



## Original Article

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## Hepatitis B vaccination status and associated factors among health science students

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## ABSTRACT

**Objective:** To evaluate hepatitis B virus (HBV) vaccine coverage and its associated factors among health science students in Vietnam.

**Methods:** This cross-sectional study involving 459 health science students at Tra Vinh University was conducted between April and June 2022. Data were collected using a structured questionnaire with items on sociodemographic characteristics, knowledge and attitude about HBV, and vaccination status. A multivariable logistic regression model was used to explore the factors associated with vaccination status.

**Results:** The majority of participants were female (65.8%) and enrolled at the medical school (56.2%). A total of 30.3% participants received the full dose of the HBV vaccine. The percentages of participants with sufficient knowledge and positive attitudes toward HBV infection were 75.2% and 43.4%, respectively. Vaccination was 11.8 times higher in sixth-year medical students than any healthcare student in their first-year [adjusted odds ratio (aOR) 11.8, 95% CI 3.1–45.1,  $P < 0.001$ ], and the coverage was also significant higher in those who had sufficient knowledge (aOR 2.0, 95% CI 1.1–3.9,  $P < 0.05$ ) and positive attitudes (aOR 3.0, 95% CI 1.9–4.8,  $P < 0.05$ ) than in their counterparts.

**Conclusions:** The majority of students were not fully vaccinated against HBV, indicating they were vulnerable to the disease. Administrators and authorities should reinforce health education messages aimed at encouraging all students to get vaccinated with the HBV vaccine, enhance their awareness and knowledge of HBV, and improve attitudes toward HBV infection prevention.

**KEYWORDS:** Hepatitis B; Knowledge; Attitude; Practice; Vaccination; Students

## 1. Introduction

Globally, hepatitis B virus (HBV) infection is considered a health burden and a leading cause of death[1]. HBV attacks the liver at the level of acute and chronic infection, and the majority of the burden is due to the long-term consequences of chronic infection, typically cirrhosis and hepatocellular carcinoma[2,3]. According to the World Health Organization (WHO), the Western Pacific and African regions have a higher HBV infection burden with more than

## Significance

HBV infection is one of the major public health concerns in Vietnam. Health science students are exposed to risks when they conduct internships and health services in healthcare facilities during their education. It is essential to evaluate HBV vaccine coverage and its associated factors in health science students before they commence studying in a hospital. Findings indicated that the majority of students were not fully vaccinated against HBV, indicating they were vulnerable to the disease. Administrators of universities and authorities should implement effective interventions to encourage healthcare professional students to receive recommended HBV vaccinations.

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116 million and 81 million infected people, respectively[1]. Viral infection is a major public health concern in Vietnam, which ranks as one of 20 nations with over 75% of the global burden of infection[4]. HBV leads to a high rate of morbidity in Vietnam, with most chronic infections acquired through perinatal transmission from mother to child and horizontal transmission in early childhood[5–7].

HBV transmission can also occur through sexual contact, sharing needles, syringes, or other drug-injection equipment[8]. In healthcare facilities, transmission through blood-borne pathogens is commonly reported[9]. Healthcare workers (HCWs) are more prone to contracting HBV because their occupation requires exposure to blood or body fluids[10,11]. In addition, health science students are exposed to similar risks as HCWs when they conduct internships and health services in healthcare facilities during their education. A previous study reported a remarkable rate of HBV infection among medical and health science students in Ethiopia[12]. The reasons for this high rate included lack of HBV knowledge, non-adherence to standard precautions, and, most importantly, inadequate HBV vaccination[10,13]. Therefore, it is essential to plan, develop, and apply preventive measures to reduce the risk to health profession students of hospital-associated infections.

Vaccination is considered the most effective and efficient method to prevent HBV infection and HBV-related disease progression[8,14]. Since 1992, WHO has recommended that nations include the three-dose primary series for HBV in national immunization schedules. Vaccination coverage increased during the 1990–2000 period and highly effective prevention measures and treatments have made the global elimination of viral hepatitis a realistic goal[15,16]. WHO set an ambitious goal for a global downgrade in hepatitis-related mortality of 65% and a 90% reduction in new infections by 2030[4]. WHO recommends that individuals should complete the three-dose vaccination schedule and follow up with the hepatitis B surface antigen test, especially in high-risk groups, such as HCWs and health science students[1]. However, a previous study found that the high rate of HBV infection is accompanied by insufficient preventive occupational practices among HCWs, which highlights the urgent need to protect HCWs from HBV infection[17]. The study also found that approximately half of HCWs were still not vaccinated with the HBV vaccine after one year of employment[17]. Another study indicated the existence of a low prevalence of the HBV vaccination among students in other countries, including Uganda[18], Ghana[19], and Nepal[20] ranging from 16.8% to 44.3%.

In Vietnam, HBV vaccination has been recommended for children under one year on the Expanded Program on Immunization free of charge. Immunization strategies, therefore, for health science students before they commence studying in a hospital play an important role in reducing this infectious disease burden. HBV vaccination status and its associated factors among health science

students can be used as evidence for administrators of universities and authorities to implement effective interventions to protect students. In addition, evaluating the level of knowledge and attitude of students regarding HBV can help enhance their awareness about the prevention of HBV infection. However, there is a lack of such information in Vietnam. Therefore, this study evaluated HBV vaccine coverage and its associated factors in health science students in Vietnam.

## 2. Subjects and methods

### 2.1. Participants and survey design

This cross-sectional study was conducted at Tra Vinh University, Vietnam. Participants were health science, *i.e.* medical, nursing, and public health, students who studied in the Faculty of Medicine. The population size was determined by the number of students in the university. The sample size was determined using a single population proportion formula, with an assumption of 95% confidence level, 5% margin of error (d), and 44.3% proportion (p) of HBV vaccine status for students in Uganda[18]. The minimum sample size was 380. A 20% non-response rate was calculated and added, increasing the estimated sample size to 475. The sample list for the survey was determined using a convenience sampling strategy from the list of students taken from this university.

### 2.2. Inclusion and exclusion criteria

Eligible participants were health science students studying at the Faculty of Medicine, Tra Vinh University, during the study period. Students who did not complete the survey or missed any questions in measuring their knowledge and attitudes about HBV infection and HBV vaccination status were excluded.

### 2.3. Data collection

Data were collected between April and June 2022. All 475 students were explained the aim of the survey that participation was voluntary, and were assured that their data would be kept confidential. A total of 459 students completed the questionnaire and met eligibility criteria. The participation rate was 96.6%.

### 2.4. Questionnaire

The self-administered questionnaire consisted of four parts. The first part included five questions about the sociodemographic characteristics of the students, including sex (male, female), age

group (<21, ≥21 years), place of residence (rural or urban), major (nursing, public health, medicine), and academic years (first, second, third, fourth, fifth, and sixth). In the second part, 10 “yes/no” questions were asked to assess the knowledge of HBV infection. To determine the knowledge score, each correct answer was assigned 1 point and each incorrect answer 0 points. The overall knowledge score ranged from 0 (no correct answers) to 10 (all correct answers), and a cutoff level of 7 was set as having sufficient knowledge[21]. In the third part, six questions were asked to evaluate students’ attitudes about HBV infection using a 5-point Likert scale ranging from strongly disagree to strongly agree. For each attitude item, the points were counted as 1 point (strongly agree and agree) and 0 points (undecided, disagree, strongly disagree). A total of attitude items 4 indicated a positive attitude[21]. The fourth part comprised vaccination status. Participants were categorized as having full-dose vaccination if they received three or more doses of HBV vaccination. Participants were categorized as insufficiently vaccinated if they reported receiving zero, one or two doses or were unsure of their vaccination status[1].

The questionnaire was developed based on a previous study by Haile *et al.*, and a pre-test with 30 students at Tra Vinh University before data collection[22]. The Cronbach’s alpha values of knowledge and attitude were 0.79 and 0.72, respectively.

### 2.5. Data analysis

Statistical analyses were performed using the STATA 14 software (StataCorp. LLC, College Station, TX, USA). Descriptive statistics are presented as frequencies, percentages, means, and standard deviations. The *Chi*-square test was performed in the univariable analysis, and then a multivariable logistic regression was used to assess the association between HBV vaccination status and dependent variables, odds ratio, and 95% confidence interval (95% CI). A *P*-value of <0.05 was considered significant.

### 2.6. Ethics approval

This study was conducted in accordance with the principles of the Declaration of Helsinki. Informed consent was obtained from all of the survey participants. Written approval was obtained from the National Institute of Hygiene and Epidemiology, Vietnam (No: NIHE IRB-01/2021).

## 3. Results

### 3.1. Participant sociodemographic characteristics

A total of 459 health science students participated in the study. The

majority of respondents were female (65.8%) and aged ≥ 21 years (59.9%). More than half of the participants lived in urban areas (58.4%). The students who majored in medicine accounted for the highest percentage (56.2%). The percentages of first- and second-year students were 20.3% and 23.3%, respectively (Table 1).

**Table 1.** Demographic characteristics of participants (n=459).

Variables	n	Percentage (%)
Sex		
Male	157	34.2
Female	302	65.8
Age, mean±SD	21.5 ± 1.9	
Age group, years		
< 21	184	40.1
≥ 21	275	59.9
Place of residence		
Rural	191	41.6
Urban	268	58.4
Major		
Nursing	114	24.8
Public Health	87	19.0
Medicine	258	56.2
Academic years		
First	93	20.3
Second	107	23.3
Third	52	11.3
Fourth	42	9.2
Fifth	88	19.2
Sixth	77	16.8

### 3.2. Student knowledge about HBV infection

The overall sufficient knowledge level about HBV infection was 75.2%. The majority of participants knew about the cause, transmission, treatment, and prevention of HBV infection. However, only 36.2% of the participants knew that HBV infection could not be spread by casual contact, such as handshaking (Table 2).

### 3.3. Student attitudes about HBV infection

Only 43.4% of the participants had an overall positive attitude toward HBV infection. Most of them had a positive attitude toward items such as “hepatitis B vaccine was safe and effective” (83.9%) and “I feel comfortable taking care of people with HBV” (81.9%). The negative attitudes were towards items including “changing gloves during blood collection and HBV tests that must be done” (84.7%) and “all patients should be tested for HBV before they receive health care” (83.9%) (Table 3).

### 3.4. Participant HBV vaccination status

Of the 459 surveyed students, 63.4% received at least one dose of HBV vaccine. Nearly a third had completed the full dose of HBV vaccination (30.3%).

**Table 2.** Knowledge of students towards hepatitis B ( $n=459$ ).

Variables	<i>n</i>	Percentage (%)
HBV causes liver cancer		
Correct	364	79.3
Incorrect	95	20.7
HBV carriers can transmit the infection to others		
Correct	389	84.7
Incorrect	70	15.3
HBV could not spread by casual contact such as handshaking		
Correct	166	36.2
Incorrect	293	63.8
HBV spread by contact with open wounds or cut		
Correct	329	71.7
Incorrect	130	28.3
HBV can be transmitted by contaminated blood and body fluid		
Correct	412	89.8
Incorrect	47	10.2
HBV can be transmitted by unsterilized syringes, needles, and surgical instruments		
Correct	408	88.9
Incorrect	51	11.1
Hepatitis B could not be cured or treated		
Correct	296	64.5
Incorrect	163	35.5
The vaccine can prevent hepatitis B infection		
Correct	377	82.1
Incorrect	82	17.9
HBV has a laboratory test		
Correct	396	86.3
Incorrect	63	13.7
HBV has post-exposure prophylaxis		
Correct	339	73.9
Incorrect	120	26.1
Knowledge (Sufficient)	345	75.2

**Table 3.** Attitudes of students towards hepatitis B ( $n=459$ ).

Variables	<i>n</i>	Percentage (%)
I have a concern about being infected with HBV		
Positive	285	62.1
Negative	174	37.9
Hepatitis B vaccine is safe and effective		
Positive	385	83.9
Negative	74	16.1
Changing gloves during blood collection and HBV tests must be done		
Positive	70	15.3
Negative	389	84.7
All patients should be tested for HBV before they receive healthcare		
Positive	74	16.1
Negative	385	83.9
I feel comfortable taking care of people with HBV		
Positive	376	81.9
Negative	83	18.1
Following infection control guidelines would protect from being infected with HBV at work		
Positive	354	77.1
Negative	105	22.9
Attitude (Positive)	199	43.4

### 3.5. Factors associated with full-dose vaccination status

In the univariable analysis, age group, years of study, knowledge, and attitude were associated with full-dose vaccination status ( $P<0.05$ ) (Table 4). The multivariable logistic regression analysis results of factors associated with vaccination status are shown in Table 5. Vaccination was 11.8 times higher in sixth-year medical students than any healthcare student in their first-year [adjusted odds ratio (aOR) 11.8, 95% CI 3.1-45.1,  $P<0.001$ ]. Vaccination was significantly higher in those who had sufficient knowledge and positive attitudes than in their counterparts (aOR 2.0, 95% CI 1.1-3.9,  $P<0.05$ ) and (aOR 3.0, 95% CI 1.9-4.8,  $P<0.05$ ).

**Table 4.** Associated factors between practice about hepatitis B vaccination and characteristic ( $n=459$ ).

Variables	Full dose vaccination, <i>n</i> (%)		<i>P</i>
	Yes ( $n=139$ )	No ( $n=320$ )	
Sex			
Male	47 (29.9)	110 (70.1)	0.907
Female	92 (30.5)	210 (69.5)	
Age group, years			
< 21	42 (22.8)	142 (77.2)	0.045
≥ 21	97 (35.3)	178 (64.7)	
Place of residence			
Rural	58 (30.4)	133 (69.6)	0.974
Urban	81 (30.2)	187 (69.8)	
Major			
Nursing	28 (24.6)	86 (75.4)	0.125
Public Health	30 (34.5)	57 (65.5)	
Medicine	81 (31.4)	177 (68.6)	0.193
Years of study			
First	13 (14.0)	80 (86.0)	
Second	32 (29.9)	75 (70.1)	
Third	14 (26.9)	38 (73.1)	
Fourth	12 (28.6)	30 (71.4)	
Fifth	21 (23.9)	67 (76.1)	
Sixth	47 (61.0)	30 (39.0)	<0.001
Knowledge			
Sufficient	124 (35.9)	221 (64.1)	<0.001
Insufficient	15 (13.2)	99 (86.8)	
Attitude			
Positive	93 (46.7)	106 (53.3)	<0.001
Negative	46 (17.7)	214 (82.3)	

**Table 5.** Results of logistic regression factors associated with the full hepatitis B vaccination ( $n=459$ ).

Variables	OR (95% CI)	<i>P</i>
Age group, years (Ref: < 21)	0.4 (0.1-1.3)	0.128
Major (Ref: Nursing)		
Public Health	1.9 (0.8-4.7)	0.151
Medicine	0.3 (0.1-2.2)	0.234
Years of study (Ref: First)		
Second	0.5 (0.1-3.9)	0.486
Third	0.5 (0.1-3.5)	0.458
Fourth	1.2 (0.2-6.7)	0.852
Fifth	2.5 (0.7-9.7)	0.179
Sixth	11.8 (3.1-45.1)	<0.001
Knowledge (Ref: Insufficient)	2.0 (1.1-3.9)	0.032
Attitude (Ref: Negative)	3.0 (1.9-4.8)	<0.001

## 4. Discussion

This study evaluated the HBV vaccination status in a high-risk population using a representative health science student sample in Vietnam. The findings indicated a 30.3% HBV full vaccination coverage rate, determined by including only those participants who received a standard immunization schedule with at least three doses of vaccine against HBV. The yields in this study were lower than those reported in other studies from Uganda[19], Ethiopia[23,24], and Turkey[25]. The disparity in vaccination rates might be due to differences in the standards of health systems among countries and vaccine availability. However, our rate was higher than those of Lao Peoples Democratic Republic reported as 21%[26] and of Ethiopia, reported as 5.8%[22]. In Vietnam, the HBV vaccine was launched in the Expanded Program on Immunization in 1997; however, due to limited vaccine production capacity, only a limited number of individuals were vaccinated. HBV vaccination has been implemented nationwide since 2003 and all infants were given HBV vaccine. However, HBV birth-dose vaccination coverage was low in 2007 and 2008, possibly as a consequence of serious adverse events following immunization (AEFI). Our prior study showed that approximately one-third of surveyed children were vaccinated with the birth dose, followed by a series three doses of the HBV vaccine in a timely manner[27]. Strengthening the AEFI surveillance system and case investigation have been prioritized to effectively identify causality and adequately respond to the public concerns about AEFI[28]. Nevertheless, we did not explore the reasons for vaccine refusal in this study. Observing student compliance with HBV prevention behaviors during hospital internships should provide important information on the subject. In addition, longitudinal observational studies should be conducted to determine the reasons for non-vaccination.

Regarding knowledge, our findings showed that 75.2% participants had sufficient knowledge about HBV infection, especially in terms of the cause, treatment, and prevention of HBV infection. This finding was consistent with a previous study in Uganda (74.6%)[19]. However, this rate was higher than that reported in Ghana (37%)[20]. Thus, it can be suggested that effective training and orientation on precautions should be distributed to health science students before they are enrolled in clinical practice. However, over one-third of the participants did not know that HBV infection could not be spread by casual contact, such as handshaking. This result was consistent with that reported by Tu *et al*[29]. Training should concentrate on transmission information, which enhances the understanding of the ways that viruses spread and occupational exposure to infectious diseases.

The most surprising finding in this study was that this student population had a negative attitude toward their increased risk of

HBV infection; less than half of the participants had a positive attitude toward HBV infection. The majority of participants had negative attitudes about changing gloves during blood collection and the HBV tests that must be performed, and that all patients should be tested for HBV before they receive health care. These results differ from those reported in India[30]. Strengthening health education about infection control and prevention should be implemented to enhance positive awareness of HBV infection.

HBV vaccination was more common among the sixth-year students in this study. This result may be due to students with higher education and they do internships and health services in healthcare facilities during their education, so they had the highest vaccination rate[26,31]. Moreover, only medical students experienced a 6-year education, thus they previously had a higher rate of vaccination[22,25]. In addition, the participants who had sufficient knowledge and a positive attitude were more likely to receive the full-dose series than their counterparts. These findings are in line with previous results[32–34]. A possible explanation for these results may be that the combination of a positive attitude and knowledge about the occupational hazard of HBV infection contributes to accepting vaccination. All health science students can encounter infectious diseases in their internships, and courses on prevention measures for infectious diseases should be included in the curriculum of all first-year healthcare-profession students. Providing training on HBV infection to students from the beginning is a critical step in enhancing their attitudes. In addition, students should be screened for HBV markers and administered the vaccine if recommended.

This study was limited because responses were obtained retrospectively based on the student statements and recall bias may have occurred since participants self-reported their vaccination status, which we did not verify by medical records. In addition, because this was a cross-sectional study, we could not confirm a cause-and-effect relationship between full vaccination and other factors.

To conclude, in this study, we found that the HBV vaccination rate among health-science students was relatively low. Significant results were observed between years of study, knowledge, and attitudes about HBV infection and vaccination against HBV. Administrators and authorities governing public health should reinforce health education messages aimed at encouraging healthcare professional students to get vaccinated with the HBV vaccine as recommended, enhance their awareness and knowledge of HBV, and improve attitudes toward HBV infection prevention.

## Disclaimer

The author, Giao Huynh, as the Deputy Editor-in-Chief of the

Journal, contributed to this article in her personal capacity. The views expressed are her own and do not necessarily represent the view of the institutions she is affiliated with.

### Conflict of interest statement

The author reports no conflicts of interest in this work.

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### Data sharing statement

The dataset used and analyzed during the current research is available from the corresponding author upon reasonable request.

### Authors' contributions

All authors substantially contributed to drafting and revising the article, as well as the final approval of the version to be submitted. NTB, HG and NTNH contributed to the conception and design of the study and acquisition of the data. VYL, NTNH and PDT conducted the data analysis and interpreted the results. NTB, HG, LBC, NVT and VCM revised the final manuscript.

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