



Exploring knowledge and attitudes toward the hepatitis B virus: an internet-based study among Vietnamese healthcare students

[Explorando el conocimiento y las actitudes hacia el virus de la hepatitis B: un estudio basado en Internet entre estudiantes vietnamitas de la salud]

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Abstract

Context: Hepatitis B is a serious global public health problem, especially in developing countries such as Vietnam. Many studies worldwide have focused on health care workers, a population at high risk of infection with the hepatitis B virus (HBV), but there is little research that explores the high levels of risk faced by health care students.

Aims: To assess the knowledge and attitudes of Vietnamese undergraduate students toward hepatitis B vaccination.

Methods: A cross-sectional study was conducted among 1291 Vietnamese healthcare students between November 2017 and March 2018 via social media.

Results: The mean score for knowledge was 4.0 ± 0.4 , and the mean score for attitude was lower (3.5 ± 0.6). Levels of knowledge were higher ($p < 0.001$) among sixth-year students, students who had been vaccinated, and students attending public universities. Most participants were well-informed about the diseases caused by HBV, with 1128 (87.4%) agreeing that HBV infection can lead to liver cancer. Nevertheless, 259 students believed that HBV cannot be spread by sharing a toothbrush with an infected person, and 18.7% thought that asymptomatic carriers are incapable of transmitting HBV.

Conclusions: Although students had adequate knowledge of HBV, their scores for attitude and their rates of vaccination were low. This study therefore recommends improving the knowledge and attitudes of health care students through orientation and sensitization programs and improvements in their educational environment.

Keywords: attitude; hepatitis B virus; health care students; knowledge; Vietnam.

Resumen

Contexto: La hepatitis B es un grave problema de salud pública mundial, especialmente en países en desarrollo como Vietnam. Muchos estudios en todo el mundo se han centrado en trabajadores de la salud, una población con alto riesgo de infección por el virus de la hepatitis B (VHB), pero hay poca investigación que explore los altos niveles de riesgo que enfrentan los estudiantes de atención médica.

Objetivos: Evaluar el conocimiento y las actitudes de los estudiantes vietnamitas de pregrado hacia la vacunación contra la hepatitis B.

Métodos: Se realizó un estudio transversal entre 1291 estudiantes vietnamitas de salud entre noviembre de 2017 y marzo de 2018 a través de las redes sociales.

Resultados: La puntuación media del conocimiento fue de $4,0 \pm 0,4$ y la puntuación media para la actitud fue menor ($3,5 \pm 0,6$). Los niveles de conocimiento fueron más altos ($p < 0,001$) entre los estudiantes de sexto año, los estudiantes que habían sido vacunados y los estudiantes que asistían a universidades públicas. La mayoría de los participantes estaban bien informados sobre las enfermedades causadas por el VHB, con 1128 (87,4%) de acuerdo en que la infección por el VHB puede provocar cáncer de hígado. Sin embargo, 259 estudiantes creyeron que el VHB no se puede transmitir al compartir un cepillo de dientes con una persona infectada, y el 18,7% pensó que los portadores asintomáticos son incapaces de transmitir el VHB.

Conclusiones: Aunque los estudiantes tenían un conocimiento adecuado del VHB, sus puntajes de actitud y sus tasas de vacunación fueron bajas. Por lo tanto, recomendamos mejorar el conocimiento y las actitudes de los estudiantes de atención médica a través de programas de orientación y sensibilización y mejoras en su entorno educativo.

Palabras Clave: actitud; virus de la hepatitis B; estudiantes de cuidado de la salud; conocimiento; Vietnam.

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INTRODUCTION

Hepatitis B is a liver infection caused by hepatitis B virus (HBV) that can lead to both acute and chronic liver disease (WHO, 2017). In most cases, an acute HBV infection may have nonspecific symptoms; less frequently, as in the case of fulminant hepatitis, infection can have fatal consequences unless a liver transplantation is carried out urgently (Alhowaish et al., 2017). If HBV develops into chronic hepatitis, it can lead to many serious conditions, such as liver failure, cirrhosis, hepatocellular carcinoma, and eventually to death. HBV is 50 to 100 times more infectious than HIV and can easily be passed on through body fluids, such as semen, vaginal fluids, and blood (CDC, 2015). It appears that the most common routes of HBV transmission are sexual activity, needle-sharing and unintentional needle-stick, blood transfusion, and organ transplantation (Buddeberg et al., 2008; Fairley and Read, 2012). Infected mothers can pass the infection to their newborns during delivery, and traces of infection have been found in blood donations (Mesfin and Kibret, 2013; WHO, 2017). HBV cannot be transmitted by holding hands, sharing food, kissing, hugging, coughing, sneezing, or breastfeeding (WHO, 2017).

As a hyperendemic pathogen, hepatitis B poses a major global health problem. Statistics show that the prevalence of chronic HBV infection varies greatly worldwide (from 0.5% to 20%); this is mostly due to differences in age and route of infection (WHO, 2017). According to recent research, an estimated 257 million people are living with some stage of HBV infection (defined as hepatitis B surface antigen positive status). According to a World Health Organization report from 2015, about 887 000 deaths occur annually because of complications of liver disease (including cirrhosis and hepatocellular carcinoma) (WHO, 2017). In the United States alone, between 0.7 and 1.4 million people have chronic hepatitis B, and an estimated 19 764 newly diagnosed hepatitis B patients were registered in 2013 (CDC, 2015). Southeast Asia, where there are nearly 130 million HBV carriers, has one of the highest endemic levels in the world, with

the perinatal route being the main source of infection (Custer et al., 2004). In 2003, Hipgrave and his co-researchers investigated the prevalence of HBV infection among 1579 individuals (ranging in age from 9 months to 40 years) (Hipgrave et al., 2003). They found that teenagers had the highest prevalence of HBV infection at 20.5%, adults and children came close behind at 18.8% and 18.4%, respectively, and infants were least likely to have an HBV infection; the likelihood of current or previous infection increased with age.

Health care workers (HCWs) are thought to be particularly vulnerable to HBV infection because of their occupational environment. The prevalence rate of HBV in this group is approximately 2 to 10 times higher globally than in the general population (Hadler, 1990). Moreover, the risk of occupational exposure to HBV infection is high among HCWs in developing countries, where the prevalence of HBV is high in the general population and health provision is poor (Anagaw et al., 2012; Geberemichael et al., 2013). A cross-sectional study conducted in Ethiopia, for instance, showed that 7.3% of HCWs were infected with HBV, whereas only 0.9% of non-HCWs who participated in the study were infected (Geberemichael et al., 2013). Health workers, including medical and health science students, are in front-line contact with the virus, as their duties include carrying out blood transfusions, injections, and surgical operations. Additionally, the risk of accidental exposure among trainees may be higher because of their lack of experience, insufficient training, and (to a lesser degree) fatigue (Kohn et al., 2003).

Such an epidemic demands an effective solution, and an HBV vaccine has been developed. The vaccine offers very effective protection against the hepatitis virus and the serious diseases linked to hepatitis, including liver cancer and cirrhosis, even in people who have already been exposed to the virus (Biset Ayalew and Adugna Horsa, 2017). The World Health Organization recommends that all infants should receive the HBV vaccination, and infants are commonly given a first dose of the vaccine within 24 hours of birth, followed by two more doses to complete the series (WHO, 2017). If

the first dose of the vaccine is administered within the first 24 hours after birth, it prevents 80–90% of virus transmission through the process of child-birth; the protective effect lasts for 20 years and may confer life-long immunity to HBV infection (WHO, 2017).

Nevertheless, the best way to prevent disease is through raising awareness. Prevention of any disease is proportional to the knowledge and attitudes of the population, and successful prevention reflects the importance that a society attaches to health-related issues. A study conducted in Lao indicates that 86.5% of medical students there have poor knowledge of the modes of HBV transmission and poor awareness of the risks (Pathoumthong et al., 2014).

In Vietnam, a developing country, HBV is a major threat to public health. However, there has to date been little research that explores public knowledge and understanding of HBV in Vietnam. This study therefore explores the knowledge and attitudes of university students toward HBV. The results are expected to provide baseline knowledge and understanding regarding medical and health sciences students who may be at risk of HBV.

MATERIAL AND METHODS

Study area and period

A cross-sectional survey was conducted to assess the knowledge and attitudes of Vietnamese health science students toward prevention of HBV infection. The study was conducted from November to December 2017.

Determination of sample size

In order to determine the minimum sample size needed to produce the desired results, a single population proportion formula was used. Assuming a 95% confidence interval ($z_{\alpha/2} = 1.96$), 50% prevalence rate of knowledge, and 5% margin of error, the result was 384. After the exclusion of participants who did not complete the questionnaire fully, all available students at the time of data collection were included in the study.

Research tools and data collection process

A structured, interviewer-administered questionnaire was developed by the researchers after reviewing studies by Dahlström and Funegård Viberg (2013) and Abdela et al. (2016). Students were invited to complete an online questionnaire administered through social media (Facebook) and designed using Google Forms. The questionnaire was pretested on 20 pharmacy students to check for mistakes and then revised; these students were not included in the main study. The final version of the questionnaire consisted of three sections: socio-demographic characteristics, knowledge about HBV, and attitudes toward vaccination. A five-point Likert scale was used to assess knowledge and attitudes. A response of 1 indicated strong agreement with an incorrect statement or strong disagreement with a correct statement; 2 indicated agreement with an incorrect statement or disagreement with a correct statement; 3 indicated a neutral response to a correct or incorrect statement; 4 indicated agreement with a correct statement or disagreement with an incorrect statement; and 5 indicated strong agreement with a correct statement or strong disagreement with an incorrect statement. An average score was obtained for each participant's knowledge and attitudes, and this was used to calculate the average total score for the study population.

Operational definitions

The following operational definitions were used in the study: good knowledge/attitude means that the respondent answered 70% or more of the items correctly; poor knowledge/attitude means that the respondent answered less than 70% of the items correctly.

Ethical considerations

The research protocol was approved by the University of Medicine and Pharmacy at Ho Chi Minh City. Selected students responded anonymously to the self-questionnaire. They were free to participate or not in the survey. Confidentiality was assured for all the information provided, and

no personal identifiers were included on the questionnaire.

Statistical analysis

Data were checked after downloading the responses collected via Google Forms. They were then converted to a single scale according to correct and incorrect answers, cleaned and edited using Microsoft Excel 2016, and exported to SPSS® version 20.0 for analysis. The descriptive statistics functions were used to report frequencies and proportions for categorical variables and mean and standard deviation for quantitative variables. To investigate differences in knowledge and attitudes between public and private sector students, a Chi-squared test was used. Depending on the distribution of the data, comparison of means was carried out using the student's t-test or the Mann-Whitney U test; one-way ANOVA was used when more than two means were compared to find the relation between the socio-demographic profiles of participants and their scores for knowledge and attitudes. Logistic regression was used to identify socio-demographic factors associated with knowledge and attitudes toward hepatitis B. The final models were obtained using the 'enter' method. Odds ratios (OR) and their confidence intervals (95% CI) were used as indicators of the strength of association. For all statistical analyses, a level of significance equal to or less than 5% was considered as significant.

RESULTS AND DISCUSSION

Socio-demographic characteristics

Table 1 shows the socio-demographic information collected from the university undergraduates in Vietnam who took part in the survey, including gender, faculty and year of study, monthly expenses, and HBV vaccination history. The majority of the students (849; 65.8%) were female, and participants were divided approximately equally between the public and private sectors. Pharmacy was the faculty with the most students involved in the survey, and a majority of participants (907;

70.3%) were non-religious. When asked about their history of vaccination, 887 participants said that they had already been vaccinated, and 320 said that they had plans to receive the vaccine in the future. The most commonly agreed appropriate price for vaccination was less than 15 United State Dollar (USD) (cited by 189 participants).

Knowledge and attitudes toward hepatitis B vaccination

Most of the students who took part in the survey had sufficient knowledge relating to HBV and understood the diseases it causes; for example, 1128 students (87.4%) agreed that HBV infection can lead to liver cancer (Table 2). When asked questions about mode of transmission, most participants recognized that HBV can spread through body fluids, with 1088 agreeing that HBV infection can occur through contaminated blood; nevertheless, 259 participants believed that HBV cannot be spread by sharing a toothbrush with an infected person. In terms of attitudes toward vaccination, most participants (1102) agreed that it is reasonable for Vietnam to include the HBV vaccination in its immunization program, and 942 knew which facilities provide HBV vaccination; 560 agreed that vaccinations can be made available more cheaply through supporting programs. However, only 488 were certain that the HBV vaccine is safe.

Influence of general characteristics on knowledge and attitudes

Comparison between male and female participants (Table 3) clearly showed that male students had higher knowledge scores (4.1 ± 0.6) and attitudes scores (4.0 ± 0.5) than female students (3.4 ± 0.6 and 3.5 ± 0.6 for knowledge and attitudes, respectively). The findings also indicated a significant connection between previous vaccination and knowledge and attitudes. The scores for knowledge (4.1 ± 0.5) and attitudes (3.5 ± 0.6) of people who had been vaccinated were higher than those of their unvaccinated counterparts (4.0 ± 0.6 and 3.3 ± 0.6 , respectively).

Table 1. Socio-demographic profile of Vietnamese undergraduate students included in the survey [n=1291; n (%)].

Demographic characteristics		Public sector (n=638)	Private sector (n=653)	Total (n=1291)
Gender				
	Male	228 (35.7)	214 (32.8)	442 (34.2)
	Female	410 (64.3)	439 (67.2)	849 (65.8)
Faculty				
	Medicine (F1)	249 (39.0)	22 (3.4)	271 (21.0)
	Pharmacy (F2)	273 (42.9)	555 (85.0)	828 (64.1)
	Dentistry (F3)	13 (2.0)	-	13 (1.0)
	Nursing science (F4)	85 (13.3)	31 (4.7)	116 (9.0)
	Medical technology (F5)	18 (2.8)	45 (6.9)	63 (4.9)
Year of study				
	First (Y1)	173 (27.1)	75 (11.6)	248 (19.2)
	Second (Y2)	75 (11.8)	116 (17.8)	191 (14.8)
	Third (Y3)	143 (22.4)	89 (13.6)	232 (18.0)
	Fourth (Y4)	95 (14.9)	86 (13.2)	181 (14.0)
	Fifth (Y5)	106 (16.6)	226 (34.6)	332 (26.7)
	Sixth (Y6)	46 (7.2)	60 (9.2)	106 (8.3)
Spirituality				
	Non-religion	492 (77.1)	415 (63.6)	907 (70.3)
	Buddhist	91 (14.3)	132 (20.2)	223 (17.3)
	Christian	47 (7.4)	97 (14.8)	144 (11.1)
	Catholic	5 (0.8)	3 (0.5)	8 (0.6)
	Others ^(a)	3 (0.5)	6 (0.9)	9 (0.7)
Residence				
	Urban	523 (82.0)	536 (82.1)	1059 (82.0)
	Rural	115 (18.0)	117 (17.9)	232 (18.0)
Part-time job				
	Yes	201 (31.5)	399 (61.1)	600 (46.5)
	No	437 (68.5)	254 (38.9)	691 (53.5)
Monthly expense (USD^(a))				
	<90	131 (20.5)	183 (28.0)	314 (24.3)
	90-<130	297 (46.6)	241 (36.9)	538 (41.7)
	130-<180	154 (24.1)	124 (19.0)	278 (21.5)
	≥180	56 (8.8)	105 (16.1)	161 (12.5)
Have you been vaccinated against HBV?				
	Yes	452 (70.8)	435 (66.6)	887 (68.7)
	No	186 (29.2)	218 (33.4)	404 (31.3)
Reasons mentioned for non-vaccination against hepatitis B				
	Do not know where to get vaccinated	55 (29.6)	43 (19.7)	98 (24.3)
	The vaccine is too expensive	31 (16.7)	23 (10.6)	54 (13.4)
	Fear of side effects of the vaccine	13 (7.0)	17 (7.8)	30 (7.4)
	Fear of needles	17 (9.1)	36 (16.5)	53 (13.1)
	No fear of catching hepatitis B	17 (9.1)	16 (7.3)	33 (8.2)
	Others ^(b)	53 (28.5)	83 (38.1)	136 (33.6)
Planning to get the vaccine				
	Yes	153 (82.3)	167 (76.6)	320 (79.2)
	No	33 (17.7)	51 (23.4)	84 (20.8)
Reasonable cost for vaccination (USD)				
	< 15	95 (51.1)	94 (43.1)	189 (46.8)
	15-<20	75 (40.3)	59 (27.1)	134 (33.2)
	20-<30	12 (6.5)	48 (22.0)	60 (14.9)
	≥ 30	4 (2.1)	17 (7.8)	21 (5.1)

Public sector: University of Medicine and Pharmacy at Ho Chi Minh City (YDS); Pham Ngoc Thach Medical University (PNT); Vietnam National University, Ho Chi Minh City (HCM-VNU); Ha Noi Medical University (HMU); Ha Noi University of Pharmacy (HUP); Ton Duc Thang University (TDTU).

Private sector: Ho Chi Minh City University of Technology (HUTECH); Nguyen Tat Thanh University (NTTU); Hong Bang International University (HBU); Lac Hong University (LHU).

USD^(a): United States Dollar, Others^(b): Cao Dai, Tin Lanh and Ba La Mon, Other^(b): do not know if the vaccine was given or not, do not have time, already infected.

Table 2. Knowledge and attitudes towards hepatitis B vaccination among Vietnamese undergraduate students from different sectors [(n, %); Mean score \pm SD].

Item	Public sector (n=638)				Private sector (n=653)				Total (N=1291)				χ^2	P-value
	A	B	C	Mean \pm SD	A	B	C	Mean \pm SD	A	B	C	Mean \pm SD		
Q1	163 (25.5)	114 (17.9)	361 (56.6)	3.6 \pm 1.5	321 (49.2)	96 (14.7)	236 (36.1)	2.9 \pm 1.5	484 (37.5)	210 (16.3)	597 (46.2)	3.2 \pm 1.5	79.13	0.000*
Q2	61 (9.6)	52 (8.2)	525 (82.2)	4.4 \pm 1.1	114 (17.5)	83 (12.7)	456 (69.8)	3.9 \pm 1.3	175 (13.6)	135 (10.4)	981 (76.0)	4.2 \pm 1.2	27.85	0.000*
Q3	107 (16.8)	72 (11.3)	459 (71.9)	4.0 \pm 1.4	164 (25.1)	94 (14.4)	395 (60.5)	3.6 \pm 1.4	271 (21.0)	166 (12.8)	854 (66.2)	3.8 \pm 1.4	19.53	0.000*
Q4	46 (7.2)	64 (10.0)	528 (82.8)	4.4 \pm 1.0	80 (12.3)	96 (14.7)	477 (73.0)	4.0 \pm 1.2	126 (9.8)	160 (12.4)	1005 (77.8)	4.2 \pm 1.1	17.99	0.000*
Q5	158 (24.8)	107 (16.8)	373 (58.4)	3.6 \pm 1.5	251 (38.4)	117 (17.9)	285 (43.7)	3.2 \pm 1.5	409 (31.7)	224 (17.3)	658 (51.0)	3.4 \pm 1.5	33.19	0.000*
Q6	35 (5.5)	40 (6.3)	563 (88.2)	4.6 \pm 0.9	50 (7.7)	78 (11.9)	525 (80.4)	4.2 \pm 1.0	85 (6.6)	118 (9.1)	1088 (84.3)	4.4 \pm 1.0	16.04	0.000*
Q7	109 (17.1)	118 (18.5)	411 (64.4)	3.8 \pm 1.3	150 (23.0)	143 (21.9)	360 (55.1)	3.4 \pm 1.3	259 (20.1)	261 (20.2)	771 (59.7)	3.6 \pm 1.3	12.09	0.002*
Q8	25 (3.9)	21 (3.3)	592 (92.8)	4.7 \pm 0.8	49 (7.5)	58 (8.9)	546 (83.6)	4.4 \pm 1.1	74 (5.7)	79 (6.1)	1138 (88.2)	4.5 \pm 1.0	16.80	0.000*
Q9	35 (5.5)	34 (5.3)	569 (89.2)	4.6 \pm 0.9	51 (7.8)	72 (11.0)	530 (81.2)	4.2 \pm 1.1	86 (6.7)	106 (8.2)	1099 (85.1)	4.4 \pm 1.0	17.81	0.000*
Q10	49 (7.7)	69 (10.8)	520 (81.5)	4.4 \pm 1.1	102 (15.6)	108 (16.5)	443 (67.9)	3.9 \pm 1.3	151 (11.7)	177 (13.7)	963 (74.6)	4.2 \pm 1.2	33.18	0.000*
Q11	85 (13.3)	111 (17.4)	442 (69.3)	3.9 \pm 1.2	57 (8.7)	100 (15.3)	496 (76.0)	4.0 \pm 1.0	142 (11.0)	211 (16.3)	938 (72.7)	4.0 \pm 1.1	9.03	0.011*
Q12	100 (15.7)	83 (13.0)	455 (71.3)	3.9 \pm 1.3	142 (21.7)	155 (23.7)	356 (54.6)	3.5 \pm 1.3	242 (18.7)	238 (18.4)	811 (62.9)	3.7 \pm 1.3	40.99	0.000*
Q13	20 (3.1)	46 (7.2)	572 (89.7)	4.6 \pm 0.8	36 (5.5)	61 (9.3)	556 (85.2)	4.3 \pm 0.9	56 (4.3)	107 (8.3)	1128 (87.4)	4.4 \pm 0.9	6.73	0.035*
Q14	140 (21.9)	211 (33.1)	287 (45.0)	3.4 \pm 1.3	114 (17.5)	203 (31.1)	336 (51.4)	3.5 \pm 1.1	254 (19.7)	414 (32.0)	623 (48.3)	3.4 \pm 1.2	6.50	0.039
Q15	42 (6.6)	82 (12.9)	514 (80.5)	4.3 \pm 1.0	28 (4.3)	48 (7.4)	577 (88.3)	4.1 \pm 1.0	87 (6.7)	176 (13.6)	1028 (79.7)	4.2 \pm 1.0	0.75	0.688
Q16	30 (4.7)	81 (12.7)	527 (82.6)	4.4 \pm 0.9	42 (6.4)	96 (14.7)	515 (78.9)	4.1 \pm 1.0	72 (5.6)	177 (13.7)	1042 (80.7)	4.2 \pm 1.0	3.24	0.198
Q17	35 (5.5)	42 (6.6)	561 (87.9)	4.6 \pm 0.9	28 (4.3)	40 (6.1)	585 (89.6)	4.4 \pm 0.9	63 (4.9)	82 (6.3)	1146 (88.8)	4.5 \pm 0.9	1.16	0.561
Q18	34 (5.3)	47 (7.4)	557 (87.3)	4.5 \pm 0.9	35 (5.4)	50 (7.7)	568 (86.9)	4.4 \pm 1.0	69 (5.3)	97 (7.5)	1125 (87.2)	4.4 \pm 1.0	0.04	0.980
Total	1274 (11.1)	1394 (12.1)	8816 (76.8)	4.2 \pm 0.4	1814 (15.4)	1698 (14.5)	8242 (70.1)	3.7 \pm 0.6	3105 (13.4)	3138 (13.5)	16995 (73.1)	4.0 \pm 0.4	140.52	0.000*
Q19	118 (18.5)	48 (7.5)	472 (74.0)	4.0 \pm 1.4	280 (42.9)	96 (14.7)	277 (42.4)	3.0 \pm 1.5	395 (30.6)	144 (11.2)	752 (58.2)	3.5 \pm 1.6	128.87	0.000*
Q20	35 (5.5)	34 (5.3)	569 (89.2)	4.6 \pm 0.9	57 (8.7)	63 (9.6)	533 (81.7)	4.2 \pm 1.1	92 (7.1)	97 (7.5)	1102 (85.4)	4.4 \pm 1.0	14.94	0.001*
Q21	121 (19.0)	154 (24.1)	363 (56.9)	3.7 \pm 1.4	115 (17.6)	203 (31.1)	335 (51.3)	3.5 \pm 1.3	236 (18.3)	357 (27.7)	698 (54.0)	3.6 \pm 1.3	7.83	0.020*
Q22	206 (32.3)	195 (30.6)	237 (37.1)	3.0 \pm 1.4	178 (27.3)	237 (36.3)	238 (36.4)	3.1 \pm 1.2	384 (29.7)	432 (33.5)	475 (36.8)	3.1 \pm 1.3	5.95	0.051
Q23	238 (37.3)	199 (31.2)	201 (31.5)	2.9 \pm 1.3	146 (22.4)	220 (33.7)	287 (43.9)	3.3 \pm 1.2	384 (29.7)	419 (32.5)	488 (37.8)	3.1 \pm 1.3	38.08	0.000*
Q24	589 (92.3)	-	49 (7.7)	1.3 \pm 1.1	142 (21.7)	-	511 (78.3)	4.1 \pm 1.7	731 (56.6)	-	560 (43.4)	2.7 \pm 2.0	654.40	0.000*
Q25	257 (40.3)	-	381 (59.7)	3.4 \pm 2.0	92 (14.1)	-	561 (85.9)	4.4 \pm 1.4	349 (27.0)	-	942 (73.0)	3.9 \pm 1.8	112.24	0.000*
Total	1918 (42.9)	630 (14.2)	1918 (42.9)	3.3 \pm 1.0	1010 (22.1)	819 (17.9)	2742 (60.0)	3.9 \pm 0.4	2571 (28.5)	1449 (16.0)	5017 (55.5)	3.5 \pm 0.6	450.775	0.000*

Item: Knowledge question (Q1-Q18); Attitude question (Q19-Q25); Response from participants: (A-Incorrect; B-Do Not Know; C-Correct); SD: Standard Deviation; *Significant difference

Knowledge question (Q1-Q18): Q1. People can get HBV from genes (heredity); Q2. Spread of HBV is by the air (coughing or staying in the same room); Q3. HBV spread by sexual relationship; Q4. HBV can spread through vertical transmission from mother to child; Q5. Sharing spoons or bowls for food can cause hepatitis B infection; Q6. HBV can be transmitted by contaminated blood; Q7. Sharing a toothbrush with an infected person can lead to hepatitis B; Q8. HBV spread by casual contact such as handshakes; Q9. HBV can be transmitted by sharing unsterilized syringes; Q10. Eating food prepared by an infected person can cause hepatitis B infection; Q11. HBV can cause fever, jaundice and anorexia; Q12. Asymptomatic carriers are capable of transmitting HBV to others; Q13. HBV can lead to cirrhosis or liver cancer; Q14. Infected adults are more likely to develop cancer than children; Q15. Alcohol and chemistry are main factors which promote hepatitis B; Q16. Co-infection with hepatitis C and D can lead to severe hepatitis B; Q17. Hepatitis B should be treated as soon as possible; Q18. Vaccine can prevent hepatitis B infection.

Attitude question (Q19-Q25): Q19. Only children from 0-10 years old need to be vaccinated; Q20. It is reasonable for Vietnam to include vaccination against hepatitis B in the national immunization program; Q21. Infants should be immunized for the first 0 to 24 hours after birth; Q22. Patients with immunodeficiencies should not receive hepatitis B vaccine; Q23. HBV vaccine is safe for everyone; Q24. Do you know if vaccinations can be free or low-cost through certain programs? Q25. Do you know the place where one can get hepatitis B immunizations?

Table 3. Relationships between socio-demographic profiles of participants and their scores for knowledge and attitudes by mean comparison.

CHARACTERISTIC	Knowledge						Attitude						
	Public sector		Private sector		Total		Public sector		Private sector		Total		
	Mean ± SD	p-value	Mean ± SD	p-value	Mean ± SD	p-value	Mean ± SD	p-value	Mean ± SD	p-value	Mean ± SD	p-value	
Gender^(a)													
Male	4.2 ± 0.6	0.777	3.9 ± 0.5	0.852	4.1 ± 0.6	0.471	3.3 ± 0.6	0.579	3.6 ± 0.6	0.087	3.4 ± 0.6	0.054	
Female	4.2 ± 0.5		3.9 ± 0.5		4.0 ± 0.5		3.3 ± 0.6		3.7 ± 0.5		3.5 ± 0.6		
Year of study^(b)													
First	4.0 ± 0.5	0.000*	3.7 ± 0.5	0.000*	3.9 ± 0.5	0.000*	3.1 ± 0.6	0.000*	3.6 ± 0.6	0.000*	3.2 ± 0.7	0.000*	
Second	4.0 ± 0.5		3.8 ± 0.6		3.9 ± 0.6		3.2 ± 0.7		3.8 ± 0.6		3.5 ± 0.7		
Third	4.4 ± 0.5		4.0 ± 0.4		4.2 ± 0.5		3.4 ± 0.5		3.6 ± 0.6		3.5 ± 0.5		
Fourth	4.3 ± 0.5		4.1 ± 0.5		4.2 ± 0.5		3.3 ± 0.6		3.5 ± 0.6		3.4 ± 0.6		
Fifth	4.3 ± 0.5		3.9 ± 0.5		4.0 ± 0.5		3.3 ± 0.6		3.7 ± 0.5		3.6 ± 0.5		
Sixth	4.5 ± 0.5		4.4 ± 0.4		4.5 ± 0.4		3.7 ± 0.4		3.5 ± 0.4		3.6 ± 0.5		
Spirituality^(b)													
Non-religion	4.2 ± 0.5	0.158	3.9 ± 0.5	0.701	4.1 ± 0.6	0.052	3.3 ± 0.6	0.920	3.7 ± 0.5	0.519	3.5 ± 0.6	0.417	
Buddhist	4.1 ± 0.6		3.8 ± 0.6		3.9 ± 0.6		3.3 ± 0.6		3.6 ± 0.6		3.5 ± 0.6		
Christian	4.1 ± 0.5		3.9 ± 0.5		4.0 ± 0.5		3.2 ± 0.5		3.7 ± 0.6		3.5 ± 0.6		
Catholic	3.9 ± 0.7		3.8 ± 1.3		3.9 ± 0.9		3.1 ± 0.6		3.2 ± 0.5		3.1 ± 0.5		
Others	4.2 ± 0.3		3.8 ± 0.6		3.9 ± 0.5		3.2 ± 1.0		3.6 ± 0.2		3.5 ± 0.6		
Residence^(a)													
Urban	4.2 ± 0.5	0.765	3.9 ± 0.5	0.041*	4.0 ± 0.5	0.116	3.3 ± 0.6	0.839	3.7 ± 0.6	0.019*	3.5 ± 0.6	0.101	
Rural	4.2 ± 0.5		3.8 ± 0.5		4.0 ± 0.6		3.3 ± 0.6		3.8 ± 0.5		3.5 ± 0.6		
Part-time job^(a)													
Yes	4.2 ± 0.5	0.162	3.9 ± 0.5	0.354	4.0 ± 0.5	0.000*	3.2 ± 0.6	0.320	3.8 ± 0.5	0.000*	4.0 ± 0.5	0.000*	
No	4.2 ± 0.5		3.9 ± 0.6		4.1 ± 0.6		3.3 ± 0.6		3.6 ± 0.6		4.1 ± 0.6		
Monthly expenses (USD)^(b)													
< 90	4.2 ± 0.5	0.000*	3.9 ± 0.5	0.571	4.0 ± 0.5	0.521	3.2 ± 0.6	0.073	3.7 ± 0.5	0.165	3.5 ± 0.6	0.035*	
90-<130	4.2 ± 0.6		3.9 ± 0.5		4.0 ± 0.6		3.2 ± 0.6		3.7 ± 0.5		3.4 ± 0.6		
130-<180	4.3 ± 0.5		3.8 ± 0.5		4.1 ± 0.6		3.4 ± 0.6		3.6 ± 0.6		3.5 ± 0.6		
≥180	4.3 ± 0.5		3.9 ± 0.6		4.0 ± 0.6		3.4 ± 0.5		3.7 ± 0.7		3.6 ± 0.6		
Have you been vaccinated against HBV?^(a)													
Yes	4.3 ± 0.5	0.000*	3.9 ± 0.5	0.401	4.1 ± 0.5	0.000*	3.4 ± 0.6	0.000*	3.7 ± 0.5	0.000*	3.5 ± 0.6	0.000*	
No	4.1 ± 0.6		3.9 ± 0.6		4.0 ± 0.6		3.1 ± 0.6		3.6 ± 0.6		3.3 ± 0.6		

^(a): T-test; ^(b): One-way ANOVA; SD: Standard Deviation; *Significant difference.

Factors associated with knowledge and attitudes toward hepatitis B

Number of years of education was observed to contribute to knowledge of HBV, as students in their third to sixth years had significantly greater understanding of the disease (Table 4). Other crucial factors that affected overall awareness of HBV were history of vaccination and university sector, as participants with no history of vaccination against HBV had lower scores for awareness (OR: 0.556; CI: 0.42–0.74). Although students enrolled in private universities knew less about HBV than their public university counterparts (OR: 0.498; CI: 0.35–0.71), their opinions about the disease were noticeably more accurate than those of public university students (OR: 5.362; CI: 3.87–7.43).

Average scores for knowledge and attitudes by year of study and faculty

In terms of year and faculty of study, the higher their year of education in the public sector, the more information the students had about HBV (Table 5). The mean score increased from 4.0 ± 0.5 in the first year to 4.5 ± 0.5 in the sixth year (Table 5). Students in the faculty of medicine had the most knowledge about HBV, with a mean score of 4.4 ± 0.5 for public sector universities and 3.9 ± 0.8 for private universities. The participants most aware of information about HBV were nursing science students in the public sector (mean score 3.7; median score 4.2); the participants most concerned about the issue of HBV were pharmacy students in the private sector, with mean and median scores of 3.7.

Overall, knowledge increased with year of study, and the highest gap recorded was between fifth-year and sixth-year students ($\Delta = 0.5$) (Fig. 1A-B). Sixth-year students had higher knowledge scores (ME = 4.5) and higher attitude scores (ME = 3.6). In terms of faculty of study, medicine students had by far the most knowledge (ME = 4.4). The other four faculties had generally similar scores, which were 0.3–0.5 points below those of the medicine students (Fig. 1C-D). The faculty of medical technology scored lowest for attitude at

3.0, which is 0.3 points lower than the average score for students of nursing science.

Research purposes and benefits of an internet-based study

The main objective of this study was to evaluate knowledge and attitudes toward prevention of hepatitis B in the high-risk population of health-care students in Vietnam. To the best of found knowledge, this is the first study to be carried out among all the medical universities in Vietnam. The data was collected via the internet using social media. This method of data collection was of great benefit, as it allowed us to collect quickly and conveniently a wide range of data at random from most medical universities in Vietnam. Nevertheless, it should be borne in mind that use of social media in a study decreases the opportunity for students living and studying in rural areas to participate. This study observed a substantial difference in participation rates, with nearly four times as many participants from urban areas as from rural areas.

Knowledge of transmission of HBV in comparison with other studies

In the second part of the questionnaire, 12 out of 18 items were designed to evaluate participants' understanding of the importance of preventing transmission in controlling the spread of HBV. The majority of participants answered these items correctly: 77.8% knew that HBV can spread through vertical transmission from mother to child; 84.3% knew that HBV can be transmitted through contaminated blood; and 88.2% knew that HBV is not spread by casual contact such as handshakes. However, only 46.2% knew that people cannot get HBV from their genes. This is a high proportion compared to other studies in Vietnam and South East Asia. One study of university students in Ho Chi Minh City found that less than half of students (47.6%) knew that HBV can be transmitted sexually, whereas 67.8% knew that HBV can be transmitted by sharing a toothbrush with an infected person (Dahlström and Funegård Viberg, 2013). These numbers seem low when compared to studies conducted in other parts of the world.

Table 4. Factors associated with knowledge and attitudes toward hepatitis B: results of logistical regression.

Parameter	Knowledge			Attitude			Total score		
	p-value	OR	95% CI	p-value	OR	95% CI	p-value	OR	95% CI
Gender (Ref: Male)									
Female	0.394	1.245	[0.75 - 2.06]	0.021*	1.351	[1.05 - 1.74]	0.129	1.249	[0.94 - 1.66]
Faculty (Ref: Medicine)									
Pharmacy	0.709	1.129	[0.60 - 2.14]	0.000*	0.503	[0.34 - 0.74]	0.004*	0.524	[0.34 - 0.82]
Dentistry	0.804	0.813	[0.16 - 4.15]	0.346	0.554	[0.16 - 1.90]	0.104	0.369	[0.11 - 1.23]
Nursing science	0.911	0.954	[0.42 - 2.17]	0.330	0.759	[0.44 - 1.32]	0.062	0.565	[0.31 - 1.03]
Medical technology	0.043	0.312	[0.10 - 0.96]	0.028*	0.257	[0.08 - 0.86]	0.178	0.495	[0.18 - 1.38]
Year of study (Ref: First)									
Second	0.399	1.234	[0.76 - 2.01]	0.197	1.327	[0.86 - 2.04]	0.224	1.309	[0.85 - 2.02]
Third	0.000*	3.803	[2.06 - 7.04]	0.091	1.417	[0.95 - 2.12]	0.000*	2.529	[1.63 - 3.93]
Fourth	0.000*	3.767	[1.96 - 7.26]	0.678	0.913	[0.59 - 1.41]	0.015*	1.751	[1.12 - 2.75]
Fifth	0.011*	1.785	[1.14 - 2.78]	0.011*	1.649	[1.12 - 2.42]	0.000*	2.371	[1.58 - 3.56]
Sixth	0.030*	9.385	[1.25 - 70.48]	0.006*	2.707	[1.33 - 5.53]	0.004*	8.644	[1.98 - 37.76]
Residence (Ref: Urban)									
Rural	0.002*	0.556	[0.38 - 0.81]	0.184	1.245	[0.90 - 1.72]	0.242	0.809	[0.57 - 1.15]
Part-time job (Ref: Yes)									
No	0.046*	1.297	[1.00 - 1.68]	0.015*	0.730	[0.57 - 0.94]	0.243	0.843	[0.63 - 1.12]
Vaccination (Ref: Yes)									
No	0.039*	0.705	[0.51 - 0.98]	0.000*	0.552	[0.43 - 0.72]	0.000*	0.556	[0.42 - 0.74]
University (Ref: Public)									
Private	0.000*	0.498	[0.35 - 0.71]	0.000*	5.362	[3.87 - 7.43]	0.000*	1.832	[1.31 - 2.57]

OR: Odds Ratio; 95% CI: Confidence interval 95%; *Significant difference.

Table 5. Distribution by mean, median, range, and interquartile range of knowledge and attitude scores of students by year of study and faculty.

Item	Knowledge								Attitude								
	Public				Private				Public				Private				
	Mean ± SD	Range	MD	IQR	Mean ± SD	Range	MD	IQR	Mean ± SD	Range	MD	IQR	Mean ± SD	Range	MD	IQR	
Year of study	Y1	4.0 ± 0.5	2.2 - 5.0	4.0	3.7 - 4.4	3.7 ± 0.5	2.2 - 4.4	3.7	3.4 - 4.0	3.1 ± 0.6	1.6 - 4.4	3.1	2.7 - 3.6	3.6 ± 0.6	1.9 - 4.7	3.7	3.4 - 4.1
	Y2	4.0 ± 0.6	1.8 - 5.0	4.2	3.6 - 4.5	3.8 ± 0.6	1.6 - 4.8	3.8	3.5 - 4.2	3.2 ± 0.7	1.6 - 5.0	3.1	2.7 - 3.6	3.8 ± 0.6	1.9 - 4.9	3.9	3.4 - 4.1
	Y3	4.4 ± 0.4	2.6 - 5.0	4.3	4.1 - 4.7	4.0 ± 0.4	3.0 - 4.8	4.0	3.7 - 4.3	3.4 ± 0.5	2.1 - 4.4	3.3	3.0 - 3.7	3.6 ± 0.6	1.9 - 4.7	3.7	3.3 - 4.0
	Y4	4.3 ± 0.6	1.6 - 5.0	4.4	4.0 - 4.6	4.1 ± 0.5	1.7 - 5.0	4.2	3.9 - 4.5	3.3 ± 0.6	1.9 - 4.9	3.3	2.9 - 3.9	3.5 ± 0.6	1.6 - 4.7	3.6	3.1 - 4.0
	Y5	4.3 ± 0.5	2.1 - 5.0	4.4	4.1 - 4.6	4.1 ± 0.5	1.7 - 5.0	4.2	3.9 - 4.5	3.3 ± 0.6	2.1 - 4.4	3.3	3.0 - 3.9	3.5 ± 0.6	1.6 - 4.7	3.6	3.1 - 4.0
	Y6	4.5 ± 0.2	3.8 - 5.0	4.6	4.4 - 4.7	4.4 ± 0.4	2.4 - 4.8	4.4	3.5 - 4.5	3.7 ± 0.4	2.3 - 4.4	3.7	3.3 - 3.9	3.5 ± 0.4	2.1 - 4.7	3.7	2.9 - 3.9
Faculty	F1	4.4 ± 0.5	1.6 - 5.0	4.5	4.2 - 4.7	3.9 ± 0.8	2.4 - 4.6	4.2	3.5 - 4.5	3.5 ± 0.6	1.9 - 5.0	3.4	3.1 - 3.9	3.1 ± 0.6	2.1 - 3.7	3.2	2.8 - 3.5
	F2	4.1 ± 0.5	1.8 - 5.0	4.2	3.9 - 4.4	3.9 ± 0.5	1.6 - 5.0	3.9	3.6 - 4.2	3.1 ± 0.6	1.6 - 4.4	3.1	2.7 - 3.6	3.7 ± 0.5	1.6 - 5.0	3.7	3.4 - 4.0
	F3	3.9 ± 0.6	2.8 - 4.8	3.7	3.6 - 4.4	-	-	-	-	3.2 ± 0.6	2.1 - 4.4	3.1	3.0 - 3.6	-	-	-	-
	F4	4.1 ± 0.5	2.6 - 5.0	4.2	3.8 - 4.5	3.7 ± 0.9	2.3 - 4.5	4.2	3.3 - 4.4	3.7 ± 0.9	1.7 - 4.6	4.2	3.3 - 4.4	3.2 ± 0.5	2.7 - 4.0	2.9	2.8 - 3.5
	F5	3.9 ± 0.6	2.7 - 4.9	4.1	3.5 - 4.4	3.3 ± 0.7	2.4 - 4.1	3.3	2.8 - 3.7	3.0 ± 0.5	2.3 - 3.9	3.0	2.6 - 3.4	3.2 ± 0.6	2.4 - 3.9	3.2	2.8 - 3.5

SD: Standard Deviation; Range: Min-Max; MD: Median; IQR: (Q1: 25th percentile; Q3: 75th percentile). Medicine (F1); Pharmacy (F2); Dentistry (F3); Nursing science (F4); Medical technology (F5).

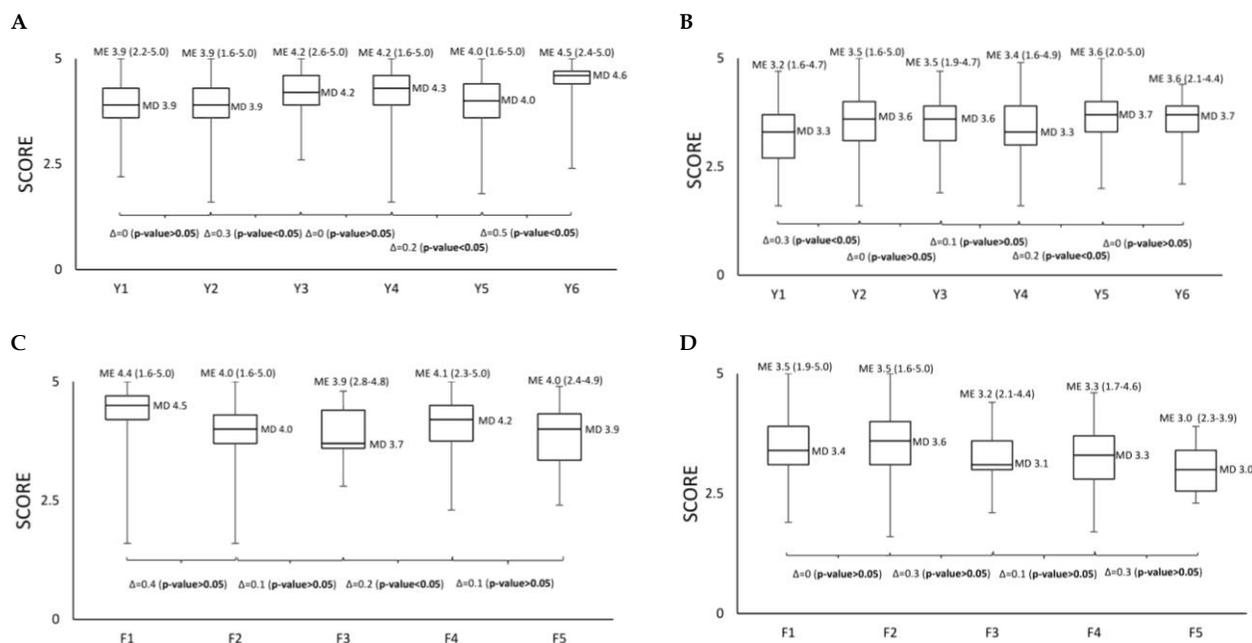


Figure 1. Distribution of scores for knowledge and attitude by year of study and faculty.

(A) Knowledge by year of study; (B) attitude by year of study; (C) knowledge by faculty; and (D) attitude by faculty. MD: median; ME: mean (Min-Max).

In a cross-sectional study of 269 undergraduate dental students at Kalinga Institute of Dental Sciences, Bhubaneswar, 85.9% said that hepatitis B is transmitted through contaminated blood and body fluids, 84.4% said that it was transmitted through sexual contact, and 95.9% said that it was transmitted through unsterilized syringes, needles, and surgical instruments (Sundar Ray et al., 2017). Additionally, a study of medical students in Northwest Ethiopia found that most respondents knew that exposure to infected blood or body fluid, contaminated needles, contact with non-intact skin, and unsafe sexual contact are risk factors for HBV infection (Abdela et al., 2016).

Attitudes toward HBV vaccination and vaccination status in Vietnam in comparison with other studies

Vaccination is internationally recognized as an effective way to prevent HBV, especially in developed countries. To date, many studies have been carried out worldwide to assess HBV vaccine status. A cross-sectional study of hepatitis B and influenza vaccines among medical students in Germany found that 86.5% of them had been vaccinated.

Similarly, high numbers were reported by two Italian studies of medical students (83.7%) (Trevisan et al., 2008) and by a study of healthcare students from a single institution in Greece (84.4%) (Pavlopoulou et al., 2009). The present study found that only 68.7% of total students in both the public and private sectors had been vaccinated. This number seems much lower than for comparable studies in Europe, but it is in line with other research in Asia—70.6% for medical students in Pakistan (Khan et al., 2010), 72.4% for medical, dental, and nursing students in Nepal (Bhattarai et al., 2014), and 63.6% of participants in Thailand (Ohlson and Bladh, 2015)—and much higher than in some other studies. A study conducted in the seven faculties of the University of Health Sciences, Lao reported a low rate of vaccination among students (30.5%), and a study in Ho Chi Minh City found that only 58.8% of students reported being vaccinated against HBV (Dahlström and Funegård Viberg, 2013). Although rates of vaccination have increased, they remain low in the context of the significant spread of HBV.

These findings also demonstrate that the attitudes of participants (3.5 ± 0.6) were less satisfac-

tory than their levels of knowledge (4.0 ± 0.4). An important issue is that participants were unwilling to be vaccinated, despite having adequate knowledge about the benefits of vaccination. Kesieme et al. (2011) conducted a study in Nigeria among operating room staff, and they found poor immunization rates (26.8%), despite good knowledge of the risk factors for hepatitis B and of the benefits of the vaccine. Low rates of vaccination appear to be related to a lack of motivation among students to be vaccinated against hepatitis B and also to a degree of carelessness on their part; the main reason given by participants for not being vaccinated was that they did not know where to get vaccinated. Furthermore, 46.8% of unvaccinated students thought that a reasonable price to pay for vaccination was less than 15 USD; this may reflect the fact that vaccination is too expensive (almost 30 USD for the whole vaccination process), especially in a medium- and low-income country such as Vietnam.

Differences in knowledge and attitudes between public and private university students

The present study observed clear differences in knowledge and attitudes between university students from the public sector and those from the private sector. The knowledge of public university students was slightly greater than that of private university students: 82.2% of public university students knew that HBV is not airborne, whereas only 69.8% of private university students knew this. Furthermore, 92.8% of public students knew that HBV is not spread by casual contact such as handshakes, but 16.4% of private students did not know this. This study also found that 70.8% of public university students had been vaccinated, compared to only 66.6% of private university students. According to a study by Hwang et al. (2008), factors such as being screened or vaccinated against HBV are correlated with higher levels of knowledge.

Relationships among knowledge, attitudes, and year of study in comparison with other studies

This study shows a significant connection between the knowledge and attitudes of participants

and their year of study. Students in their first year had the lowest scores for both knowledge (3.9 ± 0.5) and attitudes (3.2 ± 0.7), while students in their final year scored 4.5 ± 0.4 for knowledge and 3.6 ± 0.5 for attitudes. A possible reason for the relative lack of knowledge among first-year students is that they had not yet obtained a clear understanding of infectious diseases or been exposed to real-life cases in the health care workplace. This hypothesis is well supported by a study of 486 dental students in India, which indicated that levels of knowledge among interns and final-year students were good, whereas first-year and second-year students showed lower levels of knowledge (Nagpal and Hegde, 2016).

Relationships among knowledge, attitudes, and faculty in comparison with other studies

Another important finding of the present study is the clear difference in levels of knowledge among students from different faculties. The highest knowledge scores belonged to medical students (4.4 ± 0.5), and the lowest scores belonged to dental students (3.9 ± 0.6). A study at Haramaya University demonstrated that medicine students had the highest scores of any faculty for knowledge and attitudes (Mesfin and Kibret, 2013). These results are in line with findings from studies at B. J. Medical College, Ahmadabad, and Gujarat, India, in which the majority of medical students were found to have accurate knowledge regarding modes of transmission (Daud et al., 2007). However, the results contradict those of a study conducted in Pakistan, which found that the scores of dental students for both knowledge and attitudes were higher than those of medical students (Ali et al., 2017). This could be explained by a limitation of the present study: because this research method restricted the participants to internet users, it was unable to ensure that a comparable population from each faculty took part.

CONCLUSIONS

The majority of students who participated in this survey had good knowledge of hepatitis B. However, their awareness of and rates of vaccination were not high enough to protect them from

the occupational risks they face. This study therefore recommends improving the knowledge and attitudes of health care students through orientation and sensitization programs and through improvements to their educational environment. Advanced education in medical universities is necessary in order to ensure that future HCWs provide the best possible counseling for patients.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHOR CONTRIBUTION:

Contribution	Vo TQ	Nguyen LHT	Pham MN
Concepts or ideas	x		
Design	x	x	
Definition of intellectual content	x	x	
Literature search	x	x	x
Experimental studies	x	x	
Data acquisition	x	x	
Data analysis	x	x	
Statistical analysis	x	x	
Manuscript preparation	x	x	
Manuscript editing	x	x	x
Manuscript review	x	x	x

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