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Risk Factors for Hepatitis B Virus Infection among Patients Attending Health Facilities in Sulaimani City, Iraq: A Case-Control Study

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Risk Factors for Hepatitis B Virus Infection among Patients Attending Health Facilities in Sulaimani City, Iraq: A Case-Control Study

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Abstract

Background: The hepatitis B virus is a major threat to public health because it causes disease. Approximately 5% of people worldwide are chronically infected, and this virus has infected approximately one-third of the population. The purpose of this study was to assess the risk factors for hepatitis B transmission among patients who visit medical institutions in Sulaimani City.
Method: A case-control study was carried out among 240 individuals (120 cases and 120 controls) visiting health facilities in Sulaimani City between August 11 and December 31, 2024. Convenient sampling was used for selecting participants. Data on demographics, behavioural risk factors, and medical history were obtained through an organized questionnaire; they were interviewed face-to-face. The Chi-square test (χ2-test), Fisher's exact test, odds ratio (OR), mean, and standard deviation were calculated.
Results: Overall, 120 cases and 120 controls participated in this study. Regarding the case group, 68.3% were males, 53.3% were aged between 35 and 55, and 76.7% were married. The risks linked to hepatitis B infection were dental procedures (OR = 2.9, P < 0.001), blood transfusion (OR = 2.9, P < 0.001), cupping therapy (Hijamat) (OR = 3.6, P < 0.001), tattooing (OR = 2.6, P = 0.025), and sharing sharp personal hygiene items (OR = 2.6, P = 0.007). Merely 21.7% of those who took part were aware of how the hepatitis B virus spreads.
Conclusions: Dental procedures, blood transfusions, cupping therapy (Hijamat), tattooing, and sharing sharp personal hygiene items were hepatitis B infection. Most of the respondents had no information about the hepatitis B virus transmission modes. These highlights demonstrate that in order to stop the hepatitis B virus from spreading further, individuals must be educated about its risk factors and mechanisms of transmission. The goal of interventions should be to reduce the risk factors for hepatitis B. Adults should remain the priority of hepatitis B vaccination efforts.

Keywords: Hepatitis B, Risk factors, Health facilities, Infection, Cases, Transmission

1. Introduction

Globally, the spread of the hepatitis B virus (HBV) continues to be an important issue in public health [1]. This illness is very contagious; in fact, it is ten times more infectious than hepatitis C and fifty to one hundred times more infectious than HIV. It is called "silent killer" because many people who have HBV do not know they have the illness [2]. In an effort to increase awareness and promote the avoidance, detection, and treatment of HBV infections, the World Health Organization (WHO) has declared July 28 to be World Hepatitis Day. The elevated common occurrence of HBV infections throughout the last ten years prompted this categorization [3].

HBV infection is linked to a significant incidence of complications and deaths and represents a great financial burden, despite being avoidable with a safe and effective vaccine and health education [4]. Infection with HBV often results in the appearance of

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many serological markers with varying degrees of clinical and epidemiological relevance. These HBV virus-related indicators provide serologic proof of both severe and long-lasting HBV contagion as well as the state of immunological infectivity [3]. Worldwide, the number of people infected with HBV is over 2 billion, and up to 350 million of them have become chronic carriers [5, 6]. HBV is widespread throughout Asia [7]. Over 75% of HBV contagions occur in Africa, Asia, and the Middle East. This infection is notably more prevalent in low-income countries compared to higher-income countries [6]. A Study on HBV prevalence in Iraq found that 1% of Iraqi people tested positive for HBsAg [8]. The Hepatitis B virus accounts for approximately 47% of hepatic cancer cases and 44% of liver cirrhosis [9]. Cirrhosis and hepatocellular carcinoma caused by HBV kill over 600,000 individuals annually. Consequently, chronic hepatitis B ranks as the tenth most common reason for mortality globally [10].

Numerous scientific publications have noted that behavioral, healthcare service-related, and socioeconomic factors all contribute to HBV infection [2]. Vertical transmission and horizontal transmission are the two ways that HBV is transmitted. In regions where the virus is highly prevalent, it often passes vertically from mother to child at delivery. In contrast, in low-endemic areas, person-to-person transmission is commonly reported. The possible factors contributing to person-to-person transmission have been identified, including a history of unprotected intercourse, blood transfusions, hemodialysis, dental treatments, surgical interventions, and abrasions from haircuts. Certain groups are more likely to get HBV, for example, homosexual men, multiple sexual partners, drug and alcohol abusers, healthcare professionals, and family members who live with an HBV carrier. Furthermore, people with piercings, tattoos, and shared household items, such as razor blades, nail clippers, and toothbrushes, have a higher prevalence of Hepatitis B [2, 11, 12].

Limited studies are available about the risk factors that make it more likely for hepatitis B to spread in Sulaimani City. Therefore, this study was conducted among patients attending health facilities to determine the participants' socio-demographic background, assess the risk factors related to HBV transmission, and evaluate their knowledge about HBV transmission modes.

2. Methodology

2.1. Study site

A health facility-based retrospective case-control study was performed in Sulaimani City, Kurdistan Region, Iraq, between August 11 and December 31, 2024. Cases and controls were recruited from three health facilities, including the Gastroenterology and Liver Teaching Hospital, Sulaimani Thalassemia and Hereditary Blood Disease Center, and Sulaimani Dialysis Center. These facilities are highly visited by patients infected with HBV.

2.2. Study population

The study population for the case and control groups consisted of patients attending the Gastroenterology and Liver Teaching Hospital, the Sulaimani Thalassemia and Hereditary Blood Disease Center, and the Sulaimani Dialysis Center.

2.3. Inclusion criteria

Cases: Patients diagnosed with hepatitis B virus (HBV) infection who tested positive for hepatitis B surface antigen ($HBsAg^+$).

Controls: Patients without liver disease who tested negative for both hepatitis B surface antigen ($HBsAg^-$) and hepatitis B core antibody ($HBcAb^-$).

2.4. Exclusion criteria

Cases: Patients with critical health conditions or who had HBV infection but were also infected with one or more additional hepatitis viruses were excluded from this study.

Control: Individuals with serious medical conditions were excluded from the study.

2.5. Sample size

A total of 240 participants were enrolled in this study and assigned to two groups: a case group and a control group, with 120 individuals in each group.

2.6. Sample collection

Convenience sampling was used to select the participants.

2.7. Data collection

Direct interviews were employed to collect data from participants. They were questioned confidentially using a standardized questionnaire including the required data. The questionnaire mainly focused on the individual's demographic characteristics, potential risk factors for HBV transmission, reasons for the HBV test (only for cases), and knowledge about HBV transmission routes.

Respondents were asked about risk factors, including the sharing of individual cleanliness items (such as shaving instruments, razors, nail clippers, and toothbrushes), cupping (Hijamat), receiving blood, organ transplantation, surgical operations (including endoscopy procedures), and dental treatments. The participants' knowledge about HBV transmission routes was assessed by asking them some questions about the modes of spread, such as blood transmission, organ transplantation, surgical operations, dental treatments, sexual intercourse, tattooing, piercing the body, sharing personal items, and intravenous drug injection. In addition, the cases were questioned about the reasons for HBV screening. To ensure clarity and time required, the questionnaire was pretested with ten participants from the research population before data collection. Refinements were made in response to pre-test input, and participants in pre-testing were not included in the study sample.

2.8. Data analysis

The data were entered and analysed using IBM SPSS Statistics, version 27. Every day, data was input, and to guarantee quality control, duplicate data entry was done. Analytical and descriptive methods were employed. As part of the descriptive method, means, percentages, and frequencies were calculated. In the analytical process, the mean age of the two groups was compared using an independent-samples t-test. Associations between categorical variables were assessed using the chi-square (χ^2) test and Fisher's exact test, with odds ratios (OR) calculated where appropriate. Quantitative variables were presented as mean ± standard deviation (SD), while qualitative variables were expressed as frequencies and percentages. A p-value ≤ 0.05 was considered indicative of a statistically significant difference or association. Results were presented using text, tables, and figures.

2.9. Ethical considerations

The study was conducted in accordance with the ethical standards outlined in the Statement of Helsinki [13] and according to the research ethics of the Sulaimani Polytechnic University. Recruited individuals for this study were informed about the study's objective; they were free to contribute, and participation was voluntary. The responders gave their verbal consent. The collected data was assured to remain secret.

3. Results

3.1. Background characteristics of the participants

In this study, 240 individuals participated, distributed into two homogeneous groups, case and control groups, each with 120 participants. The mean age of the cases and controls was 42.13 (±13.06) and 41.47 (±13.88), respectively (P= 0.702). Regarding the case group, the majority (68.3%) were males, over half (53.3%) were aged between 35 and 55, and more than three-quarters (76.7%) were married (Table 1). Approximately one-fifth (21.7%) of the participants had information about hepatitis B routes of transmission, as follows: 38 (31.6%) of cases and 14 (11.7%) of controls.

3.2. Risk factors for hepatitis B virus infection

The results of this study indicated a strong association between hepatitis B infection and dental procedures (OR:2.9; 95% CI:1.6–5.1), blood transfusion (OR:2.9; 95% CI:1.6–5.3), cupping (OR:3.6; 95% CI:1.9–6.9), tattooing (OR:2.6; 95% CI:1.1–6.3), and sharing personal hygiene items (OR:2.6; 95% CI:1.3–5.3), ($P < 0.05$) (Table 2).

3.3. Reasons for screening hepatitis B virus

The HBV cases had different reasons for screening for HBV; the main reasons were pre-marriage, having symptoms of hepatitis B, pre-surgery, and pre-blood donation (22.5%, 20.0%, 16.7%, and 15% respectively), Fig. 1.

4. Discussion

In this study, over two-thirds of cases were male; this finding aligns with the results of previous research performed in Iraq, Palestine, Egypt, Iran, Brazil, Romania, and Liberia [4, 6, 8, 10, 14–17]. Research conducted in Saudi Arabia revealed that the frequency of HBV infection was much greater in men compared to females [18]. A review study indicated that male exposure to HBV was greater than that of females [19]. Gender, as a concept, refers not just to an individual's sexual features but also to a collection of distinctions that arise from men's and women's physiology and psychology, as well as diverse social and cultural settings [20]. Biological and physiological distinctions between males and females may be ascribed to variances in disease risk factors, the protective or exacerbating effects of sex hormones, hereditary differences, and distinct anatomical

Table 1. Comparison of background characteristics between the cases and controls.

Characteristics	Cases No (%)	Controls No (%)	P value (χ^2-test)	Total No (%)
Gender				
Male	82 (68.3)	80 (66.7)	0.783	162 (67.5)
Female	38 (31.7)	40 (33.3)		78 (32.5)
Age (years)				
18–25	16 (13.3)	17 (14.2)	0.692	33 (13.8)
25–35	20 (16.7)	26 (21.7)		46 (19.2)
35–45	28 (23.3)	24 (20.0)		52 (21.7)
45–55	36 (30.0)	29 (24.2)		65 (27.1)
≥ 55	20 (16.7)	24 (20.0)		44 (18.3)
Marital status				
Married	92 (76.7)	91 (75.8)	0.808	183 (76.3)
Single	24 (20.0)	23 (19.2)		47 (19.6)
Widowed/Divorced	4 (3.3)	6 (5.0)		10 (4.2)
Education				
Illiterate	6 (5.0)	8 (6.7)	0.978	14 (5.8)
Primary	28 (23.3)	31 (25.8)		59 (24.6)
Secondary	61 (50.9)	55 (45.8)		116 (48.3)
High education	25 (20.8)	26 (21.7)		51 (21.3)
Occupation				
Government employee	35 (29.2)	39 (32.5)	0.957	74 (30.8)
Self-employed	44 (36.7)	41 (34.2)		85 (35.4)
Students	7 (5.8)	8 (6.7)		15 (6.3)
Housewife	21 (17.5)	20 (16.7)		41 (17.1)
Unemployed	13 (10.8)	12 (10.0)		25 (10.4)
Family size				
<5	62 (51.7)	71 (59.2)	0.242	133 (55.4)
≥5	58 (48.3)	49 (40.8)		107 (44.6)
Residence				
Urban	84 (70.0)	87 (72.5)	0.669	171 (71.3)
Rural	36 (30.0)	33 (27.5)		69 (28.7)
Diabetes				
Yes	16 (13.3)	11 (9.2)	0.307	27 (11.3)
No	104 (86.7)	109 (90.8)		213 (88.7)
Thalassemia				
Yes	10 (8.3)	9 (7.5)	0.811	19 (7.9)
No	110 (91.7)	111 (92.5)		221 (92.1)
Hemophilia				
Yes	3 (2.5)	2 (1.7)	1.000	5 (2.1)
No	117 (97.5)	118 (98.3)		235 (97.1)
Kidney dialysis				
Yes	11 (9.2)	12 (10.0)	0.826	23 (9.6)
No	109 (90.8)	108 (90.0)		217 (90.4)
Total	120 (100.0)	120 (100.0)		240 (100.0)

structures [20]. Our findings presumably stem from the increased exposure of males in Iraq to occupational HBV risk factors. In the current study, the majority of HBV cases were between the ages of 18 and 55; this might be ascribed to the fact that individuals in these age groups are at risk for contracting HBV. In addition, some of them were diagnosed due to HBV blood screening for the marriage process, donating blood, and employment.

Concerning marital status, over three-quarters of HBV cases were married; this result is consistent with the results of studies performed in Iran and Malaysia [6, 11]. Similarly, two previous studies conducted in Egypt and Iran found that HBV infection was significantly higher in married than in unmarried individuals [17, 21]. Furthermore, a result of a Nigerian study demonstrated that the risk of contracting HBV was four times higher for married people than for those who had never been married [3]. This might be attributed to married couples possessing several risk factors for HBV infection. Regarding participants' knowledge about HBV transmission, most of them were unaware of the routes of HBV transmission. Likewise, a study conducted among chronic hepatitis B cases found that less than two-fifths were aware of the main modes of transmission [22]. Furthermore, a survey carried out in Oman reported that less than one-third of medical students had information on

Table 2. Comparison of hepatitis B risk factors distribution between cases and controls.

Potential risk factors	Cases No (%)	Controls No (%)	P value (χ^2-test)	OR (95% CI)
Surgical procedures (operation)				
Yes	29 (24.2)	18 (15.0)	<0.074	1.8 (0.9–3.5)
No	91 (75.8)	102 (85.0)		
Dental procedures				
Yes	50 (41.7)	24 (20.0)	<0.001	2.9 (1.6–5.1)
No	70 (58.3)	96 (80.0)		
Blood transfusion history				
Yes	44 (36.7)	20 (16.7)	<0.001	2.9 (1.6–5.3)
No	76 (63.3)	100 (83.3)		
Cupping therapy (Hijamat)				
Yes	43 (35.8)	16 (13.3)	<0.001	3.6 (1.9–6.9)
No	77 (64.2)	104 (86.7)		
Tattooing				
Yes	19 (15.8)	8 (6.7)	0.025	2.6 (1.1–6.3)
No	101 (84.2)	112 (93.3)		
Sharing personal hygiene items (razor or nail clipper)				
Yes	29 (24.2)	13 (10.8)	0.007	2.6 (1.3–5.3)
No	91 (75.8)	107 (89.2)		
Contact with household HBV cases				
Yes	5 (4.2)	1 (0.8)	0.098	5.2 (0.6–44.9)
No	115 (95.8)	119 (99.2)		
Total	120 (100.0)	120 (100.0)		240 (100.0)

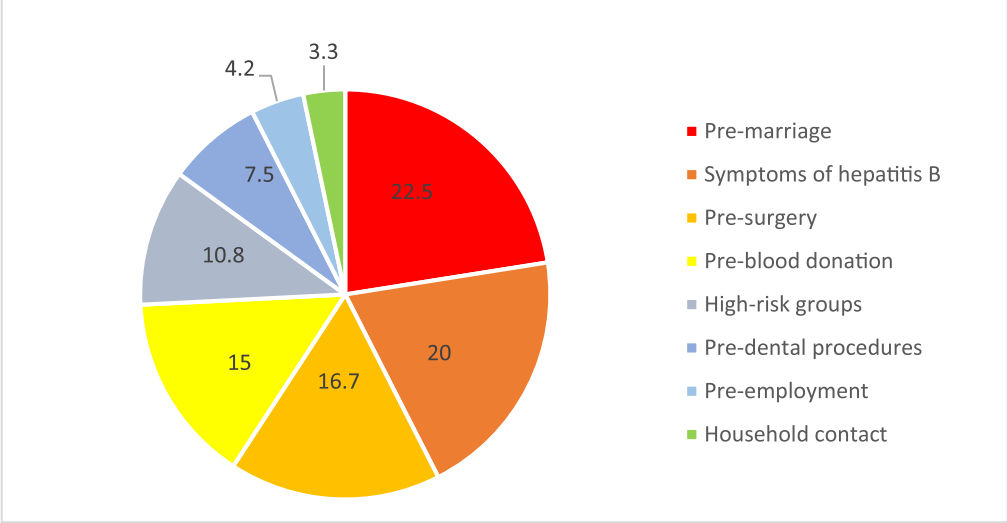

Fig. 1. Reasons for screening hepatitis B virus in the case group.

the transmission mode of HBV [23]. Poor knowledge is an issue since inadequate information may contribute to the risk of HBV transmission [24].

Regarding risk factors, the current research found no strong association between surgical procedures and HBV infection. This conclusion corroborated the findings of two prior investigations performed in Palestine and Iran [4, 17]. This may be attributed to hospitals implementing stringent health protocols prior to surgery to prevent the spread of blood-borne diseases. The present study revealed that dental operations were substantially more prevalent in the cases compared to the controls. A study in Saudi Arabia reported a significant association between dental extraction and HBV infection [25]. Likewise, the results of two previous studies indicated a significant association between patients with prior dental procedures and HBV infection [4, 18]. Similarly, studies performed in Yemen, Palestine, and Iran described that the prevalence of HBV infections was significantly high in patients with a history of dental treatments [4, 17, 26]. A case-control study conducted in North Ethiopia indicated that persons with a history of dental treatments have a considerably increased risk of HBV infection compared to those without such a history

[2]. Contaminated instruments, operatory apparatus, or the environment may disseminate infectious microorganisms inside a dental facility, alongside direct exposure to blood, oral fluids, or other body fluids [27]. Research indicated that HBV transmission may occur under certain situations when an anti-suction device is used during dental procedures [28]. The probability of HBV transmission resulting from injury with a contaminated needle is around 30% when the source is e-antigen positive [29].

The present study showed a significant association between blood transfusion and HBV infection. Similarly, studies conducted in Saudi Arabia, Palestine, Iran, and South Brazil revealed a strong association between blood transfusion and HBV infections [4, 7, 17, 18]. The first marker that appears in the blood following HBV transmission is HBV DNA. After viral replication in the hepatocytes, the HBV viral load can reach $10^8 – 10^{10}$ virus particles per millilitre of serum [30]. Despite ongoing technological advancements in blood donation screening, hepatitis B infection continues to pose a significant risk of transfusion-transmitted viral infection [31]. The remaining risk of HBV transmission is associated with the pre-seroconversion window period, infection with immunovariant strains, and occult HBV carriage [31]. In the current study, cupping therapy (Hijamat) was significantly dominant among the case group participants. Results of previous studies showed that HBV infections were significantly higher in patients who had cupping therapy [4, 26, 32]. A substantial amount of evidence indicates that the practice of Hijamat poses a considerable risk of contracting bloodborne illnesses, including hepatitis B, hepatitis C, and HIV [33]. Our result might be because non-professionals usually perform Hijamat in Iraq, and no rules or guidelines exist to control and regulate this activity.

The current research revealed a strong association between tattooing and HBV infection, corroborating the results of a survey performed in Nigeria [34]. Similarly, a review's findings indicated that tattooing and HBV infection were most strongly associated [35]. A study carried out in Iran indicated that tattooed individuals are more likely to contract HIV, HBV, and HCV, even if they have a minor tattoo on their body [36]. HBV remains infectious in the environment and on dry surfaces for at least one week [37]. The use of non-sterile needles, the same dyes for several people, and unhygienic techniques have all been linked to the spread of blood-borne illnesses [38]. This research found that a significant association between the sharing of sharp personal items, including razors, shaving machines, nail clippers, and HBV infection, corroborates results from a study done in South Brazil [7]. Furthermore, in the present study, the prevalence of a family history of HBV infection was greater in the case group compared to the control group. A study conducted in Iran indicated that family history was the predominant risk factor among HBV patients [39]. Similarly, three cross-sectional investigations indicated a robust correlation between a familial history of HBV and HBV infections [17, 18]. Furthermore, a case-control study revealed that the likelihood of catching the hepatitis B virus was around fourfold greater among persons exposed to hepatitis B cases at home compared to those unexposed [2]. HBV may persist for almost a week on dry surfaces; moreover, HBV is 100 times more infectious than HIV, complicating its epidemiology and increasing the risk of horizontal intra-familial transmission [37]. Furthermore, the majority of the cases in our research were uninformed about the modes of HBV, which elevates the likelihood of acquiring the infection [24].

In the present study, the main reasons for screening were pre-marriage, having symptoms of hepatitis B, pre-surgery, and pre-blood donation. In comparison, all guidelines recommend that people at high risk for acquiring HBV infection should be screened; these individuals include people living in locations with a high frequency of chronic HBV infection, individuals at high risk of contracting HBV, persons with an elevated risk of transmitting HBV, and those at risk of reactivation of HBV [40].

Regarding the limitations in this study, the main mode of HBV transmission is through sexual intercourse [41]. In this study, the participants were not questioned about extramarital sexual activity because this subject is taboo in our culture.

5. Conclusion

This study reported that most participants had no information about HBV transmission modes. Hepatitis B infection was strongly related to dental procedures, blood transfusions, cupping therapy (Hijamat), tattooing, and sharing sharp personal hygiene items. Health authorities should provide health education campaigns to the public to disseminate information about transmission methods and risk factors of HBV infection. Interventions should focus on reducing HBV risk factors; blood transfusion safety must be strictly controlled, and dental clinics should practice good infection control and sterilization. Control and regulate unhygienic practices performed by non-professionals, including cupping and tattooing, and restrict them under strict health supervision. Screening for HBV among high-risk groups for early diagnosis and treatment of missed cases. Vaccination programs against HBV should continue with an emphasis on high-risk groups.

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Conflict of interest

No conflicts of interest exist to declare.

Ethical approval

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of the Sulaimani Polytechnic University (Date: 27. 10. 2024 / No.: 13/245).

Author's contribution

The author actively contributed to the conception, design, data analysis, and preparation of the manuscript for this study. He has also reviewed and approved the final version of the manuscript.

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