

1-1-2015

The relationship between hepatitis serology of ambulance attendants and duration of education

ERTUĞRUL GÜÇLÜ

AZİZ ÖĞÜTLÜ

OĞUZ KARABAY

Follow this and additional works at: <https://journals.tubitak.gov.tr/medical>



Part of the [Medical Sciences Commons](#)

Recommended Citation

GÜÇLÜ, ERTUĞRUL; ÖĞÜTLÜ, AZİZ; and KARABAY, OĞUZ (2015) "The relationship between hepatitis serology of ambulance attendants and duration of education," *Turkish Journal of Medical Sciences*: Vol. 45: No. 2, Article 22. <https://doi.org/10.3906/sag-1404-90>
Available at: <https://journals.tubitak.gov.tr/medical/vol45/iss2/22>

This Article is brought to you for free and open access by TÜBİTAK Academic Journals. It has been accepted for inclusion in Turkish Journal of Medical Sciences by an authorized editor of TÜBİTAK Academic Journals. For more information, please contact academic.publications@tubitak.gov.tr.

The relationship between hepatitis serology of ambulance attendants and duration of education

Ertuğrul GÜÇLÜ*, Aziz ÖĞÜTLÜ, Oğuz KARABAY

Department of Infectious Diseases and Clinical Microbiology, Faculty of Medicine, Sakarya University, Sakarya, Turkey

Received: 13.04.2014 • Accepted: 08.07.2014 • Published Online: 01.04.2015 • Printed: 30.04.2015

Background/aim: Healthcare workers (HCWs) run the risk of hepatitis B virus (HBV) infection. Studies investigating the HBV and hepatitis C virus (HCV) serology of HCWs have been generally conducted in secondary or tertiary hospitals. In this study we aimed to determine the relationships between education level and HBV and HCV serology and HBV vaccination status of ambulance attendants.

Materials and methods: The data of this study were obtained by retrospective review of ambulance personnel files in Sakarya Province, Turkey.

Results: Out of 314 ambulance attendants, 216 (68.7%; 78 males, 138 females) were enrolled in this study. The mean length of employment in the province's ambulance service was 5.22 years. While hepatitis B surface antigen positivity was found in 3 (1.4%) workers, 147 (68%) of them were positive for hepatitis B surface antibodies (anti-HBs). The lowest HBV vaccination rate was 12.5%, in drivers. Naturally acquired immunity against HBV was again the highest in drivers (17.5%; $P < 0.05$). All personnel were anti-HCV-negative. Anti-HBs positivity is rather low in the province's ambulance service attendants, and positive anti-HBs status related to vaccination is associated with vocational training.

Conclusion: Training should be performed to increase HBV awareness of ambulance attendants. Nonvaccinated personnel should be determined on the first day of employment, and regulations should be put in place to ensure their vaccination.

Key words: Ambulance, healthcare workers, hepatitis B, hepatitis C, immunization, education

1. Introduction

Viral hepatitis infections caused by the hepatitis B virus (HBV) and hepatitis C virus (HCV) affect the liver primarily. While people exposed to HBV in adulthood generally recover spontaneously and acquire natural immunity, it sometimes causes chronic infection and, in rare cases, acute liver failure with a high risk of death. On the other hand, HCV infections generally become chronic. While serologic evidence is present in approximately one-third of the world's population for previous contact with HBV, it is estimated that the prevalence of HCV is 2% to 3% (1).

Approximately 35,000,000 people (12% of the world population) work in the healthcare field (2). Healthcare workers (HCWs), namely doctors, nurses, paramedics, and laboratory employees, are at risk of viral agents transmitted by blood (HBV, HCV, human immunodeficiency virus (HIV)) (2,3). The risk of HBV, HCV, and HIV transmission after injury by a contaminated injector is 23%–37%, 1.8%, and 0.3%, respectively (4). It is estimated that

approximately 66,000 HBV, 16,000 HCV, and 1000 HIV infections are observed every year in HCWs due to these injuries (5).

The major method of reducing the vocational risk is the prevention of risky contact. In this respect, full compliance with infection control programs and universal precautions, safe device usage, appropriate medical waste management, and appropriate performance of postexposure prophylaxis are measures that may be taken (6). HCWs' knowledge about reporting risky contacts and obtaining infection control team consultation, awareness of the need for treatment and follow-up, and ability to access these amenities are important factors for the timely initiation of appropriate postexposure prophylaxis. Additionally, it is proposed to encourage the vaccination of HCWs and recommended to certify the status of immunization when offering a job (3,6).

The immunization rates of HCWs against HBV range between 12.8% (Kenya) and 77% (New Zealand and Australia) due to the development level of the countries

* Correspondence: ertugrulguclu@hotmail.com

in question (5,7). This rate is 75% in the United States (8). Although the vaccination rate in Turkey varies by facility, it ranges from 41.3% to 75.7% (3).

Studies investigating the HBV and HCV seroprevalence and HBV immunity status of HCWs are generally performed in secondary and tertiary hospitals. In the English literature, we have not encountered any studies investigating HBV and HCV seroprevalences and immunity status by HBV vaccination of ambulance attendants. To our best knowledge, this study aims to reveal the HBV and HCV seroprevalence and the immunization status against HBV of ambulance attendants for the first time.

2. Materials and methods

This study is a sectional epidemiological study involving 216 ambulance attendants from Sakarya Province in Turkey, which has a total of 314 ambulance attendants. Ambulance attendants whose hepatitis B and C serology had been investigated under the scope of employee safety from May 2012 to December 2012 were included in the study. Data were obtained by the retrospective review of personnel files.

A questionnaire form containing demographic data such as age and sex and questions about his/her duty, vaccination status, and education level was given to the study's participants (Table 1). Answers given in the form and hepatitis B and C serological profiles (hepatitis B surface antigen (HBsAg), hepatitis B surface antibodies (anti-HBs), hepatitis B core immunoglobulin G antibodies (anti-HBcIgG), and hepatitis C virus antibodies (anti-HCV) included in personnel files were recorded in an MS-Excel file.

Samples with a result of >10 IU/mL for anti-HBs and titers of >1 IU/mL for HBsAg, anti-HBcIgG, and anti-HCV were accepted as positive. A person with positive HBsAg and anti-HBcIgG test results was considered to be a carrier, people with only positive anti-HBs test results were considered to be vaccinated, people with positive anti-HBs and anti-HBcIgG test results were considered to have had the infection previously and to have naturally

acquired immunity, and people with no positive test for HBV were considered to be both not in contact with HBV and not vaccinated. The anti-HCV-positive people were considered to be infected with HCV, and anti-HCV-negative people were considered to be uninfected with HCV.

2.1. Statistical analysis

Quantitative variables were described as percentages. Students t-test was used to compare quantitative variables. Cross-table statistics were presented for intergroup categorical comparisons, and their significance levels were determined using the chi-square test and Fisher's exact test. The statistical significance level was accepted as a P value of less than 0.05.

2.2. Ethics statement

The study protocol was approved by the institutional review board of Sakarya University (IRB No: 71522473.050.01.04/34)

3. Results

The data of 216 ambulance attendants were included in the study. The average age of the workers was 29.4 years (min: 18, max: 54) and the majority were females (63.9%). Drivers had the highest mean age among them. While the drivers' mean age was 42.7 years, the mean age of other personnel was 26.3 years ($P < 0.01$). The majority of attendants were emergency medical technicians (EMTs) (69.4%), 18.5% were drivers, 8.3% were paramedics, 1.9% were administrative officials, and 1.9% were doctors.

Positive HBsAg was detected in 3 (1.4%) individuals. While 2 of these worked as drivers, 1 was an EMT. Anti-HBs was found as positive in 147 studied individuals (68%). While the highest positive anti-HBs rate was detected in paramedics (77.7%), the lowest positive anti-HBs rate was in drivers (30%) ($P < 0.05$). While 7 positive anti-HBs results in drivers (17.5%) were due to naturally acquired immunity, 5 of these (12.5%) were due to immunization by vaccine. When all personnel were considered, it was detected that a total of 19 (8.8%) had naturally acquired immunity (Table 1). Naturally acquired immunity was

Table 1. The questionnaire form applied to the staff.

Please answer the questions	Answers
1. What is your age?	
2. What is your sex?	
3. How many years have you been working in the Sakarya Province ambulance service?	
4. What is your job in the Sakarya Province ambulance service?	
5. Have you been vaccinated for hepatitis B previously?	
6. If your answer is "yes" for question 5, how many years ago were you vaccinated?	
7. What is your educational level?	

higher among drivers compared to other personnel ($P = 0.04$). Anti-HCV was found to be negative in all personnel. HBsAg, anti-HBs, and anti-HCV serology of Sakarya Province ambulance attendants and their responses to the question as to whether they had been previously vaccinated for hepatitis B or not are presented in Table 2.

The mean duration of employment in the Sakarya Province ambulance service was 5.22 years. While the positive anti-HBs rate was 100% in the workers aged less than 20, it was 30% to 35% in workers aged more than 40 years. Thirty-nine individuals (18.1%) had been employed in this work for ≤ 1 years, 44 (20.4%) for 2–4 years, 108 (50%) for 5–9 years, and 25 (11.6%) for ≥ 10 years. While naturally acquired immunity was detected in 5.1% of the attendants working in this job for ≤ 1 year, this rate was 16% in those working for ≥ 10 years (Table 3).

When the educational status of personnel was examined according to the number of years of education, it was observed that the drivers were the group with the

least education received. While the mean duration of the education received by drivers was 9.42 years, the mean duration of the education received by other personnel was 12.38 years ($P < 0.001$). The mean numbers of years of education received by all personnel are shown in the Figure.

While 107 personnel (49.5%) replied to the question “Were you vaccinated for hepatitis B before?” with “Yes”, 74 (34.2%) responded with “No”. Only 95 personnel answered the question “How many years ago were you vaccinated for hepatitis B?” The personnel that declared that they had been vaccinated by the hepatitis B vaccine were vaccinated, on average, 5.69 years ago.

HBsAg and anti-HBs was found positive in 3 and 26 (12 naturally immune, 14 immune by vaccine) personnel, who stated that they were not vaccinated for hepatitis B, retrospectively. Seven personnel who stated that they were not vaccinated for hepatitis B and who had natural immunity were EMTs, and 5 were drivers. Out of 14

Table 2. Hepatitis serology and hepatitis B vaccination status of Sakarya Province ambulance service personnel.

Duty	Age, years	Vaccination history, yes/no, n	Positive HBsAg, n (%)	Positive anti-HBs, n (%)	Positive anti-HCV, n	Naturally acquired immunity (positive anti-HBcIgG and positive anti-HBs), n (%)
Drivers n = 40	42.7 \pm 6.6	8/30	1 (2.5)	12 (30)	0	7 (17.5)
Emergency medical technicians, n = 150	26.1 \pm 3.87	80/38	2 (1.33)	116 (77.3)	0	12 (8)
Paramedics, n = 18	26.4 \pm 4.17	14/4	0	14 (77.7)	0	0
Administrative duty, n = 4	34.3 \pm 4.6	3/1	0	3 (75)	0	0
Doctors, n = 4	26.7 \pm 2.2	2/1	0	2 (50)	0	0
Total, n = 216	29.4 \pm 7.4	107/74	3 (1.4)	147 (68)	0	19 (8.8)

Table 3. Hepatitis serology results by age and length of service.

Criteria, years (n)	Vaccination history, yes, n (%)	Positive HBsAg, n (%)	Positive anti-HBs, n (%)	Positive anti-HCV, n	Natural immunity (positive anti-HBcIgG and anti-HBs), n
Age					
18–19 (n = 10)	1 (16.7)	0	10 (100)	0	0
20–29 (n = 138)	81 (71.7)	1 (0.7)	108 (78.3)	0	12 (8.7)
30–39 (n = 39)	17 (51.5)	1 (2.6)	20 (51.3)	0	2 (5.1)
40–49 (n = 23)	7 (30.4)	0	7 (30.4)	0	4 (17.4)
>50 (n = 6)	1 (16.7)	1 (16.7)	2 (33.3)	0	1 (16.7)
Length of service					
≤ 1 (n = 39)	15 (48.4)	1 (2.56)	31 (79.5)	0	2 (5.1)
2–4 (n = 44)	24 (66.7)	0 (0)	33 (75)	0	6 (13.6)
5–9 (n = 108)	60 (65.9)	2 (1.85)	73 (67.6)	0	7 (6.5)
≥ 10 (n = 25)	8 (34.8)	0 (0)	10 (40)	0	4 (16)

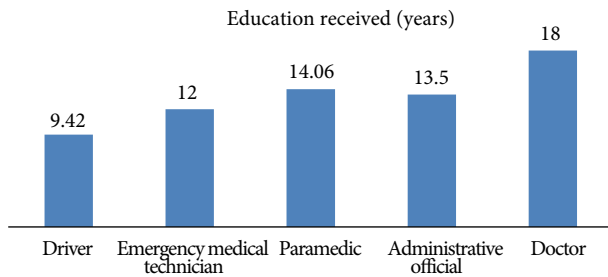


Figure. Years of education by vocational groups.

personnel who were found to be only anti-HBs-positive in their serological assays, although they had stated that they were not vaccinated before, 1 was a driver, 1 was an administrative official, and the other 12 were EMTs.

While anti-HBs was detected as negative in 15 personnel (14.2%) who stated that they were vaccinated for hepatitis B previously, naturally acquired immunity was detected in 6 individuals. One of these individuals with naturally acquired immunity was a driver and 5 of them were EMTs.

4. Discussion

The most remarkable finding of our study was that while the immunization rate against HBV was low in the HCWs with lower educational levels (drivers) compared to other healthcare personnel, their naturally acquired immunity was high. In short, the frequency of contact with HBV was inversely proportional with the duration of education received by the HCWs.

Higher naturally acquired HBV immunity in drivers may be primarily due to their being older than other personnel. While the mean age of drivers was 42.7 years, the mean age of other personnel was 26.3 years ($P < 0.01$). In a study conducted in Italy, similar to our study, naturally acquired immunity was found to be 1.36% in people aged less than 30 years, 7.32% in the age group of 31–50, and 21.39% in people aged more than 50 years (9).

Another factor affecting the high naturally acquired immunity rate in drivers is the duration of working in the job. As the duration of work increases, the naturally acquired HBV immunity rate also increases (10). While in our study drivers had been employed for 9.39 ± 6.10 years, the duration of employment of other personnel in the job was 4.08 ± 2.37 years ($P < 0.001$).

Being in a younger age group, being female, having a high educational level, having had 2 or more doctor appointments in the last year, and being a healthcare employee are independent factors associated with a high rate of immunization by vaccine (11). The rate of immunization against HBV was found to be much lower in drivers (12.5%) compared to other personnel. We think that the most important reason for this is the level

of education received. Among the groups investigated, drivers were the group with the lowest level of education. While drivers had an average educational duration of 9.42 ± 2.54 years, other personnel had received education for an average of 12.38 ± 1.13 years ($P < 0.001$). If in-service training on occupational health risks is given to all HCWs, awareness of occupational risks is increased. Thus, they will be more aware of measures to be taken to protect both themselves and their patients.

Moreover, the drivers' higher mean age compared to other personnel and sex, all of them being male, were other factors in their low rates of immunization by vaccine. In our opinion, whether the education received was healthcare education or not is also an important factor in the low immunization rate. When educational status is taken into account, only drivers among the ambulance service officials had received no healthcare education in their educational history, with other employees having started their professions by receiving healthcare education. Like us, Bodenheimer et al. (12) indicated that the rate of immunization by HBV vaccine was high in healthcare workers who know that the vaccine is safe and efficient, who are aware of the danger of hepatitis B, and who feel vulnerable to postinfection disease or death as compared to other personnel. Additionally, a misleading feeling of confidence, arising from less patient contact required by their duties as compared to other personnel, may have caused the low rate of immunization by vaccine in drivers. In one study it was found that infection risk perception is an independent factor associated with immunization by vaccine (13).

In our study, anti-HBs positivity was found to be 68%. Isolated anti-HBs-positivity, or in other words presence of positive protective antibodies due to vaccine, was detected in 128 (59.3%) cases. This rate is less than the results found in other studies conducted in recent years on HCWs in Turkey. In 2010 and 2011, Uludağ Altun et al. (14) found the rate of vaccinated personnel as 86.9%, and Baysal et al. (15) found it as 67.9%. Our rate of immunization by vaccine is also lower than the rates reported in other European countries. It was reported that the rates of immunization by vaccine of HCWs in European countries ranged from 85% to 93%. This rate was found to be 84.9% in Belgium, 85.3% in Italy in 2006, 87.5% in Poland, 88% in Spain, and 93% in the United Kingdom (16–18). We think that the low number of personnel immunized by vaccine in our study is related to the personnel group studied. Studies investigating the immunity status of HCWs are generally conducted in secondary and tertiary hospitals, but our study was conducted with ambulance service attendants. In secondary and tertiary hospitals, there are personnel who work on infection control committees, who know the significance of immunization, and who provide continuous training on the subject, and there are personnel such as

infectious disease and clinical microbiology specialists and infection control nurses available. Continuous training and serology screenings are performed in specific periods to increase the awareness of immunization by vaccine in personnel working in secondary and tertiary hospitals. On the other hand, training regarding immunization by vaccine for personnel working in first-line response and for Sakarya Province ambulance service attendants is not as frequently performed as it is for second- and third-line staff. Moreover, the absence of role models who can increase the immunization awareness among Sakarya Province ambulance service attendants, such as infectious disease and clinical microbiology specialists or infection control nurses, may have caused the low number of personnel vaccinated. In another study, it was found that the presence of a colleague immunized by the HBV vaccine at the same work place was a factor affecting vaccination in healthcare personnel (14).

Positive HBsAg rates in healthcare workers vary by country. This rate varies by HBsAg seroprevalence and development level of the country in question. In developing countries, 40%–65% of HBV infections in HCWs were attributable to percutaneous occupational exposure. By contrast, in developed countries, the attributable fraction for HBV was less than 10%, largely because of extensive immunization and the efficient performance of postexposure prophylaxis (19). In our study, the positive HBsAg rate was found to be 1.4%. This rate was found to be 1% in India, 2.4% in Korea, and 0% in Japan (20–22).

Contrary to expectations, anti-HCV prevalence in HCWs is at the same level or lower compared to the general

public. Increasing awareness, application of universal protection measures, and young age may be considered as reasons for low positive anti-HCV in HCWs. While in Turkey the anti-HCV-positivity rate is estimated at 1% to 2% in the general population, no anti-HCV-positivity was detected in our study (1).

Negative anti-HBs was found in 14.2% of personnel, who stated that they were vaccinated for HBV previously. One of the reasons for not detecting sufficient protective antibodies even after being vaccinated for HBV may be related to the protective success of the vaccine. The protectiveness of recombinant HBV vaccines is over 95%; however, it was found to be 90%–95% in healthcare workers (23). Furthermore, vaccine failure increases in people aged above 40, men, smokers, and those suffering from obesity and immune deficiencies. Moreover, the high anti-HBs titer at baseline may decrease over time. Thus, in one study, while the positive anti-HBs rate was found to be 57.9% 1 to 5 years after the last vaccine dose, it was found to be 39.02% in those for whom more than 5 years had passed (24).

In conclusion, the positive anti-HBs rate is lower in Sakarya Province ambulance service attendants compared to other HCWs. One of the significant factors affecting the immunity rate is education. Regular and continuous training should be provided to HCWs on account of their being in a group with a high risk for diseases transmitted by blood and the significance of being vaccinated by recombinant HBV vaccines. HBV serology of all HCWs should be determined and recorded, and those with no immunity should be vaccinated.

References

1. European Centre for Disease Prevention and Control. Hepatitis B and C in the EU Neighbourhood: Prevalence, Burden of Disease and Screening Policies. Stockholm, Sweden: ECDC; 2010.
2. Goniewicz M, Włoszczak-Szubzda A, Niemcewicz M, Witt M, Marciniak-Niemcewicz A, Jarosz MJ. Injuries caused by sharp instruments among healthcare workers--international and Polish perspectives. *Ann Agric Environ Med* 2012; 19: 523–527.
3. Hepatit B Çalışma Grubu. Türkiye Hepatit B Yol Haritası. İstanbul, Turkey: Türk Karaciğer Araştırmaları Derneği; 2010 (in Turkish).
4. U.S. Public Health Service. Updated U.S. Public Health Service guidelines for the management of occupational exposures to HBV, HCV, and HIV and recommendations for postexposure prophylaxis. *MMWR Recomm Rep* 2001; 50: 1–52.
5. Prüss-Üstün A, Rapiti E, Hutin Y. Estimation of the global burden of disease attributable to contaminated sharps injuries among health-care workers. *Am J Ind Med* 2005; 48: 482–490.
6. Gupta A, Anand S, Sastry J, Krisagar A, Basavaraj A, Bhat SM, Gupte N, Bollinger RC, Kakrani AL. High risk for occupational exposure to HIV and utilization of post-exposure prophylaxis in a teaching hospital in Pune, India. *BMC Infect Dis* 2008; 8: 142.
7. Suckling RM, Taegtmeier M, Nguku PM, Al-Abri SS, Kibaru J, Chakaya JM, Tukey PM, Gilks CF. Susceptibility of healthcare workers in Kenya to hepatitis B: new strategies for facilitating vaccination uptake. *J Hosp Infect* 2006; 64: 271–277.
8. Simard EP, Miller JT, George PA, Wasley A, Alter MJ, Bell BP, Finelli L. Hepatitis B vaccination coverage levels among healthcare workers in the United States, 2002-2003. *Infect Control Hosp Epidemiol* 2007; 28: 783–790.
9. De Paschale M, Manco MT, Belvisi L, Brando B, Latella S, Agrappi C, Mirri P, Gatti A, Clerici P. Prevalence of markers of hepatitis B virus infection or vaccination in HBsAg-negative subjects. *Blood Transfus* 2012; 10: 344–350.

10. Beltrami EM, Williams IT, Shapiro CN, Chamberland ME. Risk and management of blood-borne infections in health care workers. *Clin Microbiol Rev* 2000; 13: 385–407.
11. Lu PJ, Byrd KK, Murphy TV, Weinbaum C. Hepatitis B vaccination coverage among high-risk adults 18-49 years, U.S., 2009. *Vaccine* 2011; 29: 7049–7057.
12. Bodenheimer HC, Fulton JP, Kramer PD. Acceptance of Hepatitis B vaccine among hospital workers. *Am J Public Health* 1986; 76: 252–255.
13. Topuridze M, Butsashvili M, Kamkamidze G, Kajaja M, Morse D, McNutt LA. Barriers to hepatitis B vaccine coverage among healthcare workers in the Republic of Georgia: an international perspective. *Infect Control Hosp Epidemiol* 2010; 31: 158–164.
14. Uludağ Altun H, Eraslan A, Özdemir G. Seroprevalences of HBV, HCV and HIV among healthcare workers in a secondary care hospital. *Viral Hepatit Dergisi* 2012; 18: 120–122 (in Turkish with English abstract).
15. Baysal B, Kaya Ş, İnalcan M. Bir eğitim araştırma hastanesi personelinde HBV, HCV ve HIV seroprevalansı. In: XI. Ulusal Viral Hepatit Kongre Kitabı; 12–15 Nisan 2012. Antalya, Turkey: Viral Hepatitle Savaşım Derneği; 2012. p. 44 (in Turkish).
16. De Schryver A, Claesen B, Meheus A, Van Sprundel M, François G. European survey of hepatitis B vaccination policies for healthcare workers. *Eur J Public Health* 2011; 21: 338–343.
17. Vranckx R, Jacques P, De Schrijver A, Moens G. Hepatitis B vaccination coverage in Belgian health care workers. *Infection* 2004; 32: 278–281.
18. Stroffolini T, Coppola R, Carvelli C, D'Angelo T, De Masi S, Maffei C, Marzolini F, Ragni P, Cotichini R, Zotti C et al. Increasing hepatitis B vaccination coverage among healthcare workers in Italy 10 years apart. *Dig Liver Dis* 2008; 40: 275–277.
19. Singhal V, Bora D, Singh S. Hepatitis B in health care workers: Indian scenario. *J Lab Physicians* 2009; 1: 41–48.
20. Sukriti, Pati NT, Sethi A, Agrawal K, Agrawal K, Kumar GT, Kumar M, Kaanan AT, Sarin SK. Low levels of awareness, vaccine coverage, and the need for boosters among healthcare workers in tertiary care hospitals in India. *J Gastroenterol Hepatol* 2008; 23: 1710–1715.
21. Shin BM, Yoo HM, Lee AS, Park SK. Seroprevalence of hepatitis B virus among health care workers in Korea. *J Korean Med Sci* 2006; 21: 58–62.
22. Nagao Y, Matsuoka H, Kawaguchi T, Ide T, Sata M. HBV and HCV infection in Japanese dental care workers. *Int J Mol Med* 2008; 21: 791–799.
23. Coates T, Wilson R, Patrick G, Andre F, Watson V. Hepatitis B vaccines: assessment of the seroprotective efficacy of two recombinant DNA vaccines. *Clin Ther* 2001; 23: 392–403.
24. Al-Jumaily HF, Turkey AM, Dawood MS. Seroconversion of Anti-HBs alone among certain high risk groups in Al-Ramadi city, Western Iraq. *Int Res J Med Med Sci* 2013; 1: 56–63.