Original Article

Trend in Prevalence of Hepatitis B Virus Infection Among Blood Donor Individuals: An Eleven-year of Experience in Lorestan, Iran

Abbas Ahmadi Vasmehjani, Sajad Yaghubi[1], Yousef Erfani[2], Zamaneh Hajikhezri, Mohammad Farahmand, Mohammad Shayestehpour[3,4], Omid Ali Adeli[5], Maryam Beiranvand[6,7]

Department of Virology, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran, [1]Department of Clinical Microbiology, Iranshahr University of Medical Sciences, Iranshahr, Iran, [2]Department of Medical Laboratory Sciences, School of Allied Medical Sciences, Tehran University of Medical Sciences, Tehran, Iran, [3]Department of Microbiology and Immunology, Faculty of Medicine, Kashan University of Medical Sciences, Kashan, Iran, [4]Autoimmune Diseases Research Center, Kashan University of Medical Sciences, Kashan, Iran, [5]Department of Public Health, Lorestan University of Medical Sciences, Khoramabad, Iran, [6]Blood Transfusion Research Center, High Institute for Research and Education in Transfusion Medicine, Tehran, Iran, [7]Blood Transfusion Research Center, High Institute for Research and Education in Transfusion Medicine, Khoramabad, Iran

Abstract

Background: Hepatitis B virus is one of the transfusion transmissible infections. Despite the availability of hepatitis B virus (HBV) vaccine and screening tests but still danger of virus transmission via blood transfusion is high in some regions. The objective of this study was to determine the trend of seroprevalence of hepatitis B in over an 11-year period (2005–2015). **Methods:** In this study, 355,083 blood donors were estimated for hepatitis B surface antigen (HBs Ag) seropositivity during 2005–2015 who referred to blood infusion centers of Lorestan province. Third-generation ELISA method was used to detect HBs Ag. **Results:** The prevalence of HBs Ag in blood donors was 0.29% (1017). It was decreased steadily from 2005 to 2015 (0.68% to 0.12%) but increased in 2008 year. The trend prevalence of HBs Ag seropositivity significantly decreased over the study period ($P < 0.001$). The decline in HBV infection rates was more prominent in regular and repeated donor's groups compared to people who donated blood for the first time ($P < 0.001$). **Conclusions:** The result of present study was indicated, Lorestan city in west of Iran can be classified as a low-income region because the low prevalence of HBs Ag in blood donors. Also the prevalence of HBs Ag in first-time donors was higher than other groups.

Keywords: *Blood donors, hepatitis B, Lorestan, prevalence, trend*

Introduction

Hepatitis B virus (HBV) infection is a major public health problem in many countries of the world, especially in Asia that is still a threat in the developing countries.[1] This virus is easily transmitted by blood products as both blood and plasma-derived components and may be infected with low level.[2,3] Transfusion-transmitted HBV infection plays a critical role in the spread of this infection. World Health Organization (WHO) believe that HBV has infected more than 2 billion people in the world.[4] In countries where the prevalence of HBV infection is high and intermediate such as Iran, the viral transmission is still considered as a serious complication of transfusion.

The prevalence of chronic HBV infection has been classified into four groups: low prevalence (<2%), low–intermediate prevalence (2-4.99%), high–intermediate prevalence areas (5-7.99%), and high prevalence (>8%).[5-7] However, more studies conducted in Iran have reported a higher prevalence for HBV in range of 2.7 to 9.7%.[8,9] Iran had low–intermediate HBV prevalence before 2010 but, it located within the low HBV prevalence areas after 2010.[10]

Vaccination against HBV can change the epidemiology of disease. In recent years, HBV prevalence has increased in older individuals who were not received vaccine at birth.[4] Therefore, HBV may be transmitted mostly through transfusion. In this case, screening program in blood donor individuals for determining HBV rates is essential. Accurate data of the prevalence of HBV infection are essential to assess the impact of control measurements in each region, including vaccination programs. However, low reports among 2011-2017 have estimated the prevalence of HBV infection in different population of Lorestan which indicated low prevalence rate.[11-13]

Address for correspondence:
Maryam Beiranvand,
Blood Transfusion Research Center, High Institute for Research and Education in Transfusion Medicine, Tehran, Iran,
E-mail: maryam.rozgol@gmail.com

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Therefore, there are little data on HBV prevalence among blood donor in previous decades in Lorestan, west of Iran. Thus, the aim of this study was to determine the trend of HBs Ag seropositivity during 11 years (2005-2015) who attended the Blood Transfusion Centers (BTC) section of cities of Lorestan province.

Methods

Study population

This descriptive study has been carried out on blood donors referred to blood infusion centers of Lorestan province from 2005 to 2015. Data from records of blood donors were collected and analyzed. The derived-data of interview include history of high-risk behavior such as sexual contact and tattoo, history of transmitted-transfusion infection, and history of transfusion. As a routine program, all donors checked for physical examinations and health interview before donation. The individuals in age range of 18 to 60 years, body weight greater than 50 kg, hemoglobin levels of ≥13 g/dL, no history of high-risk behavior such as sexual contact and tattoo, the absence of transmitted-transfusion infections such as HIV and HCV, blood transfusion, and hypertension, serious illnesses such as an influenza-like symptom were considered as desired donors. Those who were outside the range of inclusion criteria were excluded; for example, the lack of data of HIV and HCV condition.

All donors were signed a written informed consent. Participants were healthy volunteers and considered as first-time donors if they are not previously a history of donation. Regular donors had more than one donation during 1 year,[14] and repeated donors had more than 1-year intervals between the donations.[15]

Serological laboratory tests

To investigate HBs Ag existence in donated blood, ELISA test was carried out on serum of donors with history, no history, and periodic donors. All the samples were analyzed using ELISA method to detect HBs Ag (ELISA kits DIA PRO Diagnostic Bioprobes, Srl., Italy). Positive samples were tested two times and repeatedly reactive bloods were considered as seropositive. Based on the Iranian Blood Transfusion Organization policies, the negative blood samples in repeated test were excluded, and the confirmed positive donors were recalled for counseling and other approaches.

Statistical tests

Descriptive data were reported as frequencies and percentages. This study investigated the spread of HBV infection during 11 years. Chi-square test was used to compare the seroprevalence rates of HBV infection among blood donors grouped and to trend analyzing of seropositivity of HBs Ag during this 11-year period. *P* values of less than 0.05 were accepted as significant. Statistical analysis was performed using SPSS 21 software and also graph was drawn by Prism 6 software.

Results

A total of 355,083 blood donors (from 2005 to 2015) were participated in this study, in that 118,361 (33.1%) were females and the remaining (66.9%) were males, 194,816 (54.9%) were married while 160,267 (45.1%) were single. Also the age range of the participants was 18-38 years. The majority of blood donations (81.3%) were obtained from Khorramabad, while the remaining donations (18.7%) were collected from the other cities. The total whole blood donations increased from 791 in 2005 to 10320 in 2013 that this difference was statistically significant ($P < 0.001$) [Table 1].

Figure 1 shows the prevalence of HBs Ag in blood donors between 2005 and 2015 years. Of 355,083 donors, 1017 were determined to be seropositive for any of the screened HBs Ag, indicating an overall seroprevalence rate of 0.29% for HBs Ag. It was steadily declined from 2005 to 2015 but increased in 2008 year and but again decreased in subsequent years. Over this 11-year period, seroprevalence rates of HBs Ag showed significant decreasing trends from 0.68% to 0.12% ($P < 0.001$).

Table 2 shows the prevalence of HBs Ag based on donor's status during 2005-2015 years. We found out that from the

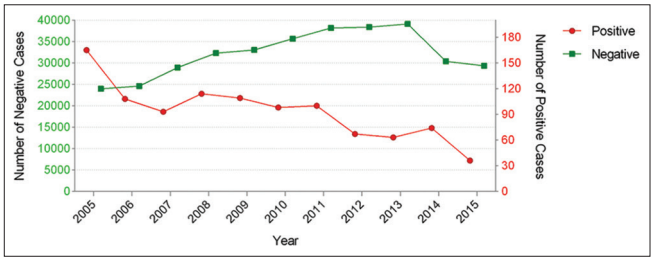

Figure 1: Trends of HBs Ag seropositivity among blood donors in west of Iran, 2005–2015

Table 1: Blood donors during 2005-2015 in west of Iran

Blood donor *n* (%)	Years										
	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
First-time donors	15992	11958	12908	12725	11520	11017	11343	9989	9906	9496	6667
Repeated donors	791	2782	4782	5683	6760	8011	8449	9297	10320	1023	8330
Regular donor	7370	9990	11355	14015	14877	16742	18502	19180	18946	19954	14403
Total	24153	24730	29045	32423	33157	35770	38294	38466	39172	30473	29400

Table 2: The distribution of HBsAg based on donor's status

Donor status	Screened No	HBs Ag Positive No (%)	HBs Ag Negative No (%)	*P*
First-time donors	123521	840 (0.68%)	122681 (99.32%)	*P*<0.001
Repeated donors	66228	142 (0.21%)	66086 (99.89%)	
Regular donor	165334	35 (0.02)	165299 (99.98)	

total 355,083 blood donors, the regular blood donors were the majority of donors. The results show the prevalence of HBs Ag based on first-time donors (0.68%) were significantly more positive when compared with repeat and regular donors, while lowest rate of HBs Ag was in the case of regular donors that this difference was significant.

Discussion

Blood transfusion is an important risk factor for transmission of viral infections such as HBV.[16] Therefore, efficient strategies such as screening of all blood donations for this virus should be implemented to reduce this risk. After 2010, the transmission risk of HBV has been decreased considerably in countries such as Iran where all blood donations were screened for this virus. According to before 2010 data, Iran was classified in the low–intermediate prevalence areas but based on recent data after 2010, was classified in the low HBV prevalence region.[10] In recent decade, vaccination against HBV and increasing peoples' awareness of HBV risk factors have reduced prevalence of the virus in Iran.[17] On the other hand, according to the classification of WHO for HBV prevalence, the HBs Ag prevalence in blood donors of eastern Mediterranean region office (EMRO) of the WHO reached a low or intermediate level and also Iran was classified within low prevalence levels in these countries.[18] The trends in prevalence of viral infections among blood donors must be monitored to evaluate the effectiveness of strategies implemented by Iran blood transfusion organization and other major approaches such as vaccination.[19,20] Therefore, the present study was designed to find out the trend of HBs Ag prevalence in all blood donations from 2005 to 2015.

In present study, overall seroprevalence rate for HBs Ag is 0.29%. It was steadily declined from 2005 to 2015 but increased in 2008 year and but again decreased in subsequent years. Over this 11-year period, seroprevalence rates of HBs Ag showed significant decreasing trends from 0.68% to 0.12%. It means that decreasing trend prevalence of HBs Ag in 11 years' period. Previous studies have shown that the trend prevalence of HBs Ag in Asian population was decreasing during 2006-2010,[21] and that in this study, decreasing trend was indicated in 2011-2015 but increasing trend in this region of Iran in 2006-2008 was shown. The HBs Ag seroprevalence rate obtained in the present study is lower than those observed in previous studies from Iran.[22-24] Also the seropositivity rate in the same region such as Lorestan was shown 1.10% in IDUs that was higher than this study.[25] However, the changes in the prevalence pattern differed according to socioeconomic lifestyle and level of awareness and geographical status. Also this decreasing trend of HBs Ag in blood donor was as a result of the improvement in donor recruitment and selection such as exclusion of high-risk peoples from donation pools, monitoring in transfusion centers, and vaccination program. Also flexible variation of HBs Ag seropositivity in 2006-2011 has indicated as a result of changing HBs Ag screening diagnostic ELISA kits.

The results of the present study are similar to some previous studies that the prevalence of HBs Ag has been reported higher among first-time donors in comparison with regular and repeated donors.[20,22,26] The seropositivity rate of HBs Ag in neighbor cities, which was carried out during 2009-2013, was reported 0.14 and this rate in first-time donors has been much higher than regular donors.[21] But in other study, Hamadan blood infusion center, seropositivity highest rate was in first-time donors than with history donors.[27] In study of Majdzadeh *et al.*, the rate of chronic hepatitis B estimated about 1.7% or lower in general population and 0.8% in blood donor.[28] In other report, that have been carried out in Isfahan, positive HBs Ag rate in first-time donors compared to repeated donors was 1.55 times.[29] Regular donors are regularly tested by blood infusion organizations, and they are given necessary trainings, so the rate of positive HBs Ag on them is considerably low.

The results of the present study have some limitations. First, two-thirds of HBV cases are asymptomatic; therefore, the reported incidence rates might be underestimated. Second limitation is the absence of total demographics data such as sex and age. Finally, the lack of adequate data of the HIV and HCV condition, would not show TTVs rate in blood donors of this region.

This report underscores decreasing the prevalence of HBs Ag in our donor population. The obtained trend in this study suggests that routine screening of blood donors can prevent transmission of HBV by transfusion. Nevertheless, the current study is the first one describing long-term changes in HBV condition in blood donors. In respect to these data, Lorestan city in west of Iran as title a region low-intermediate prevalence was classified, therefore overall decreasing trend of positive HBs Ag rate in Iran after 2010 as title low –intermediate prevalence was confirmed. Finally, we can contribute to reduce the spread of this virus by encouraging people to regular

blood donation, performing the latest diagnostic tests on donated bloods, and continuing vaccination of HBV infection.

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Author contribution

AA, SY, and MB contributed to the design and implementation of the study. ZH and OA carried out the experiment. MF performed the statistical analysis. MF and MS wrote the manuscript in consultation with AA, MB, YE and SY.

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Conflicts of interest

There are no conflicts of interest.

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