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RESEARCH PAPER

Healthcare students' vaccination status, knowledge, and protective behaviors regarding hepatitis B: a cross-sectional study in Turkey

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ABSTRACT

Aim: We aimed to determine the vaccination status, knowledge, and protective behaviors of healthcare students related to hepatitis B and to examine the related factors.

Method: This cross-sectional study was conducted in seven universities from seven geographical regions of Turkey. The study group included 5451 healthcare students. Data were collected with a questionnaire including items on sociodemographic characteristics, vaccination status, knowledge and protective behaviors related to hepatitis B. Data were analyzed with Pearson's chi-square and logistic regression analyses.

Results: 86.0% of the students had hepatitis B vaccine while 7.6% did not. Vaccination was higher in nursing and midwifery students (aOR = 1.87, CI 95%: 1.26–2.77; aOR = 3.87, CI 95%: 2.14–7.02, respectively). Vaccination was 1.28 times higher in females (CI 95% 1.03–1.60). The ≥23 age group had 1.79 times higher vaccination rate than those in the ≤19 (CI 95%: 1.26–2.53). Vaccination was higher in students whose family's economic status is middle and high (aOR = 1.53, CI 95%: 1.07–2.19; aOR = 1.47, CI 95%: 1.03–2.19, respectively). Vaccination was higher in those living in towns and cities during childhood (aOR = 1.36, CI 95%: 1.06–1.74; aOR = 1.79, CI 95%: 1.34–2.38, respectively). Females had more knowledge of hepatitis B and protective behaviors. Both knowledge and protective behavior scores of vaccinated participants were significantly higher ($p < .05$).

Conclusion: We found that the vaccination rate in healthcare students was high, but lower than the country's targets. The students were sensitive about the protective behaviors from hepatitis B infection and had sufficient knowledge of HBV contamination.

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Introduction

Hepatitis B is one of the most common infectious diseases threatening public health worldwide. Infection caused by hepatitis B virus (HBV) is the leading cause of mortality and workforce loss. HBV is a virus that causes both acute and chronic liver disease.[1] Very few people develop acute hepatitis following HBV infection. In most cases, the disease is asymptomatic. Since these people are unaware and are not treated, chronic infection may occur.[2,3] Hepatitis B is a disease that causes chronic hepatitis, cirrhosis, and hepatocellular carcinoma. The vast majority of deaths related to HBV result from cirrhosis and hepatocellular carcinoma.[4] Unless HBV infection is diagnosed and treated regularly, mortality due to viral hepatitis increases.[5] The World Health Organization (WHO) aims a 65% decrease in viral hepatitis-related mortality and a 90% decrease in incidence by 2030 compared to 2015. WHO also aims to eliminate viral hepatitis totally by 2030.[5] The prevalence of HBV infection in the world is 3.5%. According to WHO, Turkey is among the countries with moderate endemicity.[2] Hepatitis B prevalence varies according to geographical regions in Turkey (4–10%).[6,7] In our country, the prevalence of hepatitis B in general population is higher than that of European countries.[6]

Public health activities to control HBV infection have increased in the last three decades.[4] The HBV vaccination program is one of the most successful and effective public health programs to control HBV infection.[2–4] The national HBV vaccination program in Turkey started in 1998. The HBV vaccine has been included in the compulsory childhood vaccination calendar by the Ministry of Health in Turkey.[6,7] The rate of zero-age hepatitis B vaccination was 72% in 2002, 96% in 2017, and 99% in 2019.[8]

Healthcare professionals are at risk of infection by HBV and other bloodborne pathogens. HBV is transmitted through perinatal transmission, percutaneous tract, open wounds and cuts, and sexual and close personal contacts.[1,2] There is a high risk of HBV transmission from patient to patient or from patient to healthcare professionals through materials and devices used in healthcare provision.[3,4] Healthcare students (HCSs) have an increased

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risk of encountering HBV infection as much as actively working healthcare workers (HCWs) as they do internships and health services in healthcare institutions during their education.

The best investment in the fight against HBV infection is immunization and education. In healthcare schools, training on individual protective measures against HBV infection can positively affect the health of young people and direct them to be sensitive and conscious toward both themselves and patients.[2] Taking personal protective measures against HBV and having knowledge and awareness about treatment and follow-up are important steps in breaking the chain of infection.[1,3,4] There is a need for up-to-date data across the country to determine the control and priorities for HBV infection in HCSs and evaluate hepatitis B immunization so far.

In this study, we aimed to determine healthcare university students' vaccination status, knowledge and protective behaviors regarding hepatitis B and to examine the related factors. Since students from different provinces and sociocultural levels are included in the scope of our study, it is thought that the results will be a guide for the school administrators in healthcare.

Materials and methods

This cross-sectional study was conducted at seven universities located in seven different geographical regions of Turkey. The participants were HCSs studying at these universities. HCSs participating in the study receive 4-year education, medicine 6 years, dentistry and veterinary medicine 5 years, and healthcare technician 2 years. The population was determined by obtaining the information about the number of students from universities. There were a total of 22,282 students in the health-related schools of universities. In studies conducted with university students in Turkey, the rate of hepatitis B vaccination varied between 39.5% and 67.7%.[9–11] The sample size of the study was calculated with OpenEpi program at prevalence: 57%, margin of error: 3%, confidence level: 99.9%, design effect: 2 and the minimum sample size to be reached was found to be 5209. A 5% non-response rate (n = 520) was calculated and added, which increased the estimated sample size to 5729. The sample list of the study was determined by stratified simple random sampling method from the list of students taken from their schools on the basis of universities. In order to carry out this study, written permission was obtained from the administration of the schools.

Measurements/instruments

Data Registration Form: This questionnaire consists of three parts. The first part interrogates sociodemographic characteristics of the students, the school they attended, age, gender, place of residence, childhood residence, parental educational level, perception of the economic situation of the family, presence of a healthcare worker in the family, HBV vaccination status, and the reasons of HBV vaccination/not having vaccination. In the second part, 18 questions were asked to measure knowledge of HBV infection and 5 questions (total 23) to measure knowledge of HBV infection contamination. In the third part, 13 questions were asked to measure the students' protective behaviors against HBV infection. The answers given by the students to the knowledge and behavior questions were collected as "true," "false" and "I don't know."

Data collection/procedure

The data were collected between February 4, 2019 and December 27, 2019. The aim of the study was explained to the students. They were informed that they were free to participate in the study and the data would be kept confidential within the scope of the study. After that, their informed consent was obtained. There was no information in the questionnaires indicating the name or the identity of the student. A total of 5451 students completed the questionnaire. The rate of participation was 95.1%.

Data analysis

Statistical analysis was performed using SPSS 24.0 statistical software. Descriptive statistics were explained as mean, standard deviation, number, and percentage. The dependent variable of the study is the history of HBV vaccination, knowledge of HBV infection and preventive behavior. The information regarding the history of HBV vaccination was obtained as (I had it, I did not have it, I don't know). The knowledge and behavior of the students were grouped as 1 = correct", "0 = false or I do not know" according to their answers. When calculating the knowledge and behavior score, the knowledge and behavior of those who knew more than half of the total questions were grouped as good, while those who knew less than half of the questions were grouped as bad (knowledge: Good:≥13; behavior: Good:≥8). Chi-square test was used to determine the relationship between independent variables and dependent variables in statistical analysis. Crude and adjusted Odds Ratio and 95% confidence intervals of each variable with a significant relationship in the chi-square test were calculated by logistic regression method. In the analyses made according to the schools of the students, veterinary students who would not directly encounter hepatitis patients due to their profession were taken as reference. A p value less than 0.05 was considered significant.

Ethics

This study was conducted in accordance with the principles of the World Medical Association Helsinki Declaration. Written permission was obtained from noninvasive Research Ethics Committee of Dokuz Eylul University, Izmir, Turkey prior to the study (Date: 01.03.2018; 2018/06-28).

Results

A total of 5451 students participated in our study. 68.7% of the students were female and the rest were male. The age range of the participants was 17–64 and the mean age was 21.1 ± 2.3. 53.0% of the participants were in the 20–22 age group. 38.2% of the students lived at home with their family or friends, 45.6% lived in a town during their childhood, and

67.5% perceived their family's economic situation as middle. When the students were asked about HBV vaccination, 86.0% of them stated that they were vaccinated, 7.6% said they were not vaccinated, and 6.4% stated that they did not know (Table 1).

Logistic regression analysis results of factors associated with the vaccination status against HBV are shown in Table 2. Those who did not know whether they had been vaccinated against HBV (n = 347) were not included in this analysis. Significant results were found in both univariate and multivariate analyses between HBV vaccination status with the school, gender, age, perceived family economic status, and childhood residence of the students. Vaccination was significantly higher in nursing and midwife students than veterinary students (aOR = 1.87, CI 95%: 1.26–2.77; aOR = 3.87, CI 95%: 2.14–7.02, respectively). Vaccination was 1.28 times higher in female students than in males (CI 95%: 1.03–1.60). Additionally, vaccination was 1.79 times higher in the ≥23 age group than in the ≤19 age group (CI 95%: 1.26–2.53). Vaccination was significantly higher in those who perceived their family's economic status as middle and high compared to those who perceived their family's economic status as low (aOR = 1.53, CI 95%: 1.07–2.19; aOR = 1.47, CI 95%: 1.03–2.19, respectively). Vaccination was significantly higher in those living in towns and cities compared to those living in villages during childhood (aOR = 1.36, CI 95%: 1.06–1.74; aOR = 1.79, CI 95%: 1.34–2.38, Table 2).

Table 1. Distribution of sociodemographic characteristics and hepatitis B vaccination according to the school (n = 5451).

		School						
Variable	Total, n = 5451 (%)	Medicine, n = 847 (%)	Nursing, n = 1762 (%)	Midwife, n = 698 (%)	Physiotherapy, n = 294 (%)	Dentistry, n = 247 (%)	Healthcare technician, n = 1066 (%)	Veterinary, n = 537 (%)
Gender								
Male	1705 (31.3)	419 (49.5)	425 (24.1)	0	107 (36.4)	95 (38.5)	351 (32.9)	307 (57.2)
Female	3746 (68.7)	428 (50.5)	1337 (75.9)	698 (100.0)	187 (63.6)	152 (61.5)	715 (67.1)	230 (42.8)
Age group (years)								
≤19	1201 (22.0)	197 (23.3)	339 (19.2)	265 (38.0)	18 (6.1)	54 (21.9)	307 (28.8)	21 (3.9)
20–22	3138 (57.6)	469 (55.4)	1073 (60.9)	364 (52.1)	172 (58.5)	158 (64.0)	645 (60.5)	257 (47.9)
≥23	1112 (20.4)	181 (21.4)	350 (19.9)	69 (9.9)	104 (35.4)	35 (14.2)	114 (10.7)	259 (48.2)
Place of residence								
Home (with family/friends)	2083 (38.2)	336 (39.7)	645 (36.6)	182 (26.1)	125 (42.5)	85 (34.4)	480 (45.0)	230 (42.8)
Dormitory	3066 (56.2)	412 (48.6)	1038 (58.9)	488 (69.9)	160 (54.4)	143 (57.9)	555 (52.1)	270 (50.3)
Alone	302 (5.5)	99 (11.7)	79 (4.5)	28 (4.0)	9 (3.1)	19 (7.7)	31 (2.9)	37 (6.9)
Childhood residence								
City	1790 (32.8)	344 (40.6)	544 (30.9)	242 (34.7)	69 (23.5)	103 (41.7)	217 (20.4)	271 (50.5)
Town	2483 (45.6)	410 (48.4)	788 (44.7)	301 (43.1)	173 (58.8)	116 (47.0)	518 (48.6)	177 (33.0)
Village	1178 (21.6)	93 (11.0)	430 (24.4)	155 (22.2)	52 (17.7)	28 (11.3)	331 (31.1)	89 (16.6)
Paternal Education								
≤Middle	2867 (52.6)	210 (24.8)	1125 (63.8)	430 (61.6)	130 (44.2)	81 (32.8)	697 (65.4)	194 (36.1)
≥High school	2584 (47.4)	637 (75.2)	637 (36.2)	268 (38.4)	164 (55.8)	166 (67.2)	369 (34.6)	343 (63.9)
Maternal education								
≤Middle	3872 (71.0)	349 (41.2)	1450 (82.3)	589 (84.4)	194 (66.0)	144 (58.3)	866 (81.2)	280 (52.1)
≥High school	1579 (29.0)	498 (58.8)	312 (17.7)	109 (15.6)	100 (34.0)	103 (41.7)	200 (18.8)	257 (47.9)
Perceived family economic status								
High	1404 (25.8)	289 (34.1)	413 (23.4)	178 (25.5)	82 (27.9)	63 (25.5)	250 (23.5)	129 (24.0)
Middle	3681 (67.5)	510 (60.2)	1214 (68.9)	491 (70.3)	198 (67.3)	178 (72.1)	727 (68.2)	363 (67.6)
Low	366 (6.7)	48 (5.7)	135 (7.7)	29 (4.2)	14 (4.8)	6 (2.4)	89 (8.3)	45 (8.4)
Presence of an HCW in the household								
No	4222 (77.5)	606 (71.5)	1391 (78.9)	536 (76.8)	46 (15.6)	71 (28.7)	193 (18.1)	145 (27.0)
Yes	1229 (22.5)	241 (28.5)	371 (21.1)	162 (23.2)	248 (84.4)	176 (71.3)	873 (81.9)	392 (73.0)
Self-reported HBV vaccination history								
Yes	4690 (86.0)	714 (84.3)	1595 (90.5)	646 (92.6)	259 (88.1)	205 (83.0)	839 (78.7)	432 (80.4)
No	414 (7.6)	69 (8.1)	96 (5.4)	18 (2.6)	26 (8.8)	20 (8.1)	141 (13.2)	44 (8.2)
Unknown	347 (6.4)	64 (7.6)	71 (4.0)	34 (4.9)	9 (3.1)	22 (8.9)	86 (8.1)	61 (11.4)

Table 2. Logistic regression analysis results of factors associated with vaccination of students against hepatitis B (n = 5104).

Variable	Vaccinated n (%)	Non-vaccinated n (%)	Univariate analysis cOR (CI 95%)	*p*	Multivariate analysis aOR (CI 95%)	*p*
School* (*p* < .001)						
Veterinary	432 (90.8)	44 (9.2)	Ref: 1.00		Ref: 1.00	
Medicine	714 (91.2)	69 (8.8)	1.05 (0.70–1.56)	0.395	1.15 (0.76–1.73)	.501
Nursing	1595 (94.3)	96 (5.7)	**1.69 (1.15–2.44)**	**0.003**	**1.87 (1.26–2.77)**	**.002**
Midwife	646 (97.3)	18 (2.7)	**3.65 (2.10–6.54)**	**0.001**	**3.87 (2.14–7.02)**	**.001**
Physiotherapy	259 (90.9)	26 (9.1)	1.01 (0.61–1.70)	0.481	1.04 (0.63-0.76)	.860
Dentistry	205 (91.1)	20 (8.9)	1.04 (0.60–1.84)	0.445	1.09 (0.62–1.92)	.754
Healthcare technician	839 (85.6)	141 (14.4)	**0.60 (0.42–0.86)**	**0.002**	0.76 (0.52–1.12)	.171
Gender (*p* <0.001)						
Male	1390 (89.2)	169 (10.8)	Ref: 1.00		Ref: 1.00	
Female	3300 (93.1)	245 (6.9)	**1.63 (1.33–2.01)**	**0.001**	**1.28 (1.03–1.60)**	**.025**
Age* (Trend *p* = .003)						
≤19 years	1018 (90.5)	107 (9.5)	Ref: 1.00		Ref: 1.00	
20–22 years	2707 (91.7)	245 (8.3)	1.16 (0.91–1.47)	0.110	1.20 (0.94–1.54)	.135
≥23 years	965 (94.0)	62 (6.0)	**1.63 (1.18–2.27)**	**0.001**	**1.79 (1.26–2.53)**	**.001**
Perceived family economic status (*p* = .022)						
Low	299 (87.9)	41 (12.1)	Ref: 1.00		Ref: 1.00	
Intermediate	3146 (92.1)	268 (7.9)	**1.60 (1.12–2.26)**	**0.005**	**1.53 (1.07–2.19)**	**.020**
High	1245 (92.2)	105 (7.8)	**2.16 (1.46–3.15)**	**0.001**	**1.47 (1.03–2.19)**	**.047**
Childhood residence* (*p* <0.001)						
Village	984 (88.8)	124 (11.2)	Ref: 1.00		Ref: 1.00	
Town	2114 (91.8)	189 (8.2)	**1.40 (1.10–1.78)**	**0.002**	**1.36 (1.06–1.74)**	**.014**
City	1592 (94.0)	101 (6.0)	**1.98 (1.50–2.61)**	**0.001**	**1.79 (1.34–2.38)**	**.001**
Place of residence (*p* = .127)						
Alone	266 (93.0)	20 (7.0)	Ref: 1.00		Ref: 1.00	
Home (with family/friends)	1760 (90.9)	176 (9.1)	**1.98 (1.50–2.61)**	**0.001**	0.80 (0.49–1.31)	.385
Dormitory	2664 (92.4)	218 (7.6)	0.75 (0.45–1.19)	0.121	0.96 (0.58–1.57)	.885
Paternal Education (*p* = .360)					-	-
≤Middle	2473 (91.6)	228 (8.4)	Ref: 1.00			
≥High school	2217 (92.3)	186 (7.7)	0.91 (0.55–1.45)	0.371		
Maternal education (*p* = .671)					-	-
≤Middle	3341 (91.8)	299 (8.2)	Ref: 1.00			
≥High school	1349 (92.1)	115 (7.9)	1.09 (0.89–1.34)	0.180		
Presence of an HCW in the household (*p* = .451)					-	-
No	3634 (91.7)	328 (8.3)	Ref: 1.00			
Yes	1056 (92.5)	86 (7.5)	1.05 (0.84–1.31)	0.337		

*Chi-square *p* value <.05 cOR: crude odds ratio; CI 95%: confidence interval 95%; p: *p*-value; aOR: adjusted odds ratio.

4690 students who participated in our study had HBV vaccination. When asked about the reasons for getting vaccinated, 18.2% of them stated that they were afraid of HBV because they were in the occupational risk group, 17.6% stated that HBV infection is a very serious disease that causes death, and 16.4% had it done to protect against liver cancer. In our study, it was seen that 414 students did not have HBV vaccination. When asked about the reasons for not getting vaccinated, they answered mostly as "I don't know where the vaccine is administered" (59.5%) and "I'm afraid of needles" (12.0%, Table 3).

In order to measure the level of knowledge about HBV infection, 18 statements were given. The statements that they knew as true the most: "Blood, sexual contact, body fluids and secretions are one of the most important means of transmission of infection" (85.3%), "Healthcare personnel should have HBV vaccination to protect both themselves and patients" (85.1%), and "Healthcare personnel are in the risk group for HBV infection" (83.5%). The least known ones: "Hepatitis B is common in Turkey" (50.7%) and "Hepatitis B vaccine schedule is 3 doses 0-1-6 months" (59.9%).

Students were asked 5 questions to evaluate their knowledge of HBV contamination, and the rate of those who answered the other questions correctly, except for one question, was over 90%.

In particular, the students were found to be quite sensitive about protective behaviors against HBV infection such as the use of gloves (91.6%), hand washing (91.4%), the correct use of the medical waste container (82.0%), the control of the patient's

Table 3. Reasons for having hepatitis B vaccine or not (several possible answers).

Vaccination (4690 vaccinated students)	**No (%)***
I was afraid because I was in the occupational risk group for hepatitis B	1112 (18.2)
Since hepatitis B is a very serious disease that causes death	1077 (17.6)
To prevent liver cancer	1002 (16.4)
Hepatitis B vaccine is recommended by the Ministry of Health	954 (15.6)
Because it was recommended by my teachers at school	910 (14.9)
To be a good example to the members of my family	537 (8.8)
Because it was recommended by my family	509 (8.3)
Other	10 (0.2)
	Total n: 6111
Non-vaccination (414 non-vaccinated students)	**No (%)***
I don't know where the vaccine was administered	338 (59.5)
Because I am afraid of needles	68 (12.0)
I'm not afraid of hepatitis B infection	48 (8.5)
Because I'm afraid of the side effects of the vaccine	48 (8.5)
Because the hepatitis B vaccine is very expensive	25 (4.4)
I did not have time	22 (3.9)
Because I don't trust the protection of the hepatitis B vaccine	19 (3.3)
	Total n:568

*Since more than one option was chosen, the % distribution was calculated according to the general total.

Table 4. Factors related to students' knowledge and behavior about HBV infection: results of a logistic regression.

	Knowledge (Total score: 23)				Preventive practices (Total score: 13)			
Variable	**Good: ≥13**	**Poor: ≤12**	**aOR (CI 95%)**	***p*****	**Good: ≥8**	**Poor: ≤7**	**aOR (CI 95%)**	***p*****
School	**0.001***				**0.001***			
Veterinary	448 (83.4)	89 (16.6)	Ref:1.00		442 (82.3)	95 (17.7)	Ref:1.00	
Medicine	704 (83.1)	143 (16.9)	1.08 (0.80–1.47)	0.591	673 (75.9)	174 (20.5)	0.87 (0.65–1.17)	.378
Nursing	1538 (87.3)	224 (12.7)	1.30 (0.97–1.74)	0.074	1470 (83.4)	292 (16.6)	1.02 (0.78–1.35)	.843
Midwife	622 (89.1)	76 (10.9)	1.25 (0.86–1.82)	0.224	616 (88.3)*	82 (11.7)	1.06 (0.96–1.94)	.083
Physiotherapy	207 (70.4)	87 (29.6)	**0.44 (0.31–0.63)**	**0.001**	210 (71.4)	85 (28.6)	0.75 (0.39–1.01)	.056
Dentistry	218 (88.3)	29 (11.7)	**1.81 (1.10–2.98)**	**0.018**	200 (81.0)	47 (19.0)	0.99 (0.65–1.51)	.973
Healthcare technician	791 (74.2)	275 (25.8)	**0.62 (0.46–0.83)**	**0.001**	873 (81.9)	193 (18.1)	0.95 (0.70–1.27)	.730
Gender	**0.001***				**0.001***			
Male	1257 (73.8)	447 (26.2)	Ref: 1.00		1350 (79.2)	354 (20.8)	Ref:1.00	
Female	3271 (87.3)	476 (12.7)	**2.34 (1.98–2.76)**	**0.001**	3134 (83.6)*	613 (16.4)	**1.19 (1.01–1.40)**	**.035**
Age	**0.001***				**0.001***			
≤19 years	960 (79.9)	241 (20.1)	Ref: 1.00		1030 (85.8)*	171 (14.2)	Ref:1.00	
20–22 years	2610 (83.2)	528 (16.8)	**1.40 (1.16–1.68)**	**0.001**	2563 (81.7)	575 (18.3)	**0.80 (0.66–0.98)**	**.030**
≥23 years	958 (86.2)	154 (13.8)	**1.87 (1.46–2.40)**	**0.001**	891 (80.1)	221 (19.9)	**0.70 (0.55–0.89)**	**.004**
Vaccination history	**0.001***				**0.001***			
No	304 (73.4)	110 (26.6)	Ref: 1.00		331 (75.6)	101 (24.49	Ref: 1.00	
Yes	3942 (84.1)	748 (15.9)	**(1.98–2.76)**	**0.001**	3894 (83.0)	796 (17.0)	**1.51 (1.19–1.92)**	**.001**

*chi-square *p*-value <.001; aOR: adjusted odds ratio; CI 95%: confidence interval; **p: adjusted odds ratio *p*-value; Boldface indicates statistical significance ($p < .05$).

records in terms of HBV risk (82.1%), and notification when there is a sharp injury (85.5%). However, the rate of those who threw the needle without closing the cap after injecting was low (29.8%).

The analysis of the knowledge level of the students about HBV infection and their preventive behaviors according to age, gender, schools, and vaccination history are shown in Table 4. The knowledge of dentistry students was 1.81 times higher (CI 95%: 1.10–2.98) compared to the students studying in veterinary. Additionally, the knowledge of healthcare technician students was 38% lower and the knowledge of physiotherapy students was 66% lower compared to the students studying in veterinary (aOR = 0.62, CI 95%: 0.46–0.83; aOR = 0.44, CI 95%: 0.31–0.63, respectively). Compared to male students, the knowledge level of female students was 2.34 (CI 95%: 1.98–2.76) times higher, and the level of knowledge compared to non-vaccinated students was 1.53 (CI 95%: 1.20–1.95) times higher in vaccinated students. Compared to those in the ≤19 age group, the knowledge of students was 1.40 (CI 95%: 1.16–1.68) times higher in the 20–22 age group and 1.87 (CI 95%: 1.46–2.40) times higher in the ≥23 age group. The protective behavior of female students was 1.19 times (CI 95%: 1.01–1.40) higher compared to male students. In addition, it was 1.51 times higher (CI 95%: 1.19–1.92) in vaccinated students than non-vaccinated students. As the age of the students increased, the preventive behavior score decreased. Compared to those aged ≤19 years, the protective behavior score was 20% lower in students aged 20–22, and 30% in students aged ≥23 years (aOR = 0.80, CI 95%: 0.66–0.98; aOR = 0.70, CI 95%: 0.55– 0.89, Table 4).

Discussion

In this study, we aimed to indicate the primary prevention status of HBV in the high-risk population with a representative sample from Turkey. 86.0% of the HCSs participating in our study were found to be vaccinated against HBV. Significant results were found between the school, gender, age, perceived economic status of family, and childhood residence with vaccination against HBV. The students were observed to be sensitive about HBV infection preventive behaviors. The level of knowledge about HBV infection was higher in those who studied in dentistry, who were female, who were older than 19 years, and who had vaccination. In addition, female and vaccinated students had more HBV protective behaviors, while students aged 23 and over neglected the rules of protection against HBV infection.

In our study, HBV vaccination was more common in nursing and midwife students. Consistent with the literature, the rate of vaccination of students varies according to the schools in the field of healthcare. In some studies, the highest rate of vaccination was among postgraduate students (64.2%),[12] medical students,[13,14] and nursing students.[15] In a study conducted with medical students, 93.9% of the students were found to be vaccinated; about half of them were vaccinated at the beginning of the school and one-third were vaccinated in the first year of education.[16] In their study, Aaron et al.[17] observed that medical attendants, laboratory technicians, and outpatient department staff were not vaccinated. In Turkey, consistent with the Ministry of Health and occupational health and safety act, the subject of infection prevention and control measures, students in the field of healthcare are to have an HBV serological examination before starting their internship. Students with insufficient or negative HBV antibodies should be vaccinated. There may be two reasons for the higher HBV vaccination rate among nursing and midwifery students. First, in our study, it was found that female students were vaccinated at a higher rate than male students. The fact that all midwifery students were females and most of the nursing students were females may have affected this result. Secondly, midwifery and nursing students come into contact with patients earlier and more frequently than other school students. For this reason, nursing and midwifery schools may have given more importance to the vaccination rules. Our finding shows that these rules are not strictly enforced in other departments except nursing and midwifery.

In our study, while the dentistry students had more knowledge of HBV infection, the healthcare technician and physiotherapy students had less. In studies conducted with university students in different schools, medical students were found to have more HBV knowledge than those studying in other schools.[13,14,18] In the literature, there are studies showing that midwifery students have higher knowledge and behavior[19] and dentistry students have more protective behavior.[20,21] In a study, midwifery students' knowledge was shown to be higher than those in other schools and nursing students' protective behaviors were higher.[22] Physiotherapy, public health officer, optometry and psychiatry students had less information and protective behaviors compared to medical students.[23] In a study conducted in Ghana, nursing students with two years of education had lower HBV knowledge and attitude.[24] The fact that students study in a school where direct invasive interventions are not performed with the patient may be a factor in less HBV knowledge.

We found that female students were more likely to be vaccinated against HBV infection. There are several studies in the literature indicating a high frequency of HBV vaccination in female students, which is consistent with our finding.[15,25] However, there are studies demonstrating no difference according to gender.[12] In our study, female students had higher knowledge of HBV infection and more protective behavior. Although there are studies in the literature showing that gender is not related to HBV knowledge and preventive behavior,[22,23,25] there are also studies indicating that female students have higher HBV knowledge and protective behavior, consistent with our finding.[18,19,24,26] This is probably because women are better health seekers than men.[26] It is recommended that intervention programs such as HBV vaccination and awareness be gender sensitive to increase acceptance among students, especially in terms of male students' participation.

In our study, it was observed that as the age of the students increased, HBV knowledge increased, whereas protective behavior from HBV infection decreased. There are studies in the literature demonstrating that the knowledge and awareness of students increases as the age increases.[12,15,19,24] There are also studies that do not show a significant relationship between the age of the students with the knowledge and protective behavior.[22,23,27] Despite the increase in HBV knowledge as the age of the students increased, the decrease in the prevention of HBV infection showed that the students did not turn their knowledge into practice when they went to internships in hospitals. We do not have data to explain the reasons for this behavior. Observing students' compliance with HBV prevention behaviors during hospital internships can provide important information on the subject. In addition, it is recommended to conduct longitudinal observational studies to clearly reveal the reasons for these behaviors.

In our study, the rate of vaccination was higher for students whose families had higher economic levels and who lived in bigger residences during their childhood. In a study conducted in Ethiopia, HBV vaccination status and good practice toward the prevention of hepatitis B infection was found to be higher in students living in urban residents.[22] In studies conducted with health science students in different countries, no relationship was found between vaccination, knowledge of HBV infection and preventive behavior with economic status and place of residence.[21,28] The level of development of countries is a major factor in vaccinating. The rate of HBV vaccination among health science students in Ethiopia was 4.6%. The authors stated that HBV immunization in the country started about ten years ago.[23] In line with the recommendations of the Ministry of Health, students in the field of healthcare who had negative results are recommended to be vaccinated by determining the HBV seroprevalence.

When the students were asked about the reasons for getting vaccinated, the students stated that they were mostly afraid because of being in the occupational risk group, HBV infection is a very serious disease that causes death, and they had it to be protected from liver cancer. In a study conducted in previous years, the first three most common causes were similar to our finding.[12,22,23] In our study, 8.1% of the students did not have HBV vaccination. When asked about the reasons for not being vaccinated, the highest rate of answer was "I don't know where the vaccine was administered." In a study, similar results to our finding were found.[12] In other studies, "resource constraints,"[28] "since there is no vaccine in campus clinics,"[25] and "busy schedule"[20] are the main reasons for not getting HBV vaccination. Additionally, vaccination cost may play a role in the low vaccination rate among students.[29] In Nepal, the lack of effective vaccination programs is the main reason for non-vaccination.[15] In Turkey since 1998, HBV vaccine has been administered free of charge to all newborns. Furthermore, a catch-up vaccination is offered for non-vaccinated children at primary and high school and risk groups are also being vaccinated. The immunization coverage for HBV has been over 95% in the last ten years.[8] High vaccination rates against HBV can be achieved by identifying unvaccinated students with effective guidance service.

In our study, the students who were vaccinated had more knowledge and preventive behavior regarding HBV infection. It has been reported that medical and nursing students who have HBV vaccination have higher knowledge of HBV prevention and transmission.[14,16,22,24,27] Rathi et al.[30] found the vaccination rate to be quite low and stated that this result may be related to the low level of knowledge and awareness of the students. Microbiology and/or infectious diseases courses are taught in different years in the curricula of the schools participating in the research. In addition, the importance given to the subjects differs according to the schools. For example, while infectious diseases have an important place in the curriculum in nursing and midwifery, these subjects are less included in the curriculum in physiotherapy and health technician schools. Since all HCSs may encounter infectious diseases, it is recommended to include a course on infectious diseases and prevention measures in the curriculum of these schools in the first year. Providing training on HBV infection to HCSs from the first year of their education is an important step to raise awareness. In addition to contact precautions, students should be screened for HBV markers and those who are not immune should be vaccinated.

The most important limitation of our study is that the frequency of HBV vaccination and the factors affecting it were collected retrospectively based on the students'

statements. Since retrospective information was collected, a recall bias may have played a role in some data. Since this limitation can also be seen in those who stated that they were not vaccinated, it can be interpreted as a random error and cannot be considered as bias. Another limitation of this study is that data on vaccination against HBV was collected through self-reports and could not be verified with medical records. Despite these limitations, the main advantage of the study is that it was conducted with a large sample representing students in the field of healthcare in Turkey. Our results send a strong message to universities in Turkey to develop and adopt a clear protocol on HBV protection prior to hospital practice. Hepatitis B prevention and control steps can be added to the training packages in schools.

In this study, we found that the HBV vaccination rate among university students in the healthcare was high, but lower than the country targets. Therefore, it is recommended that students be tested for HBV marker before starting their clinical practice in the hospital and susceptible students should be vaccinated against HBV. Significant results were found between the school, gender, age, economic status, and childhood residence of the student with the vaccination against HBV. It was observed that the students were sensitive about preventive behaviors from HBV infection and had sufficient knowledge about HBV contamination, while their knowledge of vaccination was low. The general lack of knowledge of hepatitis B seems to be a major obstacle for WHO and national health administrators to achieve their goals. It is recommended that HBV infection transmission routes and preventive rules be taught to students.

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Authors' contributions

AA participated in the design of the study, acquisition of data, performed the statistical analysis and drafted the manuscript. SY participated in the design of the study, acquisition of data and performed the statistical analysis. AK, SYK, EC, GK and FE participated in the design of the study and participated in acquisition of data. All authors read and approved the final manuscript.

Disclosure of potential conflicts of interest

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