

Original article

Prevalence of hepatitis B and hepatitis C in patients referred to health centers in the Hamadan province, Iran: an epidemiologic study of infections between 2004 and 2007

Masoud Sabouri Ghannad^a, Soroor Afagh Hojati^b, Mohammad Mirzaei^c, Amirhossein Sahebkar^{d,e}

^aDepartment of Microbiology, Faculty of Medicine, Hamadan University of Medical Sciences, ^bBahar Hospital, Hamadan University of Medical Sciences, ^cDepartment of Health Services, Hamadan University of Medical Sciences, Hamadan 6517838736, ^dBiotechnology Research Center, Mashhad University of Medical Sciences, Mashhad 917751365, ^eCardiovascular Research Center, Mashhad University of Medical Sciences, Mashhad 917751365, Iran

Background: Hepatitis B virus (HBV) and Hepatitis C virus (HCV) are the main causes of liver related morbidity and mortality.

Objective: To assess the epidemiologic features of HBV and HCV infections between 2004 and 2007 in the Hamadan province, Iran.

Methods: In a cross-sectional study, epidemiologic and demographic characteristics of patients infected with HBV or HCV, or both, during about four years were collected from health centers in the Hamadan province.

Results: Overall, there were 1533 infected patients (66.2% with HBV, 32.5% with HCV, and 1.3% with both). Male patients comprised 74.4% of patients. In view of marital status, 71.3% were married, 27% single, and 1.7% were widowed or divorced. The majority of patients (78.4%) inhabited urban areas while 21.6% inhabited rural areas. Patients <4 years old had the lowest rate of infection (0.26%), while the highest incidence (13.11%) was found in the 25–29-year-old age range. With respect to serologic markers, 61.4%, 33.7%, 4.4% and 0.3% of patients were HBsAg+, HCVAb+, HBsAb+ and HBeAg+, respectively. Overall, the incidence of HBV was found to be decreased from 2004 to 2007, while the incidence of HCV increased from 2004 to 2007.

Conclusion: The prevalence of HBV infection decreased during the period of study. This could be attributed to the increasing public vaccination of neonates and people at high-risk, which began about 15 years ago. However, it seems that an increasing incidence of high-risk behaviors including intravenous drug abuse with shared syringes has led to an increased incidence of HCV infection.

Keywords: Epidemiology, health center, hepatitis B virus, hepatitis C virus, prevalence

Hepatitis B virus (HBV) and hepatitis C virus (HCV) are the main causes of liver related morbidity and mortality. HBV- and HCV-associated complications, mainly cirrhosis and hepatocellular carcinoma (HCC), represent major public health problems. Based on World Health Organization (WHO) statistics, up to 3% of the world's population (170 million) are infected with HCV [1] and 3 to 4

million people are newly infected annually [2]. Hepatitis B is one of the most common infectious diseases with about 400 million infected patients worldwide, predominantly (75% to 80%) living in Asia and Eastern Europe [3]. One of the *highest detection rates* of cancers in the world is associated with HCC. In the year 2000, more than 500,000 patients infected with HCC were reported and this prevalence is rising in many countries [4]. HCC is typically correlated with HBV and HCV infections [5]. HBV causes an estimated one million deaths annually. Infection with HBV is the main risk factor for cirrhosis and HCC [6]. Evidence is also emerging that HBsAg carriers

Correspondence to: Dr. Masoud Sabouri Ghannad, Department of Microbiology, Faculty of Medicine, Hamadan University of Medical Sciences, Hamadan, 65178-3-8736, Iran. E-mail: sabouri@umsha.ac.ir

have 25 to 37 times higher risk of developing HCC compared with uninfected individuals [7]. It has been reported that about 53% of HCC cases in the world population involve HBV [4]. The occurrence of HBV infection has been dramatically reduced following mass public vaccination. Nevertheless, HCV infection still remains a matter of concern [8] because of the lack of an efficient vaccine. About 85% of HCV-infected subjects develop chronic infection [9, 10]. HBV is frequently transmitted by horizontal or via vertical spread from an HBsAg⁺ mother [10]. However, the most common HCV transmission route is parenterally in adulthood by blood transfusion or intravenous drug abuse [11]. Uncommonly the virus is also transmitted through breast-feeding, transplacentally, or through sexual intercourse [6, 7, 12].

A large number of hepatitis B carriers have been reported in the Islamic Republic of Iran [13]. According to WHO classification in 2000 and 2001, there are about 1.5 million people with HBV infection in Iran. Of this population, 15% to 40% are thought to be at the threat of spreading HCC infection and consequent cirrhosis without intervention [13]. HCV has also been detected in Iran, but at a lower rate. Although the incidence of HBsAg in Iran's population has declined in the past two decades, there are limited data on HCV. Moreover, the epidemiological pattern of HBV and HCV infections in the Hamadan province (northwest of Iran) are unknown. Therefore, the present study aimed to organize the demographic data regarding HBV and HCV infection and estimate a more precise incidence of infection in the population of Hamadan province between 2004 and 2007.

Methods

A retrospective cross-sectional study of HBV- and HCV-positive blood donors who were referred to the Blood Transfusion Organization and Diagnostic Laboratories including governmental and private hospitals in Hamadan city and seven other counties between March 2004 and February 2008 was conducted. Data from all positive patients were recorded in questionnaires using EPI software. The data were collected based on the routine surveillance system, which has been managed by the ministry of health in Iran and the patients recorded their own data.

Results

This study was performed using data from the Hamadan province of Iran. Demographic data from patients infected with HBV or HCV, or both, who were referred to health centers from 2004 to 2007 were recorded. Overall, there were 1533 infected patients, of whom 1015 (66.2%) were infected with HBV, 499 (32.5%) with HCV, and 19 (1.3%) patients were infected with both HBV and HCV. Of the 1533 infected patients, 1,141 (74.4%) were male. In view of marital status, 1,093 patients (71.3%) were married while 414 (27%) were single, 14 (0.9%) were widowed, and 12 (0.8%) divorced as shown in **Table 1**. Up to 1,291 (78.4%) of patients inhabited urban areas, while 332 (21.6%) inhabited rural areas. The cumulative incidence in urban areas was 122.45 per 100,000 people, while it was 45.1 per 100,000 among the rural population. The average cumulative incidence in the Hamadan province was 89.3 per 100,000 inhabitants (**Figure 1**). This shows a higher risk of infection with HBV and HCV in urban vs. rural inhabitants. As shown in **Table 1**, 97.26% of patients were not vaccinated. The lowest incidence of infection with HBV/HCV (0.26%) was found in patients less than four years old. By contrast, the highest incidence (13.11%) was found among the 25 to 29-year-old age group (**Figure 2**). Overall, the incidence of HBV/HCV infection is less in older people. In view of occupational status, 382 (24.91%) of patients were employed in nongovernmental organizations (NGO) and the rest were categorized in the following groups: 22.57% as housewives, 9% as labors, 8.34% as farmers, 8.54% as unemployed, and 6.32% as drivers. Other patients were school or university students (6.1%), in the military (1.5%), teachers (1.2%), children (0.4%), and health staff (0.26%) (**Figure 3**). **Figure 4** shows that the incidence of hepatitis B has decreased from 2004 to 2007, while the rate of hepatitis C increased during 2004 to 2007 from 117 to 139 cases. The annual incidence of HBV and HCV infection in the Hamadan province was found to be 14.7 and 7.25 cases per 100,000 population, respectively. The highest rate of infection was from the city of Hamadan (136.1 per 100,000 population) while the lowest incidence was found in Nahavand city (10.6 per 100,000 population). HBsAg⁺ serology was found in 61.4% of patients, HCVAb⁺ in 33.7%, HBsAb⁺ in 4.4%, and HBeAg⁺ in 0.3% of patients (**Figure 5**).

Table 1. Some baseline characteristics of the study population

Characteristics	Number (%)
Sex	
Male	1,141 (74.4)
Female	392 (25.6)
Marital status	
Married	1,093 (71.3)
Single	414 (27)
Widow	14 (0.9)
Divorced	12 (0.8)
Residence	
Urban	1,291 (78.4)
Rural	332 (21.6)
Vaccination	
Yes	2.74%
No	97.26%

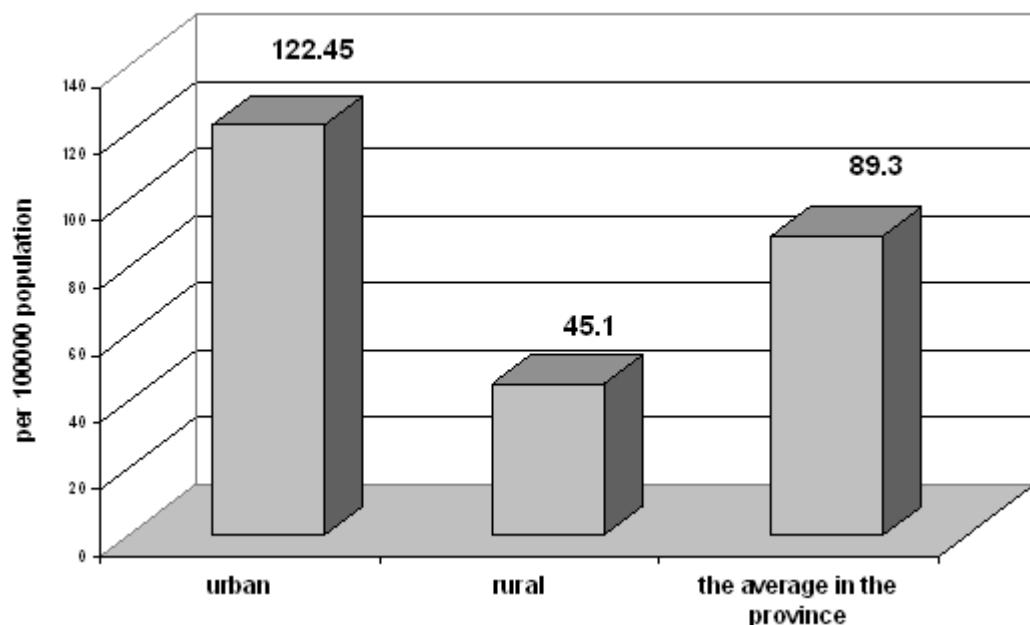


Figure 1. Cumulative incidence of HBV and/or HCV infections in urban and rural areas between 2004 and 2007

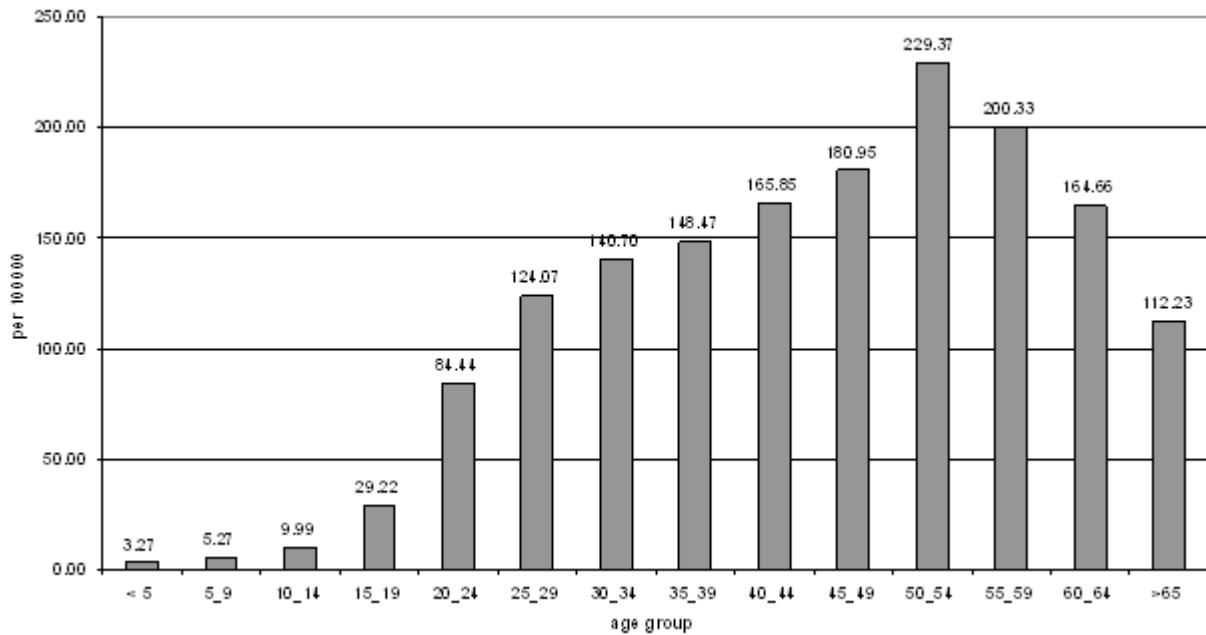


Figure 2. Distribution of HBV and HCV infections in different age groups between 2004 and 2007

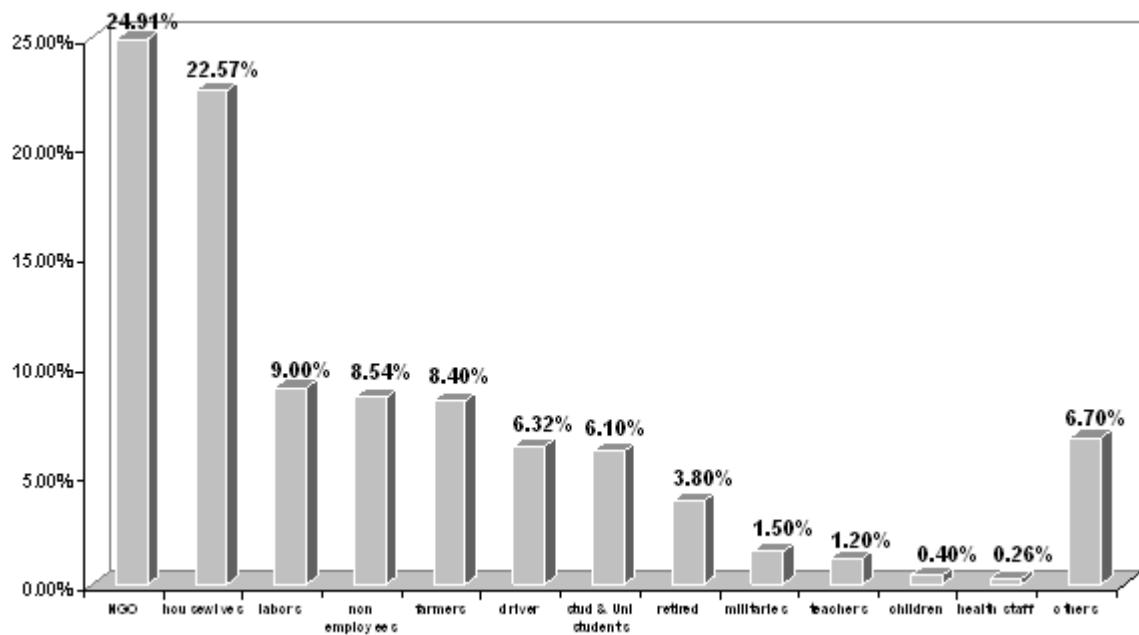


Figure 3. Distribution of HBV and HCV infected patients in view of occupational status.

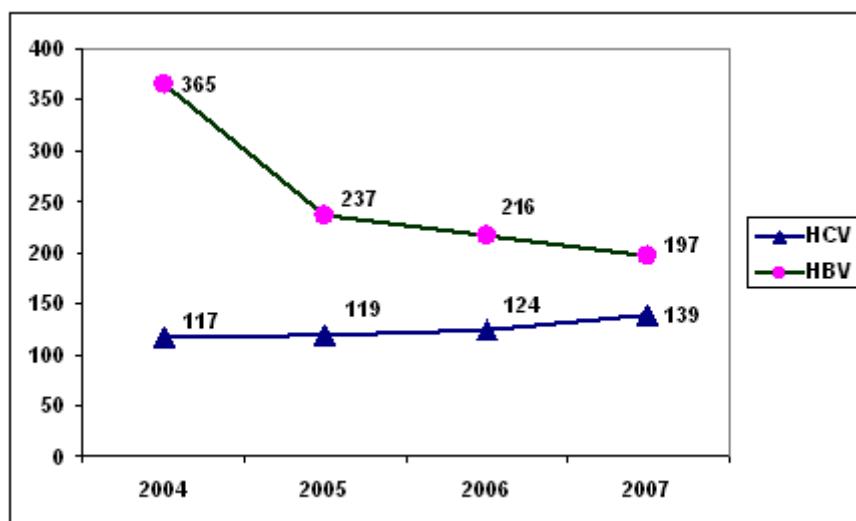


Figure 4. Annual frequency of new HBV and HCV infections in the Hamadan province during 2004 to 2007.

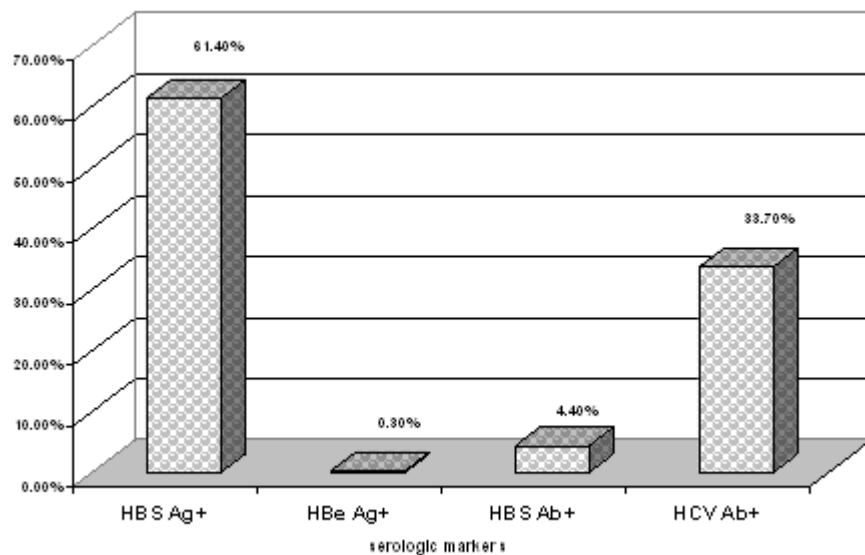


Figure 5. Serologic markers in HBV infected patients between 2004 and 2007

Discussion

This research assesses in detail the distribution of HBV and HCV infections as well as characteristics of at-risk people in the Hamadan province of Iran between 2004 and 2007. The frequency of the HBV and HCV infections was approximately three times higher in men. This higher risk of infection among men could be attributed to the risky behaviors such as intravenous drug abuse using shared syringes, which is more prevalent among men. However, the number of women referred to health centers may be less than men. The high incidence of infection with HBV or

HCV, or both, among married patients may be the result of the age range of this group of people, who are usually categorized as adults and therefore usually lack HBV vaccination. Moreover, it may imply the role of sexual contact as an important transmission route of HBV and HCV in this part of Iran. The cumulative incidence of HBV and HCV infection in urban inhabitants of the Hamadan province was about three times higher than in rural inhabitants. This is generally thought to be the result of a higher prevalence of risk factors and the greater number of urban inhabitants compared with rural inhabitants.

As confirmed by the present findings, the highest incidence of HBV infection is seen in unvaccinated people. A previous study reported the protective efficacy of hepatitis B vaccine as 82.3% or 86.2% [14]. There are other publications that have reported a seroconversion rate of more than 90% in adults [15, 16]. Thus, the reason for HBV infection in 2.74% of vaccinated people may be the result of impaired immunity in this group. Therefore, it seems that monitoring the response to HBV vaccination is critical. As mentioned above, individuals less than four years of age had the lowest incidence of HBV/HCV infection (0.26%), while the highest incidence was observed among 25 to 29 years age group (13.11%). This low incidence among individuals less than four years old may be the result of the national mass vaccination program that was started during 1993 in Iran. Similar studies have also reported that the prevalence of HBV infection decreases after mass public vaccination, e.g. from about 3.5% in 1990s to 2.14% in 2000s [13].

Another finding to emerge from the current study is the reduction of HBV infection incidence from 2004 to 2007. This again highlights the significant impact of increasing public vaccination in neonates and high-risk individuals. In addition to the national vaccination, 17, 18, and 19-year-olds, have been encouraged to undergo free vaccination against HBV in the last few years. By contrast with hepatitis B, the incidence of hepatitis C infection was found to be mildly increased (18.8%) during the period of study. The reason may be the result of the lack of an efficient vaccine for HCV and increased prevalence of risky behaviors such as intravenous drug abuse and tattooing. A number of previous studies have reported the frequency of HBsAg+ cases in different provinces of Iran as follows: Golestan (6.3%), Tehran (2.2%), Eastern Azerbaijan (1.3%), Hamadan (2.3%), Isfahan (1.3%), Kermanshah (1.3%), Hormozgan (2.4%), and Khorasan (3.6%) [17]. In a similar study performed in the Hamadan province in 1989, people were tested for hepatitis B markers and risk factors. Of 4930 subjects studied, 3.49% were reported to be HBsAg+, while 18.09% HBsAb+, and 5.13% were HBcAb+. Among HBsAg+ subjects, 13.8% were also HBcAg+. The lowest prevalence rates were seen in two groups; children and young adults less than 19 years old and in those over 60 years old. No difference between men and women was observed [18]. The authors of the mentioned study concluded that the horizontal

transmission of the disease seems to be the main form of transmission in young adults and children [18]. In another study, the characteristics of 104,236 blood donors were recorded in the Hamadan during 1981 to 1993. The data obtained in this latter research indicated that the overall HBsAg prevalence was 2.96%. Of all the patients with cases of HBsAg+ infection, 164 were tested for both HBeAg and HBeAb. The results showed that 11% of evaluated patients were HBeAg+, but were HBeAb negative, 82.3% were HBeAb+, but were HBeAg negative, and 6.7% were positive for both markers [19].

Overall, the prevalence of HBV infection in Iran is supposed to be 2.14% (95% CI: 1.92–2.35), being 2.55% (95% CI: 2.25–2.85) in males and 2.03% (95% CI: 1.6–2.46%) in females [11]. Investigations in neighboring countries have indicated the prevalence of HBsAg among blood donors to be 9.8% in Yemen, 3.8% in Syria, 1.2%–1.7% in India, and 1.2% in Egypt [20–23]. A research in Pakistan, showed that 2.56% of people in the general population were HBsAg⁺²⁴. In Saudi Arabia—known as an endemic area for HBV infection—indicated that the prevalence of HBsAg in children has decreased from 6.7% in 1992 to 0.3% in 1997 [25].

Overwhelmingly, data obtained in this research supports the effectiveness of comprehensive attempts which have been undertaken as standards of care in the last 15 years for reducing the rate of HBV infection. However, the sanitation authorities still have to provide further effort and policies to control HBV and in particular HCV infection in Hamadan province in Iran.

The authors have no conflict of interest to declare.

References

1. World Health Organization. Hepatitis C: global prevalence. *Wkly Epidemiol Rec.* 1997; 2:341–4.
2. McHutchison JG. Understanding Hepatitis C. *Am J Manag Care.* 2004; 10:S21–29.
3. Nair S, Perillo RP. Hepatitis B and D. In: Zakim D, Boyer TD, eds. *Hepatology.* 4th ed. Philadelphia: Saunders, 2003.
4. Lupberger J, Hildt E. Hepatitis B virus-induced oncogenesis. *World J Gastroenterol.* 2007; 13:74–81.
5. Hu KQ, Yang H, Lin YC, Lindsay KL, Redeker AG. Clinical profiles of chronic Hepatitis C in a major county medical center outpatient setting in United States. *Int J Med Sci.* 2004; 1:92–100.

6. Alter M. Epidemiology of hepatitis B infection in the Western Pacific and South-East Asia. Gut. 1976; 38(suppl. 2):S18-23.
7. El-Serag HB. Hepatocellular carcinoma: recent trends in the United States. Gastroenterology. 2004; 127: S27-34.
8. Wang CS, Chang TT, Yao WJ, Chou P. Comparison of Hepatitis B Virus and Hepatitis C Virus prevalence and risk factors in a community-based study. Am J Trop Med Hyg. 2002; 66:389-93.
9. Conry-Cantilena C, VanRaden M, Gibble J, Melpolder J, Shakil AO, Viladomiu L, et al. Routes of infection, viremia, and liver disease in blood donors found to have hepatitis C virus infection. N Engl J Med. 1996; 334:1691-6.
10. Alter MJ, Margolis HS, Krawczynski K, Judson FN, Mares A, Alexander WJ, et al. The natural history of community-acquired hepatitis C in the United States. The Sentinel Counties Chronic non-A, non-B Hepatitis Study Team. N Engl J Med. 1992; 327:1899-905.
11. Alavian SM, Gholami B, Masarrat S. Hepatitis C risk factors in Iranian volunteer blood donors: A case-control study. J Gastroenterol and Hepatol. 2002; 17: 1092-7.
12. Cooreman MP, Schoondermark-Van de Ven EM. Hepatitis C virus: biological and clinical consequences of genetic heterogeneity. Scand J Gastroenterol. 1996; Suppl. 218:106-15.
13. Alavian SM, Hajarizadeh B, Ahmadzad-Asl M, Kabir A, Bagheri-Lankarani K. Hepatitis B Virus Infection in Iran: A Systematic Review. Hepatitis Monthly. 2008; 8:281-94.
14. Lolekha S, Warachit B, Hirunyachote A, Bowonkiratikachorn P, West DJ, Poerschke G. Protective efficacy of hepatitis B vaccine without HBIG in infants of HBeAg-positive carrier mothers in Thailand. Vaccine. 2002; 20:3739-43.
15. Arslanoglu I, Cetin B, Isguvenc P, Karavus M. Anti-HBs response to standard hepatitis B vaccination in children and adolescents with diabetes mellitus. J Pediatr Endocrinol Metab. 2002; 15:389-95.
16. Cook IF, Murtagh J. Comparative immunogenicity of hepatitis B vaccine administered into the ventrogluteal area and anterolateral thigh in infants. J Paediatr Child Health. 2002; 38:393-6.
17. Farhat A, Khademi G, Mazouman SJ. The prevalence of hepatitis B carrier state in Khorasan province of Iran. Saudi Med J. 2003; 24:549-51.
18. Amini S Mahmoodi MF, Andalibi S, Solati AA. Seroepidemiology of hepatitis B, delta and human immunodeficiency virus infections in Hamadan province, Iran: a population-based study. J Trop Med Hyg. 1993; 96:277-87.
19. Mojtabahedzadeh SM. Prevalence of HBsAg and VDRL positive cases in Hamadan province blood donors. Journal of research in medicine, Shaheed Beheshti University of Medical Sciences, 1995; 3,4:74 [Article in Persian language].
20. Othman BM, Monem FS. Prevalence of hepatitis virus antibodies among intravenous drug abusers and prostitutes in Damascus, Syria. Saudi Med J. 2002; 23: 393-5.
21. Haider NA. Prevalence of HBV and C among blood donors and high risk groups in Hajjah, Yemen Republic. Saudi Med J. 2002; 23:1090-4.
22. Darwish MA, Raouf TA, Rushdy P, Constantine NT, Rao MR, Edelman R. Risk factors associated with a high seroprevalence of hepatitis C virus infection in Egyptian blood donors. Am J Trop Med Hyg. 2003; 49: 440-7.
23. Nanu A, Sharma SP, Chatterjee K, Jyoti P. Markers for transfusion transmissible infections in North Indian voluntary and replacement blood donors: prevalence and trends, 1989–1996. Vox Sang. 1997; 73:70-3.
24. Khokhar N, Gill ML, Malik GJ. General seroprevalence of hepatitis C and hepatitis B virus infections in population. J Coll Physicians Surg Pak. 2004; 14:534-6.
25. Ashgar A. Prevalence of hepatitis B virus genotype in Saudi Arabia: a preliminary report. Indian J Gastroenterol. 2008; 27:81-2.