

Prevalence of seromarkers of HBV and HCV among blood donors in eastern Saudi Arabia, 1998–2001

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Summary

The prevalence of serological markers of HBV and HCV were determined for blood donors in eastern Saudi Arabia. Between 1998 and 2001, 13 443 donors (10 778 Saudi and 2665 non-Saudi), were screened for HBsAg, anti-HBc Ab, and anti-HCV Ab using commercial kits. There was a steady decrease in the HBsAg (2.58 and 1.67%), anti-HBc rates (15.32 and 9.15%), and anti-HCV (1.04 and 0.59%) rates between 1998 and 2001, respectively. However, there was a marked difference between Saudi and non-Saudi donors with regard to anti-HBc ($P < 0.001$) and anti-HCV ($P < 0.01$), but not HBsAg prevalence rates in the same time period.

Keywords Hepatitis C virus, hepatitis B virus, antibodies, prevalence, blood donors

Introduction

Hepatitis B virus (HBV) and hepatitis C virus (HCV) are major determinants of post-transfusion hepatitis, and the introduction of serological screening tests for HBV surface antigen (HBsAg), anti-HBV core (anti-HBc) antibody, and anti-HCV antibody as surrogate markers for HBV and HCV hepatitis allowed for a significant reduction of post-transfusion hepatitis (Germain & Goldman, 2002). The prevalence rates of these serological markers is quite variable, exemplified by prevalence of HBsAg which may vary from low (0.1–1.0%) in Europe and North America to very high in south east Asia and the Indian subcontinent (Rehman *et al.*, 1996; Alter *et al.*, 1999; Apichartpiyakul *et al.*, 1999). Likewise, the prevalence of anti-HCV may vary from as low as 0.2% in the USA and Europe to as high as 19% in Egypt and Pakistan (Saeed *et al.*, 1991; Rehman *et al.*, 1996).

Studies on the prevalence of these serological markers in Saudi Arabia produced inconsistent results, and HBsAg

rates of 4% (Altamimi *et al.*, 1998) and 6.7% (al-Faleh *et al.*, 1992), as well as anti-HCV prevalence rates of 1.0% (Altamimi *et al.*, 1998) and 1.5% (Alkarawi *et al.*, 1992) were reported. In view of the heterogeneity of the Saudi population (native Saudis vs. nationals of other countries), it was possible that these varied rates were because of the inclusion of both Saudis and non-Saudis in the study sample. This study addresses the prevalence rates of HBsAg, anti-HBc, and anti-HCV in eastern Saudi Arabia in the period 1998–2001. Study subjects were grouped into Saudis and non-Saudis.

Materials and methods

Study subjects

Between 1998 and 2001, blood samples were collected from 13 443 blood donors after obtaining information on age, gender, nationality, and reason for donation (for patients, employment/licensing, or volunteer). Donor selection was based on a medical history obtained by a qualified interviewer, a questionnaire completed by the donor him-/herself, which includes risk factors for blood-borne viral transmission and clinical examination to further assess eligibility, based on the American Association of Blood Banks standards. Participants were grouped into Saudi and non-Saudi blood donors.

Accepted for publication 4 December 2003

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Serological assays

Serological tests were performed by enzyme immunoassay using the Abbott AxSym system and the appropriate reagents (Abbott Laboratories, Deerfield, IL, USA) for detection of HBV markers. HCV was screened by the same system using HCV version 3.0, which is a third generation recombinant (HCr43, c200, c100-3, and NS5).

Statistical analysis

Donors were subgrouped as Saudi national and non-nationals, and data were presented as number (percent) of subjects positive for HBV or HCV serological marker. Statistical analysis was performed using the SPSS v.11.0 for Windows program (SPSS Inc., Chicago, IL). Pearson's χ^2 test, odds ratio (OR) and 95% confidence interval (CI) were used in assessing significance.

Results

Study subjects

Of the 13 443 volunteer blood donors tested between 1998 and 2001, 10 778 were Saudi nationals, while the remaining 2665 were non-Saudis and comprised nationals of Egypt ($n = 330$), Sudan ($n = 310$), India ($n = 357$), Pakistan ($n = 217$), and the Philippines ($n = 225$) (Table 1). Reasons for blood donation varied from volunteer ($n = 2,856$), employment/licensing ($n = 4,266$), and

for designated patients ($n = 6,321$) (Table 1). The overall number of donors remained virtually unchanged throughout the study period.

Seroprevalence of HBV and HCV markers

None of the donors (Saudi and non-Saudi) tested positive for either HIV 1,2 or for malaria (Table 2), and six Saudi (0.056%) and two non-Saudi donors (0.075%) tested positive for HTLV-I/II ($P = 0.71$). Although the prevalence rate of HBsAg was comparable between Saudi

Table 1. Demographics and characteristics of study participants

	1998	1999	2000	2001	Total
Number	3379	3414	3618	3032	13 443
Nationalities					
Saudi	2788	2823	2774	2788	10 778
Non-Saudi	591	591	844	639	2665
Arabian Gulf	32	32	18	26	108
Yemini	10	27	39	14	90
Egyptian	79	85	95	71	330
Sudanese	85	56	79	90	310
Pakistani	47	53	69	48	217
Indian	89	65	106	97	357
USA/UK	5	7	8	3	23
Philippino	47	51	69	58	225
Others	197	215	361	232	1005
Reasons for donation					
For patients	1410	1402	1913	1596	6321
Employment/licensing	1446	1398	830	592	4266
Volunteer	523	614	875	844	2856

HBV/HCV	Year	Saudi*	Non-Saudi*	P^\dagger	OR	95% CI
HBsAg	ALL	252 (2.34)‡	55 (2.06)	0.40	1.14	0.84–1.51
	2001	40 (1.67)	5 (0.72)	0.099	2.16	0.81–4.86
	2000	63 (2.27)	18 (2.13)	0.81	1.07	0.61–1.88
	1999	77 (2.73)	16 (2.71)	0.98	1.01	0.57–1.69
	1998	72 (2.58)	16 (2.71)	0.86	0.95	0.54–1.60
Anti-HBc	ALL	1458 (13.53)	659 (24.73)	<0.001	0.48	0.43–0.53
	2001	219 (9.15)	133 (20.81)	<0.001	0.38	0.31–0.48
	2000	354 (12.76)	224 (26.54)	<0.001	0.40	0.34–0.49
	1999	458 (16.22)	150 (25.38)	<0.001	0.57	0.46–0.70
	1998	427 (15.32)	152 (25.72)	<0.001	0.53	0.43–0.65
Anti-HCV	ALL	106 (0.98)	88 (3.30)	<0.001	0.29	0.21–0.39
	2001	14 (0.59)	12 (1.88)	0.001	0.31	0.14–0.66
	2000	29 (1.05)	30 (3.55)	<0.001	0.29	0.17–0.48
	1999	34 (1.20)	26 (4.40)	<0.001	0.26	0.16–0.44
	1998	29 (1.04)	20 (3.38)	<0.001	0.30	0.17–0.53

*Total number of subjects was: total, Saudi: 10 778; non-Saudi: 2665; 2001: Saudi, 2393; non-Saudi, 639; 2000: Saudi, 2774; non-Saudi, 844; 1999: Saudi, 2823; non-Saudi, 591; 1998: Saudi, 2788; non-Saudi, 591.

†Pearson's χ^2 test.

‡Percent of total within year.

Table 2. Prevalence of HBsAg, Anti-HBc, and anti-HCV

(252/10778; 2.34%) and non-Saudi (55/2665; 2.06%) ($P = 0.40$), higher anti-HBc prevalence rate was seen among non-Saudi (659/2665, 24.73%) compared with Saudi (1458/10778, 13.53%) donors ($P < 0.001$) (Table 2). Similarly, higher anti-HCV rates were noted among non-Saudi (88/2665, 3.30%) vs. Saudi (106/10778, 0.98%) ($P < 0.001$) (Table 2).

There was a steady decrease in the overall prevalence of HBsAg-, anti-HBc-, and anti-HCV-positive individuals from 1998–2001, which reflects higher assay sensitivity and stricter selection criteria. HBsAg prevalence rates dropped from 2.58% in 1998 and 2.73% in 1999 to 1.67% in 2001, and in parallel anti-HBc rates dropped from 15.32% in 1998 and 16.22% in 1999 to 9.15% in 2001 (Table 2). Similarly, there was a steady decline in anti-HCV prevalence rates among Saudi donors from 1.04% in 1998 and 1.20% in 1999 to 0.59% in 2001 (Table 2). The prevalence of anti-HBc and anti-HCV, but not HBsAg, was higher among non-Saudi compared to Saudi donors throughout 1998–2001 ($P < 0.001$).

Serological reactive donors

Analysis of the prevalence of anti-HBc, HBsAg, and anti-HCV among non-Saudi donors revealed heterogeneity in the seroprevalence of these markers (Table 3). The prevalence of anti-HBc ranged from 7.32% (Palestinian) to 36.94% (Filipinos) (Saudi donors = 13.53%), and HBsAg rates ranged from 0.0% (Palestinian) to 3.85% (Pakistani) (Saudi donors = 2.34%). In addition, varied prevalence of anti-HCV were noted among non-Saudi donors, with Egyptian (14.61%) and Pakistani (3.85%)

donors with a high anti-HCV rate, whereas Syrian (0.0%), Palestinian (0.0%), and Jordanian (0.44%) donors had a low prevalence rate (Saudi donors = 0.98%) (Table 3).

Discussion

Compared with previous studies on the prevalence of HBV and HCV serological markers among blood donors in Saudi Arabia (Altamimi *et al.*, 1998; Al-Faleh *et al.*, 1999; Zekri *et al.*, 2002), the rate for HBsAg (2.34%), anti-HBc (13.53%), and anti-HCV (0.98%) reported here appears to be different from those reported elsewhere. In view of the heterogeneity in the Saudi population, it is likely that this is the result of selection criteria, as in those and other studies, there was no clear separation between Saudi and non-Saudi donors. Accordingly, the rates previously reported may be the result of inclusion of donors from countries endemic with HBV and HCV, including Egypt and Pakistan (Mehdi, Pophali & Al-Abdul Rahim, 2000).

This was supported by an earlier study performed in eastern Saudi on blood donors from 1992 to 1998, in which statistically significant lower rates of anti-HBc and anti-HCV were seen among Saudis when compared with other nationalities, especially from developing countries (Ankra-Badu *et al.*, 2001). In our hands, when Saudi donors were compared with non-Saudi donors, a significantly higher ($P < 0.001$) rates of anti-HBc (24.73% vs. 13.53%) and anti-HCV (3.30% vs. 0.98%) were seen among non-Saudi vs. Saudi donors, respectively. Among the non-Saudi donors, marked variation were noted in the seroprevalence of HBV and HCV markers, exemplified by the rates of 0.0% seen among Syrian and Palestinian donors compared with the 14.61% prevalence rate for Egyptians. While regional differences in the prevalence of these serological markers cannot be excluded (Abdelaal *et al.*, 1994; Fakeeh & Zaki, 1999), the inclusion of non-Saudi donors most likely has provided for the artificially higher prevalence rates for HBsAg anti-HCV noted in previous studies.

High prevalence of anti-HBc (13.53%) was seen among the donors tested, which was significantly higher than HBsAg rates (2.34%). However, the significance of positive anti-HBc as contraindication for transfusion remains controversial, as some suggested that anti-HBc screening may prevent some HCV cases in high HBV prevalence areas, while others suggested that anti-HBc screening does not necessarily identify additional donors capable of transmitting HCV, but may reduce the risk of transmission of HBV from chronic cases with undetectable levels of HBsAg. In two separate studies on 6035 (Bernvil *et al.*, 1997) and 5043 (Zekri *et al.*, 2002) consecutive blood

Table 3. Serological reactive donors

Country	Anti-HBc		HbsAg		Anti-HCV	
	Number	%*	Number	%*	Number	%*
Bangladesh	38	31.93	2	1.68	1	0.84
Egypt	124	31.23	8	2.02	58	14.61
Philippines	58	36.94	4	2.55	2	1.27
India	66	16.18	4	0.98	5	1.23
Jordan	40	17.62	5	2.20	1	0.44
Pakistan	48	23.08	8	3.85	8	3.85
Palestine	6	7.32	0	0.00	0	0.00
Sudan	87	27.36	2	0.63	5	1.57
Syria	37	25.00	3	2.03	0	0.00
Yemen	65	22.11	8	2.72	3	1.02
Others†	90	29.32	11	3.58	5	1.63
Saudi	1458	13.53	252	2.34	106	0.98

*Percent of total donors of specific nationality.

†Includes countries in which donor number was <50.

donors in Saudi Arabia, the positivity rate for HBV-DNA by polymerase chain reaction was found to be extremely low, which prompted the recommendation of restricting the anti-HBc blood for emergencies without excluding them.

Nevertheless, the use of anti-HBc as a marker for previous HBV infection, which is rarely negative when infection is or was present, remains of value, as it persists between the disappearance of HBsAg. Moreover, the HBV genome has been found to have a higher mutation rate than was previously thought, and conventional markers, except anti-HBc, often miss such mutations during donor screening (Moradpour & Wands, 1995). In addition, as the anti-HBc test was introduced in 1996 in our hospital, the blood rejection rate has increased but there was a steady decrease in the overall prevalence of HBsAg, anti-HBc, and anti-HCV.

Although the number of HBsAg, anti-HBc and anti-HCV carriers appears to be declining in eastern Saudi Arabia, strict blood transfusion measures must be adhered in view of risk of HBV and HCV, in addition to HIV and other microorganisms that are transmitted parenterally. It should also be noted that results presented do not reflect the seroprevalence of HBV and HCV infection among unselected Saudi population, owing to the fact that blood donors are a preselected group. Further studies aimed at determining the epidemiology of HBV and HCV infection among Saudis at large, together with careful assessment of the status of the anti-HBc positive cases, will be of value in determining the safety of blood/blood product in light of the occurrence of sporadic cases of HBV and HCV transmission by nonparenteral routes.

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