

# Prevalence and Risk Factors of Hepatitis B Virus in Jazan Region, Saudi Arabia: Cross-Sectional Health Facility Based Study

Hussein Ageely<sup>1\*</sup>, Mohamed Salih Mahfouz<sup>2</sup>, Abdelrahim Gaffar<sup>2</sup>, Erwa Elmakki<sup>1</sup>, Ibrahim Elhassan<sup>3</sup>, Abu Obaida Yasin<sup>1</sup>, Ibrahim Bani<sup>2</sup>

<sup>1</sup>Department of Internal Medicine, Faculty of Medicine, Jazan University, Jazan, KSA

<sup>2</sup>Department of Family and Community Medicine, Faculty of Medicine, Jazan University, Jazan, KSA

<sup>3</sup>Department of Microbiology, Faculty of Medicine, Jazan University, Jazan, KSA

Email: [hageely@me.com](mailto:hageely@me.com)

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## Abstract

**Objectives:** The objectives of this study were to estimate the prevalence of the HBV infection in Jazan, Kingdom of Saudi Arabia (KSA) and to correlate serologic findings with epidemiological data and known risk factors. **Methods:** Cross-sectional study conducted in 10 health facilities Jazan province. Study participants (2041) were interviewed using a structured questionnaire. HBsAg was tested in the blood samples collected from the study participants using commercially available kits. **Results:** The overall prevalence of hepatitis B among study participants was 8.3% (95% CI: 7.2 - 9.6). The prevalence of HBsAg was found to be the highest (22.4%) among those who were over 60 years old (95% CI: 13.2 - 35.0). For participants under 20 years old, the prevalence was the lowest, at only 2.5%. For males the HBV prevalence was 11.2% (95% CI: 9.3 - 13.3), compared to 7.0% (95% CI: 5.5% - 8.8%) for females. Subjects with a family history of HBV ( $p = 0.002$ ) and dental procedures ( $p = 0.008$ ) were found to be associated with higher risk for HBV infection. **Conclusion:** The prevalence of HBsAg in adults in Jazan remains highly relative to KSA national level. Results showed a marked reduction in HBV among participants under 20 years old. This could be mainly attributed to the successful implementation of the children's HB immunization programs in the region. Additional efforts to control HBV and vaccination for adults are highly recommended.

## Keywords

Hepatitis B virus, Prevalence, Risk Factors, Jazan

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\*Corresponding author.

## 1. Introduction

Hepatitis B is caused by infection with the Hepatitis B virus (HBV) [1]. HBV is a serious public health problem worldwide and a major cause of chronic hepatitis, cirrhosis, and hepatocellular carcinoma (HCC) [2] [3]. The World Health Organization (WHO) estimates that about 240 million people have been infected with HBV world widely [4]. Prevalence of HBV varies greatly from place to place, depending on the mode of transmission and other epidemiological factors [5].

Previous epidemiological studies carried out in KSA have shown that the prevalence of HBsAg has fallen during the past two decades dramatically [6] [7] with considerable variation in prevalence from one region to another [8]-[11]. Jazan Province is described by predominantly high rates of HBV. For a long period, it has been characterized by hyper-endemic HBV infection and its sequelae of chronic liver diseases and hepatocellular carcinoma [12] [13].

HBV is transmitted through blood, semen, and vaginal secretions [1]. Factors that increase the risk of infection include unprotected sexual contact with an infected person, sharing needles and drug injection equipment, sharing personal items with an infected person, having direct contact with the blood of an infected person, touching open wounds or needle sticks, and contact during childbirth [1]. A key mode of transmission of chronic HBV infection is vertical from an HBV-infected mother to child [14]. Studies conducted in KSA showed that risk factors of HBV infection were similar to those identified globally [15].

The control of childhood HBV infections has greatly reduced the prevalence and burden of HBV infections and their sequelae [16] [17]. Immunization is considered to be the most powerful control tool for HBV infection [18] [19]. The health authority in KSA has included the HBV vaccine in the routine childhood immunization program since October, 1989 [20].

The main objectives of the current study were to determine the prevalence of hepatitis B infection in Jazan Province and to correlate the results with epidemiological data and known risk factors.

## 2. Material and Methods

### 2.1. Study Area

We conducted this study in 10 health facilities in Jazan province. Jazan (also called Gizan) is one of the 13 provinces of the KSA. It is located in southwest of KSA and is highly populated, with 1.5 million residents [21]. Jazan province is divided into 13 sub-administration units.

### 2.2. Study Population

The study population comprised people residing in all Jazan provinces during the study period.

### 2.3. Study Design and Sampling

A cross-sectional, health-facility-based study was conducted during the period between October and December 2009. A representative sample of 2200 participants was estimated based on previous HBV prevalence in the region, 95% confidence interval (CI), marginal error 2%, non-response rate 10% and design effect 1.5. The sampling design was a random cluster sampling in two stages based on the different administrative sub-regions in the province. In the first stage 10 sub-regions were selected at random. To further support this, mostly utilized health facility in each sub-region unit was used as sampling location. In the second stage participants were recruited randomly in each institution selected.

### 2.4. Data Collection

All study subjects were interviewed using a structured questionnaire. Standardized, face-to face interviews were conducted by physicians. The study questionnaire involved information on demographics, socioeconomic status and other background characteristics. Risk factors such as sexual behaviors, injection risk, history of blood transfusion, history of surgery, dental procedures, cupping and jaundice, were also included.

### 2.5. Blood Sample Collection and Serum Preparation

A blood sample totaling 5-ml was taken from each study participant. Serum was separated after 15 minutes at

room temperature by bench centrifuge and stored at  $-40^{\circ}\text{C}$  upon being tested.

## 2.6. Serological Testing

The determination of the presence of HBsAg was carried out using rapid tests by ACON<sup>®</sup> [22] according to the manufacturer's test procedure. Prior to the study, one doctor and one technician from each PHCC unit were trained in the test procedure. All positive cases were referred to the Hepatology Clinic for confirmatory tests and treatment.

## 2.7. Data Management and Analysis

Data entry and statistical analysis were carried out with SPSS 17. Age-specific and gender-specific HBV prevalence estimates were calculated with 95% confidence intervals (CIs). Chi-square tests/Fisher exact test were used to compare categorical variables and to assess association with risk factors. Multivariate logistic regression analysis was utilized to investigate to control for confounders, and the corresponding ORs with 95% CIs were also estimated. The logistic model was checked for fitness using the Hosmer-Lemeshow goodness of fit test. A  $p$ -value  $< 0.05$  was considered to be statistically significant.

## 2.8. Ethical Considerations

Informed written consent was obtained from all adults and from guardian of the children enrolled as per ethical guidelines of Saudi Arabia regulations. Purpose, potential risk and benefits of the study have been communicated in Arabic language and consent was documented for all study participants. The ethical approval for the current study was obtained from the ethical committee of the Faculty of Medicine, Jazan University. Participants were told that they have the right to withdraw from the study if they wish at any time, a privacy of participant was respected and data were kept confidentially and utilized for the study purposes only.

## 3. Results

The response rate for test was 92.8% (2041 from the target of 2200 participants). **Table 1** presents some background characteristics of the study population. Around 46.3% of the participants were between 20 and 39 years old, followed by 19% of participants who were in the age group 30 to 39 years old. Only 2.9% of the participants were over 60 years old. Regarding the residence of the study population, 48.1% were from urban areas compared with 31.9% from rural areas. The ratio of males to females was 1:1, and 90.2% of the respondents were Saudi nationals.

The prevalence of HBsAg according to demographic characteristics in Jazan region is shown in **Table 2**. The prevalence of HBsAg by age shows that participants over-60 age group had the highest HBV prevalence (22.2%) (95% CI: 13.2 - 35.0). The prevalence among participants under 20 years old was only 2.6% (95% CI: 1.21 - 5.4). The prevalence of HBV according to place of residence shows that 5.2% of the urban population were HBV positive (95% CI: 3.9 - 6.7) compared with 7.0% among respondents from rural areas (95% CI: 5.2 - 9.3). Regarding gender, the HBV prevalence among men was 11.2% compared with 7.0% among women, with a significant difference in HBV prevalence based on gender ( $p = 0.002$ ). The overall prevalence of HBV infection was found to be 8.3% (95% CI: 7.2 - 9.6).

**Table 3** illustrates the seropositivity of HBsAg by risk related variables. Participants with a history of previous dental procedures, blood transfusion, hemodialysis and family history of HBV or HCV were associated with HBsAg infection ( $p = 0.008$ ,  $0.032$ ,  $p = 0.034$  and  $p = 0.002$  respectively). No significant difference in infection risk was found, according to other variables in the table.

The univariate prevalence odds ratios with 95% confidence interval estimates for the risk factors are presented in **Table 4**. Significant risk factors for HBV infection were: history of dental procedures ( $p = 0.008$ ), history of blood transfusion ( $p = 0.032$ ), family history of HBV or HCV ( $p = 0.002$ ) and hemodialysis ( $p = 0.016$ ). Further analysis was conducted using multiple logistic regression model to evaluate the contribution of each risk factor in the presence of other risk factors. The only risk factor that retained statistical significance in the final regression equation was having had a dental procedure. The associated odds ratio for this variable was 2.0, with a 95% confidence interval estimate of 1.15 to 3.41. In the presence of this variable, hemodialysis, blood transfusion, and family history of HBV and HCV lost significance.

**Table 1.** Demographic characteristics of the studied population.

| Characteristics          | NO          | %          |
|--------------------------|-------------|------------|
| <b>Age groups</b>        |             |            |
| <20 years                | 248         | 12.2       |
| 20 - 29 years            | 946         | 46.3       |
| 30 - 39 years            | 388         | 19.0       |
| 40 - 49 years            | 183         | 9.0        |
| 50 - 59 years            | 95          | 4.7        |
| >60 years                | 60          | 2.9        |
| Not stated               | 121         | 5.9        |
| <b>Residence type</b>    |             |            |
| Urban                    | 981         | 48.1       |
| Rural                    | 652         | 31.9       |
| Not stated               | 408         | 20.0       |
| <b>Educational Level</b> |             |            |
| Illiterate               | 256         | 12.5       |
| Primary                  | 294         | 14.4       |
| Intermediate             | 333         | 16.3       |
| High secondary           | 579         | 28.4       |
| Graduate                 | 347         | 17.0       |
| Post graduate            | 4           | 0.2        |
| Not stated               | 228         | 11.2       |
| <b>Marital Status</b>    |             |            |
| Bachelor                 | 594         | 29.1       |
| Married                  | 1105        | 54.1       |
| Widowed                  | 18          | 0.9        |
| Polygamist               | 13          | 0.6        |
| Children                 | 311         | 15.2       |
| <b>Total</b>             | <b>2041</b> | <b>100</b> |

#### 4. Discussion

The global HBV carriage rate varies widely, ranging from 1% to 20%. This variation is mainly attributed to the mode of transmission and control efforts. In the present study we have successfully determined the prevalence of HBsAg and its associated risk factors in Jazan region. Our results indicated that the prevalence of HBsAg in Jazan area was 8.3% (169 cases out of 2041 total participants). These results indicate a slight increase in the prevalence of HBV in adults compared with (Ayoola, *et al.* 2003) [23] and lower than the prevalence produced by Arya, *et al.*, 1985 [9]. Recent studies of HBV in other parts of KSA suggested a significant decline of the during the past two decades [6] [24].

On the other hand, the present study revealed a marked reduction in the prevalence of HBV in participants under 20 years of age, with a prevalence rate of 2.5% compared to the rate of 6.7% before the HBV vaccination

**Table 2.** Prevalence of HBV Infection Among 2041 volunteer Jazan Region by Age, Residence and Gender.

| Characteristics           | N-positive/N-tested | HBsAg%     | 95% CI           | p-value |
|---------------------------|---------------------|------------|------------------|---------|
| <b>Age groups</b>         |                     |            |                  |         |
| <20 year                  | 6/233               | 2.6        | 1.2 - 5.4        |         |
| 20 - 29 year              | 74/885              | 8.4        | 6.7 - 10.3       |         |
| 30 - 39 year              | 32/333              | 9.6        | 6.8 - 13.2       | 0.000   |
| 40 - 49 year              | 24/172              | 14         | 9.5 - 19.9       |         |
| 50 - 59 year              | 9/78                | 11.5       | 6.2 - 20.5       |         |
| >60 year                  | 12/54               | 22.2       | 13.2 - 35.0      |         |
| <b>Residence type</b>     |                     |            |                  |         |
| Urban                     | 48/929              | 5.2        | 3.9 - 6.7        | 0.134   |
| Rural                     | 43/614              | 7.0        | 5.2 - 9.3        |         |
| <b>Gender</b>             |                     |            |                  |         |
| Male                      | 102/912             | 11.2       | 9.3 - 13.3       | 0.002   |
| Female                    | 67/956              | 7.0        | 5.4 - 8.6        |         |
| <b>Overall prevalence</b> | <b>169/2041</b>     | <b>8.3</b> | <b>7.2 - 9.6</b> |         |

**Table 3.** Prevalence of HBV Infection in Jazan Region according to some selected risk-factors ( $n = 2041$ ).

| Variables (Exposure to Potential Risks) | Yes             | No              | p-value |
|---|-----------------|-----------------|---------|
| Dental procedures                       | 04.80% (26/542) | 8.4% (107/1279) | 0.008   |
| History of blood transfusion            | 12.00% (17/142) | 7.0 (117/1671)  | 0.032   |
| Hemodialysis                            | 30.00% (03/10)  | 7.4% (132/1785) | 0.034   |
| Washam (tattoos)                        | 0% (0/4)        | 7.2% (135/1795) | 0.732   |
| Family history of (HBV/HCV)             | 53.3% (57/107)  | 3.1% (48/1566)  | 0.002   |
| History of surgery                      | 6.8 (21/309)    | 7.5 (114/1512)  | 0.649   |
| Hospitalization                         | 6.80% (39/576)  | 7.7% (97/1261)  | 0.484   |
| Hijama (cupping)                        | 12.1% (8/66)    | 7.4% (127/1726) | 0.341   |

program [25]. This marked reduction in the HBV infection rate among this age group is likely to be explained by the success of the HBV vaccination program conducted by the health authority in the area. This also suggests that vaccinating those in older age groups might reduce both the prevalence and the burden of the diseases among the local population.

History of blood transfusion and family history of HBV/HCV were associated with a high risk of HBV infection; this finding is supported by Alswaidi and Brien's study, as they found that the sharing of personal belongings, particularly razors, was one of the risk factors in KSA [15], and is also similar to what Pereira *et al.* reported in their multi-centric study in Brazil [26]. Hemodialysis results in frequent blood transfusions and thus increase the risk of HBV infection. Dental procedures were associated with HBV infection in Jazan, this finding is similar to the situation in Brazil [26].

An association between hospitalization and HBV infection has been reported in many studies [26] [27], but in our study there was no significant association. Hijama (cupping) was found to have no significant association with HBV infection; a similar finding reported by Pereira *et al.* in their multi-centric study in which they suggested no significant relationship between tattoos and body piercings and HBV infection [26].

**Table 4.** Some factors associated with hepatitis B virus infection according to the bi-variate and the multivariate analysis (Prevalence ORs), with 95% CIs ( $n = 2041$ ).

| Variables                                   | Bivariate          |                 | Multivariate       |                 |
|---|--------------------|-----------------|--------------------|-----------------|
|   | OR (95% CI)        | <i>p</i> -value | OR (95% CI)        | <i>p</i> -value |
| <b>Demographics</b>                         |                    |                 |                    |                 |
| Age (less than 20/20+)                      | 3.22 (1.70 - 6.01) | 0.001           | 3.28 (1.30 - 8.27) | 0.012           |
| Gender (Female/Male)                        | 1.67 (1.21 - 2.30) | 0.002           | 0.61 (0.38 - 0.99) | 0.043           |
| Residence (Urban/Rural)                     | 1.30 (0.90 - 2.11) | 0.135           | 1.49 (0.94 - 2.36) | 0.083           |
| <b>Exposure to potential risks (yes/no)</b> |                    |                 |                    |                 |
| Dental procedures                           | 1.81 (1.16 - 2.81) | 0.008           | 1.98 (1.15 - 3.41) | 0.013           |
| Blood transfusion                           | 1.80 (1.05 - 3.10) | 0.032           | 0.35 (0.19 - 0.70) | 0.052           |
| Hemodialysis                                | 5.36 (1.30 - 20.9) | 0.016           | 0.28 (0.04 - 0.69) | 0.165           |
| Drug addiction                              | 1.10 (0.0 - 1.22)  | 0.870           | 1.21 (0.16 - 8.98) | 0.847           |
| Family History of (HBV/HCV)                 | 1.50 (1.16 - 2.04) | 0.002           | -                  | -               |
| History of surgery                          | 1.10 (0.69 - 1.81) | 0.650           | -                  | -               |
| Hospitalization                             | 1.14 (0.78 - 1.68) | 0.484           | -                  | -               |

One of the potential limitations of this study, that it was based on a cross-sectional survey design, the direction of relationships and causal relationships cannot be determined. In addition to that, the population of this study included only patients attending different selected health facilities in the region, which might put its implication in the data fullness and completion. And finally information regarding the potential risk factors was based only on self-reporting of study participants. Despite these limitations, the study updated our knowledge about the status of HBV in Jazan region and emphasized the role of vaccination in reducing the prevalence of the infection.

## 5. Conclusion

In conclusion, the prevalence of HBV in children under 20 years old in Jazan area is markedly low. Although the prevalence of HBV has been declining in all parts of KSA, its overall prevalence in Jazan region is still high. This high prevalence rate calls for additional efforts regarding the vaccination program, active screening and vaccination for young adults and public health education campaigns in the media to promote better awareness of risk factors.

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