The Seroprevalence of Hepatitis B in Akbar Abad Village, Kavar, Southern Iran

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ABSTRACT

Background: About 2 billion people were reported to be infected with hepatitis B virus (HBV) and among them; 350 million are chronically infected cases. This study was performed to determine the prevalence of hepatitis B in Kavar, southern Iran.

Methods: From August 2008 to March 2009, 3739 individuals aged between 1 and 88 years were screened for infection with HBV in Akbar Abad Village, Kavar, Southern Iran. A questionnaire was used to record demographic data, history of vaccination and the correlated risk factors. Ten milliliter of the blood sample was taken from each subject. Sera were checked for hepatitis B surface antigen (HBs Ag) and hepatitis B core antibody (HBC Ab).

Results: Among subjects, 7.1% were positive for HBC Ab and 2.2% for HBS Ag. Out of positive cases for HBC Ab, 7.3% were female, and 7.6% were male. Out of positive cases for HBS Ag, 2.2% were female, and 2.5% were male. The minimal rates of HBC Ab and HBS Ag were noticed in the age group 1–15 year old. The highest positivity was observed among unemployed individuals. Among subjects with low educational level, 7.5% were positive for HBC Ab and 2.4% for HBS Ag. The highest prevalence was visible in the widow group and the lowest in married persons. Opium addiction had a significant relationship with HBC Ab. The prevalence of HBV seropositivity was higher among drivers, those with a history of dental treatments and family history of liver diseases blood transfusion tattooing recipients.

Conclusions: Our results showed that screening of pregnant women for HBs Ag and vaccination of high-risk individuals including family members of patients with hepatitis B should be implemented in future planning.

Keywords: Hepatitis B core antibody, hepatitis B antigen, hepatitis B virus, Iran, prevalence

INTRODUCTION

Hepatitis B virus (HBV) is a partially double-stranded DNA virus and an important cause of morbidity and mortality worldwide.1-3 About 2 billion people were reported to be infected with HBV and
among them, 350 million are chronically infected cases. Most of the chronically-infected subjects live in developing countries and are high-risk for liver cirrhosis and hepatocellular carcinoma. In high endemic countries, the seroprevalence of hepatitis B surface antigen (HBs Ag) is more than 8%; in countries with intermediate endemicity is 2–7%; and in low endemic areas is less than 2%. In Southeast Asia, China and Africa, the prevalence of HBs Ag is high and approximately 10% of the population are chronic carriers. High-risk groups in HBV infection are intravenous drug users, attendees of sexually transmitted disease clinics, homosexual men, hemodialysis patients, children born from HBs Ag positive mothers and health care workers. Three major routes of vertical, horizontal and sexual transmission were reported for HBV infection. In developing countries, vertical transmission from an infected mother to newborns, horizontal transmission among children, sexual transmission, transfusion of infected blood or blood products, needle stick injury were demonstrated as common routes of transmission. The disease has no seasonal distribution, but the carrier rate is higher in tropical regions. The prevalence as carriers varies widely from 0.1% in the developed countries to 20% in the developing nations. The prevalence in Bangkok was shown 4.6% for HBs Ag and 20% for HBe Ag. In Croatia, less than 2% were carriers for HBs Ag in the general population. A study in Pakistan revealed 2.56% positivity for HBs Ag in the general population. In Turkey, among 802 school children, the overall anti-HBs, anti-HBc, and HBs Ag were 724 (90.2%), 56 (7%), and 22 (2.7%) children respectively.

Due to more referrals of HBV patients from Akbar Abad village in Kavar District in Fars Province, Southern Iran to our center, this population-based cross-sectional study was conducted to determine the prevalence and risk factors of HBV in this population.

METHODS

From August 2007 to March 2008, 3739 (Age range of 1–88 years old) individuals from Akbar Abad Village in Kavar District in Fars Province, Southern Iran were enrolled including more than 95% of the population in the area while just 143 subjects did not participate in this study. The village is 50 km far from Shiraz, the Capital of Fars Province while most of the residents were truck drivers. A questionnaire was provided to collect the information on demographic data, marital status, history of vaccination, being in prison, any blood transfusion, any current use of intra venous substances, any tattooing and any sexual contact with persons having hepatitis or jaundice. The clinical data of these parturients were recorded for further analysis.

Regarding age, individuals were divided into three groups (1–15, 16–49 and older than 50 years). In relation to the level of education, the subjects were divided into two groups of low (lower than high school diploma) and high educational levels (university level). Considering marital status, subjects were divided into three groups of single, married and widow.

One physician, two laboratory technicians and one trained interviewer who completed the questionnaire were included in our team. Blood samples were obtained from each person, and their sera were transferred to the central laboratory in the Gastroenterology and Hepatology Research Center and stored at −70°C for further tests. The serum samples from all individuals were tested for HBs Ag and HBC Ab.

An informed written consent was provided from each participant, and if less than 12 years old, it was taken from their parents. The study was approved in the Shiraz University of Medical Sciences Ethics Committee. All data were statistically analyzed by SPSS software (version 11.5, Chicago, IL, USA) using Chi-square, students, and Fisher Exact tests for comparison of the data. A P < 0.05 was considered statistically significant.

RESULTS

Out of 3739 subjects, 2317 (62%) were female and 1422 (38%) were male, among them 7.1% were positive for HBC Ab and 2.2% for HBs Ag and 3.8% (143 subjects) had missing data in the questionnaire who were excluded from the study. Out of 266 positive cases for HBC Ab, 161 (7.3%) were female, and 105 (7.6%) were male and the difference was not statistically significant (P = 0.376). Out of 83 positive cases for HBs Ag, 49 (2.2%) were female and (2.5%) were male and the difference was not statistically significant (P = 0.351).
The minimal rates of HBC Ab (5.4%) and HBS Ag (1.5%) were noticed in the age group 1-15 year old. This rate increased with age and reached 8.6% of HBC Ab and 2.7% of HBS Ag in the age group >50 years old. The difference between various age groups were not statistically significant ($P = 0.372, P = 0.08$, respectively).

The highest positivity was observed among unemployed individuals (22% for HBC Ab and 11% for HBS Ag). Among subjects with low educational level, 7.5% were positive for HBC Ab and 2.4% for HBS Ag, but these figures were 7.2% and 2% respectively for HBC Ab and HBS Ag in subjects with high level of education having an inverse relationship with increasing level of education. The differences were not statistically significant ($P = 0.46$ and $P = 0.39$ for HBC Ab and HBS Ag, respectively).

Regarding marital status, 49.3%, 50.1% and 0.2% of subjects were single, married and widow. The highest prevalence was visible in the widow group (22.2% for HBC Ab and 11% for HBS Ag) and the lowest in married persons (5.4% for HBC Ab and 1.8% for HBS Ag, respectively). The difference was statistically significant ($P = 0.0001$ for HBC Ab and $P = 0.029$ for HBS Ag, respectively).

One of the risk factors for HBV infection was opium addiction that had a significant relationship with HBC Ab ($P = 0.008$). The prevalence of HBV seropositivity tended to be higher in the central regions (Drivers) than surrounding territories (Farmers). A significant correlation was observed between the localities ($P = 0.0001$ for HBC Ab and $P = 0.005$ for HBS Ag). The prevalence of HBS Ag positivity was higher in groups that had a history of dental treatments and family history of liver diseases. The prevalence of HBC Ab was higher in groups with a history of blood transfusion and tattooing. No significant relationship was visible between the factors of family history of liver diseases or hepatitis, history of being in prison, history of blood transfusion, hemophilia, major thalassemia, IV drug abuse, alcohol consumption, sexual activity, dental treatments and tattooing.

**DISCUSSION**

Regarding HBV infection, the world can be classified into three regions of high, intermediate and low HBV endemicity. In the Middle East, countries such as Bahrain, Iran, Israel and Kuwait are considered as areas of low endemicity, with HBs Ag carrier rates of less than 2%; while, Cyprus, Iraq and the United Arab Emirates are areas of intermediate endemicity that the carrier rate in these countries ranges from 2% to 5%. The areas of high endemicity include Egypt, Jordan, Oman, Palestine, Yemen and Saudi Arabia, with carrier rate from 2% to 18.5%. The prevalence of HBs Ag in Iran was reported between 2.5% and 7.2% in 1979 by Farzadegan. In our study, 2.2% and 7.1% of participants were positive for HBS Ag and anti-HBc respectively, which is lower than some studies in our country.

Alavian et al. reported a prevalence of 0.80% for HBS Ag and 5.02% for HBC Ab in Kurdistan, which is lower than our study. In another study, Alavian et al. showed that the prevalence for HBs Ag in Kermanshah was 1.3% that is lower than our study. Salehi et al. noticed a prevalence of 3.38% for HBs Ag and 23.58% for HBC Ab in Sistan and Baluchistan, which is higher than our study. Mostaghi et al. in their study among hemodialysis patients in Bushehr province, southern Iran reported a prevalence of HBs Ag, anti-HBc antibody, HBe Ag and anti-HBe antibody in 8 (6.72%), 24 (25.16%), 2 (1.68%) and 3 (2.52%) patients, respectively. Vahdani et al. among homeless subjects older than fifteen years in Tehran, Iran reported that 70 (34.7%) subjects were infected with hepatitis B. Among Iranian blood donors during 1998–2007, the prevalence of HBV infection among 14,599,783 donations declined from a 1.79% (1789/100 000 donations) in 1998 to 0.41% (409/100 000 donations) in 2007. In Fars province, HBs Ag prevalence decreased from 0.89% in 92 999 donations in 1998 to 0.34% in 148 014 donations in 2007. The variation may be due to different vaccination coverage schedules and the protective antibody titers.

In our study, the prevalence of HBS Ag and anti-HBc Ab of 2.2% and 7.1%, respectively is still lower than many studies in the world. Among female prisoners in Goiás, Brazil; overall HBV prevalence was 18.9%. In Maghreb region, HBS antigen carriage was shown to include 1.8–4.9% of the population. In Northern Australia, it was demonstrated that 49% of patients were hepatitis B antigen positive, and 48% were hepatitis B e antibody positive. Elmukashfi et al., in their
study among health care workers in public teaching hospitals in Khartoum State, Sudan showed that the prevalence of Anti-HBc, HBs Ag, HBsAb, and HBeAg was found to be 57%, 6%, 37% and 9% respectively.[32] Rossi et al. findings revealed that among 209,822 immigrants and refugees in Montreal, Canada, the overall seroprevalence of infection for HBV was 7.2%.[33] In China, National surveys denoted to a prevalence of 10% for chronic HBV infection in the general population.[34] HBV infection in 225 individuals in the Western Brazilian Amazon was shown to be 79.1%.[35] Kone et al. results indicated that the seroprevalence of HBV among 2946 new blood donors at the Nianankoro Fomba Hospital (NFH) was 5.3%.[36]

In our study, the prevalence of HBs Ag and anti-HBc Ab of 2.2% and 7.1% respectively, which are higher than some studies in the world. Among children and adolescents in Singapore, 4 of the 1,200 samples were positive for HBs Ag, with an overall prevalence of 0.3%.[37] Epidemiology of viral hepatitis B in Ibb city, Yemen was reported to be 1.81%.[38]

In 1980s in Iran, the HBs Ag prevalence rate was reported 3% ranging from 1.7% in Fars Province to 5% in Sistan-Balouchestan Province.[39] The prevalence rate of HBs Ag in Shiraz, southern Iran among 7897 healthy voluntary blood donors was 1.07% (85 subjects) were positive for HBs Ag.[40] In a study on 39841 persons from all parts of Iran, 1.7% were positive for HBs Ag (678 individuals). The rate of hepatitis carriers in different provinces of the country varied between zero and 3.9%.[41]

In a population-based study on 6,583 subjects aged between 18 and 65 years from three provinces of Tehran, Golestan, and Hormozgan in Iran, the prevalence of HBs Ag and anti-HBc antibody was 2.6% and 16.4%, respectively. Predictors for HBs Ag or anti-HBc antibody in multivariate analysis included older age, educational level less than high school diploma, residing in rural areas, and history of liver diseases. The difference for gender was not statistically significant.[42]

The seroprevalence of HBV, HCV, and HIV infections was evaluated in Uzbekistan in 1918 subjects for HBs Ag, anti-HCV, and anti-HIV was 13.3%, 13.1%, and 0%, respectively.[43] In another study on 4671 Chinese adult patients with at least one office visit during a 2-year period, HBs Ag testing was available in 64% (3012/4671) of cases. The overall HBs Ag seroprevalence rate was 11.1% (335/3012) and in persons aged 30–39 years was 14.9%. HBe Ag testing was available for 75% (250/335) of HBs Ag + cases. Seventy-five percent (188/250) were HBe Ag positive.[44] In Yemen as a high endemic area for HBs Ag, in a study of 178 individuals, 13.2% of mothers and 4% of infants aged 6–12 months were positive for HBs Ag.[45] Another study on 26,874 blood donors in Kuwait in 2002 showed that the prevalence of HBs Ag among Kuwaiti national and non-Kuwaiti Arab donors was 1.1% and 3.5% and for anti-HBc was 17% and 33.3%, respectively.[46]

The efficacy of the HBV vaccination program was evaluated by 2 large seroepidemiological studies before and after mass vaccination. The overall seropositivity rate showed no significant decline between 1991 and 1999 except in the age group 2–14 years, while the rates reduced significantly (1.3% vs. 0.8%). This decrease was more prominent in rural (1.5% vs. 0.8%) than urban areas (1.1% vs. 0.9%).[47]

In Saudi Arabia, a steady decrease in the HBs Ag (2.58 and 1.67%), and anti-HBc Ab rates (15.32 and 9.15%) was seen among 13,443 blood donors between 1998 and 2001, respectively.[42]

The trend of HBV seroprevalence over the 16 years between 1989 and 2004 among blood donors in Turkish populations showed that the overall prevalence of HBs Ag was 4.19% during the study period. The annual prevalence of HBs Ag gradually increased from 4.92% in 1989 to 5.23% in 1991 and gradually decreased to 2.10% in 2004. This could be related to a significant increase in the number of volunteer blood donors that increased from 135,779 to 197,815.[48]

Possible risk factors for transmission of HBV were evaluated in our study. Age was an important element in the current survey that was a determinant in HBV seroprevalence. We classified the subjects into three age groups. The lowest prevalence was noticed among 1–15 years age group (5.4% for HBC Ab and 1.5% for HBs Ag). This difference may be due to national neonatal vaccination against HBV infection as part of our expanded program on immunization that was implemented since 1993 and a reach over 80% of the population.
A case-control study was carried out on 632 subjects with chronic hepatitis B referred to Karaj Hepatitis Center, Tehran Province, Iran. Logistic regression analysis showed that only male sex, old age, being married, close contact history within family, extramarital sexual activity, undergoing major surgeries, history of intravenous drug abuse, experimental dentist visit, phlebotomy and high risk jobs (police, driver, and barber) were independent risk factors for prediction of hepatitis B infection.\[49\]

Among female prisoners in Goiás, Brazil HBV prevalence was more in age >30 years, a low education level, sex with a sexually transmitted diseases carrier, and a male sexual partner serving in the same penitentiary.\[26\] Among 387 HBV patients, HBV patients were younger, more frequently men, more often of Asian or African origin, and less frequently contaminated by transfusion or intravenous drug use.\[50\]

In another study conducted by Zali et al., the age group 2–9 years had the least prevalence rate (1.2%) while the highest level (2.9%) was seen in the age group of 50–59 years. Differences among the various age groups were statistically significant.\[42\]

Based on the results of this study, the prevalence rate among males and females was 2.2% and 2.5% for HBS Ag and 7.3% and 7.6% for HBC Ab. It may be due to a higher chance of HBV chronicity among men compared to women. In Zali et al.’s study, 1.5% of female and 1.9% of male participants were positive for HBS Ag (\(P = 0.0033\)).\[42\]

The other important factor was the area of habitation. In our study, the prevalence of HBV infection was higher in central parts than the surrounding territories which may be due to poorer socioeconomic and sanitary conditions of the locality. On the other hand, central parts had more population and a more rate of family marriage and the occupation in central parts for men was driver and in the surrounding was farmers. Therefore, the chance of transmission and number of infected subjects showed a rising trend. In Zali et al.’s survey, investigation of individuals on the basis of their area of habitation revealed that 335 (1.5%) of urban and 343 (2.0%) of rural populations were positive for HBS Ag, respectively (\(P < 0.0001\)).\[39\] In another study including 226 gypsies from Shahr-e-Kord, Southwest of Iran with a mean age of 20.7 years, 35 subjects (18%) were HBs Ag positive. Also, 44 persons (23.9%) were positive for HBC Ab.\[51\]

Another important element in the current study was educational level that without considering the age factor, there was an inverse relationship with the prevalence rate of seropositivity. The seroprevalence was higher among low educated subjects (7.5% for HBC Ab and 2.5% for HBS Ag). It may be due to an intimate relationship between the level of education and the socioeconomical status. The carrier rate of HBS Ag in another study in Iran also revealed an inverse correlation with increasing level of education.\[41\]

Regarding marital status, subjects in our study were divided into three groups of married, divorced or widowed and never married individuals. The prevalence of HBV infection was higher in widows that may be due to high-risk sexual behavior. Results of another study revealed that marital status is one of the most important factors affecting the prevalence rate of HBS Ag carrier state (\(P = 0.0006\)).\[41\]

Another important factor in our study was the type of occupation. The prevalence of HBV infection was different in various occupational groups with the highest in unemployed individuals. It may be due to their being away from the family and their high-risk sexual behaviors. Zali et al. had reported the highest level of infection in farmers (3.2%) which is different to our results.\[42\] Difference in culture and socioeconomic status may explain the difference. The prevalence of HBs Ag in 1,113 Iranian large vehicle drivers was reported 5.9% (confidence interval 95%; 4.5-7.3%) and was different from the prevalence in the general population (1.7%),\[52\] which identical to our results.

Considering the socioeconomic status, the subjects were divided into three groups of low, average and high. The prevalence rate was found to be 2.5%, 1.6% and 1.3% in each group, respectively that was statistically significant (\(P < 0.0001\)).\[22\] In another study in Nahavand, Central Iran on 1824 subjects in 2002, the HBs Ag positivity was 2.3% while the history of previous surgeries and being in imprison were the major risk factors for their infection.\[53\]
In a study, 2,447 HBs Ag positive blood donors were compared with 2,425 HBs Ag negative donors in Tehran, Capital of Iran. Factors predicting HBV infection were family history of hepatitis B infection, history of receiving a blood transfusion, hospitalization, unsafe sex, male gender, and living in urban localities.\[54\]

Routes of HBV transmission was another index evaluated in our study. It seems that the prominent route of transmission was horizontal that may be due to the high prevalence of HBV infection in the age groups of older than 15 years old. However, it seems that the routes of transmission showed a correlation with the prevalence of disease in each country, such as the low endemicity for sexual behavior and IV drug abuse, the intermittent endemicity for perinatal, sexual behavior and IV drug abuse and the high endemicity for perinatal and horizontal routes.\[55\]

Our results showed that the seroprevalence of hepatitis B markers was 2.2% for HBs Ag and 7.1% for HBC Ab. As HBV infection is still a problem of public health importance, particularly in developing countries, therefore, screening of pregnant women for HBs Ag and vaccination of high risk individuals including family members of patients with hepatitis B should be implemented in future planning. Insufficient coverage of HBV vaccination, sharing of a blood-contaminated equipment among injection drug users, and inadequate perinatal care for pregnant women are major risk factors for HBV infection in these countries. Screening of HBV infection during pregnancy, and prophylactic use of HBV immunoglobuline and vaccine for high-risk infants will reduce rates of perinatal HBV transmission. Implementing local strategies for hepatitis B screening and attention to the HBV vaccination program will reduce the infection rate.

**CONCLUSIONS**

Screening of HBV infection during pregnancy, and prophylactic use of HBV immunoglobuline and vaccine for high-risk infants will reduce rates of perinatal HBV transmission. Implementing local strategies for hepatitis B screening and attention to the HBV vaccination program will reduce the infection rate.

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