Original Article

Prevalence of Hepatitis B and C in Donated Blood from the Jazan Region of Saudi Arabia

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Abstract

Background: **Infections caused by the hepatitis B virus (HBV) and the hepatitis C virus (HCV) are global public health problems. The safety of donated blood can be estimated by monitoring the prevalence of viral markers in the donor population. The present study was carried out in the Jazan region to determine the prevalence of HBV and HCV among Saudi blood donors.**

Methods: **Over a period of six years (January 2004 to December 2009), a total of 29 949 blood units were collected from healthy voluntary and replacement native Saudi blood donors. The donated units were serologically screened for hepatitis B surface antigen (HBsAg), antibody to hepatitis B core antigen (anti-HBc), and antibody to hepatitis C virus (anti-HCV). These data were then analysed.**

Results: **HBsAg was positive in 3.8% of the blood units that were collected, the blood units with anti–HCV seropositivity had the lowest prevalence (0.41%), and the prevalence of HBsAg was highest in the group that was > 46 years of age. A significant decline in the prevalence of HBV infection has been observed, from 5.6% in 2004 to 2.3% in 2009 ($P < 0.001$).**

Conclusion: **The present study showed that the prevalence of HBV and HCV was in a significant decline from 2004 to 2009, and the prevalence of HBsAg and anti-HCV significantly increased with age.**

Keywords: *blood donors, hepatitis B virus, hepatitis C virus, Jazan, prevalence, Saudi Arabia*

Introduction

Blood donation is a process involving the collection, testing, preparing, and storing of blood and blood components. Blood donors are divided into groups. A voluntary blood donor is a person who donates blood voluntarily and does not receive payment, and who donates only for an internal sense of altruism, or community responsibility. A replacement donor, either a friend or family member of the recipient, is someone who donates blood to replace the blood that is used for a transfusion, to ensure a consistent supply. Transfusion plays an important role in the supportive care of medical and surgical patients. Transfusion-transmitted infectious diseases remain a major topic of interest for those involved in blood safety. Globally, the most notable transfusion-related risks are human immunodeficiency virus (HIV), hepatitis B virus (HBV), and hepatitis C virus (HCV) due to their high prevalence rates (1).

The risk of transmitting hepatitis through transfusions of blood and blood products has been known since 1950 (2,3). In 1965, Blumberg reported on the discovery of the hepatitis B surface antigen (HBsAg) (4). In 1970, Purcell identified the hepatitis B virus (HBV) (5). The presence of antibodies against the hepatitis B virus core (anti-HBc), in the absence of both the hepatitis B surface antigen (HBsAg) and the hepatitis B surface antibody (anti-HBs), is evidence of a chronic HBV infection, which remains detectable for life (6,7). Usually, an HBV infection is diagnosed with the detection of HBsAg and anti-HBc in the serum or plasma of an individual (8,9).

The World Health Organization (WHO) reports that approximately 350 million people are chronically infected with the hepatitis B virus (HBV) and 170 million people carry the hepatitis C virus (HCV) worldwide (10).

The hepatitis C virus (HCV) was discovered in 1989 as the major causative agent of non A and non B hepatitis (11). The hepatitis C virus (HCV) is transmitted via blood and blood products, both parenterally and through sexual contact (12).

In Saudi Arabia, the average prevalence of HBsAg in blood donors ranges from 2.7% to 9.8% (13,14); however, several studies of blood donors in Saudi Arabia have shown regional variations in the prevalence of HBsAg (15–17). The overall prevalence of HCV among blood donors in Saudi Arabia is 1.1% (18).

In the Jazan region, which occupies the

south-western part of Saudi Arabia, a previous study conducted over a period of 25 months (June 1995 to June 1997) showed that the prevalence of HBV infection among blood donors was 5.4% (19).

In the early 1990s, the introduction of new and improved screening tests for transfusion-transmissible diseases led to remarkable improvements in the safety of the blood supply. The national testing guidelines in Saudi Arabia indicate that all blood units must be screened for markers of transfusion-transmitted diseases (TTDs), including HBsAg, anti-HBc, anti-HBs (for all anti-HBc positive samples), anti-HCV, HIV I/II, HIV p24 antigen, and the human T-lymphotropic virus (anti-HTL I/II), in addition to using a serological test for syphilis and malaria. All blood component units with a positive TTD test must be screened in duplicate.

The objective of this study was to evaluate the prevalence of hepatitis B and C infections among native Saudi blood donors in the Jazan region of Saudi Arabia.

Material and methods

Across-sectional study was conducted by a retrospective review of the profiles of 29 949 blood units collected from voluntary and replacement natives Saudi blood donors from January 2004 to December 2009, at King Fahd Central Hospital in the Jazan region of Saudi Arabia. The blood donors were either voluntary non remunerated, or replacement donors. The selected donors were healthy according to their clinical histories, and physical examinations, and they fulfilled the suitability criteria for donation. A self-administrated questionnaire was completed by the donors; this questionnaire inquired about risk factors for blood-borne viral transmission, and included a clinical examination to further assess eligibility based on the American Association of Blood Banks standards. The age of the studied donors ranged from 17 to 60 years.

Donors who had tested positive in previous attempts can be recognised by the computerised registration system, and are not allowed to donate, while donors who had tested negative and were allowed to donate previously are treated as new donors.

The donated units were serologically screened by enzyme-linked immunosorbent assay (ELISA) (Siemens-BEPIII, Dade Behring, Marburg, Germany) for HBsAg, anti-HBc, anti-HBs, and anti-HCV. To detect HBsAg, a commercially available Monolisa™ HBsAg ULTRA kit (Bio-Rad, Marnes-la-Coquette, France; sensitivity of 100% according to the user manual) was utilised to detect total antibodies against the hepatitis B virus core (anti-HBc IgG and IgM), using Monolisa™ anti-HBc PLUS components. To test for anti-HBs, a Monolisa anti-HBs kit was utilised (Bio-Rad, Marnes-la-Coquette, France). Detection of anti-HCV antibodies was performed using the commercially available Murex anti-HCV version 4 kit (Murex Biotech Limited, Dartford, UK).

All blood units that were positive in the screening process were tested in duplicate. The anti-HBs tests were performed on all positive 'anti-HBc alone' samples. There were no contradictory results.

Data were analysed using SPSS computer software (SPSS 16, 2008; SPSS Inc., Chicago, IL, USA). The chi-squared test was used on the observed versus expected frequencies in the distribution of the hepatitis markers, corresponding to different characteristics. *P*-values less than 0.05 were considered statistically significant.

Results

Over a period of six years (January 2004 to December 2009), a total of 29 949 blood units were collected, of which 22 947 (76.6%) units from replacement donors and 7002 (23.4%) units from voluntary native Saudi blood donors at King Fahd Central Hospital in Jazan, Saudi Arabia(Table 1). The prevalence of the hepatitis B and C viruses was determined in this cross-sectional study.

The overall prevalence of HBsAg was 3.8%. The results also showed that the blood units that were positive for anti-HCV had the lowest prevalence (0.41%) and the blood units that were positive for anti-HBc (and negative for both HBsAg and anti-HBs) had the highest prevalence (5.7%) (Table 2) .

The differences in the prevalence of HBsAg, anti-HBc, and anti-HCV in the blood units that were collected from replacement and voluntary donors were statistically significant for HBsAg and anti-HBc ($P < 0.001$ for each) and not statistically significant for anti-HCV ($P = 0.20$).

There was a statistically significant decline in the prevalence of both HBsAg and anti-HCV from 2004 to 2009 ($P < 0.001$ and $P = 0.002$, respectively). The overall prevalence of anti-HBc increased from 6.2% in 2004 to 6.8% in 2008. However, the results show that the prevalence was inconsistent and had no general trend over time. The differences are also statistically significant ($P < 0.001$) (Table 2). The results

also show that co-infection (dual infection) of HBV and HCV was observed in only six donors (0.02%) from the study population.

The distribution of HBsAg, anti-HBc, and anti-HCV in the different age groups is presented in Table 3. The prevalence of HBsAg generally increased with age, showing the highest rate in those > 46 years of age (7.7%). The prevalence of anti-HBc also increased with age, showing the lowest rate in those aged 17–26 years (2.6%) and the highest rate in those > 46 years of age (21.4%). The increased prevalence rates for HBsAg and anti-HBc are statistically significant ($P < 0.001$, each). Both of these increases are statistically significant ($P < 0.001$ for each). The difference in the prevalence rate for anti-HCV between the age groups is minimal and not statistically significant ($P = 0.064$) (Table 3).

Table 1: The results of the HBsAg, anti-HBc, and anti-HCV tests for all donated blood units according to the reason for donation during the period from 2004 to 2009 in the central blood bank in Jazan region, Saudi Arabia

Reason for donation	Number of donated blood units (%)	anti-HCV +ve		anti-HBc +ve		HBsAg +ve	
		Percent	No.	Percent	No.	Percent	No.
Replacement	22 947 (76.6)	0.46%	106	6.3%	1452	4.2%	971
Voluntary	7002 (23.4)	0.25%	18	3.7%	260	2.5%	172
Total	**29 949**	**0.41%**	**124**	**5.7%**	**1712**	**3.8%**	**1143**

Table 2: The distribution of donated blood units with positive HBsAg, anti-HBc, and anti-HCV tests according to the year of donation

Year	Number of donated blood units	anti-HCV +ve		anti-HBc +ve*		HBsAg +ve	
		Percent	No.	Percent	No.	Percent	No.
2004	5241	0.74%	39	6.2%	324	5.6%	295
2005	5334	0.39%	21	6.2%	331	4.5%	238
2006	4949	0.46%	23	4.6%	230	4.4%	216
2007	4903	0.32%	16	6.4%	313	3.4%	165
2008	4169	0.33%	14	6.8%	284	2.6%	108
2009	5353	0.22%	12	4.3%	232	2.3%	122
Total	**29 949**	**0.41%**	**125**	**5.7%**	**1714**	**3.8%**	**1144**

* with negative HBsAg- negative anti HBs.

Table 3: The distribution of donated blood units with positive HBsAg, anti-HBc, and anti-HCV tests according to the age groups

Age Group	Number of donated blood units	anti-HCV +ve		anti-HBc +ve*		HbsAg +ve	
		Percent	No.	Percent	No.	Percent	No.
17–26	13 581	0.33%	45	2.6%	355	2.6%	350
27–36	10 753	0.43%	47	6.1%	659	4.3%	461
37–46	3366	0.65%	22	12.8%	432	5.8%	196
> 46	626	0.31%	2	21.4%	134	7.7%	48
Total	**28 326****	**0.41%**	**116**	**5.6%**	**1580**	**3.7%**	**1055**

* with negative HBsAg- negative anti HBs.

** The ages of 1623 donors were missing from the source but they are distributed by almost equal percentages in the three positive tests as noticed by the stability of their percentages from the total.

Discussion

The current retrospective study reports for the first time on the six-year prevalence of HBV and HCV seropositivity, and viral hepatitis rates in blood donors from the Jazan region in the south- western area of Saudi Arabia. The risk of infection by transfusion–transmitted viruses has been remarkably reduced since the introduction of serological screening.

The present study shows that the prevalence of HBV infection among native Saudi blood donors in the Jazan region has significantly declined, from 5.6% in 2004 to 2.3% in 2009 (Table 2). Based on this result, a general trend towards a decline in HBsAg seropositivity in the donor population has been observed within the last several years.

The HBsAg seropositivity results observed in this study are considerably lower than those reported by Ayoola et al., who tested blood donors from the Jazan region between 1995 and 1997 (5.4%) (19). This study presumed that the most important factor that is responsible for the decline in HBV infection was the introduction of the HBV vaccination in 1989 (20).This decline in HBV infection could also be due to the greater awareness of HBV among blood donors.

Previous studies on the prevalence of HBsAg among blood donors in Saudi Arabia show that the prevalence rate varied from one region to another. Our result was similar to that reported by Bashawri et al., who tested samples from the eastern region of Saudi Arabia between 1998 and 2001 (15). The result of our study (2.3%) was higher than that which was previously reported by al Hazmi et al. (1.4%) using samples that were collected from the central region of Saudi Arabia between 2000 and 2002 (16). El Beltagya et al. reported that the prevalence of HBsAg in blood donors from the north-west region of Saudi Arabia was 3% (17), which is lower than our result.

The distribution of HBV worldwide shows variations depending on geographical location. In China, 1.4% of blood donors were reported to be positive for HBV (21). High rates of chronic infections were also found in the Indian subcontinent, as 2% to 5% of blood donors were estimated to be infected (22). In Europe, the prevalence of HBV in blood donors ranged from 0% to 5.2%, and in the United States the prevalence ranged from 0.4% to 1.0% among blood donors (23,24).

Anti-HBc can be detected in the absence of both HBsAg and anti-HBs in acute, chronic or resolved HBV infections, and it remains detectable for life (7). In this study, 1714 (5.7% of total) blood units were positive for anti-HBc among the HBsAg-negative, and/or anti-HBs- negative samples. This result differs from previously reported rates of 3.2% (25), 21.4% (26) and 13.53% (15) in blood donors from different parts of Saudi Arabia.

Studies worldwide show the presence of anti-HBc in HBsAg-negative blood donors. The incidence of anti-HBc in blood donors varies, ranging from 0.07% to 18% and from 0.3% to 38% (26–28). In Saudi Arabia, the HCV prevalence in blood donors ranges from 0.4% to 1.7% (15,16). In this study, the anti-HCV seropositivity rate among the tested blood units was 0.4%. This result is 5 times lower than that reported by Ayoola et al. from samples collected in the Jazan region from 1995 to 1997 (1.9%) (19). The prevalence of HCV infection was significantly different in samples collected from various Saudi Arabian regions. The anti-HCV seropositivity rates in blood donations from various regions in Saudi Arabia were 0.4% (central region, between 2000 and 2002) (16) and 0.98% (eastern region, between 1998 and 2001) (15). The prevalence in blood donors from the Americas was 0.072% (24), and in Europe it ranged from 0.02% to 3.03% (23). In this study, the prevalence of HBsAg and anti-HCV significantly increased with age. This finding is in agreement with previous results reported by Mehdi et al. (29). This finding may be explained by the increased exposure encountered with age, and to the greatly increased awareness of blood-borne viral infections, in addition to a successful vaccination program against the hepatitis B virus that has been implemented in Saudi Arabia since 1989 (20).

The present study revealed that HBV infection was more prevalent among replacement blood donors than among voluntary donors. This observation is consistent with the World Health Organization (WHO) viewpoint that remunerated blood donors, and familial replacement donors are more likely to transmit transfusion-transmissible infections, compared to voluntary donors (33).

Conclusion

In conclusion, this study reveals that the decrease in HBV and HCV prevalence among Saudi Arabian blood donors in the south-western area of Saudi Arabia over the past few years might be associated with the

introduction of immunisation programs, and an increased awareness of hepatitis B throughout the country.

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Conflict of interest

The author has no conflict of interest.

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