



# Interspousal Transmission of Hepatitis B virus: A Cross-Sectional Descriptive-Analytical Study

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Received 2017 February 01; Accepted 2017 February 28.

## Abstract

**Background and Aim:** Sexual transmission is one of the routes of hepatitis B transmission. This study aimed at assessing the prevalence of hepatitis B among the spouses of patients with hepatitis B.

**Methods:** This cross-sectional descriptive-analytical study was done on 397 spouses of chronic carriers of hepatitis B, who had referred during years 2003 to 2014 to a private clinic of infectious diseases in Birjand, Iran. Serological tests for hepatitis B surface antigen and anti-core antigen antibody were performed for all participants. Data were entered in the SPSS software (v. 19.0) and analyzed through the Chi-square and Fisher's exact tests at a significance level of less than 0.05.

**Results:** The prevalence of hepatitis B among participants was 8.3%. Resolved hepatitis B was observed in 40.6% of the participants. The prevalence of hepatitis B surface antigen positivity and hepatitis B core antigen antibody positivity among participants whose spouses had shown hepatitis B e-antigen positivity was 15.8% and 70.2%, respectively. This rate among participants whose spouses had shown hepatitis B e-antigen negativity was 7% and 36.3%, respectively. Hepatitis B e-antigen positivity among participants' spouses was significantly correlated with transmission of hepatitis B core antigen antibody positivity (odds ratio = 4.18; 95% confidence interval: 2.08 - 8.38;  $P < 0.001$ ).

**Conclusions:** This study suggests the high risk of hepatitis B interspousal transmission, particularly among patients with hepatitis B e-antigen positivity. Therefore, public education about hepatitis B and emergency vaccination against it are essential for spouses of infected patients, to prevent interspousal transmission.

**Keywords:** Epidemiology, Hepatitis B, Interspousal Transmission

## 1. Background

Hepatitis B virus is among the most significant global health problems (1). Currently, about 400 million people are affected with hepatitis B (2) and 240 million people have chronic hepatitis (1). More than 75% of patients with hepatitis B live in Asian countries (3). Despite extensive immunization programs, hepatitis B annually causes more than one million deaths around the world (4). Around 3% of the total population of Iran (i.e. around two million people) are hepatitis B carriers (5). This rate in Birjand, a big city in the east of Iran, is around 1.6% (6). Of course, hepatitis B prevalence has been reduced in Iran in the recent years so that Iran is now categorized as a country with low hepatitis B endemicity. This decrease in hepatitis B prevalence in Iran may be due to factors, such as increased public awareness about hepatitis B risk factors as well as national hepatitis B immunization program since 1993 for all neonates and high-risk individuals (7).

The dominant hepatitis B transmission route varies in different areas. For instance, the dominant routes in high- and moderate-endemicity areas are respectively the maternal-infant route and the horizontal route during childhood and adolescence. However, in low-endemicity areas, hepatitis B is mainly transmitted through unsafe sex and injection drug abuse during adulthood (8). Blood transfusion is also another hepatitis B transmission route (9). The most common transmission routes in Iran are maternal-infant transmission and injection drug abuse.

A study on 2120 Chinese patients on hemodialysis and 409 of their spouses showed that hepatitis B was significantly correlated with age, gender, past history of surgery, and positive family history of hepatitis (10). The risk factors of hepatitis B in Iran are age, masculinity, history of contact with infected individuals, positive family history of hepatitis B, blood transfusion, multiple sexual partners, hospitalization, dental procedures, major surgeries, and employment in certain occupations, such as hairdressing and driv-

ing (7, 8, 11).

The spouses of patients with hepatitis B surface antigen (HBsAg) seropositivity are at greater risk of hepatitis B. A study from China showed that the prevalence of hepatitis B among HBsAg-positive and HBsAg-negative individuals was 13.21% and 6.29%, respectively (12). However, there is limited information about individuals, who have been exposed to hepatitis B in Iran. Therefore, the present study was performed in order to assess the prevalence of hepatitis B among the spouses of patients with hepatitis B.

## 2. Methods

This cross-sectional descriptive-analytical study was done on 397 spouses of chronic carriers of hepatitis B, who had referred during years 2003 to 2014 to a private clinic of infectious diseases in Birjand, Iran. Sampling was done through a census. The authors referred to carriers' medical records available from the private clinic database and collected necessary data about their demographic and serologic characteristics. Next, carriers were contacted and their spouses were asked to refer to the clinic to provide blood samples for serologic testing. Blood samples were tested for total hepatitis B core antigen antibody (HBcAb) and HBsAg. Enzyme-Linked Immunosorbent Assay (ELISA) kits were used for HBcAb testing (BioELISA HBcAb, Biokit, Barcelona, Spain) and HBsAg testing (Enzygenost® HBsAg 5.0, DadeBehring, Inc., Newark, USA). Collected data were entered in the SPSS software (v. 19.0) and analyzed through the Chi-square and Fisher's exact tests. All P values of less than 0.05 were considered significant. The institutional review board of Birjand University of Medical Sciences, Birjand, Iran, approved this study with the ethical approval code of IR.BUMS.REC.1394.408.

## 3. Results

A total of 397 spouses of chronic hepatitis B carriers participated in this study. Participants ranged in age from 18 to 71 with a mean of  $51.10 \pm 11.10$ . Most of the cases were aged 40 to 60. There were 234 males (58.9%) and 163 females (41.1%).

The prevalence of hepatitis B among participants was 8.3% (33 cases). Moreover, 40.6% (161 cases) showed signs of resolved hepatitis B, i.e. they were HBcAb-positive and HBsAg-negative. In 14.4% (57 cases) of the participants, whose spouses showed hepatitis B e-antigen (HBeAg) positivity, 15.8% (nine cases) were HBsAg-positive and 70.2% (forty cases) were HBcAb-positive. On the other hand, among 85.6% of participants (340 cases), whose spouses were HBeAg-negative, 7% (24 cases) were HBsAg-positive

and 36.3% (123 cases) were HBcAb-positive. Furthermore, HBeAg positivity among participants' spouses was significantly correlated with HBcAb positivity as serological markers of hepatitis B (odds ratio = 4.18;  $P < 0.001$ ). However, HBeAg positivity among participants' spouses was not significantly correlated with HBsAg positivity among the participants (odds ratio = 2.40;  $P = 0.06$ ).

## 4. Discussion

This study aimed at assessing the prevalence of hepatitis B among the spouses of patients with hepatitis B. Findings revealed that 8.3% of participants were infected with hepatitis B. In line with the current findings, other studies from different areas of Iran showed that the rate of intra-familial transmission of hepatitis B was 8% (13), 10.6% (14), 11.7% (15), and 12.3% (16). However, some other studies from Iran reported that the prevalence of hepatitis B among the spouses of patients with hepatitis B was as high as 23.3% (17) and 28.7% (14). Another study on 454 chronic HBsAg-positive carriers and 1817 of their family members showed that the prevalence of HBsAg positivity among family members was 19.3% (18). This difference in hepatitis B prevalence among the spouses or the family members of patients with hepatitis B could be attributed to different factors, such as poorer hygiene and lifestyle habits, greater addiction rate, and stronger tendency for tattoos in some areas (19). However, due to certain cultural and religious beliefs, the total prevalence of intra-familial hepatitis B transmission in Iran is less than other countries (20). For instance, HBsAg positivity among the spouses of patients with hepatitis B was reported to be 21.1% in Brazil (21) and 29.6% in Turkey (22).

Around 40.6% of the participants showed evidence of resolved hepatitis B, i.e. were HBcAb-positive and HBsAg-negative. This findings denote that sexual transmission was the most common route for interspousal hepatitis B transmission. Of course, 83.1% of participants (330 cases) showed HBsAg antibody positivity, probably due to frequent exposure to hepatitis B or having hepatitis B vaccination. Similar to the current findings, the rate of resolved hepatitis B in a study from Turkey was 43.8% (22).

It is noteworthy to mention that HBeAg positivity has a significant role in hepatitis B transmission, particularly from the mother to the infant (23). Study findings also indicated HBeAg positivity as a significant factor behind hepatitis B transmission so that total HBcAb positivity among participants was significantly correlated with HBeAg positivity among their spouses. However, HBsAg positivity among participants was not correlated with HBeAg positivity among their spouses. Similarly, a study from New Delhi

**Table 1.** The results of HBsAg and HBcAb Testing Among the Spouses of Carriers Based on the Results of HBeAg Testing Among Carriers<sup>a</sup>

| Carriers Spouses | HBeAg Test Results |           |            | Total      | Statistical Test Results |             |      |
|------------------|--------------------|-----------|------------|------------|--------------------------|-------------|------|
|                  | Positive           | Negative  |            |            | P Value                  | 95%CI       | OR   |
| HBsAg            | Positive           | 9 (15.8)  | 24 (7)     | 33 (8.3)   | 0.06                     | 0.95 - 6.08 | 2.40 |
|                  | Negative           | 48 (84.2) | 316 (93)   | 364 (91.7) |                          |             |      |
| HBcAb            | Positive           | 40 (70.2) | 123 (36.3) | 163 (41.1) | < 0.001                  | 2.08 - 8.38 | 4.18 |
|                  | Negative           | 17 (29.8) | 217 (63.7) | 234 (58.9) |                          |             |      |

<sup>a</sup>Values are expressed as No. (%).

showed higher transmission rate from HBeAg-positive individuals and no significant correlation between HBeAg positivity among carriers and HbsAg positivity among their spouses (24). The difference between the correlation of HBeAg positivity in carriers with HBsAg positivity and HBcAb positivity among spouses may be due to the fact that 90% of people, who are infected with hepatitis B during their adulthood, will become HBsAg-negative within two years and remain HBcAb-positive for years. The prevalence of hepatitis B in the entire Iranian population is 1% to 3.5% (5). However, studies, including the current study, have reported that hepatitis B prevalence among the spouses of HBsAg-positive patients is as high as 8% to 12% (13-16). The higher prevalence of hepatitis B among the spouses of HBsAg-positive patients may be due to the sexual transmission of the infection. Effective and extensive patient and public education, punctual screening programs, and serious vaccination campaigns could help reduce interspousal transmission of hepatitis B.

#### 4.1. Conclusions

This study suggests the high prevalence of active and resolved hepatitis B among the spouses of patients with chronic hepatitis B, particularly among patients with hepatitis B e-antigen positivity. Accordingly, the spouses of infected patients are at great risk of hepatitis B. Given the seriousness of hepatitis B and its life-threatening complications, hepatitis-related public education, HBsAg testing at marriage, and hepatitis B vaccination for non-immune couples are essential to prevent interspousal transmission.

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