

SEROPREVALENCE OF TRANSFUSION TRANSMISSIBLE INFECTIONS IN BLOOD DONORS: A THREE YEAR EXPERIENCE

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ABSTRACT

Objective: To determine seroprevalence of transfusion transmissible infections (TTIs) in blood donors and to compare the present results with the data from studies conducted in past.

Study Design: Descriptive study.

Place and Duration of Study: Armed Forces Institute of Transfusion (AFIT), Rawalpindi from January 2010 to December 2012.

Material and Methods: All the blood donors who had donated blood at AFIT during the three year study period were included. Prior to blood donation at the institute, all the donors were subjected to a preset, structured questionnaire to determine their eligibility for donation as per the criteria set by the institute. Donors' serum samples were screened for hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV) and syphilis by using HBsAg, anti-HCV, HIV antigen-antibody combination assay and syphilis antibody test, respectively. The repeatedly reactive samples were considered as true reactive.

Results: A total 160552 blood donors were screened during the study period. The mean age of the donors was 29 ± 10.2 years (Range: 18 - 60 years). Out of these, 158144 (98.5%) were male donors and 2408 (1.5%) were female donors. 7385 (4.6 %) donors were volunteer and 153167 (95.4%) donors the replacement donors. The seroprevalence of TTIs in the donors for HBV, HCV, HIV and syphilis was 2385 (1.48%), 4194 (2.61%), 26 (0.02%) and 1520 (0.95%), respectively. The seroprevalence of HBV was higher and statistically significant (p value <0.05) in Gp-II (31-45 years) and the seroprevalence of both HCV and Syphilis was higher and statistically significant (p value <0.05) in both GP-II (31-45 years) and GP-III (46 years and above) when compared with overall seroprevalence of the respective infections in all age groups.

Conclusion: This study highlights that the seroprevalence of HBV and HCV is decreasing in our blood donors, but still it is an important risk factor for spread of these infections. The seroprevalence of HIV is rising gradually in the blood donors.

Keywords: Blood donors, Seroprevalence, Transfusion transmissible infections.

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INTRODUCTION

Safety of blood products is a major public health concern in most of the developing countries including Pakistan, as there are many healthcare related challenges and limited resources¹⁻³. According to a report published by the Government of Pakistan in 1999, approximately 1.2 million blood donors donate annually in the country⁴, and the number of blood donors has been constantly increasing since then. A study based on ten year data of Pakistani blood donors has reported that

seroprevalence of transfusion transmissible infections (TTIs) ranges between 1.46% to 2.99% for hepatitis B virus (HBV), 3.01% to 4.99% for hepatitis C virus (HCV), and 0% to 0.06% for human immunodeficiency virus (HIV)⁵.

Armed Forces Institute of Transfusion (AFIT), Rawalpindi, is the largest transfusion center in northern Pakistan. Annually, more than 50,000 donations are collected at this institute. AFIT also acts as a specialized, regional transfusion center to meet the needs of all armed forces hospitals in Rawalpindi and Islamabad. A four year study (from January 1996 to December 2000) was conducted at AFIT to determine the seroprevalence of TTIs among the blood donors⁶. Of 103858 blood donors

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tested by enzyme linked immunosorbent assay (ELISA), 3.3% were positive for hepatitis B surface antigen (HBsAg), 4.0% for anti-HCV antibodies and 0.007% for anti-HIV antibodies. Serologic screening of blood donors has been conducted on highly sensitive chemiluminescence microparticle immunoassay (CMIA) in our institute in the recent past. Another study conducted later in 2005 at AFIT, determined the seroprevalence of TTIs in blood donors; 2.16% for HBsAg, 4.16% for anti-HCV, and 0.004% for anti-HIV⁷.

Present study was conducted to determine the existing seroprevalence of HIV, HBV, HCV, and syphilis in the blood donors and also to compare the results with data from past studies at our institute. Seroprevalence of an infection can vary with time and it is necessary to monitor the seroprevalence in a given area for a specific time period. The data in this study will help in formulating the strategies for screening of blood in our setup as well as in other blood banks in the Northern Pakistan and to monitor future trend in seroprevalence of these infections.

MATERIAL AND METHODS

This study was conducted over a period of 3 years, from January 2010 to December 2012, with the approval of the institutional ethical committee. Non-probability, consecutive sampling was done and all the people who donated blood in our institute, after an informed consent, were included in the study. This included both, the first time as well as the repeat donors. Prior to blood donation all the potential donors was subjected to a preset, structured questionnaire to determine their eligibility for donation as per the criteria set by the institute. All the donors, who did not meet the standards of blood donation selection criteria outlined by the institute, like age, weight, hemoglobin level, history of hepatitis B, hepatitis C or HIV positive test result, history of fever or dental procedure in the past one week, history of vaccination in last 1-4 weeks, were excluded from the study.

Serum samples were collected in serum separator tubes (5 ml) from each donor and labeled with a unique identification number.

Samples from all the donors were kept at room temperature and were tested each day as one single batch, within 24 hours of collection. These serum samples were then screened for HBsAg, anti-HCV, and HIV antigen-antibody combination assay (HBsAg qualitative II kit, anti-HCV kit, and HIV Ag/Ab Combo kit, respectively, Abbott Diagnostics) on an automated immunoassay analyzer (Architect i2000, Abbott Diagnostics, Abbott Park, IL). The serological screening for syphilis was done by the rapid immunochromatographic kit (ICT; TP, InTec Products, Inc., Xiamen), used for determination of specific anti-syphilis antibodies. The donor samples found initially reactive were retested in duplicate on the same day. The repeatedly reactive samples were declared as true reactive and the blood products from these donors were separated, rechecked and sent for incineration. The validity of each test run was confirmed with the controls provided in the kit, according to the manufacturer's instructions.

Statistical Package for Social Sciences (SPSS) version 20 was used for statistical analysis of the data. Mean value \pm SD was calculated for quantitative variables like age. Frequency and percentage was calculated for all the qualitative variables like gender, age groups and was compared for seropositivity status for all the four infections (TTIs). Chi square test was applied to compare the seroprevalence in different groups under study. P value of < 0.05 was considered as significant.

RESULTS

A total 160552 blood donors were screened during the study period, with a mean age of 29 ± 10.2 years (Range: 18 - 60 years). Out of these, 158144 (98.5%) were male donors and 2408 (1.5%) were female donors. Only 7385 (4.6 %) donors were volunteer and 153167 (95.4%) were the replacement donors. The seroprevalence of TTIs in the donors for HBV, HCV, HIV and syphilis was 2385 (1.48%), 4194 (2.61%), 26 (0.02%) and 1520 (0.95%), respectively.

The gender based seroprevalence data is shown in Table-1. Seroprevalence of HBV, HCV and HIV was much higher and statistically significant (p value < 0.05) in males than in

females. The age based seroprevalence data is shown in Table-2. The seroprevalence of HBV was higher and statistically significant (p value <0.05) in Gp-II (31-45 years) when compared with the overall seroprevalence of HBV in all age groups. The seroprevalence of both HCV and syphilis was higher and statistically significant (p value <0.05) in both GP-II (31-45 years) and GP-III (46 years and above) when compared with overall seroprevalence of HCV.

DISCUSSION

This study has led to important follow up data about the seroprevalence of TTIs among the blood donors at AFIT. Our study shows that the seroprevalence of HBV and HCV has decreased among the blood donors in our institute, over a period of time since it was first reported in 2002^{6,7}. The pattern of HBV decrease in seroprevalence has been that of a steady decline from 3.3% (1996-2000), 2.16 % in 2005 to 1.27 % in present study (2010-2012). For HCV the seroprevalence remained somewhat stable from 4.0% (1996-2000) to 4.16% in 2005. It then

part of Expanded Program on Immunization, screening of pregnant females for HBV and HCV, effective screening of blood donors in recent past, increased availability of interferon treatment for HCV, availability of oral treatment for HBV, increased awareness about hazards of re-use of syringes and better infection control practices among health care workers. For HIV, there is a different scenario as the HIV infection has moved from the low prevalence state to a concentrated epidemic in our country⁸. This is the main reason that the seroprevalence of HIV infection, although still very low, has gradually increased in the blood donors over a period of last 15 years.

The seroprevalence of TTI among the blood donors reported from Pakistan varies to a great extent depending upon the geographic area within the country, the time period of the study and the type of technique used (Rapid ICT, ELISA or Chemiluminescence) for screening. The screening data from interior Sindh in Pakistan, from 2004-2007, has shown a very high prevalence rate of 6.2% for HBV and

Table-1: Gender based seroprevalence of TTIs in blood donors at AFIT.

Gender of donors	No of donors	HBV	HCV	HIV	Syphilis
Male	158144	2376 (1.50%)	4166 (2.63%)	26 (0.02%)	1503 (0.95%)
Female	2408	9 (0.37%)	28 (1.16%)	0 (0.00%)	17 (0.70%)
Total	160552	2385 (1.48%)	4194 (2.61%)	26 (0.02%)	1520 (0.95%)

Table-2: Age based seroprevalence of TTIs in blood donors at AFIT.

Age group of donors (Years)	No of donors	HBV	HCV	HIV	Syphilis
Gp-I (18-30)	108567	1491 (1.37%)	2549 (2.35%)	18 (0.02%)	896 (0.82%)
Gp-II (31-45)	48143	825 (1.71%)	1517 (3.15%)	8 (0.02%)	561 (1.16%)
Gp-III (46 and above)	3842	69 (1.80%)	128 (3.33%)	0 (0.00%)	63 (1.64%)

Gp: Group

declined rapidly to 1.84% in time period 2010-2012. Seroprevalence of HIV has gradually increased in the blood donors at AFIT; it was 0.007% during the year 1996-2000, 0.004% in year 2005 and 0.02% in year 2010-2012.

The downward trend for HBV and HCV in blood donors is mainly due to the multiple factors which have led to a decrease in overall prevalence of these infections in general population as well as the blood donors. These factors include mass hepatitis B vaccination as

7.5 % for HCV⁹. In the same study, there was a trend of decrease in seroprevalence of HBV in literate blood donors while the seroprevalence for HCV increased gradually during the study period. A study conducted on 1,27,828 samples of blood donors at Peshawar, Khyber Pukhtunkhwa (KPK), from 2008 to 2011, recorded mean seroprevalence for HBV, HCV, HIV and syphilis at 2.68%, 2.46%, 0.06% and 0.43%, respectively¹⁰. The seroprevalence of HBV (3.66%) was much higher in the blood donors in Northern areas of Pakistan, between

2003-2005; whereas seroprevalence of HCV (1.35%) was lower than the rest of the country¹¹. This clearly depicts that seroprevalence of these infections may vary in different parts of the country. A Karachi based study conducted in 2008 has shown that only 0.22% of donors were reactive for syphilis antibodies in contrast with 0.95% in our study. However, Venereal disease research laboratory (VDRL) test was used for syphilis screening, which is different than the rapid ICT method used in our study¹².

In neighbouring India, a study conducted on 20,000 blood donors, showed that 450 (2.25%) were seropositive for HBV¹³. Similar to our study, the seroprevalence was higher in males than in females. The age related seroprevalence also rose in the same fashion; from 1.78 % in 19-25 year age group to 3.03% in 35-45 year age group. The reported seroprevalence of HCV from India (0.39%) is, however, lower than the one found in our study, and also lower than the figures reported elsewhere in Pakistan¹⁴. Another main difference was the trend of decrease in HCV seroprevalence with increasing age of the donors. A retrospective study in a tertiary care centre in India has reported the seroprevalence of HBV, HCV, HIV and syphilis (VDRL) to be 1.7%, 0.8%, 0.6% and 0.7%, respectively¹⁵. While HCV infection is again lower in comparison with our data, HIV infection rate appears to be very high in Indian blood donors.

CONCLUSION

The study highlights the fact that the seroprevalence of HBV and HCV is on the decline in our blood donors. However, these viruses still remain the important agents for spread of TTIs. The seroprevalence of HIV is rising gradually in the blood donors. All the reactive blood donors need to be notified, followed up, counseled and referred to specialist care centers. These efforts by blood

banks can prevent further transmission of TTIs. There is also a strong need to expand voluntary, non-remunerated donor base for minimizing spread of these infections.

AUTHORS CONTRIBUTION

Saifullah Khan Niazi conceived the idea, analysed the data and drafted the manuscript. Asad Mahmood, Maqbool Alam and Eijaz Ghani did the literature review, critical analysis and revised the manuscript.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author.

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