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Determination of knowledge level and vaccination status of nursing students regarding hepatitis B infection and hepatitis B vaccine

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ABSTRACT

Aims: The study was conducted to determine the knowledge level and vaccination status of nursing students regarding hepatitis B infection and hepatitis B vaccine.

Methods: The universe of this descriptive and cross-sectional study consisted of 747 students studying at the department of nursing. In the study, a 43-item questionnaire form and the vaccine hesitancy scale were used.

Results: Of the students, 77.7% were female. The mean age was 20.68±1.68. Eight percent of the students had a chronic disease and 2.1% were diagnosed with hepatitis (71.4% hepatitis B). Of the students, 77.3% had hepatitis B vaccine. Students stated that those who were injected with the same injector (77.8%), who received blood transfusions (72.2%), and who had heterosexual intercourse ranked in the top three in the hepatitis risk group (63.9%). Students stated that the primary modes of hepatitis transmission were: 93.6% through blood, 78.8% through needlestick injuries with infected injectors, and 72.7% through sexual intercourse. The most accurate information that the students had about hepatitis was the existence of hepatitis B vaccine (96.9%) and hepatitis B carriers (77%). The mean knowledge level of the students about hepatitis was 5.22±1.92. The mean score that the students obtained from the vaccine hesitancy scale was 31.25±6.18. It was found that there was a significant relationship between knowledge level and vaccine hesitancy ($p<0.005$).

Conclusion: Levels of hepatitis B knowledge and vaccine hesitancy are moderate in nursing students. It is recommended to provide training and awareness activities for nursing students in this regard.

Keywords: Hepatitis, health knowledge, vaccine hesitancy, nursing, students

INTRODUCTION

Hepatitis B virus (HBV) is a non-cytopathic and hepatotropic virus with the potential to cause chronic infection, which can lead to cirrhosis and hepatocellular carcinoma.[1] HBV can be transmitted through the use of blood and blood products, sharing living spaces, transfusion, transplantation of infected organs, shared use of contaminated needles, sexual contact, sharp/piercing instruments such as manicure-pedicure sets, razors, and scissors as well as during cosmetic procedures like acupuncture, tattooing and piercing.[2] In a systematic review evaluating the studies conducted in our country in terms of age and region, HBsAg positivity was found as 4.6%, and it was reported that approximately three million people had chronic hepatitis B.[3]

Physicians, dentists, nurses and laboratory personnel are at risk of hepatitis B infection since they come into contact with blood and other body fluids during their daily lives. In the study conducted by Apaydın et al.[2] it was reported that 14.4% of healthcare professionals were infected with HBV. In a study involving 2945 healthcare professionals working in an hospital, 3.2% of the participants were found to have a diagnosis of hepatitis B, and 88.4% of the individuals diagnosed with hepatitis B had chronic HBV in their families.[4]

Transmission to healthcare personnel occurs primarily through percutaneous injuries with contaminated needles and injectors, or by percutaneous or mucosal exposure to small quantities of blood during surgical and dental procedures.[2] HBV transmission among healthcare personnel can be prevented by strict adherence to the standard microbiological practices and techniques and by the routine use of appropriate barrier precautions when handling patients' blood and other body fluids.[2]

In the study of Kader et al.[5] the higher anti-HBs positivity compared to the studies conducted in the last 10 years and where 26-50% anti-HBs positivity was detected was attributed to the increase in awareness and vaccination programs with trainings. In the study conducted by Apaydın et al.[2] HBV immunity was determined to be 85% in physicians and nurses and 70% in other healthcare professionals. Studies reveal that the vaccination rate in healthcare professionals is still not at the desired level. Therefore, it is necessary to increase

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the knowledge levels and vaccination rates of healthcare professionals on hepatitis B.

It is thought that determining the knowledge level and vaccination rates of healthcare professionals about hepatitis B while they are still students, as well as eliminating the lack of knowledge on this subject, will contribute to reducing the risk of hepatitis B transmission, taking protection measures and increasing vaccination rates when transitioning to professional life.

Vaccine hesitancy, defined as the delay in acceptance or refusal of vaccination despite the availability of vaccination services, has become a growing concern in global public health. It is a complex and context-specific phenomenon influenced by various factors. The World Health Organization conceptualizes vaccine hesitancy through the "3C model," which includes confidence (trust in vaccines and health authorities), complacency (low perceived risk of vaccine-preventable diseases), and convenience (accessibility and availability of vaccines).[6]

Recent global trends such as misinformation on social media, distrust in pharmaceutical industries, and low risk perception due to successful immunization programs have contributed to the rise in vaccine hesitancy.[6] Among healthcare professionals and students, this issue is particularly critical, as they are expected to not only protect themselves through vaccination but also guide the public as role models. Nursing students, in particular, play an important role in patient education and public health promotion. Therefore, their attitudes and hesitations toward vaccines, especially those targeting high-risk infections like hepatitis B, warrant careful evaluation.

In this context, the present study was conducted to determine the knowledge level, vaccination status, and vaccine hesitancy of nursing students regarding hepatitis B infection and the hepatitis B vaccine.

METHODS

Ethics
The study was conducted with the permission of Uludağ University Faculty of Medicine Clinical Researches Ethics Committee (Date: 30.05.2023, Decision No: 2023-12/8). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Type of the Study
It is a cross-sectional and descriptive study.

Place of the Study
The study was conducted between 30/06/2023 and 31/12/2023 on the students of the nursing department of the faculty of health sciences of a university.

Universe and Sample of the Study
The universe of the study consisted of 747 students enrolled at Bursa Uludağ University, Faculty of Health Sciences, Department of Nursing. Inclusion criteria were being an undergraduate nursing student enrolled at the faculty during the data collection period, having no communication difficulties, and voluntarily agreeing to participate in the study. The required sample size for this known population was calculated as approximately 254 using the standard sample size formula with a 95% confidence level and a 5% margin of error. However, a total of 326 students who met the inclusion criteria and voluntarily agreed to participate were included in the study. This number exceeds the minimum requirement and enhances the statistical power and representativeness of the findings. Students who declined to participate, had communication difficulties, or were of foreign nationality were excluded. A convenience sampling method was used in this study.

Data Collection Tools of the Study
The data were collected with the questionnaire form developed by the researcher in line with the examined literature, and the "vaccine hesitancy scale" whose Turkish validity and reliability process was conducted by Yılmaz et al.[7] In this study, the internal consistency coefficient (Cronbach's alpha) of the vaccine hesitancy scale was calculated as 0.84. The data collection process was carried out between 30 June and 31 December 2023. I administered the questionnaire and the vaccine hesitancy scale face-to-face in a classroom setting. Prior to data collection, i informed the students about the aim of the study and obtained their verbal and written informed consent. The implementation was conducted in a quiet and appropriate environment where the students could complete the questionnaires independently. I was present during the application to provide clarification when needed, without influencing their responses. Each participant completed the questionnaire anonymously, and the entire process took approximately 15–20 minutes. This approach ensured voluntary participation, accuracy, and consistency in data collection.

Questionnaire Form
The questionnaire form consisted of 43 items. The first 35 items of the form included sociodemographic characteristics (age, gender, etc.) while the other 8 items included information questions about hepatitis B infection and hepatitis B vaccine. Knowledge-related items were scored as "correct (1)" and "incorrect/don't know (0)". It was accepted that as the number of correct answers increased, the knowledge level also increased.

Vaccine Hesitancy Scale
The Turkish validity and reliability study of the scale, who was developed by Luyten et al.[8] in 2019, was conducted by Yılmaz et al.[7] The five-point Likert-type (1=strongly disagree, 5=strongly agree) scale consists of 9 items in total with two sub-dimensions, lack of trust (7 items) and risks (2 items). The total score of the scale varies between 9-45. As the score obtained from the scale increases, vaccine hesitancy decreases.

Statistical Analysis
The data were evaluated in the SPSS 22 program by using means, percentages, One-way ANOVA test, t test and Pearson correlation test.

RESULTS

The mean age of the students was 20.68±1.68, and 77.7% of them were female. Of the students, 67.5% graduated from Anatolian high schools and 46% were living in the dormitories. Of the students, 77.3% had a nuclear family type, and the economic status of 76.4% was moderate. The education level of the mothers of 37.1% of the students was primary education, and the education level of the fathers of 28.5% was high school. Of the students, 10.4% were smokers, and 8.6% were drinking alcohol (**Table 1**).

Eight percent of the students had a chronic disease, 2.1% had a diagnosis of hepatitis (71.4% hepatitis B). Thirty-four percent of the students had an individual with chronic disease in their families, and 5.2% had a diagnosis of hepatitis (94.1% hepatitis B). Of the students, 83.1% stated that they obtained information about hepatitis from various sources, and 39.9% of them stated that they obtained this information from the internet. Of the students, 49.4% stated that they received training on hepatitis B infection and hepatitis B vaccine (**Table 1**).

Of the students, 77.3% were vaccinated against hepatitis B, and 67.9% of them were vaccinated after starting their education in the nursing department. Vaccine dose was only completed in only 29% of them. Among the students who were not vaccinated, 56.8% stated that they were not vaccinated because they had sufficient antibody levels. Among the vaccinated students, 77.8% stated that they had sufficient antibody levels. A total of 83.7% of the students had their hepatitis antibody/antigen levels tested after starting their educations in the nursing department. Among the students who were not vaccinated, 44.6% stated that they were considering getting vaccinated. Of the students, 19.9% stated that they had previously cared for a patient diagnosed with hepatitis B, and 62.6% reported being concerned about being infected with hepatitis B while providing care (**Table 2**).

The top three hepatitis risk group was stated by the students as follows; those who injected drugs with the same injector by 77.8%, those who had blood transfusion by 72.2%, and those who were in heterosexual relationships by 63.9%. The students stated that the primary modes of hepatitis transmission were:

Table 1. Distribution of students' sociodemographic and health-related characteristics (n=326)

Variables	Categories	n	%	Variables	Categories	n	%
Class	1 2 3 4	146 54 65 61	44.8 16.6 19.9 18.7	Family type	Nuclear Extended Broken	252 56 18	77.3 17.2 5.5
Age	(Mean±SD)	20.68±1.68	R=17-30	Gender	Male Female	76 250	23.3 76.7
High school graduated from	Anatolian high school Science high school Health vocational high school General high school Other	220 28 21 15 42	67.5 8.6 6.4 4.6 12.9	Economic status	Income is less than expenses Income equals expenses Income exceeds expenses	41 249 36	12.6 76.4 11.0
Mother's educational level	Literate/illiterate Primary school Middle school High school University and higher	37 121 66 69 33	11.3 37.1 20.2 21.2 10.1	Father's educational level	Literate/illiterate Primary school Middle school High school University and higher	16 79 65 93 73	4.9 24.2 19.9 28.5 22.4
Smoking status	I do not use I use I quit	283 34 9	86.8 10.4 2.8	Alcohol consumption status	I do not use I use I quit	296 28 2	90.8 8.6 0.6
Current residence	Living with relatives Living with family Living with friends Living alone Dormitory	20 135 13 8 150	6.1 41.4 4.0 2.5 46.0	Presence of an individual with a chronic disease in the family	Yes No	111 215	34.0 66.0
Presence of an individual with a hepatitis diagnosis in the family	Yes No	17 309	5.2 94.8	Type of hepatitis in an individual diagnosed with hepatitis in the family (n=17)	Hepatitis B Hepatitis C	16 1	94.1 5.9
Presence of chronic disease	Yes No	26 300	8.0 92.0	Presence of hepatitis	Yes No	7 319	2.1 97.9
Type of hepatitis (n=7)	Hepatitis A Hepatitis B Hepatitis B+hepatitis E	1 5 1	14.3 71.4 14.3	Status of receiving education about hepatitis B infection and hepatitis B vaccination	Yes No	161 165	49.4 50.6
Status of obtaining information from various sources about hepatitis acquisition status	Yes No	271 55	83.1 16.9	Sources of information about hepatitis (n=271)	School Internet Social media Healthcare personnel A family member TV Newspaper	52 108 10 93 3 2 3	19.2 39.9 3.7 34.3 1.1 0.7 1.1

SD: Standart deviation, R: Range

Table 2. Students' thoughts and attitudes regarding hepatitis B (n = 326)

Variables	Categories	n	%
Status of receiving the hepatitis B vaccine	Yes No	252 74	77.3 22.7
Time of receiving the hepatitis B vaccination (n=252)	Before starting nursing school After starting nursing school	81 171	32.1 67.9
Number of doses of hepatitis B vaccine received (n=252)	1 2 3	63 116 73	25.0 46.0 29.0
Reason for not receiving the hepatitis B vaccine (n=74)	Natural immunity Sufficient antibody level Physician's recommendation Disregard/lack of concern	5 42 21 6	6.8 56.8 28.4 8.1
Knowledge of having sufficient immunity levels (n=252)	Yes No	196 56	77.8 22.2
Time of testing hepatitis antigens and antibodies	Before starting nursing school After starting nursing school I did not have it tested	24 273 29	7.4 83.7 8.9
Consideration of receiving the hepatitis B vaccine (n=74)	Yes No	33 41	44.6 55.4
Providing care to patients diagnosed with hepatitis B	Yes No	65 261	19.9 80.1
Concerns about hepatitis B transmission while providing care	Yes No	204 122	62.6 37.4

93.6% through blood, 78.8% through needlestick injuries with infected injectors, and 72.7% through sexual intercourse. Of the students, 59.2% stated that HIV, 47.2% stated that chronic liver diseases, and 41.7% stated that being over 40 years old posed a risk for non-response to the hepatitis B vaccine (Table 3).

The most accurate information that the students had about hepatitis was the existence of hepatitis B vaccine (96.9%) and hepatitis B carriers (77%). The mean knowledge level of the students about hepatitis was 5.22±1.92. The mean score that the students obtained from the vaccine hesitancy scale was 31.25±6.18 (lack of confidence 25.46±6.21; risks 5.79±1.22) (Table 4).

Among the sociodemographic characteristics of the students, grade, father's educational status and smoking status were found to affect the knowledge level about hepatitis B ($p<0.05$) (Table 5).

It was found that the students' health-related characteristics and factors related to their thoughts/attitudes towards hepatitis, such as the presence of chronic illness in the family, knowledge about hepatitis, receiving education on hepatitis B infection and hepatitis B vaccine, caring for a patient diagnosed with hepatitis B, and concerns about getting infected with hepatitis B while providing care, influenced their knowledge level about hepatitis B ($p<0.05$) (Table 6).

A statistically significant relationship was found between the knowledge level of the students about hepatitis B and vaccine hesitancy ($p<0.005$) (Table 7).

DISCUSSION

Among the students, 2.1% were diagnosed with hepatitis (71.4% hepatitis B), and 5.2% reported having a family member diagnosed with hepatitis (94.1% hepatitis B). In a study conducted on nursing students, it was stated that 3.7% of the students had a family member diagnosed with hepatitis B.[9] In a study conducted by Sönmez and Akben[9] on nursing students, 3.7% reported that they had a family member diagnosed with hepatitis B. In the study conducted by Salduz and Özder[10], 0.8% of the students were found to be HBsAg positive, and 5.2% reported having a family member who was a hepatitis B carrier. The minor differences observed among studies may be attributed to factors such as variations in the geographical regions where the research was conducted, the participants' level of knowledge about hepatitis B, and the extent to which family members disclosed the diagnosis to the participants. Additionally, some individuals may be unaware of the diagnosis within their family or may choose not to disclose it, which could also contribute to discrepancies in reported rates. Considering these factors, the findings of the present study appear to be generally consistent with those in the literature, suggesting that the rates of reported hepatitis diagnoses among student populations with similar sociodemographic characteristics remain relatively comparable.

While 83.1% of the students stated that they had knowledge about hepatitis, 39.9% reported that they obtained this information from the internet. In a study conducted on the students of a faculty of medicine, it was found that 77.7% of the students obtained information about HBV from school and 35% from the media.[11] In a study conducted on nursing students in Ghana, it was reported that the sources of information about hepatitis B were school (60.6%), healthcare professionals (21.8%), and media (5%).[12] Our study results differ from the results of certain studies. This difference is thought to result from variations in the geographical locations where the studies were conducted, as well as differences in educational opportunities and access to the internet.

Of the students, 49.4% stated that they had received education about hepatitis B infection and hepatitis B vaccine. In a study conducted by Alkan et al.[11] it was found that 83.2% of medical faculty students eceived education about hepatitis B infection and hepatitis B vaccine. In contrast, a study conducted on university students reported that only 45.2% of them had

Table 3. Students' knowledge about hepatitis B risk groups, modes of transmission, and vaccine unresponsiveness (n=326)

Variables			n	%	Modes of transmission of hepatitis B		n	%
Hepatitis B risk groups	Heterosexual relationships	True False	207 117	63.9 36.1	Bloodborne	Yes No	305 21	93.6 6.4
	Sharing a syringe for drug injection	True False	252 72	77.8 22.2	Sexual contact	Yes No	237 89	72.7 27.3
	Living in the same household as a person with hepatitis B	True False	118 206	36.4 63.6	Sweat and tears	Yes No	69 257	21.2 78.8
	Receiving a blood transfusion	True False	234 90	72.2 27.8	Needle stick injury with an infected syringe	Yes No	257 69	78.8 21.2
	Receiving an organ transplant	True False	193 131	59.6 40.4	Breast milk	Yes No	62 264	19.0 81.0
	Using the same toilet	True False	74 250	22.8 77.2	Birth from an infected mother	Yes No	179 147	54.9 45.1
	Drug use	True False	122 202	37.7 62.3	Hemodialysis	Yes No	107 219	32.8 67.2
	Healthcare workers	True False	190 134	58.6 41.4	Kissing (lip-to-lip)	Yes No	73 253	22.4 77.6
	Born to mothers who are HBV carriers	True False	198 126	61.1 38.9	Shared use of cups, spoons, and forks	Yes No	56 270	17.2 82.8
	Patients with immune deficiencies	True False	115 209	35.5 64.5	Chronic skin wounds	Yes No	87 239	26.7 73.3
	Living in nursing homes and communal living settings	True False	100 224	30.9 69.1	Bed bug or mosquito bites	Yes No	40 286	12.3 87.7
Creating risk of non-response to hepatitis B vaccination	Being over 40 years old	Yes No	136 190	41.7 58.3	Shared use of toothbrushes and razors	Yes No	132 194	40.5 59.5
	Obesity	Yes No	114 212	35.0 65.0	From mother to baby during pregnancy	Yes No	144 182	44.2 55.8
	Gender	Yes No	62 264	19.0 81.0	Tattooing equipment	Yes No	137 189	42.0 58.0
	Chronic liver diseases	Yes No	154 172	47.2 52.8	Ear piercing	Yes No	116 210	35.6 64.4
	HIV	Yes No	193 133	59.2 40.8	Blood transfusion	Yes No	209 117	64.1 35.9
	Diabetes mellitus	Yes No	94 232	28.8 71.2	Dental treatment	Yes No	97 229	29.8 70.2
	Celiac disease	Yes No	59 267	18.1 81.9	Procedures like manicure and pedicure	Yes No	84 242	25.8 74.2
	Smoking	Yes No	110 216	33.7 66.3				

HIV: Human immunodeficiency virus

received education about hepatitis B.[13] The findings of our study fall between these two studies, suggesting that the level of education received about hepatitis B may vary depending on the university, faculty, curriculum, academic year, and particularly the high proportion of first-year students in the sample of the present study.

It was determined that 77.3% of the students received hepatitis B vaccine, and 67.9% of them received the vaccine after starting their education in the nursing department. However, only 29% of them had completed the vaccine dose. It was found that 56.8% of the students did not receive the vaccine since they already had sufficient antibody levels. 77.8% of the students, who received the vaccine, stated that they had sufficient antibody levels. In the studies conducted, it was found that the vaccination rates among students varied between 39.5% and 93%.[9,10,13-15] The 77.3% vaccination rate identified in our study falls within the reported range and represents a relatively high level. Differences in vaccination rates across studies may be attributed to factors such as sample characteristics, institutional vaccination policies, the geographic region where the research was conducted, and whether hepatitis B vaccination is mandatory prior to clinical placements. In the study by Şahin[13], the vaccination rate was reported as 39.5%, which may reflect lower awareness or limited accessibility to vaccines at that time. In contrast, the 93% rate reported by Saç et al.[14] may be associated with mandatory screening protocols implemented before clinical practice or institutional vaccination requirements. These variations indicate that the level of hepatitis B vaccination among healthcare students is shaped not only by individual decisions but also by institutional health policies, the timing of educational interventions, and recommendations based on antibody screening.

While 19.9% of the students stated that they had previously cared for a patient diagnosed with hepatitis B, 62.6% expressed concerns about being infected with hepatitis B while providing care. In a study conducted by Koç et al.[16] it was found that 88.9% of the students were afraid of being

Table 4. Distribution of students' knowledge levels on hepatitis and vaccine hesitancy scores (n=326)

Variables		n	%
There is carrier status in hepatitis B.	True False I don't know	251 24 51	77.0 7.4 15.6
There is a hepatitis B vaccine.	True False I don't know	316 6 4	96.9 1.8 1.2
Among viral hepatitis, hepatitis B has the highest transmission level.	True False I don't know	194 30 102	59.5 9.2 31.3
Hepatitis B virus can survive in inanimate environments.	True False I don't know	117 68 141	35.9 20.9 43.3
When hepatitis B becomes chronic, it can progress to cirrhosis and hepatocellular carcinoma.	True False I don't know	193 17 116	59.2 5.2 35.6
Hepatitis B immunoglobulin should be given to newborns from mothers infected with hepatitis B virus.	True False I don't know	244 15 67	74.8 4.6 20.6
Hepatitis B vaccines prevent the development of hepatocellular carcinoma and cirrhosis.	True False I don't know	149 40 137	45.7 12.3 42.0
Hepatitis B is included in the routine vaccination schedule.	True False I don't know	235 42 49	72.1 12.9 15.0
Number of correct answers/knowledge level	Mean±SD	5.22±1.92	R=0.00-8.00
Lack of trust	Mean±SD	25.46±6.21	R=9.00-35.00
Risks	Mean±SD	5.79±1.22	R=2.00-10.00
Total VHS score	Mean±SD	31.25±6.18	R=15.00-41.00

R: Range, VHS: Vaccine hesitancy scale, SD: Standard deviation

Table 5. The effect of students' sociodemographic characteristics on their knowledge level regarding hepatitis B (n=326)

Variables		Mean±SD	Significance
Class	1 2 3 4	4.81±1.85 5.40±2.17 5.58±1.65 5.63±1.98	F=4.172 p=0.006
Age		20.68±1.68	r=0.082 p=0.142
Gender	Male Female	5.31±1.89 4.92±2.02	t=1.551 p=0.122
Current residence	Living with relatives Living with family Living with friends Living alone Dormitory	5.31±1.74 5.69±1.93 5.00±1.77 5.10±2.00 5.05±1.80	F=0.634 p=0.594
High school graduated from	Anatolian high school Science high school Health vocational high school General high school Other	5.29±1.85 4.96±2.11 5.38±1.49 5.46±2.09 4.83±2.31	F=0.725 p=0.575
Family type	Nuclear Extended Broken	5.25±1.86 5.23±1.83 4.66±2.93	F=0.790 p=0.455
Economic status	Income is less than expenses Income equals expenses Income exceeds expenses	5.36±2.09 5.18±1.85 5.33±2.24	F=0.230 p=0.795
Mother's educational level	Literate/illiterate Primary school Middle school High school University and higher	4.91±1.81 5.27±1.88 5.65±1.84 4.85±2.03 5.27±2.05	F=1.714 p=0.147
Father's educational level	Literate/illiterate Primary school Middle school High school University and higher	4.31±1.85 5.40±1.75 5.50±1.68 5.41±2.03 4.71±2.06	F=3.017 **p=0.018**
Smoking status	I do not use I use I quit	5.29±1.93 5.00±1.70 3.66±1.93	F=3.417 **p=0.034**
Alcohol consumption status	I do not use I use I quit	5.22±1.95 5.21±1.70 5.00±0.00	F=0.013 p=0.987

F: One-way ANOVA test, SD: Standard Deviation

Table 6. The effect of students' health-related characteristics and hepatitis-related thoughts/attitudes on their knowledge level regarding hepatitis B (n=326)

Variables		Mean±SD	Significance
Presence of chronic disease	Yes	4.96±1.90	t-0.714
	No	5.24±1.93	p=0.476
Presence of hepatitis	Yes	4.60±1.64	t=-1.034
	No	5.24±1.93	p=0.302
Presence of an individual with a chronic disease in the family	Yes	5.51±1.73	t=1.978
	No	5.06±2.00	**p=0.049**
Presence of an individual diagnosed with hepatitis in the family	Yes	5.00±1.96	t=-0.485
	No	5.23±1.92	p=0.628
Knowledge of hepatitis	Yes	5.44±1.75	t=3.924
	No	4.12±2.35	**p=0.000**
Receiving education about hepatitis B infection and hepatitis B vaccination	Yes	5.47±1.70	t=2.405
	No	4.96±2.09	**p=0.017**
Receiving hepatitis B vaccination	Yes	5.30±1.80	t=1.292
	No	4.93±2.28	p=0.199
Providing care to patients diagnosed with hepatitis B	Yes	5.76±1.55	t=2.988
	No	5.08±1.98	**p=0.003**
Concerns about hepatitis B transmission while providing care	Yes	5.38±1.88	t=2.025
	No	4.94±1.97	**p=0.044**

t: t test, SD: Standard deviation

Table 7. The relationship between students' knowledge level regarding hepatitis B and vaccine hesitancy (n=326)

Variable		Lack of trust	Risks	VHS total
Knowledge level regarding hepatitis B	r	0.150	-0.061	0.138
	p	**0.007**	0.271	**0.012**

r: Pearson correlation test, VHS: Vaccine hesitancy scale

infected with hepatitis B, and 69.9% experienced stress while caring for a patient with hepatitis B. Similarly, in the study conducted by Abdela et al.[17] 77.2% of medical and health sciences students reported being concerned about the risk of HBV infection. The findings of our study are consistent with the literature, indicating that students tend to experience anxiety in situations involving contact with patients infected with HBV.

The top three hepatitis risk group was stated by the students as follows; those who injected drugs with the same injector by 77.8%, those who had blood transfusion by 72.2%, and those who were in heterosexual relationships by 63.9%. In a study conducted on nursing students, the risk of hepatitis B transmission through contaminated blood and blood products was found to be 77.6%, the risk of transmission through unsterilized injectors and surgical instruments was 88.7%, and the risk of transmission through unprotected sexual intercourse was 81.8%.[18] In a study conducted on nursing students in India, the students ranked the modes of hepatitis B transmission in the following order of risk: multiple sexual partners, blood transfusion, and the use of non-sterile injectors.[19] While the ranking and proportions in our study are generally consistent with trends reported in the literature, the differences observed regarding sexual transmission are particularly noteworthy. These discrepancies may be attributed to cultural factors, the scope of sexual health education and whether such topics are openly discussed within the participants' communities. Additionally, in some studies, participants were asked to rank the risk factors, whereas in our study, they were asked to directly identify high-risk groups, which may have influenced the distribution of responses. Considering all these factors, it can be concluded that students' awareness of the transmission routes of hepatitis B is largely consistent with the existing literature.

The students stated that the primary modes of hepatitis transmission were: 93.6% through blood, 78.8% through needlestick injuries with infected injectors, and 72.7% through sexual intercourse. In a study conducted by Balegha et al.[20] 90.8% of nursing students stated that hepatitis B was transmitted through blood, 81.8% through unprotected sexual intercourse, and 79.8% through mother-to-child transmission. In a study conducted by Barçın and Taşova[21], 84.7% of university students stated that hepatitis B was transmitted through blood, 66.3% through sexual intercourse, and 63.4% through the shared use of needles or sharp objects. In the study of Salduz and Özder[10], 94.7% of the students stated that the hepatitis virus can be transmitted through blood, 64.5% mother-to-child transmission, 72.9% sexual contact, 53.8% body fluids, and 9.2% respiratory transmission. In the study conducted by Ünsar et el.[22] it was found that 94% of nursing students and 71.8% of physiotherapy and rehabilitation students were aware of the transmission modes of HIV/AIDS, hepatitis C, and hepatitis B. Minor differences in the reported rates may be attributed to variables such as the educational level of the sample group, type of faculty, average age of participants, and even the timing of the study in relation to public health awareness events. In addition, variations in the structure of the questions, such as whether they were multiple-choice, ranking, or open-ended, and the data collection environment, whether online or face-to-face, may also contribute to discrepancies in the findings. In our study, parenteral routes such as blood transmission and the use of contaminated needles were the most frequently reported modes of transmission, which may indicate a heightened awareness among nursing students regarding occupational exposure. Overall, it can be concluded that students' level of awareness regarding the primary transmission routes of hepatitis B is consistent with the literature and can be considered satisfactory.

The information that students most accurately knew about hepatitis was the existence of a hepatitis B vaccine (96.9%) and carriers (77%). In a study conducted in Bangladesh, 82.6% of nursing students stated that HBV can be prevented through vaccination, and 75.6% stated that hepatitis B carriers (those who are not ill) can transmit infection to others.[18] In a study conducted on nursing students in India, 76.61% of the students stated that there was a vaccine for hepatitis B.[19] When our findings are compared with the literature, it is observed that there are certain differences in the levels of awareness about the hepatitis B vaccine among students from different regions. This situation is thought to result from the differences in the content of health education programs and awareness campaigns conducted in different regions.

The students' level of knowledge about hepatitis was at the moderate level (5.22±1.92). In studies conducted among healthcare students in Ghana (59.5%) and Egypt (57.85%), the students' level of knowledge was reported to be moderate and

sufficient.[12,23] In another study conducted in Ethiopia among students studying in the healthcare field (86.2%), the students' level of knowledge was determined to be high.[17] Our study results reveal that the level of knowledge about hepatitis B is still not at the desired level. The difference in study results is believed to result from variations in the inclusion criteria, education systems, and sample size.

The total score that students obtained from the vaccine hesitancy scale (31.25±6.18) and the subscale scores were at the moderate level (lack of trust 25.46±6.21; risks 5.79±1.22). In the study conducted by Saç et al.[14] it was stated that nursing students identified vaccination as the best way to protect against hepatitis B. In a study conducted by Shrestha et al.[24] it was found that 86.7% of the students believed that the hepatitis B vaccine is safe and effective. In the study conducted by Açıkgöz et al.[15] on students in health departments, 19% of the students expressed that they did not trust the protective effect of the hepatitis B vaccine, and 48% stated that they were not afraid of hepatitis B infection. Studies report that students studying in the healthcare field have varying levels of hesitancy regarding the vaccine. This situation is believed to result from differences in inclusion criteria, such as whether students have received education on hepatitis B infection and the hepatitis B vaccine, or whether there are individuals diagnosed with hepatitis in their family.

In this study, nursing students were found to have a moderate level of vaccine hesitancy based on the mean scores obtained from the vaccine hesitancy scale. This finding indicates that even individuals who are expected to take an active role in future healthcare services may experience uncertainty in their attitudes toward vaccination. In a systematic review conducted by Pavlovic et al.[25] on healthcare professionals across Europe, it was reported that healthcare workers may experience vaccine hesitancy, and in some studies, students in health-related fields were also included in the study samples. The same review provided specific findings regarding Turkiye, highlighting that healthcare professionals in the country expressed doubts about the necessity of certain vaccines, demonstrated hesitancy regarding the reliability of vaccination information sources, and that negative media coverage contributed to a decline in vaccine confidence. These findings are consistent with the moderate level of hesitancy observed in our study and emphasize the ongoing need for awareness and education on vaccination, particularly within the Turkish context. Moreover, Paterson et al.[26] emphasized that healthcare professionals' attitudes toward vaccines can directly influence public confidence in immunization programs. In this context, the presence of vaccine hesitancy among nursing students should be considered not only an individual-level issue but also a potential risk to public health. Based on these findings, it is important that structured vaccine literacy programs be integrated into nursing curricula. Similarly, national immunization strategies should be designed to target not only the general public but also healthcare students, in order to build long-term vaccine confidence and strengthen public health efforts.

It was found that the students' sociodemographic characteristics, particularly their class level, affected their knowledge level about hepatitis B ($p<0.05$). This situation is believed to result from the fact that the majority of the group included in the study were first-year students. In institutions that provide education and training in the healthcare field, basic information is included in the first-year curriculum, while courses covering diseases, risk factors, prevention methods, treatment and care are thought in later years. A study conducted in Bangladesh also mentioned that students' knowledge level increased since they progressed through their classes, with third-year students, in particular, having more knowledge about hepatitis B. It was stated that this situation indicated the need for basic information provided at the beginning of the educational process to be reinforced with more specific and clinical knowledge in subsequent years.[18,27] In addition, in a study conducted by Çetin et al.[28] to evaluate vaccine hesitancy among health students, it was found that trust in vaccines increased as the year of study progressed.

It was found that father's educational level affected the students' knowledge level about hepatitis B ($p<0.05$). In studies conducted in Ethiopia and Ghana, it was observed that sociodemographic characteristics, particularly the educational level of the mother and father, affected the students' knowledge level about hepatitis B.[12,17] When parents have a higher level of education, their awareness of the importance of having knowledge about health increases, and they motivate their children to learn as well.[29,30] Furthermore, it is believed that the profession of parents, along with the fact that men generally occupy positions in the workforce in a large part of society, and the associated increase in social interaction among men, also affects awareness on this subject.

It was found that the students' smoking status affected their knowledge level about hepatitis B ($p<0.05$). A study conducted among dentists in Monte Carlo reported that lifestyle factors such as alcohol consumption and tobacco use were negatively associated with hepatitis B vaccine uptake.[31] The study estimated that non-smokers and individuals who did not consume alcohol were 2.5 and 3 times more likely, respectively, to receive the hepatitis B vaccine compared to their counterparts. Smoking is one of harmful habits to health. Smoking is an indication of individuals level of care and concern for their own healths. Individuals who care about their health are actively in an effort to maintain and improve their well-being. This effort increases the tendency to seek knowledge on health-related subjects.[32]

It was found that having a family member with a chronic disease affects the students' level of knowledge about hepatitis B ($p<0.05$). The presence of a chronic disease in the family leads to other family members experiencing the entire disease process, from start to finish, and closely observing the symptoms, complications, and limitations associated with the disease. This situation reflects on individuals' attitude towards protecting and improving their own health.[33]

It was found that obtaining information from various sources and receiving education about hepatitis B infection and hepatitis B vaccine affect the level of knowledge about hepatitis B ($p<0.05$). As individuals continuously research and learn about any health-related topic and receive education, their knowledge and awareness levels increase.[20] Education is

the most important and effective tool that contributes to the increase in knowledge level. In a study conducted in India, it was observed that the students' knowledge levels about hepatitis B and C significantly increased after educational intervention.[34]

It was determined that providing care to patients diagnosed with hepatitis B and the concern about being infected with hepatitis B while providing care affected the students' level of knowledge about hepatitis B ($p<0.05$). In the study conducted by Açıkgöz et al.[15], it was detected that as the level of knowledge about HBV infection increased, protective behaviors also increased. As an individual's level of knowledge about infectious diseases, risk factors, modes of transmission, and prevention methods increases, the attitude towards providing care improves positively, and the concern about being infected decreases.[35] Considering that the majority of the sample group consisted of first-year students who had not yet received formal education on hepatitis B infection, and that the number of individuals in this group who obtained information about hepatitis B infection from various sources might be low, this is considered an expected result.

A significant relationship was determined between the students' level of knowledge about hepatitis B and their vaccine hesitancy ($p<0.005$) In the study conducted by Türkoğlu et al.[36] it was determined that the most important reason for vaccine hesitancy/refusal was identified as lack of knowledge (41.6%). In another study conducted in Europe on vaccine hesitancy, lack of knowledge was also determined as one of the most influential factors (50%) affecting vaccine hesitancy.[32] These studies reveal that, even in different geographical regions, lack of knowledge is a significant factor influencing vaccine hesitancy. This situation indicates that increasing students' level of knowledge is an important step in terms of reducing vaccine hesitancy.

Limitations

Due to the use of convenience sampling and the fact that the study was conducted in a single institution, the generalizability of the findings to all nursing students may be limited. Future studies with randomized sampling and multi-center designs are recommended to enhance generalizability. In addition, the lack of questioning the parents' professions and the disregard for the class distribution balance made it difficult to interpret certain results.

CONCLUSION

The knowledge level about hepatitis B and the level of vaccine hesitancy among nursing students are at the moderate level. The level of knowledge is a factor affecting vaccine hesitancy. It is recommended to provide education and awareness programs for nursing students to increase their knowledge level and reduce vaccine hesitancy.

Although the study found that father's educational level affected the level of knowledge about hepatitis B, it could not be determined whether this was due to the level of education or father's profession. In future studies, professions of both the mother and father should be considered for evaluation.

Moreover, since the study was conducted with a small sample group and the class distribution was not balanced, the results of the study cannot be generalized. It is suggested to repeat the study with a larger sample group, ensuring balance between the classes.

In light of the findings, it is recommended to implement structured in-service training programs that emphasize the importance of hepatitis B infection and vaccination, particularly prior to the commencement of clinical practice. Increasing awareness through such initiatives may contribute to improved vaccination uptake and better preventive behaviors among healthcare students.

It is believed that the study, which evaluates the knowledge level and vaccine hesitancy of all healthcare science students, especially nursing students, in the hepatitis B risk group, will lead to new studies by increasing awareness about filling the knowledge gap and reducing vaccine hesitancy. It is predicted that this situation will contribute to a decrease in healthcare expenditures and workforce losses, along with an increase in vaccination rates.

The findings of this study indicate that vaccine hesitancy persists even among nursing students, who are expected to be knowledgeable and proactive regarding preventive health measures.

ETHICAL DECLARATIONS

Ethics Committee Approval

The study was conducted with the permission of Uludağ University Faculty of Medicine Clinical Researches Ethics Committee (Date: 30.05.2023, Decision No: 2023-12/8).

Informed Consent

All patients signed and free and informed consent form.

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The author declares no conflicts of interest.

Financial Disclosure

The author declares that this study received no financial support.

Author Contributions

The author declares that they participated in the design, execution, and analysis of the paper, and that they approved the final version.

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