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# Trends of Transfusion Transmissible Infections among the blood donors in a Tertiary Care Hospital

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**ABSTRACT**

**Context:**Transfusion of blood and its components carries risk of hazardous adverse effects despite having life saving potential in emergency situation. Five mandatory Transfusion transmissible infections (TTI) for which screening is done in the Blood Bank immediately after collection are HIV, HBV, HCV, Malaria & syphilis.

**Aims**:Present study aimed to know the prevalence and changing trends of HIV, HBV, HCV, malaria and syphilis in voluntary as well as replacement donors in our centre.

**Settings and Design**:This record based study was conducted in the blood bank of MKCG Medical College from the period 1st September to 30th September 2017.

**Methods and Material**:Data were collected from the record section of the Blood Bank in a predesigned format on all the Blood units collected from January 2012 to December 2016 .Data thus collected entered into excel sheet & analysed.

**Statistical analysis used**:
Data analysis was done using descriptive statistics like ratio, percentage and chi-square test. For statistical significance cut off value was taken at 95% level.

**Results:**A total of 129632 blood units were collected out of which (53.72%) were from voluntary donors. Significantly more Males had donated. Overall (TTI) prevalence was (2.47%). There was increasing proportion of TTI with HIV, HBV and HCV over the five years and decreasing proportion with Malaria and Syphilis. Majority of TTI 2826(88.23%) units were positive for HBV (88.2%) followed by HIV (4.75%).HBV prevalence was found to be more in Voluntary donors and prevalence of all other infections were more in replacement donors.

**Conclusions:**High coverage with Hepatitis B immunisation with promotion of voluntary donation and creating awareness on blood transmissible infection by appropriate information, education and communication will help in reducing rate of TTI prevalence.

**Keywords:** blood donor, Transfusion transmitted infection, HCV, HIV, HBV.

## INTRODUCTION

Blood transfusion carries the risk of transmitting major infections such as hepatitis, HIV, Syphilis, and malaria [1]. Availability of newer and more- sensitive screening tests like Nucleic Acid Amplification Test

with strict implementation of testing rules has significantly reduced incidence of Transfusion Transmitted Infections (TTIs).Evaluation of data for the prevalence of TTIs permits an assessment of acquisition of these infections in blood-donor population and gives information about epidemiology of infections in population. Present study aimed to know the prevalence and changing trends of HIV, HBV, HCV, malaria and Syphilis in voluntary as well as replacement donors in our centre.

**Subjects and Methods:**

This record based study was conducted in the blood bank of our institute from the period 1st September 2017 to 30th September 2017. After clearance from the Institutional ethical committee and waiver of consent, due permission was granted from the Superintendent of the hospital. Data were collected from the record section of the Blood Bank in a predesigned format on Blood units collected from January 2012 to December 2016. Any discrepancies found in the data were verified from the manually documented data during the same period. All the blood units collected in the Blood bank and in the camps in the above mention period were included in the study. The format was designed to collect information on type of donors (voluntary /Replacement), gender of the donors, total transfusion transmitted infection detected in each group of donors.

A voluntary donor is a person as per NACO guidelines, who gives blood, plasma or other blood components of his/her own free will and receives no payment for it, either in the form of cash or in-kind which could be considered a substitute for money. This includes time off work, other than reasonably needed for the donation and travel. Small tokens, refreshments and reimbursement of the direct travel costs are compatible with voluntary, non-remunerated blood donation. Replacement blood donor is one who gives blood when it is required by a member of the patient's family or community. This may involve a hidden paid donation system in which the donor is paid by the patient's family [2].

After routine screening by donor questionnaire and medical examination, blood was collected from donor in an anticoagulant containing blood bag, sample for testing was taken from blood bag and kept in pilot test tube. Five mandatory TTI s for which screening was done in the Blood Bank immediately after collection are Human Immunodeficiency Virus (HIV), Hepatitis B virus (HBV), Hepatitis C Virus (HCV), Malaria & Syphilis. To detect TTI in the collected blood following tests are being conducted in the institution. The screening of HIV is done by ELISA using Erba Lisa [TRANSASIA BIO-MEDICALS LTD] kit. The screening of HBsAg for HBV is done by ELISA using Erba Lisa [TRANSASIA BIO-MEDICALS LTD] kit. (HCV) infection was screened for anti-HCV by ELISA using Erba Lisa [TRANSASIA BIO-MEDICALS LTD] kit. Test for Syphilis is done by R.P.R. Test kit supplied by NACO. Malaria parasite was tested by ICT using My test [NanoEnTek] Kit. All the tests were performed according to the manufacturer's instructions. The samples which came reactive were again repeat tested on the following day to confirm them positive. The blood bag was discarded for which the pilot sample was positive and corresponding donor was notified.

From 23rd June 2016, NAT of HIV, HBV, and HCV was implemented in the institute. From then till 31st December 2016, the entire ELISA negative sample for HIV, HBV and HCV are again subjected nucleic acid amplification testing by Roche Cobas TaqScreen MPX test on ROCHE COBAS s 201system.

All the collected data were entered into the excel sheet. Data analysis was done using descriptive statistics like ratio, percentage and chi-square test .For statistical significance cut off value was taken at 95% level.

**Results:**

During the five years period i.e. from January 2012 to December 2016, total 129632 blood units were collected out of which 69639(53.72%) were from voluntary donors and 59993(46.28 %) were from replacement donors. Except in the year 2013 and 2014, percentage of voluntary donors were more .There was significant difference between the contribution of the voluntary and replacement donors over five years ($\chi^2$=2985.647 df=4,p=0.0000 ) . Overall male donors accounted for 92.88% blood units while that for female was only 7.12%. Considering year wise donation and also type of donation i.e. voluntary and replacement, male donors were significantly more than female donors.



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[ $\chi^2$ = 270.159, df = 4, $\chi^2$/df = 67.54 , P($\chi^2$> 270.159) = 0.0000 for voluntary ,$\chi^2$ = 1141.988, df = 4, $\chi^2$/df = 285.50 , P($\chi^2$> 1141.988) = 0.0000 for replacement donors)] (Table 1).

Table No 1: Distribution of collected total blood units (Original)

| Year | Voluntary | | | Replacement | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Male No(%) | Female No (%) | Total No (%) | Male No(%) | Female No (%) | Total No (%) | Total Male No (%) | Total Female No (%) | Total Collection |
| 2012 | 14512 (94) | 900(6) | 15412( 63) | 8242 (91) | 860 (9) | 9102 (37) | 22754 (93) | 1760(7) | 24514 |
| 2013 | 11093 (92) | 1011 (8) | 12104( 48) | 11856 (91) | 1209 (9) | 13065 (52) | 22949 (91) | 2220 (9) | 25169 |
| 2014 | 9731 (90) | 1101 (10) | 10832( 42) | 13420 (89) | 1584 (11) | 15004 (58) | 23151 (90) | 2685 (10) | 25836 |
| 2015 | 14164 (94) | 947 (6) | 15111( 57) | 11009 (95) | 533 (5) | 11542 (43) | 25173 (94) | 1480 (6) | 26653 |
| 2016 | 15219 (94) | 961 (6) | 16180( 59) | 11152 (99) | 128 (1) | 11280 (41) | 26371 (96) | 1089 (4) | 27460 |
| Total | 64719 (93) | 4920 (7) | 69639( 54) | 55679 (93) | 4314 (7) | 59993 (46) | 120398( 93) | 9234 (7) | 129632 |

Of the total collected blood units, 3203 (2.47%) blood units were positive for transfusion transmissible infections (TTI) of which 48.01% and 50.98% were contributed by voluntary and replacement donors respectively. Prevalence of TTI was significantly more among the replacement donors 1633(2.72%) than voluntary donors 1570(2.25%). [$\chi^2$ = 81.519, df = 4, $\chi^2$/df = 20.38 , P($\chi^2$> 81.519) = 0.0000]. Over the 5 years there was decrease in prevalence of Syphilis and increase in that of HBV. For HIV though there was increase in prevalence in the year 2016, it was almost in the same rate for the year 2013, 2014 and 2015 (Fig 1 and 2).



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Fig – 1 :Year wise prevalence of HIV, HCV, MALARIA, SYPHILIS)

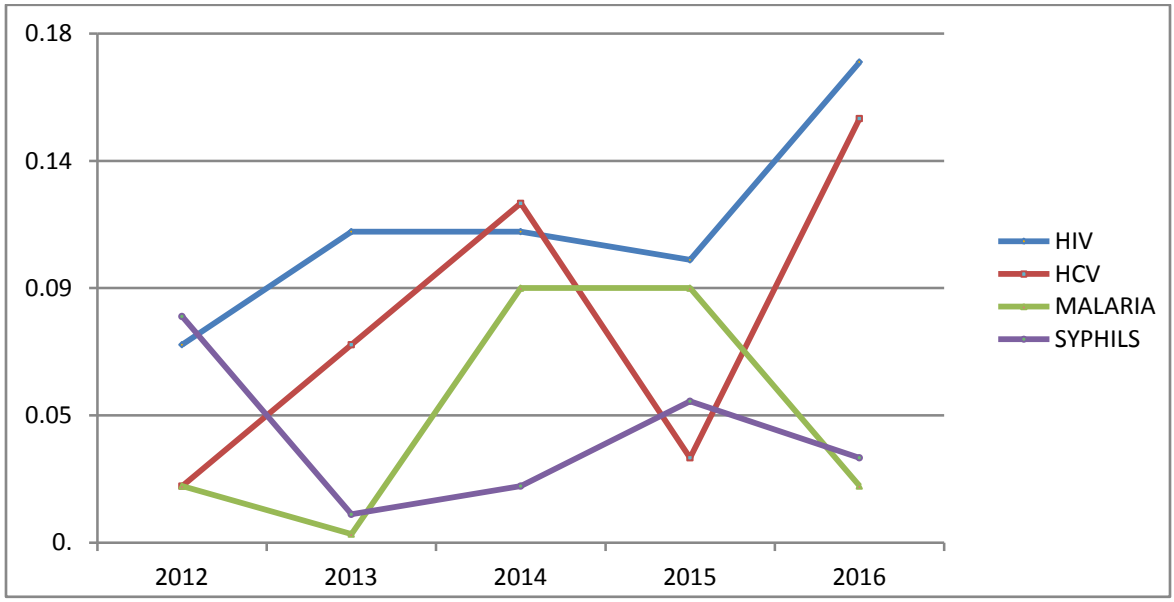
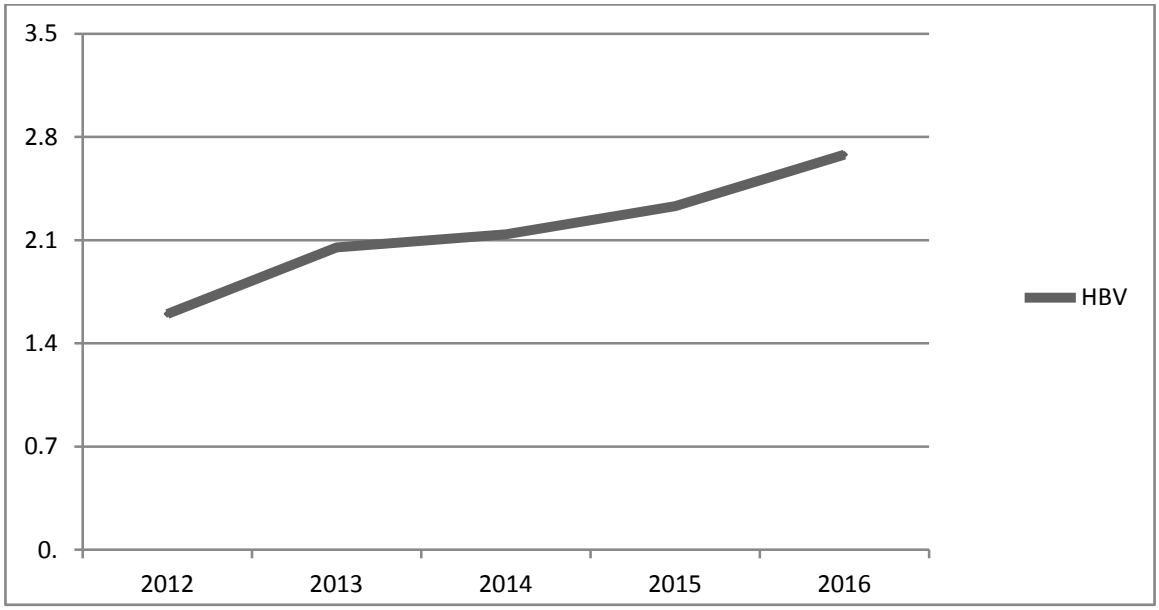



Fig – 2 : Year wise prevalence of HBV




Year wise prevalence of TTI reactive units was 1.81%, 2.26%, 2.5%, 2.63% and 3.07% in 2012, 2013, 2014, 2015, and 2016 respectively.(Table 2) Majority of TTI 2826(88.23%) units were positive for HBV( 88.2%) followed by HIV (4.75%). Other TTI positive units included HCV (3.37%), malaria (1.97%) and Syphilis (1.69%).



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Table 2: Year wise prevalence of various TTIs(original)

| Year | Total Collection | HIV No (%) | HBV No (%) | HCV No (%) | Malaria No (%) | Syphilis No (%) | Total TTI No (%) |
|---|---|---|---|---|---|---|---|
| 2012 | 24514 | 18(0.07) | 394(1.60) | 6(0.02) | 5(0.02) | 20(0.08) | 443(1.80) |
| 2013 | 25169 | 29(0.11) | 517(2.05) | 19(0.07) | 1(0.003) | 3(0.01) | 569(2.26) |
| 2014 | 25836 | 29(0.11) | 555(2.14) | 32(0.12) | 24(0.09) | 7(0.02) | 647(2.50) |
| 2015 | 26653 | 29(0.10) | 623(2.33) | 9(0.03) | 26(0.09) | 14(0.05) | 701(2.63) |
| 2016 | 27460 | 47(0.17) | 737(2.68) | 42(0.15) | 7(0.02) | 10(0.03) | 843(3.06) |
| Total | 129632 | 152(0.11) | 2826(2.18) | 108 (0.03) | 63(0.04) | 54(0.04) | 3203(2.54) |

Overall HIV prevalence among the donors was 0.11% which was 4.75% of the total detected TTI. None of the female donors were found to be positive for HIV and significantly more persons in the replacement group were positive for HIV than voluntary donors [$\chi^2$ = 10.233, df = 4,P($\chi^2$> 10.233) = 0.0367]. Year wise prevalence was 0.07%,0.11%,0.11%,0.1%,0.17% in 2012, 2013 , 2014 , 2015 and 2016 respectively.

Year wise and overall prevalence of HBV was more than other TTIs which was 2.18% and that of male and female was 2.34% and 0.21% respectively. Significantly more male donors and voluntary donors were positive for HBV than female donors.[$\chi^2$ = 69.684, df = 4, (P = 0.0000)]. Year wise prevalence for HBV reactive units was 1.61%, 2.05%, 2.15%, 2.34%, and 2.68% for the same corresponding years respectively.

The prevalence of HCV infection among blood donors was 108 (0.03%). Significantly more replacement donors were positive for HCV than voluntary donors (Fisher's exact test)[ df =4,Pearson: 14.216 (p= 0.00664)]. Overall prevalence of Malaria and Syphilis was 63(0.04%) and 54(0.04%) respectively .None of the female donors were found to be positive for Malaria and Syphilis. No Significant differences found among the replacement and voluntary donors in relation to Malaria parasite [Pearson's: 6.851 (p= 0.14398)]. But significantly more replacement donors were positive for Syphilis than voluntary donors [Pearson's: 10.63 (p= 0.031057)].



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**Table No 3- TTI in voluntary & replacement donors(Original)**

| Year | Total TTI | HIV | | HBV | | HCV | | MP | | SYPHILIS | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Vol. no. (%) | Repl no. (%) | Vol no. (%) | Repl no. (%) | Vol no. (%) | Repl no. (%) | Vol no. (%) | Repl no. (%) | Vol no. (%) | repl no. (%) |
| 2012 | 443 | 6 (33.3) | 12 (66.7) | 258 (34.6) | 136 (65.4) | 2 (33.3) | 4 (66.4) | 0 | 5 (100) | 9 (45) | 11 (55) |
| 2013 | 569 | 6 (20.6) | 23 (79.4) | 259 (50.1) | 258 (49.9) | 6 (31.5) | 13 (68.5) | 1 (100) | 0 | 3 (100) | 0 |
| 2014 | 647 | 8 (27.5) | 21 (72.5) | 214 (38.6) | 341 (61.4) | 4 (12.5) | 28 (87.5) | 3 (12.5) | 21 (87.5) | 0 | 7 (100) |
| 2015 | 701 | 7 (24.1) | 22 (75.9) | 335 (53.8) | 288 (46.2) | 5 (55.5) | 4 (44.5) | 5 (19.4) | 21 (80.6) | 4 (28.5 ) | 10 (71.5) |
| 2016 | 843 | 24 (51.1) | 23 (48.9) | 382 (51.9) | 355 (48.1) | 22 (52.3) | 20 (47.7) | 2 (28.6) | 5 (71.4) | 5 (50) | 5 (50) |
| Total | 3203 | 51 (33.5) | 101 (66.5) | 1448 (51.3) | 1378 (48.7) | 39 (36.1) | 69 (63.9) | 11 (17.5) | 52 (82.5) | 21 (38.8 ) | 33 (61.2) |

Vol- Voluntary, Repl - Replacement

**Discussion:**

A well organised 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 transfusion transmitted infections and reduction of unnecessary transfusion [2]. The exact evaluations of the risk of TTIs is imperative in order to monitor the safety of blood supply and gauging the effectiveness of the presently employed screening procedures [3]. Present study was conducted to know the prevalence and changing trends of HIV, HBV, HCV, malaria and syphilis in voluntary as well as replacement donors in the centre.In this study Voluntary donors constituted 53.72% as compared to 46.28 % of replacement donors, a finding similar to study carried out by Fernandes et al , Mondal R et al and Pallavi P et al[4-6]. However some studies from India had reported less voluntary blood donors compared to replacement donors [7-11]. Male donors accounted for 92.88%



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while that of female was only 7.12%, finding similar to other Indian studies[4-11]. During the five year study period, overall prevalence rate of all five mandatory TTIs was 2.47% which was almost similar to study by Chaurasia R et al(2.51)[8]. Other studies from India by Pallavi P et al[6], Agarwal N et al[12] and Leena M S et al [13] (2.22%,0.87% and 1.35% respectively) found lower TTI prevalence rates while studies done by Mandal R[5], Kotwal U et al[14] and Kumar R et al[15] (2.93%, 3.02% and 4.57% respectively) had reported higher rates. The trend in prevalence of TTI in present study had increased from 1.81% in 2011 to 3.07% in 2016 which was similar to study carried out by Leena et al[13].

Various studies reported that prevalence of HBV among blood donors was higher than HIV, HCV, syphilis and malaria [4-6]. In this study prevalence of HBV was more in comparisons to other TTIs over the years and in each year as well. Overall prevalence of HBV (2.18%) was lower in comparison to study carried out by Pahuja et al[10]. But Fernandes H et al, Chandra T et al and Leena MS et al had reported lower prevalence rate of HBV compared to present study[4,11,13]. Studies from other countries like Tanzania, Saudi Arabia and Ethiopia had reported much higher prevalence of HBV[15-17]. In US and China the HBV prevalence among the blood donors was quite lower compared to present study [18,21]. In present study HBV prevalence was higher in voluntary donors which was similar to study carried out by Kakar et al[7] but many had reported higher prevalence of HBV in replacement donors[4-6, 9, 11]. HIV prevalence was 0.11% which was slightly higher compared to study carried out by Fernandes et al[4] and Agarwal N et al[12]. HIV prevalence was lower in present study in comparison to most of the studies carried out in India [5,6,11,10,13,14].

Though there was increase in prevalence of HIV in the year 2016, it was almost in the same rate for the year 2013, 2014 and 2015.Prevalence of HCV infection was 0.03% similar to study carried out Fernandes et al[4] which had prevalence rate of 0.06%. Higher prevalence rate of HCV was reported by many Indian studies [5,6,8-10,12-14]. HCV prevalence was higher in replacement donors which was in contrast to study carried out by Kakar N et al [7]. Only 0.04% of the donors were positive for Malaria. Study carried out by Pallavi P et al [6] found no malaria parasite and Mandal R et al[5] found only one malaria parasite, while that of Chandra T et al[11] found prevalence to be 0.009% which was lower compared to present study. Leena M et al[13] found higher prevalence of malaria (0.129%).Though this area is endemic to malaria, lower prevalence of MP might be due to the fact that sick persons usually didn't donate blood. Chandra T et al[11] reported lower prevalence of Syphilis compared to present study while most other studies in India reported higher prevalence rates[4-6,8,9,12-14] .

The increasing prevalence of HIV, HBV, and HCV in 2016 might be due to inclusion of NAT in the blood bank from 23rd June 2016 for screening of these diseases which indicated detection of these viral infections in pre-sera conversion phase.

The prevalence of transfusion-transmissible infections in blood donations in high-income countries is considerably lower than in low- and middle-income countries. These differences reflects the variation in prevalence among population who are eligible to donate blood, the type of donors (such as voluntary unpaid blood donors from lower risk populations) and the effectiveness of the system of educating and selecting donors [20].

As published by NACO in 2007, Family/replacement donors still provide more than 45% of the blood collected in India. Such donors are supposed to be associated with a significantly higher prevalence of transfusion-transmissible infections (TTIs) including HIV, hepatitis B, hepatitis C, syphilis and malaria. For a safe blood service in our country, where comprehensive laboratory tests are neither possible nor pragmatic, it is best to switch over to 100% voluntary donations, as it is now established that only voluntary non-remunerated regular donation is the safest. Thus, one of our key strategies to enhance blood safety is to focus on motivating non-remunerated blood donors and phasing out even replacement donors [2].

But in the present study HBV prevalence was found to be more in Voluntary donors and prevalence of all other infections were more in replacement donors. Higher prevalence of HBV in apparently healthy blood donors is reciprocating with the disease burden in general population in this locality.

**Conclusion:**



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Over the five year period it was seen that proportionately more voluntary donors had donated than replacement donors. Male donors also contributed more. Overall Prevalence of TTI was significantly more among the replacement donors than voluntary donors. But HBV infection was more among voluntary donors. Hence high coverage with Hepatitis B immunisation with promotion of voluntary donation and creating awareness on TTI by appropriate information, education and communication will help in reducing its prevalence.

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