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Knowledge, Attitude, and Practices toward Hepatitis B Infection among Healthcare Students; a Nationwide Cross-Sectional Study in Jordan

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Abstract: The World Health Organization estimated that around 66 thousand HBV are caused by needlestick injuries annually. Healthcare students should be aware of HBV transmission route and preventive measures. This study assessed the knowledge, attitudes, and practices toward HBV among Jordanian healthcare students and its associated factor. A cross-national study conducted from March to August. The participants were asked to complete the questionnaire. It had four sections: participants' sociodemographic, knowledge, attitudes, and practices about HBV. 2322 participants were enrolled, 67.9% were females, 26.4% were medical student, 35.9% were in the 3rd year. 40% of the participants held a high level of knowledge and attitude. 63.9% of participants had good practices toward HBV. Medical students in the last year of study, encountered HBV patients , had better knowledge. Male students from medicine college, encountered HBV patients and had extra HBV courses showed better attitude. High practice level was associated with being dentistry student, at 5th year, encountered HBV patient and extras HBV courses. This study demonstrated insufficient knowledge and attitudes toward HBV, the practices level toward HBV among healthcare students was promising. Subsequently, public health efforts should modify the knowledge and attitude gaps to reinforce awareness and minimizing risks of the infection.

Keywords: Hepatitis B Virus; knowledge; attitude; practice; Jordan

Introduction

Hepatitis B virus (HBV) infection is a worldwide public health problem that is considered as the most global risk factors for liver cancer. In 2019, The World Health Organization (WHO) reported around 296 million people were living with the virus globally [1]. The prevalence of HBV in the Jordanian general population has dropped from 9.9% in 1985 to 2.4% in 2016 after the introduction of HBV vaccination program to the newborn and high-risk group[2]. HBV transmitted by direct contact to infected body fluids, such as; blood, semen, mucous membranes, saliva, unsafe injections,

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and from an infected mother to her child at birth (perinatal transmission)[3].The CDC recommended HBV vaccination for healthcare workers as they are at risk for needle stick injury and vulnerable to contact with infected blood and body fluids[4]. A meta-analysis study found the incidence of needle stick injury is 43% among health workers[5]. Since HBV is a bloodborne pathogen, healthcare professionals should be immunized given their risk of occupational exposure, with the occurrence being about 2 to 10 times higher than in the general population [6]. Improving public understanding of the signs, symptoms, and causes of HBV infection are a critical strategy for preventing disease spread [2]. As a result, various studies have been conducted across the world to assess healthcare student's knowledge, attitudes, and practices (KAP) about HBV and its related variables[7–10]. Healthcare students in their clinical years should have sufficient awareness about HBV infection, the modes of transmission, the main symptoms, complications, and protective measures, as it would improve their health and direct them to be more sensitive and conscious toward themselves and their patients [11–13]. There is a need for up-to-date data about the level of awareness among healthcare students in Jordan for HBV infection. In this study, we aim to determine the KAP toward HBV infection among healthcare students and to assess the related factors.

Methodology

A cross-sectional study was conducted. We were able to reach responses of 2322 participants in our study during the period between march to august. Our target population was healthcare students who finished the infectious disease course (i.e., 3rd year to 6th year) of the following four colleges (medicine, nursing, dentistry, and pharmacy) all six universities in Jordan where collage of medicine is present: Jordan University of Science & Technology, Mut'ah University, University of Jordan, Hashemite University, Al-Balqa Applied University, and Yarmouk University. A participant-driven sampling approach was applied to recruit the participants from medical colleges (i.e., medicine, nursing, dentist, and pharmacy) in different universities. After getting the ethical approval, we reached the student representatives for each batch across the universities to facilitate distributing the questionnaire to eligible participants. The questionnaire was sent to all students through messages and posted in each batch's main official social media groups. These groups are private groups under the supervision of the student representative of the concerned batch.

Questionnaire administration

An invitation letter was sent to the students who are eligible to participate in the study. The questionnaire was distributed using an online Google Form survey link. After signing the informed consent form, students were asked to complete the questionnaire. It was explicitly mentioned that participation is entirely voluntary and that the individual may quit at any moment without penalty. It was also stated that there would be no direct advantages of participating other than sharing current knowledge. No personal identities were gathered, and participants were requested to provide the necessary information to achieve correct findings.

Measurement tool

A structured online-based Arabic/English self-administered questionnaire based on a previously validated instrument was adopted [14,15]. The Arabic version was done by two researchers and edited after pilot testing on 30 medical students . It was divided into four sections: demographics of participants, knowledge section consisting of (43) questions, attitude sections with (8) questions, and practices sections with (3) questions, the questionnaire is shown in supplementary file 1. Before distributing and implementing the questionnaire, a pilot test was conducted to make sure the questions were understandable and clear.

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Ethical considerations

The study protocol was developed in accordance with the Helsinki Declaration's ethical standards, and it was evaluated and approved by the Institutional Review Board (IRB) at the University of Jordan in Amman, the Hashemite Kingdom of Jordan, on (1/25/2022) (reference number: 1/2022/2506) in meeting No.2022/1. Before completing the questionnaire, all participants provided written informed consent. The data was gathered and processed confidentially before being saved on a personal computer which only the authors can access.

Statistical analysis

Data were entered into Microsoft Excel (2016) and then imported into IBM SPSS version 25 (IBM Corp., Armonk, N.Y., USA) for analysis. For each quantitative and categorical variable, descriptive statistics were computed and expressed as either frequency and percentage or mean and standard deviation (S.D.). Associations between demographic variables, knowledge, attitudes, and practice were analyzed using the Chi-square test. Significantly associated variables were included in multivariate regression analysis and controlled for potential confounders to assess the independent effect of each variable. Each true answer received one point. A participant's score was considered good if they successfully answered more than 70% of the questions in each KAP section. Participants' scores were considered low if they successfully answered fewer than 70% of the questions in each section. A p-value of $\alpha < 0.05$ and a Confidence Interval of 95% were set to determine the statistical significance of the reported results.

Results

Demographics of survey participants

The demographic characteristics of the study sample are presented in Table 1.

A total of 2322 students responded to the questionnaire. 67.9% (n = 1577) were female, and 32.1% (n=745) were male. The mean age of participants was (22.2±1.7). 26.4% (n=612) of the participants were medical students, 25% (n=581) were nursing students, 22.9% (n=532) were pharmacy students, and 25.7% (n=597) were dental students. 35.9% (n=833) were 3rd year, 23.3% (n=541) were 4th year, 14% (n=324) were 5th year and 26.9% (n=624) were 6th year or graduates. Only 10.8% (n=250) took extra courses (besides their university lectures) about HBV. 1.2% (n=29) were infected with HBV, 3.7% (n=86) have a family member infected with HBV, and 32.3% (n=749) have encountered patients with HBV infection.

Table 1. Demographics of survey participants (n = 2322).

Respondents' Demographics		n/ Mean	%/ SD
Age		22.2	(±1.7)
Gender:	Male	745	32.1%
	Female	1577	67.9%
College:	Medicine	612	26.4%
	Nursing	581	25.0%
	Pharmacy	532	22.9%
	Dentistry	597	25.7%
Studying year:	3rd year	833	35.9%
	4th year	541	23.3%
	5th year	324	14%

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	6th year	624	26.9%
Extra courses about HBV:	Yes	250	10.8%
	No	2072	89.2%
History of HBV infection:	Yes	29	1.2%
	No	2293	98.8%
Family member infected with HBV:	Yes	86	3.7%
	No	2236	96.3%
Encountered HBV patient:	Yes	749	32.3%
	No	1573	67.7%

Knowledge about Hepatitis B Virus and its associated factors

The summary of the participants' understanding of HBV is shown in (Table 2). About 86.3% did not know the estimated prevalence of HBV in Jordan. Only 14.3% knew newborns infected with HBV were the highest risk group, and 15.5% knew that most HBV patients in Jordan got infected through mother-to-child transmission at birth. 11.8% knew about the high risks of premature death without monitoring and treatment. About two-third (69.8%) of the participants knew that HBV could cause liver cirrhosis, liver failure, liver cancer, or premature death.

Most participants claimed that HBV can be transmitted through blood transfusion (94.8%), mother-to-child at birth (80.5%), unprotected sex (82.6%), but not by sneezing or coughing (60.2%), or handshaking (75.8%). However, (58.9%) still wrongly believed that HBV could be transmitted through sharing utensils and food with an HBV-infected person. Regarding HBV vaccination, (86.6%) of the participants recognized that hepatitis B vaccination could prevent HBV infection. (23.6%) knew newborn vaccination at birth could prevent mother-to-child transmission. Few participants (12.1%) knew that giving the first dose of the hepatitis B immune globulin (HBIG) within 12 h of birth and completing the vaccine doses are the most effective way to protect infants born from HBsAg-positive mothers. Knowledge about needle stick injury was assessed; about half (48.4%) of the participants knew they should dispose the used needles and syringes into a sharp-proof container immediately without recapping. In addition, (32.9%) knew they should not recap the needle with two hands to prevent needle stick injury. The participant's knowledge about hepatitis B diagnosis and management was inadequate. Only (6.1%) knew that most patients with HBV are often asymptomatic, and (41.8%) knew that the hepatitis B surface antigen (HBsAg) test is the test used to confirm HBV infection. (37.8%) knew that the hepatitis B surface antibody (anti-HBs) test is used to identify immunity to hepatitis B. (6%) knew that infants, who born to HBsAg-positive mothers, should be evaluated for HBsAg after one year of delivery. More than half of the participants knew HBV screening is recommended for pregnant women, HIV patients, men who have sex with men, and family members of the infected patients.About (56.5%) were aware that there is no cure for HBV, but there are effective medications to manage and control the disease, (75.5%) wrongly believed that all HBV patients need to receive antiviral treatment and (48.2%) were unaware that treatment of HBV with nucleotide or nucleoside analogs (NAS) is long-term and potentially lifelong.

Table 2. Knowledge about HBV among health care students in Jordan (n = 2322).

Questions	Correct answers	
	n	%
Prevalence and Sequelae		
1. What percentage of the Jordanian population has chronic hepatitis B (HBV)?	317	13.7%

2. How did most people who have HBV in Jordan get infected?	360	15.5%
3. Which age group is most likely to develop HBV after the initial infection?	333	14.3%
4.What are the consequences of chronic hepatitis B?	1620	69.8%
47. Without proper monitoring and treatment, what is the chance a patient would die of HBV complications?	275	11.8%
Transmission Routes		
5. Can hepatitis B be transmitted through handshake?	1761	75.8%
6. Can hepatitis B be transmitted through unprotected sex?	1919	82.6%
7. Can hepatitis B be transmitted through blood transfusion?	2202	94.8%
8. Can hepatitis B be transmitted through sneezing or coughing?	1397	60.2%
9. Can hepatitis B be transmitted through from mother to child at birth?	1869	80.5%
10. Can hepatitis B be transmitted through sharing food or utensils?	955	41.1%
Prevention Measures		
11. Can cleaning and cooking food thoroughly prevent HBV transmission?	833	35.9%
12. Can the hepatitis B vaccine prevent HBV transmission?	2012	86.6%
13. Can HBV transmission be prevented by not reusing or sharing needles/syringes?	2165	93.2%
14. Can HBV transmission be prevented by avoid sharing food/utensils or eating with a person with chronic HBV?	777	33.5%
15. Can using a condom prevent HBV transmission?	1791	77.1%
16.What is the most effective preventive measure for infants born to mothers with chronic HBsAg?	653	28.1%
18. Who needs the hepatitis B vaccine?	1761	75.8%
21. Prevention of mother-to-child transmission	548	23.6%
20. The first dose of hepatitis B vaccine for baby	280	12.1%
27. Is it necessary to have sharp-proof containers at clinics for disposing of needles and sharp objects?	1467	63.2%
What would you do to prevent needle-stick injury?		
24. Wash hands with soap or disinfectant after each clinical procedure?	292	12.6%
25. Recap needle with two hands after use and discard immediately in a sharp-proof container	763	32.9%
26. Do not recap needle and discard immediately in a sharp-proof container	1124	48.4%
Diagnosis and Treatment		
35. What is the symptom most patients with chronic hepatitis B present with?	142	6.1%
33. Serum HBsAg test for identification of patients infected with hepatitis B virus	971	41.8%
34. What test should be used to identify immunity against the hepatitis B virus?	877	37.8%
50.When should infants born to mothers with HBV be evaluated for HBsAg status?	140	6%

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Who should be tested for hepatitis B?		
29. Pregnant women should be tested for hepatitis B	1541	66.4%
30. HIV-infected people should be tested for hepatitis B	1934	83.3%
31. Men who have sex with men (MSM) should be tested for hepatitis B	1581	68.1%
32. Family members of those who have hepatitis B should be tested for hepatitis B	1969	84.8%
Treatment		
36. What are the criteria for indicating treatment in patients with HBV?	787	33.9%
37. There is no cure, but there are effective medications to manage and control the disease?	1312	56.5%
What are the treatment goals for HBV patients?		
38. Inhibit the replication of the hepatitis B virus	1969	84.8%
39. Prevent disease progression of disease, particularly liver cirrhosis and liver cancer	2092	90.1%
40. Prevent mother-to-child transmission (MTCT)	2036	87.7%
41. Prevent flare of hepatitis B	2022	87.1%
42. Is it true that (NAs) are a recommended first-line treatment for HBV?	1092	47.0%
43. Is treatment of HBV with NAs long term, possibly even lifetime?	1120	48.2%
44. Do patients need to strictly adhere to the treatment of HBV?	1724	74.2%
45. Do you think that all patients with chronic HBV need to be treated immediately?	570	24.5%
46. Should all HBV patients be monitored and tested regardless of treatment status?	1486	64%

Abbreviations: HBV: hepatitis B virus; MSM: men who have sex with men; MTCT: mother-to-child transmission; NAs: Nucleotide Analogs.

Gender, taking extra HBV courses, being infected with HBV and having a family history of HBV were not associated with knowledge level, so they were not included in the multivariate logistic regression analysis. See Table 5

Table 5. Association between demographic characteristics of students and knowledge, attitude, and practices toward HBV (n = 2322).

		Level of knowledge			Level of attitude			Level of practice		
		Low 1401) (	High (921)	P-valu e	Low 1355) (	High (967)	P-valu e	Bad (838)	Good 1484) (	P-valu e
Age:		21.9(±)	22.6(±)	.000	22.1(±)	22.3(±)	.000	21.9(±)	22.4(±)	.000
Gender:	Male	470	275	.063	387	358	.000	234	511	.001
	Female	931	646		968	609		604	973	

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College:	Medicine	278	334	.000	298	314	.000	287	325	.000
	Nursing	385	196		305	276		168	413	
	Pharmacy	315	217		347	185		294	238	
	Dentistry	423	174		405	192		89	508	
Studying year:	3rd year	608	225	.000	518	315	.004	343	490	.000
	4th year	353	188		303	238		216	325	
	5th year	169	155		199	125		108	216	
	6th year	271	353		335	289		171	453	
Extra courses about HBV:	Yes	148	102	.698	118	132	.000	67	183	.001
	No	1253	819		1237	835		771	1301	
History of HBV infection:	Yes	17	12	.849	12	17	.062	9	20	.568
	No	1384	909		1343	950		829	1464	
Family member infected with HBV:	Yes	50	36	.671	47	39	.478	37	49	.172
	No	1351	885		1308	928		801	1435	
Encountered HBV patient:	Yes	364	385	.000	369	380	.000	192	557	.000
	No	1037	536		986	587		646	927	

On multivariate logistic regression analysis, significant associations were found between the level of knowledge and the following variables: age (OR = 1.007, CI = 0.934-1.087, p <0.852), college: medicine (OR= 2.174, CI = 1.706-2.77, p <0.000; ref: Pharmacy), nursing (OR = 1.147, CI = 0.884-1.489, p <0.301; ref: Pharmacy), Dentistry (OR = 0.681, CI = 0.531-0.873, p <0.000; ref: Pharmacy), studying year: 4th year (OR = 1.322, CI = 1.019-1.714, p <0.035; ref: 3rd year), 5th year (OR = 2.764, CI = 1.984-3.850, p <0.00; ref: 3rd year), 6th year (OR = 2.974, CI = 2.096-4.218, p <0.00; ref: 3rd year) and if they encountered a HBV patient (OR = 1.642, CI = 1.350-1.998, p <0.00). See Table 6

Table 6. logistic regression analysis establishing the associations between attitude and practice among the general population in Jordan.

Covariates	Knowledge			Attitude			Practice		
	OR	CI	P-value	OR	CI	P-value	OR	CI	P-value
Age:	1.007	0.934-1.087	0.852	1.051	0.976-1.133	0.189	1.046	0.960-1.140	0.300

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Gender:								
Male	NA			1.322	1.100-1.590	0.003	1.197	0.974-1.470	0.087
Female				Reference			Reference	
College:								
Pharmacy	Reference			Reference			Reference	
Medicine	2.174	1.706-2.77	0.000	1.955	1.544-2.476	0.000	1.656	1.301-2.109	0.000
Nursing	1.147	0.884-1.489	0.301	1.664	1.249-2.140	0.000	3.977	3.052-5.183	0.000
Dentistry	0.681	0.531-0.873	0.000	0.876	0.687-1.113	0.274	7.698	5.876-10.087	0.000
Studying year:								
3rd year	Reference			Reference			Reference	
4th year	1.322	1.019-1.714	0.035	1.151	0.899-1.472	0.264	1.011	0.776-1.317	0.934
5th year	2.764	1.984-3.850	0.000	1.223	0.884-1.692	0.225	1.943	1.354-2.787	0.000
6th year	2.974	2.096-4.218	0.000	1.146	0.814-1.613	0.435	1.778	1.206-2.620	0.004
Encountered HBV patient:								
Yes	1.642	1.350-1.998	0.000	1.440	1.189-1.746	0.000	2.031	1.634-2.524	0.000
No	Reference			Reference			Reference	
Extra courses about HBV:	NA							
Yes				1.371	1.040-1.807	0.025	1.437	1.042-1.981	0.027
No				Reference			Reference	

Attitude toward Hepatitis B virus and its associated factors

The majority of participants (82.3%) believed that the HBV vaccine was safe, (55.5%) thought that it was necessary to vaccinate newborns at birth. While (48.1%) were assured in counseling patients on HBV prevention. In addition, (58.9%) and (63.4%) were confident in ordering laboratory tests to diagnose HBV and to monitor patients with HBV, respectively. However, (29.5%) were confident in prescribing medications to treat HBV patients. Hepatitis B stigma among the study participants is high in which, (68.5%) expressed concerns about casual contact or working in the same office and (77%) expressed concerns about eating or sharing food with a person with HBV (Table 3).

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The variables related to HBV infection history were not included in the multivariate logistic regression analysis since they were not associated with attitude. Significant associations were found between attitude and the following variables: age (OR=1.051, CI=0.976-1.133, p <0.189), gender (male: OR= 1.322, CI= 1.100-1.590, p= 0.003; ref: female), college: Medicine (OR= 1.955, CI= 1.544-2.476, p <0.000; ref: pharmacy), nursing (OR= 1.664, CI= 1.249-2.140, p <0.000; ref: pharmacy), dentistry (OR= 0.876, CI= 0.687-1.113, p <0.274; ref: pharmacy), studying year: 4th year (OR= 1.151, CI= 0.899-1.472, p <0.264; ref: 3rd year), 5th year (OR= 1.223, CI= 0.884-1.692, p <0.225; ref: 3rd year), 6th year (OR= 1.146, CI= 0.814-1.613, p <0.435; ref: 3rd year), HBV patient encounter (OR= 1.440, CI= 1.189-1.746, p <0.00) and if they have taken extra HBV courses (OR= 1.371, CI= 1.040-1.807, p <0.025).

Table 3. Attitude toward HBV (n = 2322).

Questions	Answered yes	
	n	%
17. Are you confident in counseling patients about prevention of HBV?	1118	48.1%
19. Do you think that the hepatitis B vaccine is safe?	1912	82.3%
54. Do you feel confident in ordering HBV Vaccination for newborns?	1289	55.5%
48. Are you confident in ordering laboratory tests to monitor HBV patients?	1473	63.4%
49. Are you confident in prescribing treatment for a patient with chronic hepatitis B?	684	29.5%
51. Are you confident in ordering diagnosis tests for patients with chronic HBV?	1367	58.9%
52. Would you have any concerns having casual contact or working together with a chronic HBV patient in the same office?	731	31.5%
53. Would you have any concerns sharing food or utensils with a HBV?	535	23%

Practices toward Hepatitis B virus and its associated factors

(45.1%) of the participants sought to receive hepatitis B testing and (70.7%) sought to receive the hepatitis B vaccine before starting clinical training at the hospitals. About (61.6%) reported consistently wearing gloves when administering injections or performing medical procedures at hospitals. (Table 4) The variables related to HBV infection history were not included in the multivariate logistic regression analysis since they were not associated with practices. On multivariate logistic regression analysis, significant associations were found between the level of practice and the following variables : age (OR=1.046, CI=0.960-1.140, p <0.300), gender (male: OR= 1.197, CI= 0.974-1.470, p=<0.087; ref: female), college: medicine (OR= 1.656, CI= 1.301-2.109, p <0.000; ref: pharmacy), nursing (OR= 3.977, CI= 3.052-5.183, p <0.000; ref: pharmacy), dentistry (OR= 7.698, CI= 5.876-10.087, p <0.000; ref: pharmacy), studying year: 4th year (OR= 1.011, CI= 0.776-1.317, p <0.934; ref: 3rd year), 5th year (OR= 1.943, CI= 1.354-2.787, p <0.00; ref: 3rd year), 6th year (OR= 1.778, CI= 1.206-2.620, p <0.004; ref: 3rd year), HBV patient encounter (OR= 2.031, CI= 1.634-2.524, p <0.00) and if they have taken extra HBV courses (OR= 1.437, CI= 1.042-1.981, p <0.027).

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Table 4. HBV Preventive Practices (n = 2322).

Questions	Answered yes	
	n	%
22. Did you get the hepatitis B vaccine before entering practicum at teaching hospitals?	1642	70.7%
23. Did you get tested for HBV before entering practicum at teaching hospitals?	1047	45.1%
28. Do you consistently wear gloves when administrating injections or performing medical procedures to patients?	1430	61.6%

Correlation between KAP

Spearman rank correlation revealed a significant weak to moderate positive linear correlations between knowledge-attitude ($r = 0.249$, $p < 0.00$), knowledge-practice ($r = 0.127$, $p < 0.00$), and attitude-practice ($r = 0.156$, $p < 0.00$). This result reaffirms the relationship between knowledge, attitude, and practice toward HBV infection, as shown in Table 7.

Table 7. Correlation between knowledge, attitude, and practices scores.

Variable	Correlation coefficient	P-value*
Knowledge-attitude	.249	.000
Knowledge-practice	.127	.000
Attitude-practice	.156	.000

*Correlation significant at .01 level (2-tailed).

Discussion

Promoting awareness is a cornerstone of any strategy to control and prevent infectious diseases. In this cross-national study, we aimed to assess the level of KAP among healthcare students toward HBV infection in Jordan. Around 2300 healthcare students in their clinical years completed the questionnaire. This study revealed that the overall knowledge regarding HBV infection, prevalence, sequelae, diagnosis, transmission, preventive measures, and treatment was low. In our study, around forty percent of the healthcare students had high level of knowledge. This result is similar to a study conducted in India [7]. However other studies showed high level of knowledge among healthcare student [8,9]. We have noticed a significant knowledge gap regarding HBV prevalence, sequelae, diagnosis, preventive measures, testing, and interpretation of hepatitis B test results. Approximately less than (15%) of the healthcare student were aware of the HBV prevalence, the main route of transmission of HBV infection and whom are at higher risk of getting the infection. Only (6.1%) were aware that most HBV patients are without symptoms, about (42%) knew that HBsAg is used for diagnosis of HBV infection, and (56.5%) were aware that there is no cure but effective medications to manage the disease as observed in other studies [8,10]. This fact may be attributed to an inadequate virology curriculum and insufficient clinical training to interpret test results. Scientific knowledge about HBV is essential for healthcare students to minimize the risk of viral transmission during their clinical training. In our study, the level of knowledge about HBV infection was higher in those who studied medicine or had high education level. In addition, healthcare students who encountered patients with HBV infection are more knowledgeable than who did not. The poor knowledge in our study is alarming, and efforts should be made to explore the reasons behind such poor knowledge and understand the causes behind this fact.

Generally, the attitudes and beliefs toward HBV infection among healthcare students in Jordan were poor, which is in line with a study conducted in Ghana and Cameroon [16,17]. Only 42% of the

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healthcare students had good attitudes, a very low percentage in comparison to other studies [7,18]. The stigma of HBV infection is still a significant issue that should be targeted even among healthcare students. About 23% of students had concerns about sharing food or utensils with patients having HBV. 31.5% had concerns about contacting or working with individuals infected with HBV. This was similar to another study done in Jordan among nursing students who were afraid of treating people with hepatitis as they thought they might be at risk and that people infected with hepatitis should be isolated in a special room.[19] On the other hand, more than half (56.1%) of Saudi dentists were willing to achieve continuity of care for HBsAg-positive patients.[10] This stigma increases the psychological and social burden on patients already suffering from HBV and its medical consequences which poses significant challenges. We observed that female gender, being in a medical college, high level of education, taking extra courses about HBV infection and HBV patient encounter were good predictors for having better attitude. Despite the low level of both knowledge and attitudes, healthcare students had satisfactory level of good practices toward HBV infection. This is similar to other studies conducted in Vietnam and Ghana [14,20]. Furthermore, our results show that (45.1%) of healthcare students reported having HBV test before starting clinical training at hospitals while (70.7%) of them reported taking HBV vaccine, similar to another study done in Jordan among students in dental practices[21]. In addition, the majority (82.3%) of healthcare students believed that the HBV vaccine is safe; this finding is in line with other studies done in Ethiopia and Saudi Arabia, and in contrast to an Italian study done among dentists [8,10,22] To achieve universal hepatitis B vaccine coverage for all healthcare students, schools must implement programs to evaluate students' immunity status and provide vaccines to unvaccinated individuals. Only (32.9%) know that recapping needles is a wrong practice and can cause needle stick injury. This explains the high rates of needle stick injury among nursing staff in Jordan, as found in a previous study.[19] These findings emphasize the need for infection control training to improve injection safety practices among students. In our study, we have noticed the more clinical years spent as trainees in hospitals, the higher level of knowledge, attitude, and practices achieved, as well as HBV patients encounter.

Strengths and limitations

To the best of our knowledge, this study surveyed the biggest sample of healthcare students from Jordan's universities of different colleges, ensuring a considerable degree of representation and facilitating the extraction of comprehensive data. The study has limitations, such as that data is based on participant self-reporting and cannot be checked. Similarly, estimates of testing and vaccination coverage, as well as HBsAg seroprevalence, relied only on participant response. Because this is a cross-sectional study, establishing a cause-and-effect relationship is challenging. In addition, only quantitative measures and online convenience sampling were used to assess awareness, which are the inevitable limitations.

Conclusion

The findings of this study revealed unsatisfactory knowledge and attitude scores toward HBV infection. However, the level of practice is satisfactory among healthcare students. Students who were from the college of medicine or had higher education levels or encountered a patient with HBV infection showed to have better knowledge. While male students or students from the medicine college who encountered patients with HBV infection or took extra courses about HBV showed high level of attitude. In terms of practices, a high level of practice was shown with students from the college of dentistry, encountering patients with HBV infection and taking extra courses about HBV infection. Finally, it is necessary to implement enlightenment programs to improve healthcare students' knowledge, attitudes, and practices, particularly in weak areas.

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