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Research Article

Assessment of Knowledge, Attitude and Practices Regarding Hepatitis B Virus Infection Among Sulaimaniyah Registered Dentists: A Cross-Sectional Study

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Abstract. Background: The dental profession faces a significant risk of hepatitis B virus (HBV) contamination, highlighting the crucial role dentists play in controlling HBV cross-contamination. **Objectives:** To delve into various aspects related to HBV infection control among dentists including assessment of knowledge, examination of preventive measures, and exploration of attitudes. **Methodology:** In this observational cross-sectional study, a total of 100 dentists were interviewed

regarding their knowledge, practice, and attitude towards HBV-positive patients in Sulaimaniyah city, Iraq between January 2024 to 2025. Data collection was carried out using google forms and later was inserted into Microsoft excel and IBM SPSS for analysis. **Results:** Majority of participants were aged 36-40 years (36%), married (51%), held a Master's degree (42%), had their own clinic (79%), being vaccinated for HBV (87%), received 3 doses of vaccination (61%), checked for antibodies after vaccination (55%), and had 2-7 years in practice (34%). There were a significant association between knowledge, attitude and practice (p=0.000), as 50% exhibited good knowledge, 2% had good attitude, and 20% has good practice. Overall, the majority of individuals had fair to good levels of knowledge, while attitudes and practices toward oral health varied, with a significant portion demonstrating poor levels. Also, a significant association ($p<0.05$) between knowledge and each of gender, age and qualification were seen, while attitude was significantly related to marital status only (p=0.032), and practice had no significant association with either variable. **Conclusion:** The strong association between knowledge, attitude and practice has important implications for healthcare policies and interventions. It suggests that improving dentists' knowledge about HBV may positively influence their attitudes towards HBV-positive patients and lead to better practices in terms of patient care and infection control measures.

Keywords: Hepatitis B, dentists, knowledge, attitude, practice, oral health

INTRODUCTION

Hepatitis B virus (HBV) infection is a significant global health challenge, particularly in regions with intermediate to high endemicity, such as Iraq [1]. The nature of HBV infection varies from person to person, influenced by factors such as age at infection, immune status, and viral load. In Iraq, HBV prevalence is considered intermediate to high, emphasizing the significance of understanding its impact on the local population. Among viral infections, HBV stands as one of the most widespread, affecting a substantial portion of the global population, as approximately 2 billion individuals have been diagnosed with HBV, with >350 million identified as chronic carriers of the virus [2].

Prevalence rates vary across regions, with the highest incidences in the West Pacific (6.2%) and African (6.1%) regions. In contrast, the Americas exhibit the lowest incidence (0.7%) [3]. The spectrum of HBV infection encompasses various liver diseases, ranging from acute and chronic hepatitis to liver cirrhosis and hepatocellular carcinoma. HBV is transmitted through infected blood or body fluids, unprotected sex, sharing needles or syringes, and perinatal transmission from an infected mother to her newborn [4]. The clinical manifestations of HBV infection can vary widely, ranging from asymptomatic or mild flu- like symptoms to severe liver damage. Acute HBV typically presents with symptoms such as fatigue, abdominal pain, loss of appetite, nausea, vomiting, dark urine, jaundice, and joint pain. However, many individuals may remain asymptomatic, especially during the acute phase. Chronic HBV infection can lead to long-term complications, including liver cirrhosis, liver failure, and hepatocellular carcinoma [5].

The preventive role of HBV vaccination is significant in reducing the transmission and burden of HBV infection. HBV vaccination is the primary method for preventing HBV infection. By stimulating the immune system to produce antibodies against the HBV, the vaccine provides long-lasting protection against

infection. Vaccination is recommended for individuals at increased risk of HBV infection, including healthcare workers, people with multiple sexual partners, injection drug users, travelers to regions with high HBV prevalence, and those with certain medical conditions like chronic liver disease or HIV infection [6]. Treatment for HBV infection depends on the phase of the disease and includes antiviral medications to suppress viral replication and prevent liver damage. Public health interventions aimed at reducing the burden of HBV infection include universal vaccination programs, screening of high-risk populations, promoting safe injection practices, and raising awareness about HBV transmission and prevention [7].

Understanding the intricacies of HBV infection is imperative for healthcare professionals, including dentists, who play a vital role in the prevention, diagnosis, and management of this disease. Dental procedures involving blood or saliva present a potential risk of HBV transmission, underscoring the importance of strict infection control (IC) practices among dental practitioners [8]. Given the potential risks, it is imperative to prioritize IC practices in dental settings that includes comprehensive training for dental practitioners, adherence to strict protocols, and ongoing monitoring of compliance [9]. Despite global efforts to enhance IC measures, there is a lack of specific data regarding dentists' knowledge, attitudes, and practices concerning HBV infection in this locality. Therefore, this study aims to address this gap by investigating HBV-related knowledge, attitudes, and practices among dental practitioners in Sulaimaniyah city.

PARTICIPANTS AND METHODS

Study design and setting

This cross-sectional study was conducted on 100 registered dentists to gather their comprehensive insights (knowledge, attitudes and practices) towards HBV infection, from December 2024 to 2025 (in the span of 5 weeks) at ... Hospital, Sulaimaniyah city, Iraq, using a quantitative approach (non-random convenience sampling method).

Inclusion criteria

Registered (employed) dentists on active daily duty, regardless of age, gender, and nationality.

Exclusion criteria

Non-registered dentists.

Survey questionnaire

A validated (by 5 experts in the field) and reliable questionnaire was developed to assess dentists' knowledge, attitude, and practice regarding HBV infection through direct interviews. The questionnaire includes structured questions with multiple-choice options and Likert-scale items. It has 4 sections, focused on dentists' sociodemographic characteristic, knowledge (transmission routes, risk factors, and preventive strategies), attitude (understanding dentists' perceptions, beliefs, and practices related to HBV transmission and IC measures), and practice. Then, the

information scale of participants for each variable (knowledge, attitude, and practice) was classified as poor (<50%) with score 0 - 49, fair (50 - <75%) with score 50 - 74, and good (≥75%) with score 75-100.

Statistical analysis

The Statistical Package for Social Science (IBM, Chicago, USA) was used to analyze the data. Descriptive statistics (frequency, percentage, mean, and standard deviation) were calculated to summarize the quantitative data. Analytic statistics (Chi-square test) was utilized to explore relationships between knowledge, attitudes, and practices. The reliability of the statistics was measured using Alpha Cronbach (0.825) for 150 samples. A p-value was set as high significant (p< 0.001), significant (p< 0.05), or very highly significant (p<0.000).

RESULTS

Participants' sociodemographic and clinical data

There is a nearly equal split of gender distribution (49% male and 51% female), with majority aged 36-40 age (36%), married (51%), held a Master's degree (42%), had their own clinic (79%), being vaccinated for HBV (87%), received 3 doses (61%), checked for antibodies after vaccination (55%), and had 2-7 years in practice (34%) (Table 1).

Table 1. Sociodemographic and clinical data of the study participants.

Variable		Frequency	%
Gender	Male	49	49.0
	Female	51	51.0
Age (Years)	24-30	25	25.0
	31-35	24	24.0
	36-40	36	36.0
	41-50	10	10.0
Marital Status	Single	49	49.0
	Married	51	51.0
Academic Background	Diploma	0	0.0
	Bachelor	26	26.0
	Master of Science	42	42.0
	PhD Certified	17	17.0
	Board Certified	15	15.0
Having own clinic	No	21	21.0
	Yes	79	79.0
Been vaccinated for HBV	No	13	13.0
	Yes	87	87.0
Doses that have received if vaccinated	1	7	7.0
	2	19	19.0
	3	61	61.0

Checks for antibodies after vaccination	No	45	45.0
	Yes	55	55.0
Years in practice	1-2	23	23.0
	2-7	34	34.0
	7-12	22	22.0
	12-20	17	17.0
	>20	4	4.0
Total		100	100

Participants knowledge towards HBV infection

Among respondents, 77% considered the HBV to be a viral infection, while 10% associate it with autoimmune disease or bacterial infection, while 3% attribute it to fungal infection, with a total score of 77 (Good) (Table 2).

Table 2. Participants knowledge towards Hepatitis Virus B infection type.

Variable	Frequency	%	Total score	Result
Autoimmune disease	10	10	77	Good
Bacterial infection	10	10		
Fungal infection	3	3		
Viral infection	77	77		
Total	100	100		

The majority, believed that HBV replicated in all organs of the body (43%), while few attributed replications to specific organs or tissues (17% in liver, 16% in blood, 12% in liver and spleen or in the lymphatic tissues), with a total score of 43 (Poor) (Table 3).

Table 3. Hepatitis Virus B replication in the body organs and tissues according to the interviewed subjects.

Variable	Frequency	%	Total score	Result
All organs	43	43.0	43	Poor
Blood	16	16.0		
Liver and spleen	12	12.0		
Liver	17	17.0		
Lymphatic tissues	12	12.0		
Total	100	100.0		

Regarding the HBV incubation period, 26% expressed uncertainty about the

duration, 25% suggested 1-3 weeks, while 12% suggested 10 to 30 days after infection, with a total score of 14 (Poor) (Table 4).

Table 4. Incubation period perception of the Hepatitis B Virus according to the interviewed subjects.

Variable	Frequency	%	Total score	Result
Not sure	26	26.0		
One to 3 weeks	25	25.0		
2 to 6 weeks	23	23.0		
6 weeks to 6 months	14	14.0		
10 to 30 days	12	12.0	14	Poor
Total	100	100.0		

Most participants (57%) believed that transmission primarily occurs through blood, 23% perceived lymphatic transmission, while 13% indicated tissue transmission and 7% mentioned saliva, with the total score of 57 (Fair) (Table 5).

Table 5. Hepatitis B Virus transmission route according to the interviewed subjects.

Variable	Frequency	%	Total score	Result
Blood	57	57.0		
Lymphatic	23	23.0		
Saliva	7	7.0		
Tissue	13	13.0	57	Fair
Total	100	100.0		

Also, 37% participants believed that HBV was sensitive to all conditions, while 24% perceived low temperature and ultraviolet rays, with the total score of 37 (Poor) (Table 6).

Table 6. Hepatitis B Virus sensitivity according to the subjects' perception.

Variable	Frequency	%	Total score	Result
Dryness	15	15.0		
Low temperature	24	24.0		
Ultraviolet ray	24	24.0		
All	37	37.0	24	Poor
Total	100	100.0		

High portion of respondents (78%) identified HBV as the most prevalent type

spreaded within dental settings, 15% attributed the spread to Hepatitis C, 5% to Hepatitis A, and 2% to Hepatitis D, with the total score of 78 (Good) (Table 7).

Table 7. The hepatitis viral types that are predominantly spread among dentists' work.

Variable	Frequency	%	Total score	Result
Hepatitis A	5	5.0		
Hepatitis B	78	78.0		
Hepatitis C	15	15.0		
Hepatitis D	2	2.0	78	Good
Total	100	100.0		

Whereas 95% of respondents considered all patients as potential carriers of HBV, with the total score of 95 (Good). Additionally, 43% believed that a booster dose should be administered under all conditions, while some respondents attributed the need for a booster dose to immunosuppression (21%), chronic kidney and liver diseases (17%), low antibody level (13%), and high-risk exposure (6%), with the total score of 43 (Poor) (Table 8).

Table 8. The conditions under which a booster dose against the Hepatitis B Virus should be administered.

Variable	Frequency	%	Total score	Result
Chronic kidney and liver diseases	17	17.0		
High risk exposure groups	6	6.0		
Immunocompromised patients	21	21.0		
Low antibody levels	13	13.0		
All of the above	43	43.0	43	Poor
Total	100	100.0		

Furthermore, 35% of dentists believed that antibody titers can be detected immediately after completing the vaccination series, while 14% believed that it can be detected 1- 10 hours after vaccination, with the total score of 29 (Poor) (Table 9).

Table 9. The duration after finishing the Hepatitis B Virus vaccination series when antibody titers can be detected in an individual's blood.

Variable	Frequency	%	Total score	Result
A day to a week	22	22.0		
One to 10 hours	14	14.0		

One to 2 months	29	29.0		
It can be detected immediately after completing the vaccination series	35	35.0	29	Poor
Total	100	100.0		

Moreover, 42% believed that HBV can persist in dry environments for at least 7 days or possibly longer, with the total score of 42 (Poor) (Table 10).

Table 10. The duration for which Hepatitis B Virus can persist in dry environments without sterilization.

Variable	Frequency	%	Total score	Result
2 hours	21	21.0		
30 minutes	19	19.0		
One day	18	18.0		
At least seven days or possibly longer	42	42.0	42	Poor
Total	100	100.0		

Participants attitude towards HBV infection

Most respondents (75%) agreed to examine and treat HBV patients/carriers, with a mean score of 2.65±0.66 and a total score of 165 (Good). Also 78% agreed to treat HBV-positive patients/carriers as well, with a mean score of 2.71±0.59, and a total score of 171 (Good). In terms of the perception of HBV rarity and danger, 72% disagreed that HBV is not potentially dangerous, with a mean score of 1.40 ± 0.70, and a total score of 160 (Good). Almost 79% agreed to treat HBV patients/carriers only if full protection were available, with a mean score of 2.70±0.63 and a total score of 170 (Good). Regarding equal respect and care for both healthy and HBV-positive patients, 78% agreed with a mean score of 2.68±0.65 and a total score of 168 (Good). In terms of societal treatment of HBV-positive individuals, 79% agreed that society should not reject or dismiss them, with a mean score of 2.75±0.51, and a total score of 175 (Good). Concerning penalizing dentists who avoid treating HBV-positive patients, 47% disagreed, with a mean score of 1.80±0.84, and a total score of 80 (Poor). Regarding hesitancy to treat HBV-positive patients due to infection concerns, 58% disagreed, with a mean score of 1.65±0.83, and a total score of 135 (Fair). For the statement about leaving practice if clinic policies oblige treating HBV-positive patients, 57% disagreed, with a mean score of 1.70±0.87, and a total score of 130 (Fair). Concerning the curability of HBV and its impact on treatment decisions, 63% disagreed that HBV-positive patients may not be treated, with a mean score of 1.52 ± 0.75, and a total score of 148 (Fair). Regarding the suggestion to charge HBV-positive patients more for dental care, 72% disagreed, with a mean score of 1.40±0.70, and a total score of 160 (Good). In terms of penalizing asymptomatic HBV-positive carriers who do not disclose their condition, 44% disagreed, with a mean score of 1.88±0.87, and a total score of 112 (Fair).

Concerning the provision of dental care for HBV-positive patients at specific

clinics, 39% agreed, with a mean score of 2.06±0.85, and a total score of 94 (Poor) (Table 11).

Table 11. Distribution of attitude among participants towards Hepatitis B Virus.

Attitude	Disagree Frequency (%)	Not sure Frequency (%)	Agree Frequency (%)	Mean±SD	Total Score	Result
I would willingly examine and treat HBV patients/carriers (Agree)	10	15	75	2.65±0.66	165	Good
Since my duty is to treat all dental patients, I would treat HBV-positive patients/carriers as well (Agree)	7	15	78	2.71±0.59	171	Good
HBV is extremely rare, is not potentially dangerous, and the fear of HBV is due to adverse propaganda (Disagree)	72	16	12	1.40±0.70	160	Good
I would treat HBV patients/carriers only if full protection were available (Agree)	9	12	79	2.70±0.63	170	Good
Both healthy and HBV-positive dental patients are equally respected and both deserve complete dental care/treatment (Agree)	10	12	78	2.68±0.65	168	Good
Society should not reject or dismiss	3	19	79	2.75±0.51	175	Good
Dentists who avoid treating HBV-positive patients/carriers should be penalized (agree)	47	26	27	1.80±0.84	80	Poor

I hesitate to treat HBV-positive patients/carriers out of concern of becoming infected (Disagree)	58	19	23	1.65±0.83	135	Fair
If clinic policies oblige me to treat HBV-positive patients/carriers, I would leave practice (Disagree)	57	16	27	1.70±0.87	130	Fair
Since hepatitis B is not certainly curable, I may not treat HBV-positive patients/carriers (Disagree)	63	22	15	1.52±0.75	148	Fair
HBV-positive patients/carriers should be charged more than normal patients are (Disagree)	72	16	12	1.40±0.7	160	Good
Asymptomatic HBV-positive carriers who do not state their condition should be penalized (Disagree)	44	24	32	1.88±0.87	112	Fair
HBV-positive patients/carriers should receive dental care at specific clinics (Disagree)	33	28	39	2.06±0.85	94	Poor

Participants practice towards HBV infection

Most respondents (77%) believed that using a protective face shield was necessary when treating patients positive for HBV, with a total score of 77 (Good). Most respondents (68%) correctly identified sterilization as the process of completely destroying or eliminating all forms of microbial life, including bacteria, viruses, fungi, and spores, while disinfection is recognized as the process of reducing the number of pathogenic microorganisms on surfaces and in the environment to a level considered safe for public health. This accuracy resulted in a total score of 68 (Fair level of understanding). Conversely, 28% of respondents provided an incorrect understanding of the definitions (Table 12).

Table 12. Indicates the differences between sterilization and disinfection.

Variable	Frequency	%	Total score	Result
No	4	4.0	68	Fair
Disinfection is the process of completely destroying or eliminating all forms of microbial life, including bacteria, viruses, fungi, and spores while sterilization is the process of reducing the number of pathogenic microorganisms on surfaces and in the environment to a level that is considered safe for public health	28	28.0		
Sterilization is the process of completely destroying or eliminating all forms of microbial life, including bacteria, viruses, fungi, and spores while Disinfection is the process of reducing the number of pathogenic microorganisms on surfaces and in the environment to a level that is considered safe for public health	68	68.0		
Total	100	100.0		

Also, majority of respondents (51%) believed that sterilization is more effective in preventing HBV infection, resulting in a total score of 51 and indicating a fair level of preference. Conversely, 20% of respondents favored disinfection as the more effective method, while 29% believed both methods are equally effective (Table 13).

Table 13. Indicates which method is more effective in preventing Hepatitis B infection.

Variable	Frequency	%	Total score	Result
Both are equally effective	29	29.0	51	Fair
Disinfection	20	20.0		
Sterilization	51	51.0		
Total	100	100.0		

Additionally, 54% of respondents believed moist heat was effective in killing the HBV, resulting in a total score of 54 and indicating a fair level of recognition. Conversely, 46% identified dry heat as a method for killing the virus. Table 14 indicates that 59% of respondents believed that an autoclave was the device used for sterilization against HBV, resulting in a total score of 59 (Fair level of recognition). Conversely, 16% of respondents mentioned using an oven, while 24% indicated both devices, and only 1% mentioned none.

Table 14. Indicates the most effective device used for sterilization against Hepatitis B Virus.

Variable	Frequency	%	Total score	Result
None	1	1.0	59	Fair
Oven	16	16.0		
Autoclave	59	59.0		
Both	24	24.0		
Total	100	100.0		

Table 15 reveals that respondents had varying perceptions of the duration required for sterilization to eradicate HBV from dental equipment, as 30% of respondents believed it takes 40 minutes, while 28% indicated 20 minutes, and 26% suggested both 10 and 30 minutes. This resulted in a total score of 26, indicating a poor level of consensus on the appropriate duration for sterilization.

Table 15. Indicates the duration required for sterilization to eradicate Hepatitis B Virus from dental equipment.

Time (Minutes)	Frequency	%	Total score	Result
10	16	16.0	26	Poor
20	28	28.0		
30	26	26.0		
40	30	30.0		
Total	100	100.0		

Table 16 displays respondents' perceptions regarding the required temperature qualifications for sterilizing dental equipment from the HBV, as 40% of respondents believed that 140°C is necessary, while 27% indicated 130°C, 21% mentioned 100°C, and 12% suggested 80°C. This resulted in a total score of 27, indicating a poor level of consensus on the appropriate temperature qualification for sterilization.

Table 16. Indicates the required temperature for sterilizing dental equipment from Hepatitis B Virus.

Temperature (°C)	Frequency	%	Total score	Result
80	12	12.0	27	Poor
100	21	21.0		
130	27	27.0		
140	40	40.0		
Total	100	100.0		

Table 17 illustrates respondents' perceptions regarding surface disinfectants, in which 36% of respondents believe that formaldehyde, glutaraldehyde, and halogen compounds were surface disinfectants, resulting in a total score of 36 (Poor level of consensus on the correct surface disinfectant among respondents).

Table 17. Indicates the surface disinfectants to kill Hepatitis B Virus.

Disinfectant	Frequency	%	Total score	Result
Formaldehyde	33	33.0	36	Poor
Glutaraldehyde	11	11.0		
Halogen compounds	20	20.0		
All	36	36.0		
Total	100	100.0		

Table 18 demonstrates respondents' perceptions regarding disinfectants capable of inactivating the HBV, and 55% believed that alcohols were effective, resulting in a total score of 55 (Fair).

Table 18. Indicates the disinfectants that can inactivate Hepatitis B Virus most effectively.

Item	Frequency	%	Total score	Result
Alcohols	55	55.0	55	Fair
Halogen containing compounds	6	6.0		
Phenols	26	26.0		
Quaternary ammonium compounds	13	13.0		
Total	100	100.0		

Furthermore, a descriptive analysis showed that 80% of dentists always used gloves while treating patients, 65% always used oronasal masks. Moreover, 67% of the participants never used disposable caps, 60% never used protective eye wear, and 55% never used face masks (Table 19).

Table 19. Indicates preventive practices of dentists regarding Hepatitis B Virus in terms of using PPE.

Item Frequency (Percentage)	Always	Mostly	Never	Total
Gloves	80.0	18.0	2.0	100
Oronasal mask	65.0	32.0	3.0	
Protective-eye wear	6.0	34.0	60.0	
Face mask	16.0	29.0	55.0	

Disposable cap	3.0	30.0	67.0	
Gown	50.0	38.0	12.0	

Participants' level of knowledge, attitude, and practice towards HBV infection

Regarding the participants' knowledge, 14% demonstrated poor, 36% showed fair, and 50% exhibited good. In terms of attitude, 50% had a poor, 48% had fair, and 2% had good. Regarding practice, 56% were categorized as poor, 24% as fair, and 20% as good. Overall, the majority of individuals had fair to good levels of knowledge, while attitudes and practices toward oral health varied, with a significant portion demonstrating poor levels (Table 20).

Table 20. The participants level of knowledge, attitude and practice.

Variable	Knowledge		Attitude		Practice	
	Frequency	%	Frequency	%	Frequency	%
Poor	14	14.0	50	50.0	56	56.0
Fair	36	36.0	48	48.0	24	24.0
Good	50	50.0	2	2.0	20	20.0
Total	100	100.0	100	100.0	100	100.0

There were very high significant association between participants' knowledge and each of attitude (χ^2=27.523, p=0.000) and practice (χ^2=22.63, p=0.000) (Table 21).

Table 21. Association between knowledge, attitude and practice towards Hepatitis B Virus.

Knowledge	Attitude Frequency (%)				Practice Frequency (%)			
	Poor	Fair	Good	Total	Poor	Fair	Good	Total
Poor	7	7	0	14	11	2	1	14
Fair	7	29	0	36	10	11	15	36
Good	36	12	2	50	35	11	4	50
Total	50	48	2	100	56	24	20	100
	χ^2=27.523		p=0.000**		χ^2=22.63		p=0.000**	
**: Very high significant association, using Chi-square test								

Regarding the correlation of participants' sociodemographic data to their knowledge, attitude, and practice towards HBV, a significant association ($p<0.05$) between knowledge and each of gender, age and qualification were seen, attitude was significantly related to marital status only (p=0.032), and practice had no significant association with either variable (Table 22).

Table 22. The correlation of participants' sociodemographic data to their knowledge, attitude, and practice towards Hepatitis B Virus.

Sociodemographic		Knowledge			Attitude			Practice		
		Mean	SD	p-value	Mean	SD	p-value	Mean	SD	p-value
Gender	Male	17.5	5.1		4.0	2.0		4.7	2.2	
	Female	19.8	4.9	0.022*	4.3	2.3	0.524	4.2	1.9	0.23
Age (Years)	24-30	20.4	4.1		3.7	2.2		4.4	2.4	
	31-35	20.7	4.1		4.1	2.4		4.8	2.4	
	36-40	19.8	3.8		3.8	2.2		4.5	2.2	
	41-50	13.9	5.3	0.000***	3.8	1.5	0.394	3.6	0.7	0.751
Marital status	Single	17.9	5.7		3.7	2.0		4.2	1.9	
	Married	19.4	4.4	0.134	4.6	2.2	0.032*	4.7	2.2	0.227
Qualification	Bachelor	16.5	5.4		3.8	2.3		4.2	2.1	
	Master of Science	19.4	4.4		4.6	2.4		5.0	2.3	
	PhD Certified	15.8	6.6		3.4	1.8		3.4	1.4	
	Board Certified	19.8	5.2	0.01*	3.5	2.0	0.672	3.2	1.4	0.09

*: Significant difference, ***: Very highly significant difference, using Chi-square test

DISCUSSION

HBV infection continues to pose a considerable health burden globally, including Sulaimaniyah city, Iraq. Understanding the complexities of HBV infection and its impact on dental practitioners is crucial for effective prevention and control efforts [10]. Research focusing on dentists' knowledge, attitudes, and practices regarding HBV infection can inform targeted interventions to improve IC practices and reduce transmission rates in dental settings. Thus, this research seeks to contribute to the existing literature by evaluating dentists' knowledge, attitudes, and practices regarding HBV infection, with the ultimate goal of improving IC practices and reducing transmission rates in dental settings.

Accordingly, this study showed that the majority of the dentists were vaccinated for HBV (87%), while non- vaccinated participants were 13%, which is lower than that published among Malaysian dental professionals (32%) [10], Indian healthcare professionals (27.7%) [11] and Pakistanian health care workers (22%) [12], but it was higher than that reported among dentists in Brazil (10%) [13]. The fact that a majority of our participants who reported being vaccinated against HBV were young (<35 years) and had fewer years of professional experience that could be viewed positively. This can suggest a heightened awareness among younger individuals regarding protective measures against the HBV. In contrast, another study revealed that individuals aged <37 years, particularly surgeons or dentists, who had fewer years of professional experience, were more likely unvaccinated [14].

This study also showed that 68% of the sample received the three obligatory dosages of HBV vaccine and the majority checked for antibodies after vaccination. It is noteworthy that the respondents who had received three doses of the HBV vaccine is lower than that reported among health workers in tertiary care hospital in Croatia (86%) [15], dental professionals of the Military Hospital in Saudi Arabia (85.7%) [16], and Brazilian dentists (73.8%) [13]; however, its higher than that reported among Italian dentists (56.2%) [17] and Lithuanian general dental practitioners (35.9%) [18].

Healthcare professionals in Nigeria, expected to possess extensive knowledge and susceptibility to HBV infection, with highest level of apathy towards the vaccination program [19], and this is a possible explanation for the dentists who had not received the full vaccination package in this study. In addition, the results of the present study showed that the dentists had fair to high knowledge (36 and 50%, respectively) regarding the infection prevention and control measures of HBV. This is incompatible with another study [20], which estimated that dentists have low to average awareness of HBV transmission and management strategies (67 and 30%, respectively). Kakouei et al. have shown that lack of knowledge on the value of sterilization may contribute to transmission of pathogens [21], while Leon et al. have shown that 93 % of participants have little or no awareness of prevention measures [22]. Whereas Alsaigh et al. have observed that only 16 % of dentists used conventional recommendations for prevention [23]. Certain inadvertent reactions in dentistry to infectious patients can be prevented by adhering to recommendations for IC. In instances where contact and exposure cannot be avoided, timely vaccination and adhering to good practices will effectively prevent infection and its associated adverse effects.

The current study also showed that 50% of the participants had poor attitudes towards treating patients with HBV. Another study on dentists revealed that the fear of transmitting infection to their families, to other personnel, losing patients, coupled with the high costs associated with recommended measures to prevent and control HBV infection in case of a positive test result, and lack of moral responsibility to treat these patients were observed to play a significant role in rejecting HBV patients by dentists [24]. According to Rabiee et al., 26.3% of dentists exhibited a negative attitude, while 73% showed a positive attitude towards HBV cases [20]. Furthermore, dentists' positive attitude towards managing high-risk patients and their significant concern for both their own safety and the potential spread of infection to others mirrors findings from previous study [20].

This study also showed that there was an association between gender and vaccination status with a predominance in the females compared to the male gender, which is in accordance with another study that shows a higher predominance of HBV vaccination among female dentists. Moreover, this study showed that the dentists were practicing standard precautions, such as wearing gloves and oranasal masks yet did not adhere fully to the prevention practices against HBV, such as wearing disposable caps, face masks, and protective eye wear. In relation with these findings, Ajami et al. found that 27% registered poor practice, 60% demonstrated fair practice, and 12% indicated good practice with respect to HBV infections [25]. To prevent cross-contamination, wearing gloves is an important protective way. Using dental tools carelessly may result

in increased risk of cross-contamination by breach or hole in the glove or even hand cutting. A research on IC by Fay et al. in Sweden found that participants paid close attention to using preventive coatings, masks and gloves but less attention was given to equipment sterilization [26]. In the current research, the experience of dentists with regard to protective coatings indicated more informal use of protective equipment, which may be attributed to the affordability of this equipment. Askarian et al. observed that human behavior was low to standard safety procedures given the participants' appropriate awareness and attitude, suggesting that comprehension of IC methods and positive attitude as standards of exposure management are not sufficient to prevent infection. A comprehensive series of exposure management systems for healthcare professionals, particularly dentists, should be implemented to reduce or eliminate the risk of infection transmission to both dental practitioners and patients [27].

A study in Iran by Khosravanifard et al. [28] had some advantages over this study in terms of its methodology compared with other knowledge, attitude and practice studies of professionals in different branches of medicine towards infectious diseases. However, a better score of knowledge was noted in our study. Also, there was a weak correlation between categorized knowledge and attitude in the Iranian study [28], while this study indicates a significant association between knowledge ($p=0.000$) in relation to attitude and practice ($p<0.05$). Therefore, the strong association found in this study has important implications for healthcare policies and interventions. It suggests that improving dentists' knowledge about HBV may positively influence their attitudes towards HBV-positive patients and lead to better practices in terms of patient care and IC measures. The difference in these findings could be attributed to differences in sample size, demographics, cultural contexts, and methodologies used to assess knowledge, attitude, and practice. It's also possible that healthcare practices and attitudes towards infectious diseases like HBV vary between regions, leading to divergent results.

Khosravanifard et al. [28] were scored knowledge of dentists toward HBV as poor to moderate. This may stem from various factors, including cultural norms, healthcare policies, and the specific context of each study. Both studies underscore the importance of targeted educational interventions to improve dentists' knowledge and attitudes regarding HBV. Strategies such as continuing education programs, workshops, and online resources can enhance awareness and understanding among dental professionals. Furthermore, advocate for policies and practices that promote inclusive patient care and discourage discrimination based on medical conditions such as HBV should be enhanced.

One potential limitation of this study could be the small sample size and representativeness of the surveyed dentists. The defined sample size of 100 dentists may not be representative of the overall population of dentists in the city and limit the generalizability of the findings. Another limitation to consider is self-reporting bias, since this study relies on dentists' self-reported knowledge, attitudes, and practices regarding HBV, there may be a risk of overestimation or underestimation of certain factors due to social desirability bias or recall bias. The cross-sectional design of this study also may limit the ability to establish causal relationships between variables that

provides a snapshot of dentists' knowledge, attitudes, and practices at a specific point in time but cannot determine the temporal sequence or cause- and-effect relationships. Thus, further research in this area is encouraged, utilizing larger sample sizes to delve deeper into variations in perceptions among diverse populations.

CONCLUSION

Most dentists were vaccinated against HBV, and a majority had received the full required dosage for effective prevention. The dentists generally possessed moderate to significantly substantial knowledge about HBV infection prevention measures, including vaccination, adherence to standard precautions, and equipment management. However, a negative attitude among dentists were observed. An association between knowledge, attitude, and practice of the dentists may indicate that improving dentists' knowledge can consequently improve their attitude and practice. Based on these findings, it is suggested that national initiatives promoting HBV vaccination be launched, specifically targeting dentists. These campaigns should include mechanisms for monitoring compliance with vaccination requirements among healthcare facilities and professionals. Moreover, educational sessions tailored for dental practitioners are advised to enhance their understanding and promote effective practices in HBV infection prevention and control. Implementing IC audits in dental clinics is recommended to ensure the adequate prevention of transmission.

Declarations

Ethics approval and consent to participate: Approval (number 129) was granted from the ethical committee of college of medicine/ University of Sulaimani, Iraq. The work was implemented in accordance with international guidelines and 2008 declaration of Helsinki. Verbal consent ensuring the preservation of subject confidentiality.

Consent for publication: Not applicable.

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