

# Knowledge, attitudes, and practice about hepatitis B infection among primary health care nurses in Buraidah, Qassim Region, Saudi Arabia

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## ABSTRACT

**Background:** Nurses are at increased risk of acquiring HB infection due to occupational exposure. To control this infection, basic knowledge and a positive attitude toward HB prevention are required. This study was conducted to assess knowledge, attitude, and practice of HB infection preventative measures among primary healthcare nurses in Buraidah, Saudi Arabia. **Materials and Methods:** A descriptive cross-sectional survey was conducted from February to March 2018. A self-administered questionnaire was distributed to all nurses working in primary healthcare centers. Data were analyzed with descriptive and inferential statistics. **Results:** Of the 335 eligible participants, 262 (78%) responded to the survey. Overall, 41.2% of participants had a moderate level of knowledge about HB; however, there was no significant difference in knowledge between males and females. The majority (94.7%) had positive attitudes toward HB. Male nurses displayed significantly more positive attitudes than female nurses ( $P=0.0075$ ). Most of the respondents practiced good compliance with universal precautions. The majority (85.5%) were vaccinated, of whom 72.3% were completely vaccinated. About 14.1% of nurses were exposed to high-risk HB conditions; of these, 40.5% immediately reported their injuries. **Conclusions:** The majority of participants had moderate knowledge and a positive attitude but still need more information about HB prevention. Improving knowledge, attitudes, and good practices regarding hepatitis B prevention will contribute to increased awareness among nurses, leading to improvement in healthcare services.

**Keywords:** Attitude, Hepatitis B, Kingdom Saudi Arab, Knowledge, Nurses, Practice, Workers

## Introduction

Hepatitis B virus (HBV) infection is a potentially life-threatening liver infection worldwide,<sup>[1]</sup> with an estimated 296 million people chronically infected according to the World Health Organization (WHO).<sup>[1]</sup> More than 820,000 people die each year due to complications of HBV infection.<sup>[1]</sup>

In the Kingdom of Saudi Arabia (KSA), HBV and hepatitis C virus are the most common and important causes of cirrhosis

and HCC requiring liver transplantation, resulting in an increased healthcare system burden.<sup>[2]</sup> In 2021, the Saudi Ministry of Health (MOH) ranked hepatitis B (HB) as the first most common notifiable infectious disease.<sup>[3]</sup> HBV is transmitted by contact with infected blood or body fluids such as saliva, menstrual, vaginal, and seminal fluids. It survives on environmental surfaces for at least 7 days.<sup>[1,4]</sup>

Healthcare workers (HCWs) are at high risk for HBV infection, because of their occupational exposure to needlestick and sharps injuries (NSSIs).<sup>[5]</sup> The Centers for Disease Control and Prevention (CDC) estimate that each year, 385,000 NSSIs occur among HCWs, most (41.9%) of which involve nursing staff.<sup>[6]</sup>

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Among all HCWs, nurses comprise nearly 50% of healthcare providers and are one of the largest risk groups for HBV infection. Handling blood and blood-related product as part of their duties puts them more at risk of NSSI compared to other HCWs.<sup>[3,6,7]</sup>

To protect themselves as well as their patients, nurses should have adequate knowledge about mode of HB transmission, as well as positive attitudes and good medical practices regarding HB prevention and treatment.

Several gaps in the knowledge, attitudes, and practice (KAP) of HCWs regarding HBV infection have been reported.<sup>[8-10]</sup> Although studies in KSA have been conducted for HBV infection, there have been very few studies evaluating the KAP of HBV infection among primary HCWs.<sup>[11,12]</sup> On the literature review, we did not find studies conducted among primary healthcare (PHC) nurses in the Qassim region. Thus, the aim of the study was to evaluate KAP toward HB infection among PHC nurses in Buraidah, Qassim region, KSA. The objectives were to determine the level of knowledge and attitude and assess practices regarding HBV infection among PHC nurses. In addition, HBV KAP between the male and female PHC nurses was compared.

## Materials and Methods

A cross-sectional survey was conducted among PHC nurses in Buriadah city, Saudi Arabia, during 4 weeks from February to March 2018. There are 44 PHC centers in Buraidah. The total number of nursing staff in Buriadah PHC was obtained from official statistics of the Directorate of Health Affairs in the Qassim region. According to the official list, there were a total of 335 nurses (male = 94 and female = 241) at all PHC centers in Buraidah. Taking a universal sample, all nurses were included in the study, from any ethnicity and all ages. The student nurses and dental assistants were excluded.

The sample size was calculated using a survey random sample calculator, and the sample size was calculated electronically. The criteria used for sample size calculation are as follows:

Population size: 335

Confidence level: 95%

Margin of error:  $\pm 5\%$

Based on the above criteria, the calculated sample size was 179. Assuming a survey response rate of 70%, the sample size became 256 nurses.<sup>[13]</sup>

Although an official list of the number of male and female nurses in individual PHC centers was available, the sampling frame for nurses containing names of individual nurses was not available. So, we selected PHC centers by random sampling and then included all nurses in the selected PHC centers, as participants in our study. According to the list obtained from the Directorate of

Health Affairs in the Qassim region, a total of 335 nurses were working in 44 PHC centers in Buraidah. Taking a mean of 7.6 per PHC center, we selected 34 PHC centers to achieve a sample of 256 nurses. Some nurses were not available at the time of the survey. Thus, for achieving the calculated sample size, we decided to include all PHC centers in the Buraidah region.

The data were collected using bilingual pretested self-administered questionnaires. The contents were adapted from available questionnaires validated in previous studies on the same topic and with similar objectives.<sup>[14-18]</sup> The answers to the knowledge questions were verified using relevant CDC resources.<sup>[19]</sup> The reliability of the questionnaires of previously published studies was tested by the Cronbach alpha method. Since the participants' native language was Arabic, the instrument was translated from English into Arabic and then back translated to English. The instrument was reviewed by experts as Family Medicine, Internal Medicine, and English literature working as a medical report's translator, to check the lucidity and propriety of the elements and translation. The questionnaire was pretested in English and Arabic language during a pilot study and was provided to all nurses working in one PHC center in Buraidah that was randomly chosen from the PHC centers list.

The questionnaire was divided into four parts. Part I had questions about the demographic characteristics. Part II was about knowledge of HB. The correct answer to the questions was "yes" or "no"; the answers in the questionnaires were compared to a template with the correct answers. Part III was about attitudes toward HB. Part IV was about practices regarding HB prevention. The answer to all questions had positive statements. Responses were recorded using a five-point Likert scale, where 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree. The knowledge and attitude scores were categorized into three levels using Bloom's cut-off point.<sup>[20]</sup> The knowledge score was classified as low level ( $\leq 59$ ), moderate level (60–79), and good level (80–100); the attitude score was classified as negative attitude ( $\leq 59$ ), neutral attitude (60–79), and positive attitude (80–100).

The researcher went to PHC centers to distribute the questionnaires among nurses. Before questionnaires were given to the participants, the purpose of the study was explained to both the director of the PHC center and to the participants, who signed a written consent form. To maintain data accuracy, the questionnaire was completed in the presence of the researcher, so that the participants did not consult each other or use the internet to seek answers to the knowledge questions. The responses were checked for completeness at the same visit. All incomplete questionnaires were returned to the respective nurses on the same visit, for completion. Some nurses were not available at the time of the survey. To achieve a high response rate, another visit was made to those centers where all nurses were not available at the time of the survey.

Data were analyzed using both descriptive and inferential statistics using the Statistical Package for the Social Sciences.

The Chi-square test, independent samples *t*-test, one-way analysis of variance, and Kruskal–Wallis test were used to determine if there was any significant difference in the level of knowledge and attitude between genders and association of knowledge and attitude scores with demographic characteristics. The Chi-square test and Fisher’s exact test were used to describe the association between the knowledge category and practice questions. *P* < 0.05 was considered statistically significant.

Ethical approval was obtained from Qassim Region Research Ethics Committee, and permission to conduct the study was also obtained from the director of Public Health Sector in Buraidah. The participants signed a written consent form that clearly stated the confidentiality and voluntary nature of the research, indicating that participants were free to decline to participate. The questionnaire did not collect the participants’ identifying particulars, ensuring anonymity.

### Results

The total number of nurses available during data collection was 262/335, of whom 191 were females and 72 were males. The overall response rate was 78%. The participant age was 20–30 years for females (59.2%) and 31–40 for males (81.7%) [Table 1].

The majority of participants answered more than 60% of the questions correctly regarding knowledge about HBV. The highest scored question, which was correctly answered by 97.7% of the respondents, was regarding HBV transmission by blood donation from an infected person, whereas the lowest scored question (42%) was about the fact that people do not get infected with HBV by drinking contaminated water. There was no significant difference between genders in most of the knowledge questions [Table 2]. The majority of nurses (41.2% [108/262]) had a moderate level of HBV knowledge [Figure 1].

**Table 1: Socio-demographic characteristics of the nurses**

Demographic characteristics	Total		Males		Females	
	<i>n</i>	(%)	<i>n</i>	(%)	<i>n</i>	(%)
Age (years) ( <i>n</i> =262)						
≤30	121	46.2	8	11.3	113	59.2
31–40	126	48.1	58	81.7	68	35.6
41–65	15	5.7	5	7.0	10	5.2
Marital status ( <i>n</i> =262)						
Single	32	12.2	5	7.0	27	14.1
Married	222	84.7	65	91.5	157	82.2
Widowed	2	0.8	0	0.0	2	1.0
Divorced	6	2.3	1	1.4	5	2.6
Nationality ( <i>n</i> =262)						
Saudi	255	97.3	71	100.0	184	96.3
Non-Saudi	7	2.7	0	0.0	7	3.7
Years of experience ( <i>n</i> =252)						
≤10	170	67.5	15	23.1	155	82.9
11–20	68	27.0	43	66.2	25	13.4
21–40	14	5.6	7	10.8	7	3.7

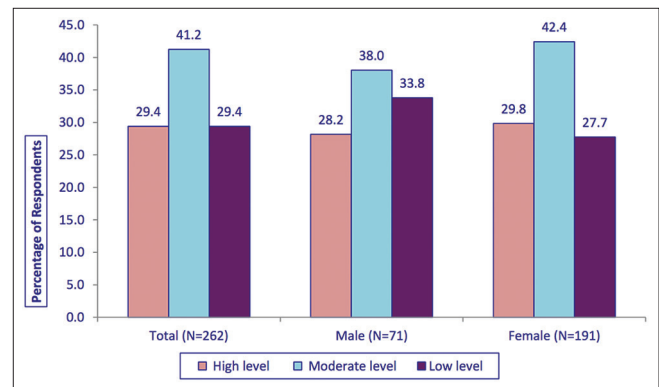
The majority of female nurses (93%) and all male nurses had total scores between 24 and 30, indicating that they had positive attitudes regarding HBV infection. Fourteen (7%) female nurses had a neutral attitude toward HB infection. Overall, there was no negative attitude among the nurses [Tables 3 and 4].

Exposure to high-risk HB conditions (e.g. percutaneous injury) occurred in 14.1% (37/262) of the nurses, the majority of whom were females (75.7% [28/37]) compared to 24.3% (9/37) of males. For respondents with an exposure history, potential options were listed in the questionnaire; the most common measure taken after exposure was washing with soap and water (72.97% [27/37]). Almost half of the nurses knew about the patient’s disease (51% [19/37]), and 40.5% (15/37) immediately reported their injury; however, 10.8% (4/37) of the nurses allowed the injury to bleed. Among other steps, the participants did HB serology, communicated with the infection control department and consulted the physician [16% [6/37]; Table 5]. A total of 224 (85.5%) nurses had been vaccinated against HBV, of whom most of them (72.3% [162/224]) had received the complete three-dose series [Figure 2]. Of the 21 nurses who had not received the HB vaccine, the most common reason was being too busy [11/21; Figure 3].

In this study, about 77.5% of nurses reported that they had not attended a continuing medical education (CME) program about HB infection. A statistically significant association was found between receiving the vaccine and attending a CME program about HB infection [*P* = 0.019; Table 5].

### Discussion

HBV infection remains the major cause of liver-related morbidity and mortality and is the tenth leading cause of mortality worldwide.<sup>[14]</sup> The knowledge of nurses about HB is an important aspect of prevention, as well as helping and treating people infected with the virus. In this study, less than half (43.9%) of the participants correctly answered that HBV is not transmitted through eating utensils. This finding showed a low level of knowledge of these daily life issues, which may result in social problems. Other studies have also reported a low level of knowledge on this aspect; only 24.7% of Iranian nurses<sup>[15]</sup>



**Figure 1:** Frequency distribution of level of knowledge of nurses and differences between the genders

**Table 2: Distribution of the participants according to their knowledge of hepatitis B and differences between the genders**

Knowledge	Total (n=262)		Males (n=71)	
	Correct answer n (%)	Incorrect answer or did not know n (%)	Correct answer n (%)	Incorrect answer or did not know n (%)
Do people get hepatitis B from genes (heredity)? *No	173 (66.0%)	89 (34.0%)	46 (64.8%)	25 (35.2%)
Can hepatitis B transmitted by unsterilized syringe, needle, and instrument? *Yes	247 (94.3%)	15 (5.7%)	65 (91.5%)	6 (8.5%)
Do people get hepatitis B from a blood donation from an infected person? *Yes	256 (97.7%)	6 (2.3%)	67 (94.4%)	4 (5.6%)
Do people get hepatitis B from a sexual relationship? *Yes	199 (76.0%)	63 (24.0%)	56 (78.9%)	15 (21.1%)
Can hepatitis B transmitted from infected mother during delivery to the infant? *Yes	164 (62.6%)	98 (37.4%)	41 (57.7%)	30 (42.3%)
Do people get hepatitis B by drinking contaminated water? *No	110 (42.0%)	152 (58.0%)	29 (40.8%)	42 (59.2%)
Do people get HBV by sharing a toothbrush with an infected person? *Yes	227 (86.6%)	35 (13.4%)	60 (84.5%)	11 (15.5%)
Do people get hepatitis B by sharing eating utensils with an infected person (sharing spoons, dishes, or drinking glasses)? *No	115 (43.9%)	147 (56.1%)	30 (42.3%)	41 (57.7%)
Do people get hepatitis B by sneezing and coughing of an infected person? *No	167 (63.7%)	95 (36.3%)	46 (64.8%)	25 (35.2%)
Do people get hepatitis B by handshake an infected person? *No	244 (93.1%)	18 (6.9%)	63 (88.7%)	8 (11.3%)
Does hepatitis B cause liver cirrhosis? *Yes	202 (77.1%)	60 (22.9%)	56 (78.9%)	15 (21.1%)
Does HBV cause liver cancer? *Yes	119 (45.4%)	143 (54.6%)	36 (50.7%)	35 (49.3%)

Knowledge	Females (n=191)		Statistical analysis for gender difference	
	Correct answer n (%)	Incorrect answer or did not know n (%)	Chi-square	P
Do people get hepatitis B from genes (heredity)? *No	127 (66.5%)	64 (33.5%)	0.67	0.796
Can hepatitis B transmitted by unsterilized syringe, needle, and instrument? *Yes	182 (95.3%)	9 (4.7%)	1.340	0.247
Do people get hepatitis B from a blood donation from an infected person? *Yes	189 (99.0%)	2 (1.0%)	—	0.048†
Do people get hepatitis B from a sexual relationship? *Yes	143 (74.9%)	48 (25.1%)	0.454	0.500
Can hepatitis B transmitted from infected mother during delivery to the infant? *Yes	123 (64.4%)	68 (35.6%)	0.978	0.323
Do people get hepatitis B by drinking contaminated water? *No	81 (42.4%)	110 (57.6%)	0.052	0.820
Do people get HBV by sharing a toothbrush with an infected person? *Yes	167 (87.4%)	24 (12.6%)	0.383	0.536
Do people get hepatitis B by sharing eating utensils with an infected person (sharing spoons, dishes, or drinking glasses)? *No	85 (44.5%)	106 (55.5%)	0.106	0.744
Do people get hepatitis B by sneezing and coughing of an infected person? *No	121 (63.4%)	70 (36.6%)	0.046	0.830
Do people get hepatitis B by handshake an infected person? *No	10 (5.2%)	181 (94.8%)	2.943	0.086
Does hepatitis B cause liver cirrhosis? *Yes	146 (76.4%)	45 (23.6%)	0.174	0.677
Does HBV cause liver cancer? *Yes	83 (43.5%)	108 (56.5%)	1.097	0.295

\*Correct response; †Fisher's exact test

**Table 3: Distribution of responses to individual items for nurses' attitude toward hepatitis B**

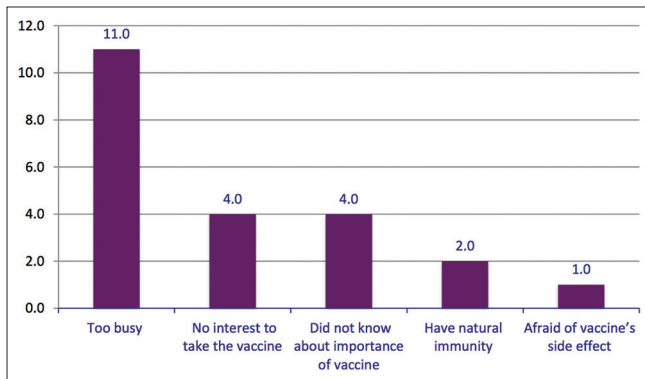
Attitudes	Total (n=262)				
	Strongly agree n (%)	Agree n (%)	Neural n (%)	Disagree n (%)	Strongly disagree n (%)
Hepatitis B infection is a major health problem.	128 (48.9)	99 (37.8%)	23 (8.8%)	10 (3.8%)	2 (0.8%)
Your job puts you at greatest risk of hepatitis B infection.	166 (63.4%)	85 (32.4%)	9 (3.4%)	2 (0.8%)	0
Vaccination protects against hepatitis B infection.	118 (45.0%)	122 (46.6%)	13 (5.0%)	9 (3.4%)	0
Hepatitis B vaccine safe and effective.	107 (40.8%)	121 (46.2%)	22 (8.4%)	10 (3.8%)	2 (0.8%)
Early screening (especially before marriage) may reduce the incidence of hepatitis B and prevent its complication.	183 (69.8%)	73 (27.9%)	3 (1.1%)	2 (0.8%)	1 (0.4%)
You recommend hepatitis B vaccine to other healthcare workers	223 (85.1%)	37 (14.1%)	2 (0.8%)	0	0

**Table 4: Gender distribution of mean scores of individual items for nurses' attitude toward hepatitis B**

Attitudes	Mean score		Statistical analysis for gender difference	
	Male (n=71)	Female (n=191)	t-test	P
Hepatitis B infection is a major health problem.	4.20	4.34	1.224	0.222
Your job puts you at greatest risk of hepatitis B infection.	4.62	4.57	0.588	0.557
Vaccination protects against hepatitis B infection.	4.51	4.27	2.395	0.017
Hepatitis B vaccine safe and effective	4.45	4.14	2.762	0.006
Early screening may reduce the incidence of hepatitis B and prevent its complication	4.85	4.59	3.181	0.002
You recommend hepatitis B vaccine to other healthcare workers	4.90	4.82	1.490	0.138

**Table 5: Frequency distribution of nurses' practice toward hepatitis B**

Variable	Response option	Frequency	Percentage	Statistical analysis for knowledge category
Do you place disposable sharps in sharps containers immediately after use?	Always	257	(98.1%)	Fisher's exact test=5.103 P=0.220
	Sometimes	4	(1.5%)	
	Never	1	(0.4%)	
Do you wear gloves when administering an injection or taking blood samples from patients?	Always	190	(72.5%)	Fisher's exact test=2.475 P=0.927
	Sometimes	69	(26.3%)	
	Never	3	(1.1%)	
Have you ever been exposed to hepatitis B risky conditions? (percutaneous injury or mucous membrane contact with infectious fluid)	Yes	37	(14.1%)	Fisher's exact test=5.040 P=0.278
	No	210	(80.2%)	
	I don't remember	15	(5.7%)	
Have you ever received hepatitis B vaccine?	Yes	224	(85.5%)	Fisher's exact test=5.705 P=0.002
	No	21	(8.0%)	
	I don't remember	17	(6.5%)	
Have you ever attended a continuing medical education program on hepatitis B infection?	Yes	59	(22.5%)	Chi-square=6.1886 P=0.0453
	No	203	(77.5%)	

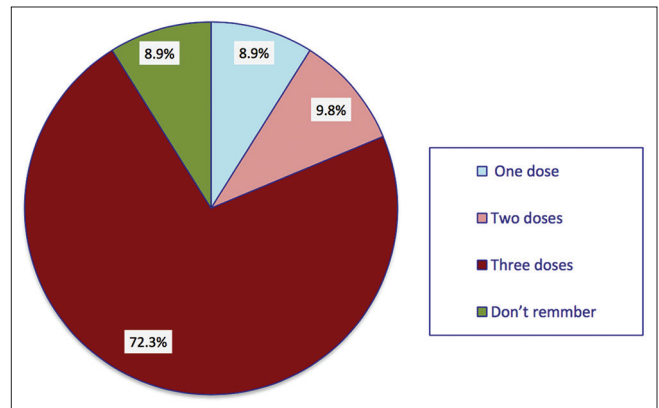


**Figure 2: Number of doses of hepatitis B vaccine received by nurses**

and 16.2% of Saudi dental students and interns<sup>[21]</sup> were aware that HBV is not transmitted through utensils.

Several studies have explored the knowledge of HCWs regarding the association of HB with liver cancer. The results showed that 90.5% of Nigerian HCWs,<sup>[8]</sup> 86.7% of Iranian nurses,<sup>[15]</sup> and 73.6% of Saudi medical students<sup>[22]</sup> believed that HBV can cause liver cancer. These results are in contrast with the findings of this study, in which only 45.4% of nurses knew that HBV could cause liver cancer. This finding is important as it is related to the awareness about the seriousness of the disease.

In our study, 41.2% of nurses had a moderate level of knowledge, whereas 29.4% had a high level of knowledge about HB



**Figure 3: Reasons for not taking hepatitis B vaccination**

infection. This finding is in accordance with a study in Ethiopia, which found that 51% and 30% of HCWs had moderate and high levels of knowledge of HB, respectively.<sup>[17]</sup> In contrast, the vast majority of nursing students in India<sup>[10]</sup> and medical students in SA<sup>[22]</sup> had a high level of knowledge about HB, possibly because knowledge about HB is still fresh in the minds of students compared to the practicing HCWs in our study.

Attitudes toward HBV infection were positive for most nurses, similar to the findings in a cross-sectional study conducted among HCWs in Ghana.<sup>[23]</sup> Although the majority of nurses in this study had a positive attitude toward HBV infection, 11 participants reported that they disagreed or did not know they were at risk of

contracting HB due to their work. This is an important finding given that all nurses are expected to know that they are more susceptible to HBV due to their profession. These nurses are less likely to seriously adhere to HB preventative measures because they believe they were not at risk of HB infection.

The results of this study showed a significant difference in mean attitude scores toward HB infection between genders. The male nurses had a better attitude than female nurses regarding HBV infection. Contrary to these findings, a study conducted in medical professionals in Pakistan found that females had higher attitude scores than males regarding HB.<sup>[24]</sup> However, a study carried out among Saudi dental students and interns reported that females had a better attitude toward HBV patients than males.<sup>[21]</sup> The incidence rate of HBV infection globally and KSA locally is reportedly higher in males than females, which may explain why male nurses had a positive attitude, as they had more contact with HB-infected persons.<sup>[3,4]</sup>

In the healthcare setting, exposure to HBV can occur regardless of the various best preventive strategies available. The HBV vaccine and safe practices for HBV prevention present an opportunity to prevent infection in unprotected HCWs.<sup>[5]</sup> As previously reported, the prevalence of HB infection in KSA before 1990 ranged from 5% to 12%, denoting high endemicity.<sup>[25]</sup> However, the prevalence of HBV infection in KSA has markedly dropped from 7% in 1989 to 0.3% by 1997 since the implementation of one important measure, namely immunization.<sup>[26]</sup> In this study, 85.5% of the respondents reported that they were vaccinated with the HB vaccine, in accordance with other studies among nurses in Iran (94.2%)<sup>[15]</sup> and India (84.7%).<sup>[10]</sup> However, the results conflict with studies among PHC workers in Al Jouf region (61.1%)<sup>[12]</sup> and nurses in Bangladesh (59%)<sup>[9]</sup> and Nigeria (62.9%),<sup>[27]</sup> where a lower proportion of the respondents were vaccinated. In the current study, 38 participants who did not remember and did not receive the HB vaccine or those who had incomplete vaccination were vulnerable to HB infection. The vaccination coverage among nurses is expected to be 100%, as vaccination is available in KSA, free of cost, and mandatory for all HCWs as recommended by the WHO and CDC.<sup>[1,4]</sup> The HB vaccination program was introduced in KSA in 1989, with infants receiving the immunization at birth.<sup>[26]</sup> This may explain why some participants answered that they did not know whether they had received the vaccine.

Regarding the area of practice, most nurses reportedly had good universal precaution (UP) practices but still had some occupational exposure. It was concerning to find that some nurses reported not wearing gloves when handling blood samples and injections, as this practice puts them at risk of contracting HBV. Also, 1.5% and 0.4% of respondents reported “sometimes” and “never” placing disposable sharps in sharp containers, respectively. In this study, 14.1% (37/262) of the nurses had been exposed to high-risk conditions for HBV infection during their careers, which is a lower percentage

than that found in Indian nurses (53.4%)<sup>[10]</sup> and Iranian nurses (57.3%).<sup>[15]</sup> The lack of post-exposure prophylaxis (PEP) knowledge or practice in this study may partly explain why only 40.54% (15/37) of those exposed to high-risk conditions for HBV infection reported their exposure. There is also the possibility of social desirability bias influencing their self-reported practices or nurses having improper injection safety practices, which may be addressed in future research. Moreover, additional studies are required to identify factors leading to occupational exposure and reasons why some nurses do not follow the PEP guidelines.

Knowledge about HB and its vaccine is important since it can increase the uptake of the vaccine. In this study, the association between receiving the vaccine and attending a CME program about HB infection with knowledge of HB infection was found to be statistically significant. This finding is supported by a study in Iran, which found that nurses who had a history of immunization had more knowledge about the mode of HB transmission and treatment strategy.<sup>[15]</sup> Our finding in this study showed that compared to males, females tended to have better practices of wearing gloves while injecting or drawing blood and attending CME programs focusing on HB. This can be interpreted as females being more adherent to infection control principles than males.

Our study had certain limitations. Because this was a self-reporting study, misunderstanding of the questions may have occurred, contributing to inaccuracies in the data. However, the researcher was present at the time of survey completion, and any queries about the questionnaire were also clarified at the time of data collection. Non-response bias was minimal in this survey as the response rate was high, and the non-responders were mostly those who were on vacation at the time of the survey. Our study surveyed PHC nurses in a single city, which may limit generalizations to other cities as well as to other healthcare settings such as hospitals. However, other cities and regions of the country are expected to have PHC nurses with similar demographics and professional backgrounds, making it possible to generalize our findings to other areas.

## Conclusion

The study assessed the KAP of nurses regarding HBV infection and found that knowledge of HB was at a moderate level. The nurses' attitude toward HB was positive and was significantly different between genders, as the males had a more positive attitude toward HB than females. The results of this study showed that the majority of nurses demonstrated good compliance with UP. However, some of the respondents were not vaccinated or had incomplete vaccination, which made them more vulnerable to HB infection in their professional life. The study findings may contribute to review of the CME program to include HB, which is provided by the MOH to PHC staff. The CME program about HB will increase awareness about PEP and help nurses adhere to the HB vaccine and infection control principles, which

are most important for preventing the transmission of HBV in healthcare settings. Moreover, there is a need for clear policies regarding HBV vaccination for nurses, to investigate their status of immunity (anti-HBs) against HB and then take appropriate measures according to their status.

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### Conflicts of interest

There are no conflicts of interest.

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