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Original Article

Decline of Hepatitis B Virus in Iranian Blood Donors in the Last Decade (2001-2010)

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Abstract

Background and Aims: This study was the trends of Hepatitis B infection among Iranian blood donors which was analyzed in a period of 10 years.

Materials and Methods: In a period of 10 years, from 2001 through 2010, a total of 16,264,830 donations from 30 regional and 35 local blood services were screened. All blood samples were tested for Hepatitis B surface antigen (HBs Ag) by commercial available kits. Sistan-Baluchestan (S&B) province representing a high prevalence and Fars province was a low prevalence area. For assessing frequency of infection, the prevalence of HBS Ag per 100 000 donations and 95% confidential intervals (95% CIs) was calculated. Statistical analysis was conducted using chi-square test and considered significant if P value was <0.05.

Results: The prevalence rates of HBs Ag dramatically declined from 1.23% in 2001 to 0.25% in 2010 in Iran. In S&B province HBs Ag prevalence decreased from 3.29% in 2001 to 0.66% in 2010 and in Fars province, the rate of HBs Ag decreased from 0.82% in 2001 to 0.12% in 2010. In this period, the number of donation progressively increased from 1361321 donation in 2001 to 1889851 donation in 2010, P v <0.00001. The number of volunteer donations increased from 92% in 2001 to 100% in 2010.

Conclusion: The findings indicated that an appropriate implementation of Iranian Blood Transfusion Organization (IBTO) programs such as the selection of blood donors/ donor recruitment, increasing non-remunerated repeat donors, routine screening for blood borne viruses, replacement donation exclusion, and implementation of automation are being performed.

Keywords: Hepatitis B virus; Blood Donation; Prevalence; Iranian Blood Transfusion Organization (IBTO)

Introduction

Hepatitis B virus (HBV) infection is an important public health problem and is a very common cause of chronic liver disease worldwide (1). Approximately 2 billion people in the world have been infected by HBV, about 400 million have chronic infection and 600,000 die each year from HBV related liver disease (1). At least 35% of Iranian population have been exposed to HBV and 3% are chronic carriers (2).

From 1970 with the introduction of Hepatitis B surface antigen (HBs Ag) testing, the risk of post transfusion Hepatitis B virus has steadily decreased (3). An appropriate implementation

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of Iranian Blood Transfusion Organization (IBTO) protocols such as selection of blood donors/ donor recruitment, increasing non-remunerated repeat donors, routine screening for blood borne viruses, improving laboratory tests, replacement donation exclusion, implementation of automation and finally appropriate use of blood and blood components have all resulted in reduction of risk of virus infection in recipients (4, 5). Since the foundation of IBTO in 1974, every single unit of blood is tested for HBs Ag as well as anti HIV , HIV Ag, and anti HCV according to the set standards to maximize safety of the blood.

However, assessment of the potential risk of transfusion-transmitted infectious disease such as HBV and the safety of the blood supply can be estimated by monitoring the prevalence of the serologic markers of the infectious diseases in screening tests.

In the present study, we assessed changes in the rates of HBV infection among Iranian blood donors in the period of 2001-2010 in the Blood Transfusion Research Center, and the Institute for Research and Education in Transfusion Medicine. In addition, the rate of HBs Ag infection was studied in two provinces for the purpose of comparison, one with high and the other with low prevalence areas. The results indicated the effectiveness of the safety measures employed during this period.

Methods

During a period of 10 years, from 2001 through 2010, a total of 16,264,830 voluntary and replacement blood donors from 30 regional and 35 local blood services were screened. The blood donors were selected using a uniform questionnaire, and physical examination for blood borne viruses such as tattooing, sight of illegal drugs injections, skin lesion, history of jaundice and behavioral habits. The donors were aged between 18 and 65 years and about 77% of them were men. All blood samples were tested for HBs Ag using commercial available kits, such as Enzygnost HBs Ag 5.0 (DADE BEHRING), Enzygnost HBs Ag 6.0 (Siemens), Monalisa Ag HBs plus (BIO-RAD), and ETI-MAK-4 (Dia-Sorin). The sensitivity of all kits was similar according to the results of Boston Biomedica Inc. panels (BBI). The HBs Ag prevalence per 100,000 donations/years and (95% CIs) confidence interval was calculated. Statistical analysis was conducted using chi-square test and considered significant if P value was <0.05.

Results

The overall prevalence rates of HBs Ag decreased from 1.23% in 2001 to 0.25% in 2010 in Iran (Table 1). In S&B province HBs Ag prevalence decreased from 3.29% in 2001 to 0.66% in 2010 and in Fars province, the rate of HBs Ag decreased from 0.82% in 2001 to 0.12% in 2010 (Table 1). Also in this period, the number of donations progressively increased from 1361321 donations in 2001 to 1889851 donation in 2010, P v <0.00001 (Figure 1). The number of volunteer donations increased from 92% in 2001 to 100% in 2010. Since 2007, all blood donations were voluntary. The number of volunteer donation in Iran from 2001 through 2010 is shown in Table 2.

Discussion

The prevalence of chronic HBV infection varies geographically, from high (>8%), intermediate (2-7%) to low (<2%) (6). In the Middle East, countries are classified as having low endemicity (< 2%), intermediate endemicity (2%–5%), or high endemicity (> 5%) of infection (7). According to the international classification, Iran was classified as having low endemicity for HBV infection (8).

There is established data confirming that the prevalence of HIV, hepatitis viruses, and other blood borne viruses are lowest among volunteer blood donors (4). Surveys of viral markers in the donor population from well-developed blood systems, such as Iranian Blood Transfusion Organization (IBTO), demonstrated that donor selection procedures

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Table 1. HBs Ag prevalence among blood donations in the whole country (30 provinces), and also in high prevalence area (S&B) and low prevalence area (Fars) during 2001-2010.
P value <0.00001

Units donated/year				HBs Ag^+ units no. (%)		
Year	Iran	S & B Province	Fars Province	Iran	High Prevalence area (S &B)	Low Prevalence area)
2001	1361321	58866	113795	16760 (1.23)	1934 (3.29)	928 (0.82)
2002	1448149	63424	125251	17447 (1.20)	1646 (2.60)	885 (0.71)
2003	1489935	63302	131751	11956 (0.80)	1074 (1.69)	805 (0.61)
2004	1494282	60781	138073	10866 (0.73)	1267 (2.08)	763 (0.55)
2005	1603149	62988	145452	9731 (0.61)	1099 (1.74)	704 (0.48)
2006	1667412	62297	142563	8607 (0.52)	858 (1.38)	497 (0.35)
2007	1735008	56057	148014	7092 (0.41)	644 (1.15)	503 (0.34)
2008	1784246	58515	147953	6406 (0.36)	636 (1.08)	374 (0.25)
2009	1791477	55223	148345	5337 (0.30)	432 (0.72)	347 (0.23)
2010	1889851	63257	151924	4663 (0.25)	421 (0.66)	185 (0.12)
Total	16264830	604710	1393121	98865 (0.64)	10011 (1.65)	5991 (0.4)

result in marker prevalence and incidences, which are significantly lower than that of the general population (4).

Results of this study demonstrated that the prevalence rates of HBs Ag declined from 1.23% in 2001 to 0.25% in 2010 in blood donors in Iran. In S&B province HBs Ag prevalence decreased from 3.29% in 2001 to 0.66% in 2010 and in Fars province, the rate of HBs Ag decreased from 0.82% in 2001 to 0.12% in 2010 (Table 1). A difference in prevalence exists among different provinces and reflecting geographical and social differences. Also, the number of volunteer donations increased from 92% in 2001 to 100% in 2010. Since 2007 all blood donations were voluntary (Table 2).

Our findings are matched with previous reports. In one study, a total of 14599783 blood donation were collected and screened for HBs Ag. The overall HBs Ag prevalence rates declined from 1.79% in 1998 to 0.41% in 2007 (9). Another study also showed that the prevalence of HBV, HCV, and HIV decreased during the 4-year study from 2004 through 2007 in the blood donation (10). The overall prevalence was 0.56% for HBV, 0.004% for HIV, and 0.13% for HCV (10).

The steady decrease in number of replacement donation from 8% in 2001 to 0% in 2010 plays significant role in the declined prevalence of HBs Ag among donors especially in high prevalence area (S&B) (Table 2). The results of a survey published by the World Health Organization (WHO) have justified that the prevalence of hepatitis viruses which are lowest among volunteer blood donors than that of replacement blood donors and these are significantly lower than that of the general population (4).

In addition, it is reasonable to assume that the decline observed may have been due to the additional safety measures in place. According to the uniform donor deferral criteria at IBTO which is similar to World Health Organization (WHO) recommendation, donors are requested not donate if they had history of yellow jaundice or other liver diseases. Also donors are asked not to donate blood if they had acquired immunodeficiency syndrome (AIDS)-related symptoms, HIV-related risk behaviors and history of viral hepatitis.

Several strategies have suggested to further reduction of prevalence of viruses among blood donors such as centralized blood transfusion system with trained staffs and

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Table 2. The number of volunteer donation in Iran from 2001 through 2010. Since 2007 all blood donations were voluntary.

Donation	year	Volunteer donation (%)	Replacement. donation (%
1361321	2001	92	8
1448149	2992	95	5
1489935	2003	96	4
1494282	2004	96	4
1603149	2005	97	3
1667412	2006	99	1
1735008	2007	100	0
1784246	2008	100	0
1791477	2009	100	0
1889851	2010	100	0
16,264,830	Total		

better equipment, increasing non-remunerated repeat donors, reduction in replacement donors, the implementation of automation and data registry of blood donors which allows the deferral of volunteers with a history of positive results and routine tests for blood borne viruses.

There are some reports on the prevalence of HBs Ag and anti hepatitis B core antibody in general population in Iran. All reports have confirmed on decreasing changing of HBV. In one study, the prevalence of hepatitis B surface antigen and anti-hepatitis B core antibody in Iran was 2.6% and 16.4%, respectively (11). A separate report has also demonstrated that Hepatitis B virus prevalence decreased greatly in Iranian population during the last decade (12). Due to the improvement in general health, general education, the improvement in the people's knowledge about HBV risk factors and implementation of national vaccination program for all neonates and high risk groups, the HBs Ag prevalence rate is changing rapidly. However, the surveillance of Hepatitis B infected individuals, and intensifying Hepatitis B vaccination of high risk groups are exactly essential for better health planning and an appropriate implementation of them will further decrease the HBV infection rate in general population. In conclusion, our results indicate that an appropriate implementation of IBTO programs such as the selection of blood donors/ donor recruitment, increasing non-remunerated repeat donors, routine screening for blood borne viruses, replacement donation exclusion, and implementation of automation are being performed.

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