

# Prevalence of Major Transfusion-Transmissible Viral Infections in Blood Donors Attending Fars Blood Transfusion Center, Shiraz, Southern Iran: 2002–05

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## Abstract

Evaluation of trends in the rate of infectious diseases of blood donors is essential for monitoring safety of blood supply and effective screening of donors. Transfusion records of blood donors who attended the Center between 2002 and 2005 were reviewed for positive cases of HBS (by ELISA), HIV (by Western Blot) and HCV (by ELISA). During 2002–05, 507,531 persons donated blood. The prevalence rates of HIV in 2002, 2003, 2004 and 2005 were 0.019%, 0.008%, 0.007% and 0.009%, respectively; the respective values were 0.57%, 0.52%, 0.53% and 0.53%, for HBS; and, 0.19%, 0.13%, 0.09%, and 0.16%, for HCV. The prevalence of HIV was higher in 2002 ( $p \leq 0.05$ ). Then, it decreased, but remained constant over the following years. The prevalence rates of HBS, HCV and HIV were significantly ( $P < 0.05$ ) higher in the first-time, male and married blood donors. The values did not correlated with age of blood donors. The prevalence of transfusion-transmissible viral infections in Shiraz blood donors is less than normal population and did not change over time. This might be due to effective donor selection and the lower prevalence rate of these infections in donor population.

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**Keywords** • Blood donor • human immunodeficiency virus • hepatitis C virus • hepatitis B virus • blood transfusion

## Introduction

**N**owadays, the blood supply is safer than ever, mainly due to more careful donor selection/screening and availability of more sensitive laboratory tests.<sup>1</sup> Currently, the risks of viral transmission during blood transfusion are extremely low.<sup>1-4</sup> It is estimated to be 1 in 677,000 units for human immunodeficiency virus (HIV),<sup>3</sup> 1 in 641,000 for human T-lymphotropic virus (HTLV),<sup>1</sup> 1 in 103,000 for hepatitis C virus (HCV),<sup>1</sup> and 1 in 63,000 for hepatitis B virus (HBV).<sup>1</sup>

Blood transfusion centers have implemented educational programmes and screening procedures aimed at reducing risk of transmitted viral infections.<sup>5</sup> Moreover, efforts are under way to improve behavioral screening of donors.<sup>5</sup> Most infections transmitted during blood transfusion are believed to be originated from donors who donate in the period between the onset of infection and the time that it can be detected by screening tests used.<sup>5</sup> Therefore, there have been continuous efforts to develop more sensitive screening tests.<sup>5</sup>

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Monitoring of trends in infectious diseases in blood donors provides a mechanism to assess the safety of the blood supply, the effectiveness of donor deferral criteria and other screening measures.<sup>4,5</sup> Changes in the rate of infectious diseases in blood donors may also reflect changes in the risk in blood recipients.

Monitoring of changes in laboratory tests is also crucial, because the apparent changes in the prevalence or incidence of transmissible viral infections (TTVI) in blood donors may actually be secondary to the introduction of a new more sensitive test.<sup>3</sup> Although the actual infection rates in donors may be constant, the use of new screening tests or confirmatory assays may result in improving the detection of infected individuals.<sup>3</sup> Therefore, we could compare the prevalence rate of TTVI over the time when the screening tests have not been changed, to exclude the effect of screening tests used.

The objective of this study was to evaluate the trend in the prevalence rates of TTVI in blood donors attended Shiraz Blood Transfusion Center, Shiraz, southern Iran between 2002 and 2005.

**Patients and Methods**

In a cross-sectional study, the medical records of all blood donors who donated blood in Fars Blood Transfusion Centers from 2002 to 2005 were reviewed. The records included data on donation type and date, demographic characteristics such as age, gender, marital status, number of times of blood donation, level of education we classified level of education to two level high grade education more than diploma and low level lower than diploma and results of serologic tests performed. The serologic tests included HIV type 1 and 2 antibodies (Ab) (Biotest, Germany), hepatitis B surface antigens (HBsAg) (Behring, Germany) and HCV Ab (Avicenna, Russia). Confirmatory tests included RIBA for HCV (Inogenix, Belgium), neutralization test for HBV (Behring, Germany), and the HIV-1 Western blot (WB) (Gene Labs, Singapore) assay for HIV.

To determine the incidence of infection in new donors, we assessed the frequency of viral markers for the first-time donors each year. The change in the risk of TTVI during 2002 to 2005 was then assessed in repeated blood donors. The prevalence of TTVI among

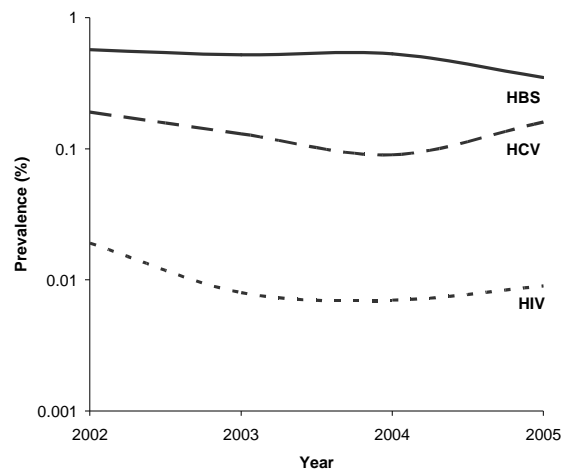
all blood donors for each viral marker during 2002 to 2005 was then calculated. The data were analyzed by  $\chi^2$  test. A  $P < 0.05$  was considered statistically significant.

**Results**

A total of 507,531 records of donors were studied. The mean±SD age of blood donors was 29.7±7.9 years. The relative frequencies of first-time, (101506) female and married donors were 20.5%, 11.75% and 48.9%, respectively. The relative frequencies of repeated (406025) male and single donors were 79.5%, 88.25% and 51.1%, respectively. The demographic characteristics of the first-time and repeated blood donors are shown in table 1.

The age of repeated blood donors was 33.6±6.2 significantly higher than that of the first-time donors 26.8±7.2,  $p = 0.02$ . Compared to first-time donors, a significantly higher numbers of repeated blood donors had higher educations,  $p = 0.03$ . However, there was no significant difference between the two groups in terms of gender [ $p = 0.07$ ] the repeated blood donors was more married  $p = 0.02$ .

The trend of prevalence rates of HBS, HCV and HIV during 2002 to 2005 are shown in fig 1.



**Fig 1:** Prevalence rates of HBS, HCV and HIV during 2002 to 2005. Note that the vertical axis has logarithmic scale.

There was significant difference in the prevalence of HIV in 2002 and those of later years  $p = 0.01$  (fig 1). No significant difference was observed among the prevalence rates of HCV over the studied years [ $p = 0.08$ ]. The prevalence of HBS in 2005 was significantly

**Table1:** Characteristic of first-time and repeated blood donors included in this study

|            | Mean±SD<br>Age (yrs) | Sex    |       | Marital status |        | Education  |             |
|------------|----------------------|--------|-------|----------------|--------|------------|-------------|
|            |                      | Female | Male  | Married        | Single | Low degree | High degree |
| First time | 26.8±7.2             | 16.1%  | 83.9% | 11.75%         | 88.25% | 86.2%      | 13.8%       |
| Repeated   | 33.6±6.2             | 18.8%  | 81.2% | 47.8%          | 52.2%  | 79.5%      | 20.5%       |

less than those in the preceding years (fig 1). The prevalence rates of HBS, HCV and HIV were significantly more in first-time blood donors than in repeated donors  $p=0.01$ . There was no correlation between the prevalence of HBS, HCV or HIV and the age of blood donors. The prevalence of HBS, HCV and HIV in married blood donors was 0.67%, 0.19% and 0.009% significantly higher than single blood donors 0.42%, 0.12% and 0.004%  $p=0.01$ .

## Discussion

All blood donors undergo pre-donation screening tests which have been improving over years.<sup>6</sup> Since 2002, blood donors have been asking not to donate, if they have had AIDS-related symptoms or any risky behaviors including drug injections, blood transfusion and unsafe sex.<sup>6</sup> Such a deferral procedure led to a rapid decline in the risk of HIV from an estimated peak of 1.1% in 1982,<sup>7</sup> to one in 600,000 transfusions in 2002.<sup>2</sup> In addition, pre-donation counseling was offered by physicians to help potential donors be informed of the potential TTVI risk factors. The counseling was effective in convincing infected volunteers not to donate blood.<sup>6</sup>

In this study, the prevalence of TTVI did not change among blood donors. that might be a reflection of didn't change in TTVI prevalence in the segment of population recruited to donate blood, careful selections of donors and employing effectiveness screening procedures with increased deferral rate of people reporting high risk behaviors.

In this study, the prevalence rate of TTVI was more in first-time than repeated blood donors. This might be due to the denial of high risk behavior at pre-donation screening or due to the donation of blood for the purpose of HIV check-up. The lower prevalence of TTVI in repeated blood donors may be due to acquiring information about the importance of safe blood in the previous donation, having negative test in previous donations and the lower probability of engaging in high risk behavior.<sup>2</sup>

Although the findings suggest a favorable pattern of infection among blood donors, further improvement in behavioral screening, donor selection and establishment of sites for free and anonymous check-up of people with high risk behavior for HIV were important factors. Approaches to improve deferral procedures include 1) increasing the awareness of general population about high risk behaviors and importance of safe blood donations; 2) ensuring that donor recruiters and sponsors do not inadvertently put force on people who may be ineligible for donation; 3) decreasing test-seeking

behavior by encouraging anonymous testing at alternative test sites; 4) identifying and characterizing important risk behaviors; and 5) proper application of deferral procedures by maintaining donor privacy using a validated standardized questionnaire.<sup>8</sup> Moreover, the implementation of more sensitive tests such as nucleic acid amplification for HIV and HCV, which is able to detect infection earlier will further decrease the risks of TTVI.

In this study, the prevalence of HBV, HCV, HIV infections in 2005 were respectively, 0.53%, .16%, and 0.009%, that the prevalence HBS and HCV which were lower than those reported from sharjah in 2005 that was 5.83%, 1.02 and higher for HIV that was 0%.<sup>7</sup> In this study the prevalence rate of HIV in first-time donors was more than that in repeated donors, which is not in agreement with a report from Germany.<sup>8</sup> The ratio of the prevalence of TTVI in first-time blood donors to repeated blood donors in this study was similar to that of a previous study.<sup>9</sup>

The present study showed that there was no correlation between the prevalence of HBV, HCV or HIV infection and age of blood donors. However, a previous study showed that the prevalence of HCV and HIV was lower in young blood donors, and that the prevalence of HBV infection was lower in old blood donors.<sup>10</sup> Moreover, similar to a previous report,<sup>11</sup> the present study showed that there was no correlation between the incidence of TTVI and the age of blood donors. As well, the prevalence rate of TTVI infection in the present study was higher in male blood donors, which is in keeping with a report from the US.<sup>12</sup> The lower prevalence of TTVI in repeated blood donors indicates the importance of recruiting repeated donors for blood safety. The other efforts that caused lower TTVI prevalence in blood donors were self-deferral process and computer registration of blood donors, which were helpful in preventing high risk blood donors and TTVI-positive cases from donating blood.

In conclusion, we found that the prevalence of TTVI infection in blood donors in the city of Shiraz was less than the general population, and did not change over the time, which might be due to effective donor selection. We also showed that the prevalence of TTVI infection in blood donors is lower than that in other countries which indicates safety of blood transfusion in our country.

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