

TRENDS AND PREVALENCE OF INFECTIOUS MARKERS AMONG BLOOD DONORS FROM BLOOD BANK OF A TERTIARY CARE HOSPITAL

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HOW TO CITE THIS ARTICLE:

Sujata S. Kumbhar, Surekha K. Chavan, Sujata R. Kanetkar, Tasneem V. Bisht. "Trends And Prevalence Of Infectious Markers Among Blood Donors From Blood Bank Of A Tertiary Care Hospital". Journal of Evidence based Medicine and Healthcare; Volume 2, Issue 5, February 02, 2015; Page: 464-471.

ABSTRACT: SUMMARY: Blood transfusion services form an integral part of health care; but simultaneously carries the risk of transmission of transfusion transmissible infections. We conducted a 5yr retrospective cross sectional study to estimate the prevalence of various infectious markers in the blood donors which was found to be 2.04%. **INTRODUCTION:** Blood safety is a major concern among health care personnel. We undertook this study to assess the prevalence of transfusion transmissible infections (TTI's) namely - HIV, Hepatitis C, Syphilis and Malaria among blood donors from blood bank of a tertiary care hospital, in Western Maharashtra, India. **METHODS:** A total of 21,293 blood units were collected from donors. All blood units were screened for HIV, HBs Ag and HCV using ELISA. Test for syphilis was done by Rapid Plasma Reagin card test and peripheral smear examination was done to detect malarial parasite. **RESULTS:** A total of 21,293 blood donors were tested, of which 19,940 (93.65%) were voluntary donors and 1,353 (6.35%) were replacement donors. The highest seroprevalence observed was for HBs Ag (1.55%) followed by HIV (0.38%), HCV (0.08%) and Syphilis (0.02%). No donor was found to be positive for malaria parasite. **CONCLUSION:** Strategies need to be implemented to improve donor selection, using highly sensitive and specific screening tests and a better structured voluntary donation system. Nucleic acid amplification test would help to detect donors in window period for HIV infection. In view of high prevalence, effective community based programs and health education with emphasis on sexually transmitted diseases may prove helpful to decrease the seroprevalence.

KEYWORDS: Blood donation, HIV, HBV, HCV, Syphilis, Malaria.

INTRODUCTION: Everyday millions of people require blood transfusion. Most transfusions save lives, but they can also put a patient at risk if blood is contaminated by an infectious disease.^[1] Risk of transmission of TTIS is about 1-2 per 1000 recipients. Many of these infectious agents may cause death or prolonged illness.^[2] Most common diseases transmitted through blood are Hepatitis B (HBV), Hepatitis C (HCV), Human Immunodeficiency Virus (HIV), syphilis and malaria.^[3] HBV and HCV are major causes of chronic liver diseases worldwide especially cirrhosis and hepatocellular carcinoma.^[4]

The incidence of HIV, HBs Ag and HCV in blood donors in India varies in different states of the country and ranges from 0.1-0.9%, 0.86-2% and 0.28-0.53% respectively.^[1]

Measuring their severity, WHO has recommended pretransfusion blood test for HIV, HBV, HCV, Syphilis and malaria as mandatory.^[5]

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A well-organized Blood Transfusion Service (BTS) is a vital component of any health care delivery system. An integrated strategy for blood safety is required for elimination of (TTIS) and for provision of safe and adequate blood transfusion services to the people. The main component of an integrated strategy include collection of blood only from voluntary, non-remunerated blood donors, screening for all TTIS and appropriate use of blood.^[6,7]

While no blood transfusion is completely safe, countries with a well-managed blood transfusion service, such as Japan, USA and Western Europe have achieved commendable levels of blood safety yet make no claims to provide 100% infection free blood.^[1] Along with voluntary, non-remunerated, repeat donors implementation of NAT (Nucleic Acid Testing) to narrow the window period would help to reduce the risk of transmission of HIV, HBV, HCV even lower.^[1,8,9]

The trend rates of these infections among blood donors should be assessed and evaluated to ensure the safety of blood supply and the efficiency of donor screening. Consequently, it will help in estimating the dangers associated with blood transfusion as well as in modifying donor screening strategies to reduce the transmission of infections. This information could also reflect the occurrence of these diseases in community.^[4]

This study was aimed at identifying the status of TTD's among blood donors with respect to sex distribution and, difference if any in voluntary and replacement donors over a period of time so as to heighten the awareness of the infectious complications of blood transfusion at our Centre.

MATERIALS AND METHODS: Study design and study period: This was a 5yrs retrospective study conducted at the blood bank unit of Krishna Institute of Medical Sciences (KIMS), Karad. The records of blood donors from July 2007 to June 2012 were analyzed. A total of 21,293 blood units were collected.

The permission from Head of the institution and clearance from institutional ethics committee was obtained. All the blood donors, voluntary and replacement, who donated blood during the study period were included in the study.

DIAGNOSTIC SETTING: Screening for HBsAg and anti HCV antibodies was carried out by ELISA method, for HIV - 4th generation ELISA for detection of both antigen (P24) and antibodies was used. Syphilis was tested using Rapid Plasma Reagin test. In this test serum samples were tested without dilution, the positive sample was then diluted to 1:8 and re-tested in the same way which if showed poitivity was labelled as reactive for syphilis. The testing kits were FDA approved. Peripheral blood smear examination was done to detect malaria parasite.

STATISTICAL ANALYSIS: Data were analyzed using Chi-square test to compare infection rates in consecutive 5 years and p-value ≤ 0.05 was considered statistically significant.

RESULTS: As in table No.1 and 2 - out of the total 21,293 donors, 19940 (93.65%) were voluntary and 1353 (6.35%) replacement donors; male donors were 20,748 (97.44%) and females were 545 (2.56%).

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While total number of donations have increased from 3609 in 1st year 4758 in 4th year, little decline seen in 5th year to 4268.

Voluntary donations increased steadily from 81.77% in the 1st year to 96.72% in the 3rd year, then little decline to 95.63% in the 4th year & again slight increase to 96.11% in the 5th year.

As in table No.3 and 4:

Overall positivity was 2.04%. It was 2.08% in the 1st year which slightly increased in the 2nd year to 2.44% but after that it decreased steadily to 1.36% in the 5th year.

Prevalence of HBs Ag is higher (1.55%) followed by HIV (0.38%) then HCV (0.08%), syphilis (0.02%) & malaria (0%).

For Hbs Ag, out of total 1.55% positivity, 1.57% was in voluntary and 1.33% in replacement donors. Of the total positivity of 0.38% for HIV, 0.08% found in voluntary and 0.37% in replacement donors. Among the total positivity of 0.08% for anti-HCV, 0.08% seen in voluntary and 0.07% in replacement donors; for syphilis, total positivity of 0.02% was seen in voluntary donors only. Thus, except for HIV, positivity rate was higher in voluntary than in replacement donors. No malarial parasite was detected in voluntary or replacement donors.

HBs Ag marker showed little increase in frequency from 1st year (1.61%) to 2nd year (1.83%), then little fall in 3rd year (1.54%) but again increase in the 4th year (1.66%) while in the 5th year it was lowest (1.14%).

HIV marker showed little increase in frequency from 0.33% in 1st year to 0.53% in 2nd year, then little fall in the 3rd year (0.51%) compared to 2nd year, after that it showed further decline in 4th year (0.38%) and it was lowest (0.16%) in the 5th year.

HCV marker showed steadiness in frequency in the 1st and 2nd years (0.08%) but little rise in the 3rd year (0.09%) and the 4th year (0.11%) and was lowest (0.05%) in the 5th year.

Regarding syphilis the frequency was 0.06% in the 1st year which came to 0% in 2nd year, but rose to 0.04% in the 3rd year and again declined to 0% in the 4th & 5th year.

Thus for HBs Ag, HCV & syphilis there was slight increase or decrease in frequency rates. These changes in frequency rates were not statistically significant as $p > 0.05$.

For HIV the change in prevalence was statistically significant as P value was 0.0432 ($p < 0.05$).

Regarding trend, for all the markers $p > 0.05$, so it was not statistically significant & so the trend for seropositivity was static one.

DISCUSSION: Transmission of infectious diseases through donated blood is of concern to blood safety.^[10] Viral infections transmitted through blood are the major cause of morbidity and mortality in blood recipients.^[2,11] The present study was undertaken to find out the prevalence and trends of TTIs namely HIV, HBsAg, HCV, Syphilis and malaria.

In the present study the total number of donors and voluntary donors were 21293 & 19940 (93.65%) respectively. This may be attributed to increase in awareness about blood donation in the society for which special efforts from Blood Transfusion Officer contributes by giving lectures, distributing pamphlets, displaying posters on blood donation in blood donation camps & involving NGOs.

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Our finding of increase in voluntary donations was comparable to Bhattacharya et al (Kolkata) (94.6%),^[12] and Sultan Ayesh Mohammed Saghir et al (Yemen) (96%), who designated it as semivoluntary.^[4] But various other studies showed more number of replacement donors than voluntary donors.^[3,10,13]

The donor group comprised predominantly of males (97.44%) in the present study, this finding is similar to various other studies also.^[10,11,13] This suggests the need to increase awareness in females. Moreover most of the females are anemic so rejection is more.

The overall positivity was 2.04% in present study which is in the range from other studies i.e. 1.35 to 5.8%.^[4,5,11,13,14,15]

Prevalence of HBs Ag is higher (1.55%), followed by HIV (0.38%) then HCV (0.08%), syphilis (0.02%) & malaria (0.0%). Similar other studies also reported the higher prevalence of HBs Ag among blood donors than HIV, HCV and Syphilis.^[4,10,11,13,16] Our positivity rates for HIV (0.38%), HBsAg (1.55%) were in the range given by Dr. R.N. Makroo^[1] for Indian donors i.e. 0.1% - 0.9%, 0.86 – 2% respectively but are lower (0.08%) for HCV for which the range given was 0.28 – 0.53%.

The positivity for HBs Ag in present study was 1.55% which is comparable to rates of 1.68% and 1.3% recorded in similar studies carried out by Arpita Chatterjee et al,^[16] and Jaisy Mathai et al,^[14] and in the range of 0.71 % to 5.39% recorded by the similar other Indian studies,^[3,4,5,10,11,13,14,15,16,17] in which lowest rate of 0.71 was quoted by Leena MS et al,^[11] and highest of 5.39% by Dr. Nittyanand Shil et al.^[17]

The positivity for HIV in this study was 0.38%, which was comparable to the similar study done by Dr. Luna Adhikari et al,^[13] who recorded it as 0.32% and it was in the range 0.14% to 1.1% of similar studies conducted in India,^[3,4,5,10,11,13,14,15,16,] in which lowest rate of 0.14% was recorded by Saghir et al,^[4] and highest rate of 0.8% by Bharat Singh et al.^[3]

The positivity for HCV in our present study was 0.08% which was comparable to the similar study carried out by Arora et al,^[15] who recorded a prevalence of 0.05% for HCV and was in the range of 0.05 to 1.62 recorded by the similar other Indian studies.^[3,4,10,11,13,14,15,16,] Among these the lowest recorded rate was 0.05 by Arora et al^[15] and the highest of 1.62 by Swapan Kumar Sinha et al.^[5]

Regarding Syphilis the positivity rate was 0.02% which is lowest compared to other similar Indian studies who observed a rate in the range of 0.1% to 1.31%^[4,5,10,11,13,14,15,16] in which the lowest recorded rate was 0.1% by Leena MS et al,^[11] and highest of 1.31% by Swapan Kumar Sinha et al.^[5]

None of the donor showed positivity for malaria. Similar finding is there in the study by Luna Adhikari et al.^[13]

There was significant change in prevalence for HIV as $P = 0.0432$ (< 0.05) whereas no significant change in the prevalence of HBsAg, HCV, & syphilis positivity over the period. In the study by Luna Adhikari et al.^[13] they found no significant change in prevalence for HBsAg, HCV, syphilis & for HIV also.

Regarding trend, all the makers showed $P > 0.05$, so it was not stastically significant & so the trend for seropositivity was static one. This finding is similar to the study by Sultan Ayesh Mohammed Saghir et al,^[4] whereas Bharat Singh et al^[3] reported increasing trend in their study.

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This might attributes to practicing stringent donor selection criteria, increase in voluntary donations, use of sensitive testing kits, trained and experienced staff.

Despite all efforts residual risk of TTI remains, because of donors in the pre – seroconversion (window) period, viral variants, non-seroconverting (immune – silent) or delayed seroconverting carriers (atypical seroconversion), difficulty in adopting the high sensitivity tests like NAT (Nucleic Acid Testing) to reduce window period, for bulk use because of its high cost.^[1]

CONCLUSION: In view to reduce prevalence and trend of TTIs in blood donors and thus ensuring safe blood transfusion this study recommends developing effective prevention strategies which includes stringent donor screening, donor deferral policies, use of improved, highly sensitive & specific test kits & if possible, implementation of NAT.

ACKNOWLEDGEMENTS: The authors acknowledges to the blood bank staff and statistician-Kakade Sir, for their assistance and cooperation.

Year	Total Donors	Voluntary Donors (%)	Replacement Donors (%)
July 07 – June 08 (year 1)	3609	2951 (81.77)	658 (18.23)
July 08 – June 09 (year 2)	3927	3761 (95.77)	166 (4.23)
July 09 – June 10 (year 3)	4731	4576 (96.72)	155 (3.28)
July 10 – June 11 (year 4)	4758	4550 (95.63)	208 (4.37)
July 11 – June 12 (year 5)	4268	4102 (96.11)	166 (3.89)
Total	21293	19940 (93.65)	1353 (6.35)

Table 1: Yearwise blood collection

Voluntary donation is more than replacement.

Sex	Voluntary (%)	Replacement	Total
Male	19414(93.57%)	1334(6.43%)	20748(97.44%)
Female	526(96.51%)	19(3.49%)	45(2.56%)
Total	19940	1353	21293

Table 2: Sex wise distribution of blood donors and their positivity rate

Major blood donor group is comprised of males and voluntary donation is more in females.

Type	Positive no. % in different years					Total positive % (total)
	1	2	3	4	5	
HBsAg	1.61 (58)	1.83 (72)	1.54 (73)	1.66 (79)	1.14 (49)	1.55 (331)
HIV	0.33 (12)	0.53 (21)	0.51 (24)	0.38 (18)	0.16 (07)	0.38 (82)

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HCV	0.08 (3)	0.08 (3)	0.09 (4)	0.11 (5)	0.05 (2)	0.08 (17)
Syphilis	0.06 (2)	0.00 (0)	0.04 (2)	0.0 (0)	0.0 (0)	0.02 (4)
Malaria	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Total	2.08 (75)	2.44 (96)	2.18 (103)	2.14 (102)	1.36 (58)	2.04 (434)

Table 3: Seropositivity of different TTIs among blood donors in 5 years

Positivity for HBs Ag was more than for other markers, no donor showed peripheral smear positive for malarial parasite.

Total	Chi-square test for prevalence		Chi-square test for trend	
	Chi-square	P value	Chi-square	P value
HB s Ag	7.021	0.1348	3.223	0.0726
HIV	9.838	0.0432	2.952	0.0858
HCV	0.9859	0.9119	0.09231	0.7613
Syphilis	6.402	0.1711	2.583	0.1080
Malaria	-	-	-	-

Table 4: Prevalence and trends in various infectious markers

Except HIV there is no significant change in prevalence of other markers and trend is static one as $p > 0.05$ for all markers.

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Date of Submission: 04/01/2015.
Date of Peer Review: 05/01/2015.
Date of Acceptance: 13/01/2015.
Date of Publishing: 27/01/2015.