



Prevalence and trends of transfusion-transmitted infections among blood donors in Tehran, Iran from 2008 to 2013



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ABSTRACT

Background: Evaluation of trends in the rate of transfusion-transmitted infections (TTIs) in blood donors is essential for monitoring blood supply safety and donor screening effectiveness. The aim of this study was to determine the trends and prevalence of hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV), and syphilis seromarkers among blood donors referred to Tehran Blood Transfusion Center (TBTC) from 2008 to 2013.

Materials and methods: The data of all blood donors referred to TBTC between 2008 and 2013 were collected. The prevalence of HBV, HCV, HIV, and syphilis infections were expressed by donation year and donors' characteristics (age, gender, educational level and donor status).

Results: Among 1,796,090 individuals who donated blood at TBTC from 2008 to 2013, analysis of trend for the prevalence of HBV showed a significant decrease from 423 to 153 per 10⁵ donors. The similar pattern of decrease was observed for the prevalence of HCV from 139 to 69 per 10⁵ donors, however the rate of decrease in HCV prevalence was slower than the rate of decrease in HBV prevalence. The prevalence of HIV was constant while the prevalence of syphilis showed a sharp decrease in 2009 and a constant prevalence from 2010 to 2013. The top three parameters influenced the rate of TTIs were donor status, age, and educational level.

Conclusion: The decreasing prevalence and trends of TTIs among the studied donors demonstrated that the safety measures which were employed in recent years in Iranian Blood Transfusion Organization have been effective.

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1. Introduction

The selection of healthy and safe blood donors has always been a serious concern for blood transfusion centers worldwide. Transfusion-transmitted infections (TTIs) are considered as a major problem associated with blood transfusion. The

most important TTIs are hepatitis B virus (HBV), hepatitis C virus (HCV), human immunodeficiency virus (HIV), and syphilis infection [1]. Transfusion-transmitted infections have been dramatically decreased in countries where routine serological screening of donors has been implemented [2]. The residual risk of TTIs was proposed to be related to the prevalence of asymptomatic infections in the society and donation during the window-period of infectious diseases [3]. The cornerstone of blood safety is donor selection which is assessed by donor interview and physical examination by a qualified physician. Moreover, other policies like deferral criteria, self-deferral procedure, increasing in number of regular

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donors, voluntary non-remunerated blood donors, educational efforts to increase public knowledge on TTIs and application of sensitive and qualified serological tests for screening of HBV, HCV, HIV and syphilis infections have been handled by Iranian Blood Transfusion Organization (IBTO) to increase blood safety.

The present study was carried out to assess the prevalence and changing trends of various TTIs including HBV, HCV, HIV and syphilis and the impact of donors' characteristics on prevalence of TTIs in blood donors in a 6-year period from 2008 to 2013 in Tehran Blood Transfusion Center (TBTC), IBTO, Iran.

2. Materials and methods

2.1. Study population

This retrospective study was carried out on collected data from all donors who referred to TBTC from 2008 to 2013. Tehran Blood Transfusion Center is the largest blood bank in Iran and is located in Tehran, with 38 fixed and 1849 mobile donation sites in Tehran province and with approximately 360,000 donations annually. Tehran province is located in the north of Iran with 12,183,391 population (from the last census in 2011). Tehran city is the capital of the province and of Iran. In the 20th and 21st centuries, this city has been the subject of mass migration of people from all around Iran.

In this study, the data related to all blood donors including characteristics of donors and the results of serological assessments for detection of TTIs were extracted from IBTO national database. The data of every donor were collected once during a year. A questionnaire which included questions on high-risk and low-risk behaviors regarding TTIs acquisition was filled for every donor by a qualified physician. First-time blood donor was defined as a donor who donated for the first-time, lapsed donor as any donor who had a history of previous donation but the interval between two donations was more than 1 year and regular donor as an individual who donated more than once during a year. Moreover, for evaluation of the impact of HBV vaccination on HBV prevalence, all the first-time blood donors born after 1989 were enrolled as cases and the ones born during 1984–1988 were selected as controls. Hepatitis B (HB) vaccination has been a part of the Expanded Program on Immunization (EPI) of Iran since 1993 on newborns. To extend HB immunization, HB mass vaccination has been planned for adolescents born during 1989–1992 and implemented for four consecutive years from 2007 to 2010. In this study, the HBV prevalence was evaluated among case and control groups from 2010 to 2013. The reason for choosing of this duration was implementation of the mass vaccination program from 2007 to 2010 and also the population underwent EPI against HB did not met the blood donation age criteria in 2008 and 2009. The present study was approved by the Ethics Committee of IBTO and informed consent was obtained from all donors.

2.2. Screening and confirmatory methods

The donations were all screened for HBV, HCV, HIV and syphilis infections according to the standard operating

procedures at TBTC. The screening tests by the year of donation are listed in [Table 1](#). Donors who were confirmed to be positive in screening tests were notified and invited for post-donation counseling and follow-up. Samples with positive result for screening of each TTI were retested by confirmatory tests according to the standard operating procedures at TBTC. The confirmatory tests by the year of donation are listed in [Table 1](#). The results of the confirmatory tests were considered for the assessment of TTIs prevalence.

2.3. Statistical analysis

The prevalence of TTIs were expressed per 100,000 (10^5) donors in tables and by percentage in figures. Relative χ^2 (chi-square value/degree of freedom) was used to show the impact of donors' characteristics on the prevalence of TTIs. P value less than 0.05 was considered to be statistically significant. Given this study intended to assess the prevalence of TTIs and impact of donors' characteristics on prevalence of TTIs in blood donors, the data of each donor were included once in a year and the prevalence was reported per donor annually. Statistical analysis was performed using SPSS version 20 and statistical graphs were generated using GraphPad Prism version 6.

3. Results

3.1. Donors' characteristics

From January 2008 to January 2014, 2,151,136 whole blood donations were collected at TBTC, where 41% were regular, 27% lapsed, and 32% first-time blood donors, also 94% were male and 6% were female. The number of female donors decreased during this interval. There has been an increasing trend in the number of regular and lapsed blood donors since 2008 and there was a decreasing trend in the number of first-time blood donors during this interval. The majority of donors had high school degree however educational level did not change significantly in the study duration. All donors' characteristics are summarized in [Table 2](#).

3.2. Prevalence and trends of TTIs in blood donors

The prevalence rate of HBV in donors showed a decline from 0.423% in 2008 to 0.153% in 2013 ([Fig. 1](#)). Moreover, the prevalence rate of HCV showed a decline from 0.139% in 2008 to 0.069% in 2013, however the slope of the HCV diagram was more gradual than the slope of the HBV diagram. The prevalence of HIV infection during the study period fluctuated from 0.011% in 2008 and reached to 0.009% in 2013. The prevalence of syphilis decreased from 0.028% in 2008 to 0.004% in 2012 and increased to 0.006% in 2013 ([Fig. 1](#)).

3.3. Impact of donor demographic characteristics on prevalence of TTIs in blood donors

In the present database, the impact of donor characteristics on the prevalence of TTIs was evaluated. The impact

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