]	0.51%	-	-
Pallavi P et al,[23]	1.27%	0.23%	0.44%
Sharma DC et al,[24]	1.16%	0.61%	0.29%
Makroo et al,[25]	1.18%	0.43%	0.24%
Qureshi et al,[26]	0.48%	0.20%	
Dobariya GH et al,[27]	0.98%	0.098%	0.081%
Kalpana et al,[28]	1.15%	0.11%	0.24%
Chandekar SA et al,[29]	1.30%	0.25%	0.26%
Mahapatra S et al,[30]	0.5%	0.17%	0.052%
Yadav UC et al,[31]	1.16%	0.09%	0.08%
Present study	0.24%	0.17%	0.012%

Authors blood bank uses ELISA 3RD generation kits which cannot detect HBV before 59 days, HCV before 82 days and HIV before 22 days of infection. As large volumes of blood and its components are being issued and transfused to the patients, even a blood unit with low viral load may cause infection to the recipient and causes life threatening events. The majority of the events occurs when the donors donate blood during window period of infection and poses a great threat to the safe blood supply. Promoting voluntary non-remunerated blood donations is another way to provide safe blood supply. Replacement donations are more in our set up and they carry a relatively higher risk of Transfusion transmitted infections. Recruitment and retention of voluntary donors is must for availability of safe blood for transfusion to the recipients as well as for community and can be achieved by vigorous and cautious screening of donors along with testing of donated blood with more advanced laboratory screening tests. Adding chemilumenescence and NAT (nucleic acid testing) to routine blood screening protocol helps in detecting very low levels of viral RNA or DNA that may be present in donated blood. Limitation of our study is that all the Transfusion transmitted infections were not included.

CONCLUSION

The overall prevalence of TTIs in our study was comparatively low. This situation may be attributed to several factors, including an effective system for donor recruitment, selection and screening among others. Voluntary non-remunerated blood donors and careful screening of transfusion transmitted infections preferably latest technologies like NAT and chemilumenescence should be implicated so that infected blood will be detected within the window period and safe blood will be supplied to the needy.

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