

# Assessment of hepatitis B vaccination and compliance with infection control among dentists in Saudi Arabia

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## ABSTRACT

**الأهداف:** التعرف على مدى تحصين أطباء الأسنان بالسعودية ضد التهاب الكبد الوبائي الفيروسي (ب)، وكذلك استخدامهم لطرق منع العدوى.

**الطريقة:** أُجريت هذه الدراسة المقطعية خلال المؤتمر العالمي الثالث لطب الأسنان، جامعة الملك عبدالعزيز، كلية الطب، جدة، المملكة العربية السعودية والذي عُقد في شهر مارس 2012م. شملت الدراسة مجموعة من أطباء الأسنان السعوديين الذين يعملون في السعودية، حيث قُمن بتوزيع واستكمال الاستبيان الخاص بالبحث والمبني للوصول لأهداف الدراسة.

**النتائج:** شملت الدراسة ما مجموعه 402 أخصائي أسنان، حيث مثل الذكور منهم 176 (44%) والإناث 226 (56%) وذلك بمعدل عمري 37.4 عاماً. وكان 246 (61%) من المشاركين بالدراسة من أطباء الأسنان العاميين و156 (39%) من الأخصائيين بمختلف تخصصات طب الأسنان. أظهرت النتائج بأن أربع أخماس (80.5%) أطباء الأسنان المشاركين قد تم تحصينهم ضد التهاب الكبد الوبائي الفيروسي (ب)، وتعرض نصفهم (48.5%) خلال الممارسة الطبية للوخز الخاطئ بالإبر علماً بأن أيًا منهم لم يشر إلى إصابته بالتهاب الكبد الوبائي نتيجة لذلك. ولقد صرح 186 (57.5%) أخصائي الأسنان تم تلقيحهم بأنهم قد أجروا مسحاً لوجود الأجسام المضادة لالتهاب الكبد (ب). وتشير النتائج أن أطباء الأسنان حديثي التخرج أظهروا مزيداً من الحرص على أخذ اللقاحات اللازمة واستخدام وسائل الوقاية أثناء الممارسة العلاجية. كما وتبين وجود علاقة بين استخدام وسائل الوقاية لمنع انتقال العدوى أثناء العمل الإكلينيكي ومدى التحصين ضد هذا المرض، كما أنه لا توجد علاقة بين التعرض للوخز الخاطئ بالإبر أثناء الممارسة والتحصين ضد هذا المرض.

**خاتمة:** أظهرت هذه الدراسة بأن لطبيعة عمل الممارسين الصحيين في مجال طب الأسنان دور في إمكانية حدوث نقل العدوى بالتهاب الكبد الوبائي الفيروسي (ب)، لذلك يجب توفير برنامج إلزامي للتحصين ضد هذا المرض مع ضرورة الحرص على استخدام وسائل الوقاية الآمنة لمنع انتقال العدوى خلال المراحل الإكلينيكية.

**Objectives:** To evaluate hepatitis B virus (HBV) vaccine coverage and the use of infection control among dentists in Saudi Arabia.

**Methods:** This cross-sectional study was carried out during the Third International Conference at the King Abdulaziz University Faculty of Dentistry, held on March 2012 in Jeddah, Saudi Arabia. Saudi or expatriate dentists working in Saudi Arabia were included in the study. The questionnaires were designed to meet the objective of the study.

**Results:** A total of 402 dentists of whom 176 (44%) were male and 226 (56%) female took part in this study. Their mean age was 37.4 years. In all, 246 (61%) were general dentists and 156 (39%) specialists. Four-fifths (80.5%) of them had been vaccinated. Almost half (48.5%) had experience of needle stick injury, but none reported having been infected with HBV. Among the vaccinated dentists, 186 (57.5%) had not been screened for HBV antibodies. Younger dentists were more particular about vaccination and more careful in using protective wear. There was an association between protective barriers and HBV vaccination, but there was no association between history of needle stick injury and vaccination.

**Conclusion:** Dental healthcare workers have a high risk of infection with HBV due to the nature of their work; so there should be a mandatory program to vaccinate dentists against HBV and to ensure application of protective measures during their practice.

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Infection control in dentistry is a serious health issue of public interest, especially since the emergence of human immunodeficiency virus (HIV) infection and autoimmune deficiency syndrome (AIDS), dentist got infection from the patient.<sup>1</sup> Dental healthcare workers (HCWs) can transmit serious viral infections to patients during surgical procedures or be infected by accidental needle injury. Dental HCWs themselves are at greater risk of infection than the general population and have the potential to transmit infection to others.<sup>2</sup> Consequently, all healthcare workers who are in contact with mucosa, blood or blood-contaminated body fluids should be regulated. Many studies have stressed the utilization of universal barriers and other methods to minimize the risk of infection.<sup>3,4</sup> Among the diseases raising the greatest concern is hepatitis B, and dentists are always at high risk of becoming infected with HBV through contact with contaminated needles and syringes or some other accident during an invasive procedure;<sup>5</sup> therefore, there should be a mandatory program to vaccinate dentists against HBV, and to ensure that they take protective measure during clinical examinations and other invasive procedures in dentistry.

Hepatitis B is a global health problem. The World Health Organization has reported that around 2 billion people worldwide have had prior HBV infection, and over 350 million people are chronic carriers. Over 250,000 die each year from HBV-associated liver disease.<sup>5-7</sup> Among the main routes of transmission are blood and body fluids.<sup>8,9</sup> Dentists are the most highly exposed group because of the nature of their work, but unfortunately they do not pay adequate attention to preventing infections.<sup>8,9</sup> Reports from several countries including Saudi Arabia show that dentists engage in some unsafe practices regarding the wearing of gloves, face masks and protective eyewear, and vaccination against HBV. It was reported that 60% of surgeons and 34% of general practitioners in the USA had a history of needle stick injury.<sup>10</sup> Vaccine coverage among dentists cannot be assumed to be adequate even though they have high risk of injury from needles and other sharp instruments used in dental practice.<sup>11</sup> Vaccination against HBV produces immunity for approximately 6-12 years, so it is widely preferred as a method of protecting against HBV transmission, but the development of post-vaccination antibodies against HBV may be impaired in approximately 30% of adults and 15% of children, while there is no response in 14% of adults to HBV vaccine. Thus, it is clear that some vaccinated individuals will not develop immunity against HBV, which means that the screening of antibody titers among vaccinated people is important in high risk groups such as health

workers.<sup>12</sup> The prevalence of HBV infection in health workers is higher than in blood donors,<sup>13</sup> yet despite the availability of the HBV vaccine, a considerable proportion of dentists remain unvaccinated.<sup>14</sup> A study at the Johns Hopkins Hospital found that about 23% of health workers were not vaccinated.<sup>15</sup> To date, vaccine acceptance among dental HCWs has not been assessed in most parts of Saudi Arabia. The purpose of the present study is to evaluate HBV vaccine coverage and the use of infection control among dentists working in Saudi Arabia.

**Methods.** This cross-sectional study was carried out during the Third International Conference at the King Abdulaziz University Faculty of Dentistry, held on March 2012 in Jeddah, Saudi Arabia. The participants at the conference were mostly from Saudi Arabia. Only Saudi or expatriate dentists working in Saudi Arabia were included in the study. The questionnaires were carefully designed to meet the objectives of the study, the main categories of questions being concerned with designation, length of service, hepatitis vaccination status, history of needle stick injuries, checks for antibodies, history of hepatitis, infection control measures taken, and demographic data such as age and gender.

Statistical analysis was carried out using Statistical Package for Social Sciences (SPSS Inc, Chicago, IL, USA) Version 15, and chi-square was employed to assess the significance of relations and statistical value was set at  $p < 0.05$ . Ethical approval was obtained from the Research Ethics Committee of Faculty of Dentistry of King Abdulaziz University.

**Results.** A total of 402 dentists, comprising 176 males (44%) and 226 females (56%) were interviewed after giving their consent and no personal data were collected. Participants' ages ranged from 25-62 years with a mean age of 37.4 years. The age group most likely to be vaccinated was those of 25-35 years, of whom 208 (95%) had been vaccinated, whereas in the group aged 36-45 years only 54 (55%) were vaccinated. Among participants, 246 (61%) were general dentists and 156 (39%) specialized in different branches of dentistry. There was no difference in percentage of vaccination between general dentists and specialists. Females were most conscious regarding vaccination: 188 females (83%) had been vaccinated as compared with 136 males (77%). Those dentists having the shortest duration of practice were the most serious regarding vaccination and all of them had been vaccinated. Only a small percentage of participants reported a previous history of

while the remainder did so occasionally, and among these, 65% were not vaccinated. The percentage of dentists using protective eyewear regularly was very low (17.5%) and all were vaccinated, but 44.5% did not use protective eyewear, among whom 66% were vaccinated (Table 1).

Both male and female dentists appeared to take seriously the use of protective barrier methods in practice. All used gloves regularly. Among the males, 142 (80.5%) always used a facemask and 34 (19.5%) did so occasionally, the equivalent figures for females being 186 (82%) and 40 (18%). However, there were only small numbers of protective eyewear users in both gender, and most did so occasionally or never (Table 2). Newly graduated dentists and those having more than 15 years of experience were more conscious of the need to take protective measures (Table 3).

There was a strong relation between HBV vaccination and using protective barrier methods. The numbers always wearing gloves were 324 (80.5%), facemasks 298 (74%), and protective eyewear 70 (28.3%) in vaccinated dentists. The chi-square statistical test revealed that there was no association between history of needle stick injury and HBV vaccination ( $p=0.086$ ). The duration of service in the dentistry profession was significantly shorter in non-vaccinated than vaccinated dentists ( $p<0.05$ ). When asked about screening for HBV antibodies after vaccination, 138 vaccinated dentists (42.5%) reported that they had been checked for antibodies, while 186 (57.5%) had not checked their HBV antibody status. Duration of practice had a direct and significant relation with the use of protective measures ( $p<0.05$ ).

**Discussion.** Vaccination coverage amongst dentists ranged from 68-100% according to reports from Saudi Arabia, the United Kingdom, the United States of America, Thailand, Nigeria, and Caribbean countries.<sup>15,16</sup> In a survey of 6444 dentists, the Canadian Dental Association found that 91% of them had been vaccinated against HBV and that 3% had acquired natural immunity. A pilot survey of London surgeons revealed that 86.5% had been vaccinated, and 3.8% reported natural immunity.<sup>17</sup>

Healthcare workers, including dentists, have been encouraged to be vaccinated when the hepatitis B vaccine became commercially available in 1982.<sup>16</sup> Indeed, a historical review of reports of HBV vaccination coverage among dentists makes it clear that the rate of vaccination has grown from 10% in the early 1990s to 98.9% in recent reports.<sup>18,19</sup> One can conclude that the awareness of the occupational hazard of cross-infection

**Table 1 -** Vaccinations among dentists in relation to age, gender, specialty, experience, needle stick injury and use of protective wear.

Parameters	Vaccinated	Non-vaccinated	Total	P-value (chi-square)
	N (%)			
<i>Age (years)</i>				
25-35	208 (95.5)	10 (4.5)	218 (100)	37.65 at 2 df 0.000*
36-45	54 (55.0)	44 (45.0)	98 (100)	
≥46	62 (72.0)	24 (28.0)	86 (100)	
<i>Gender</i>				
Male	136 (77.0)	40 (23.0)	176 (100)	1.106 at 1 df 0.293*
Female	118 (83.0)	38 (17.0)	226 (100)	
<i>Duration of practice (years)</i>				
<1	88 (100.0)	0 (0.0)	88 (100)	41.93 at 4 df 0.000*
1-5	58 (100.0)	0 (0.0)	58 (100)	
5-10	60 (81.0)	14 (19.0)	74 (100)	
10-15	22 (100.0)	0 (0.0)	22 (100)	
>15	96 (60.0)	64 (40.0)	160 (100)	
<i>Type of dentist</i>				
General	198 (80.5)	48 (19.5)	246 (100)	0.0046 at 1 df*
Specialist	126 (80.5)	30 (19.5)	156 (100)	
<i>History of viral hepatitis</i>				
Yes	8 (50.0)	8 (50.0)	16 (100)	4.98 at 1 df 0.026*
No	316 (82.0)	70 (18.0)	386 (100)	
<i>Checked for antibody</i>				
Yes	138 (100.0)	0 (0.0)	138 (100)	25.29 at 1 df 0.000*
No	186 (70.5)	78 (29.5)	264 (100)	
<i>History of needlestick injury</i>				
Yes	158 (81.5)	36 (18.5)	194 (100)	0.086 at 1 df 0.77*
No	166 (80.0)	42 (20.0)	208 (100)	
<i>Wear gloves</i>				
Always	324 (80.5)	76(19.5)	402 (100)	0.242 at 1 df 0.623*
Occasionally	0 (0.0)	0 (0.0)	0 (0.0)	
Never	0 (0.0)	0 (0.0)	0 (0.0)	
<i>Wear face mask</i>				
Always	298 (90.5)	30 (9.5)	328 (100)	59.93 at 1 df 0.000*
Occasionally	26 (35.0)	48 (65.0)	74 (100)	
Never	0 (0.0)	0 (0.0)	0 (0.0)	
<i>Wear eye protection</i>				
Always	70 (100.0)	0 (0.0)	70 (100)	23.002 at 2 df 0.000*
Occasionally	136 (88.0)	18 (12.0)	154 (100)	
Never	118 (66.0)	60 (34.0)	178 (100)	

\* $p>0.05$ , df - degrees of freedom

hepatitis and among these the percentages of vaccinated and non-vaccinated dentists were equal (Table 1). Almost half (48%) of participants reported a history of needle stick injury during practice, and of these 81.5% had been vaccinated. In the assessment of safe practice, all the dentists claimed to be using gloves regularly and 80.5% had been vaccinated. A similar proportion of dentists (81.5%) reported using a facemask regularly,

**Table 2** - Relation between using protective wear and gender.

Protective wear	Male		Female		Total	Significance level (chi-square)	
	n (%)						
<i>Wear gloves</i>							
Always	178	(44.0)	224	(66.0)	402	(100)	0.78 at 1 df
Occasionally	0		0		0		0.376
Never	0		0		0		<i>p</i> >0.05
<i>Wear face mask</i>							
Always	142	(43.0)	186	(57)	328	(100)	0.086 at 1 df
Occasionally	34	(46.0)	40	(54)	74	(100)	0.796
Never	0		0		0		<i>p</i> >0.05
<i>Wear eye protection</i>							
Always	34	(48.5)	36	(51.5)	70	(100)	0.507 at 2 df
Occasionally	68	(44.0)	86	(56.0)	154	(100)	0.776
Never	74	(41.5)	104	(58.5)	178	(100)	<i>p</i> >0.05

df - degrees of freedom

**Table 3** - Relation between using protective wear and duration of working in the health profession.

Protective wear	Duration of working					Total	Significance level chi-square						
	<1 year	1-5 years	5-10 years	10-15 years	>15 years								
n (%)													
<i>Wear gloves</i>													
Always	88	(100)	58	(100.0)	74	(100.0)	22	(100.0)	160	(100.0)	402	(100.0)	5.96 at 1 df
Occasionally	0		0		0		0	(0.0)	0	(0.0)	0	(0.0)	0.202*
Never	0		0		0		0	(0.0)	0	(0.0)	0	(0.0)	
<i>Wear face mask</i>													
Always	88	(100)	58	(100.0)	66	(89.0)	22	(100.0)	94	(59.0)	328	(82.0)	48.16 at 4 df
Occasionally	0		0		8	(8.0)	8	(0.0)	66	(66.0)	74	(18.0)	0.000*
Never	0		0		0		0	(0.0)	0	(0.0)	0	(0.0)	
<i>Wear eyewear</i>													
Always	38	(43)	6	(10.0)	0	(0.0)	10	(45.0)	16	(10.0)	70	(17.0)	61.33 at 8 df
Occasionally	40	(45)	30	(52.0)	22	(30.0)	12	(55.0)	50	(31.0)	154	(39.0)	0.000*
Never	10	(12)	22	(38.0)	52	(70.0)	0	(0.0)	94	(59.0)	178	(44.0)	

\**p*<0.05, df - degrees of freedom

with HBV and the availability of HBV vaccine have together resulted in improved vaccination coverage. Our finding of complete vaccination in 80% of dentists represents a moderate coverage rate considering the experiences of other countries, and is similar to that of a study conducted by the Canadian Dental Association. The considerable rate of incomplete vaccination in our study (20%) indicates a failure of the vaccination process that may result in low vaccine efficacy and immunization against HBV infection. On the other hand, despite the great concern of many educational and health institutions in Saudi Arabia regarding HBV vaccination, it is not mandatory for completion of registration by the Saudi Commission for Health Specialties.

The reported rate of screening for vaccine efficacy among dentists in similar surveys ranges from 43.8-46.5%.<sup>3,20,21</sup> In our study, the rate of screening for HBV antibodies was 34% among dentists who had had incomplete or complete vaccination, which is less than in the above studies (Table 1), possibly because more than 36% of dentists included in our study had practised dentistry for less than 5 years. This finding, which is inconsistent with reports from some countries such as Nigeria<sup>22,23</sup> that fewer years of professional activity were associated with lack of vaccination against HBV, may be related to the greater attention paid to vaccination by the younger dentists, while most of the unvaccinated dentists reported that they had not been vaccinated because of lack of access to vaccination. Therefore, it seems that globalization of HBV vaccination among

HCWs and making it mandatory for exposure-prone ones might be useful infection control measures. There is controversy regarding mandatory vaccination of exposure-prone HCWs against HBV. Some suggest that it is necessary, along with universal precautions to reduce occupational exposure to HBV.<sup>23</sup> However, the Canadian Medical Association advocates a concerted push for voluntary vaccination, while eventually, universal vaccination against HBV may be required to guarantee the rights of privacy, confidentiality, and autonomy for these HCWs.<sup>20</sup> In general, there is no mandatory HBV vaccination program for dentists in Saudi Arabia, and this may be a cause of low compliance among dentists with the existing voluntary program.

A cross-infection control study conducted to assess infection control among dentists reported that the use of gloves was routine for 97.1%, face masks for 82.4%, and protective eyewear for 52.9% of dentists.<sup>16</sup> However, the equivalent figures in a report from Nigeria were 70.6%, 45.9%, and 4.8%, while 1.4% and 52.7% of dentists never wore face masks and protective eyewear.<sup>7</sup> The results of our study for the rates of wearing gloves, face masks, and protective eyewear are comparable to those of the first study, at 100%, 81.5% and 17.5%, although the percentage of dentists wearing eye protection was much lower. It may be relevant that the first study mentioned above was carried out in South Africa, where rates of HIV positivity are high and where such eyewear may be used to protect dentists from HIV-infected aerosols. However, it is clear that some dentists do not follow cross-infection control methods in their practice and it may be that they decide whether to use protective barriers according to their assessment of each patient's health status, which seems unsatisfactory. Our findings show that younger dentists followed safer practice than older ones, that they took more care in cross-infection control and were more likely to be vaccinated against HBV. This may reflect recent improvements in health education, resulting in more healthy behavior in young dentists who have received such education as part of their professional training. It is known that in response to ever-developing concern about cross-infection, educational programmes in preventive care are receiving increasing attention.

In conclusion, the vast majority of dentists and specialists were vaccinated against HBV. However, less than 60% have been screened for antibodies and hence many would still be vulnerable to being infected with the virus. A number of measures are needed in order to reduce or prevent the transmission of HBV infection in the course of the patient-practitioner relationship. The HBV vaccination facilities should be generalized among

HCWs such as dentists, and the vaccine should be made continuously available by health institutions, which should bear the cost of vaccination and organizing vaccination programs to achieve 100% coverage, with administrative support in a multidisciplinary approach. Dentists must also be trained in cross-infection control methods and encouraged to use protective barrier methods, especially as vaccination may not provide immunity in some subjects. It seems useful to encourage HCWs who have been vaccinated to check their immunity status. In addition, HBV vaccination and screening for antibodies should be mandatory for undergraduate dental students before they begin to conduct clinical procedures with patients.

## References

1. Johnston BL, Conley JM. Nosocomial transmission of bloodborne viruses from infected health care workers to patients. *Can J Infect Dis* 2003; 14: 192-196.
2. Rhodes A, Aw TC, Allen C, Ridout M. Immunisation status of dental practice staff in Kent. *Br Dent J* 2008; 205: E20; 562-563.
3. AlNegrish A, Al Momani AS, Al Sharafat F. Compliance of Jordanian dentists with infection control strategies. *Int Dent J* 2008; 58: 231-236.
4. Alavian SM, Izadi M, Zare AA, Lankarani MM, Assari S, Vardi MM. Survey of the level of anti-HBs antibody titer in vaccinated Iranian general dentists. *Spec Care Dentists* 2008; 28: 265-270.
5. Gupta N, Tak J. Needlesticks injuries in dentistry. *Kathmandu Univ Med J (KUMJ)* 2011; 9: 208-212.
6. Jabłkowski M, Kuydowicz J, Strzelczyk J, Białkowska J. Prevalence of markers of hepatotropic viruses A, B, C and the efficacy of vaccination against hepatitis A and hepatitis B among medical students. *Med Sci Monit* 2002; 8: CR762-CR766.
7. Sofola OO, Savage KO. Assessment of the compliance of Nigerian dentists with infection control: a preliminary study. *Infect Control Hosp Epidemiol* 2003; 24: 737-740.
8. Suckling RM, Taegtmeier M, Nguku PM, Al-Abri SS, Kibaru J, Chakaya JM, et al. Susceptibility of healthcare workers in Kenya to hepatitis B: new strategies for facilitating vaccination uptake. *J Hosp Infect* 2006; 64: 271-277.
9. Resende VL, Abreu MH, Paiva SM, Teixeira R, Pordeus IA. Concerns regarding hepatitis B vaccination and post-vaccination test among Brazilian dentists. *Viral J* 2010; 7: 154.
10. Braunwald ED, Fauci AS. Harrison's principle of internal medicine, 15th ed. New York (NY): McGraw Hill; 2001.
11. Mahboobi N, Agha-Hosseini F, Mahboobi N, Safari S, Lavanchy D, Alavian SM. Hepatitis B virus infection in dentistry: a forgotten topic. *J Viral Hepat* 2010; 17: 307-316.
12. Duseja A, Arora L, Masih B, Singh H, Gupta A, Behera D, et al. Hepatitis B and C virus--prevalence and prevention in health care workers. *Trop Gastroenterol* 2002; 23: 125-126.
13. Martins AM, Barreto SM. [Hepatitis B vaccination among dentists surgeons]. *Rev Saude Publica* 2003; 37: 333-338.
14. Al-Omari MA, Al-Dwairi ZN. Compliance with infection control programs in private dental clinics in Jordan. *J Dent Educ* 2005; 69: 693-698.

15. Leggat PA, Chowanadisai S, Kukiattrakoon B, Yamong B, Kedjarune U. Occupational hygiene practices of dentists in southern Thailand. *Int Dent J* 2001; 51: 11-16.
16. Yengopal V, Naidoo S, Chikte UM. Infection control among dentists in private practice in Durban. *SSADJ* 2001; 56: 580-584.
17. Whittle JG. An audit of the hepatitis B vaccination status of staff in general dental practices in Lancashire. *Prim Dent Care* 2003; 10: 27-29.
18. Su J, Deng XH, Sun Z. A 10-year survey of compliance with recommended procedures for infection control by dentists in Beijing. *Int Dent J* 2012; 62: 148-153.
19. Askarian M, Malekmakan L, Memish ZA, Assadian O. Prevalence of needle stick injuries among dental, nursing and midwifery students in Shiraz, Iran. *GMS Krankenhhyg Interdiszip* 2012; 7.
20. Petti S, Messano GA, Polimeni A. Dentists' awareness toward vaccine preventable diseases. *Vaccine* 2011; 29: 8108-8112.
21. Shagufta H, Niveen AP, Rabia S. Hepatitis B and C Prevalence and Prevention awareness among Health Care Workers in a Tertiary Care Hospital. *International Journal of Pathology* 2010; 8: 16-21.
22. Osazuwa-Peters N, Azodo CC, Obuekwe ON. Occupational health issues of oral health care workers in Edo State, Nigeria. *Int Dent J* 2012; 62: 117-121.
23. Osazuwa-Peter N, AzodoCC, Ehizele AO, Obuekwe ON. Gender differences in characteristics, occupational exposure, and infection control practices among dental professionals in Edo State, Nigeria. *South Afr J Epidemiol Infect* 2012; 27: 61-65.

#### Related Articles

Kaklikkaya N, Sancaktar M, Guner R, Buruk CK, Koksai I, Tosun I, et al. Hepatitis B virus genotypes and subgenotypes in the Eastern Black Sea region of Turkey. *Saudi Med J* 2012; 33: 622-626.

Ataallah TM, Hanan KA, Maysoun KS, Sadoon AA. Prevalence of hepatitis B and C among blood donors attending the National Blood Transfusion Center in Baghdad, Iraq from 2006-2009. *Saudi Med J* 2011; 32: 1046-1050.

Atalay MA, Gokahmetoglu S, Aygen B. Genotypes of hepatitis B virus in Central Anatolia, Kayseri, Turkey. *Saudi Med J* 2011; 32: 360-363.