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Original Article

Are the students in medicine, nursing and allied health higher schools protected from Hepatitis B: A cross-sectional study from Hatay, Turkey

Tacettin Inandi[a] Nazan Savaş[a] Ersin Peker[b] Nizami Duran[c] Hande Harmancı[d]

[a]Public Health Department of Medical Faculty, Mustafa Kemal University- Hatay, Turkey

[b]Public Health Specialists, Ministry of Health, Hatay, Turkey

[c]Microbiology Department of Medical Faculty, Mustafa Kemal University- Hatay, Turkey

[d]World Health Organization, Global Hepatitis Programme, Geneva, Switzerland

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Abstract

Aim: Hepatitis B is an important public health problem and many groups, including health workers, are at risk for hepatitis B. We aimed to determine the hepatitis B surface antibody levels and frequency of needlestick injury among health occupations students. **Method:** The study population and sample were 973 students in Mustafa Kemal University, Medical, Nursing and Health Vocational High School in 2015. Of the students, %63 were reached, and 67.7% of them gave blood samples. Anti-HB_S values were calculated by enzyme-linked immunosorbent assay and an antibody titer over 10 mIU/mL was accepted as positive. **Results:** The mean age was 20.9 ± 2.7 and 68.5% were female. Anti-HBs positivity was 54.5%, and 37.3% of the vaccinated group was still anti-HB_S negative. The difference in anti-hepatitis B positivity was not significant in terms of sex, age group and school, but it was higher in vaccinated students than in others ($p < 0.05$). 29.0% of participants had a history of needle-stick injury. The highest percentage was in health emergency and anaesthesia departments ($p < 0.001$). Needle-stick injury was observed more often in senior students.

Corresponding to: Tacettin İnandı, Public health department of Medical Faculty, Mustafa Kemal University, 31040 Hatay, Turkey, E-mail: inandit@gmail.com, Tlf: 03262455114

Conclusion: Approximately half of the students were negative in terms of anti-HBs and injury risk at working places is extremely high. However, there is no clear hepatitis B policy for the students. There is a policy need for all students in healthcare settings.

Keywords: Hepatitis B antibodies, health occupations students, needle-stick injury, health policy, immunization history

Tıp, hemşirelik ve sağlık meslek yüksekokulu öğrencileri Hepatit B'den korunuyor mu: Hatay'dan kesitsel bir çalışma, Türkiye

Öz

Amaç: Hepatit B önemli bir halk sağlığı sorunudur ve sağlık çalışanları dahil pek çok grup hepatit B açısından risk altındadır. Bu çalışmada tıp, hemşirelik ve sağlık meslek yüksekokulu öğrencilerinin anti-hepatit B antikor düzeylerini ve iğne batması sıklığını belirlemek amaçlanmıştır. **Yöntem:** Çalışmanın evreni ve örneklemi 2015 yılında Mustafa Kemal Üniversitesi Tıp, Hemşirelik ve Sağlık Meslek Yüksek Okulu ilk ve son sınıfında okuyan 973 öğrencidir. Öğrencilerden % 63'üne ulaşılabildi ve bunların % 67.7'sinden kan örneği alındı. Serum örneklerindeki hepatit B yüzey antikoru değerleri "enzyme-linked immunosorbent assay" yöntemiyle çalışıldı, antikor titresi 10 mIU/mL üzeri pozitif kabul edildi. **Bulgular:** Öğrencilerin yaş ortalaması ve standart sapması 20.9±2.7 olup % 68.5'i kadın idi. Anti-HBs pozitifliği % 54.5 olarak elde edildi. Anti-HBs pozitifliğindeki farklılık cinsiyet, yaş grubu ve okul açısından farksız iken, aşılı olanlarda diğerlerine göre daha yüksek idi ($p<0.05$). Katılımcıların % 29.0'unda iğne batması öyküsü vardı. En yüksek sıklık sağlık acil ve anestezi bölümü öğrencilerinde idi ($p<0.001$). Son sınıf öğrencilerinde iğne batması daha sık gözlendi. **Sonuç:** Öğrencilerin yaklaşık yarısında anti-HBs negatiftir ve çalışma ortamında yaralanma riskleri yüksektir. Buna karşın hepatit B'den korunmak amacı ile staj yapmakta olan öğrenciler için açık bir politika yoktur. Sağlık kuruluşlarında staj yapan öğrencileri işyeri risklerinden koruyacak bir politika gereklidir.

Anahtar kelimeler: Hepatit B antikor, sağlık meslekleri öğrencileri, iğne batması, sağlık politikası, aşı öyküsü

Introduction

Hepatitis B virus (HBV) is one of the most prevalent infectious agents. The Global Hepatitis Report by World Health Organization (WHO) indicates that in 2015, viral hepatitis killed 1.34 million persons, a death toll on par with those due to tuberculosis (1.37 million) and higher than those caused by the human immunodeficiency virus (1.06 million).[1] Of these deaths, 96% were the result of complications of chronic HBV (66%) and hepatitis C virus (HCV) (30%) infections. Globally, in 2015, an estimated 257 million people were living with chronic HBV infection and 71 million with chronic HCV infection.[1] Despite these facts, viral hepatitis has largely remained unaddressed until to 2016. Recognizing this problem, the World Health Assembly endorsed the Global Health Sector Strategy (GHSS) on viral hepatitis in May 2016, which called for the elimination of viral hepatitis as a public threat by 2030, defined as reducing new infections by 90% and mortality by 65% due to viral hepatitis.[2]

HBV is highly contagious and transmission from mother to child or from infected child to another child is common in endemic areas. Percutaneous or mucosal exposure to infected blood and various body fluids, as well as through saliva, menstrual, vaginal, and seminal fluids are other transmission routes. Healthcare workers are at higher risk in terms of HBV transmission because of injuries with contaminated material at healthcare settings.

Immunization is the most effective way to prevent hepatitis B virus infections.[2] WHO recommends that all infants receive the hepatitis B vaccine as soon as possible after birth, preferably within 24 hours, for preventing the transmission of the virus from mother to infant at birth and it should be followed by 2 or 3 doses to complete the primary series.[3] Hepatitis B vaccine is also recommended by WHO for all healthcare workers who have not received a complete primary series.[4] Viral hepatitis B is on the list of occupational disease of the International Labour Organization.[5] Centers for Disease Control and Prevention (CDC) also recommends that healthcare workers should be vaccinated for hepatitis B followed by proof of seroconversion in the form of anti-HBs positivity after the vaccination.[6] If seroconversion does not take place, an additional three doses should be administered.[6,7] The Ministry of Health of Turkey recommends 3 doses of hepatitis B vaccine with subsequent anti-HBs response testing for all healthcare workers who potentially would have exposure to patients or contaminated equipment.[8]

An effective vaccine has been available since 1981[7] and there has been a significant decrease in the prevalence of HBV in many countries since then. [1,9] A recent modelling study shows that the vaccination scale-up is already having a large effect on the global viral hepatitis epidemic. Without any infant or birth-dose vaccination, there would be 25 million new cases in 2020; meaning that interventions have already reduced new cases by 83% and cumulatively averted 310 million new cases between 1990 and 2020. The impact is largely mediated by the effects of infant vaccination.[10]

Turkey is considered an intermediate endemic country in terms of HBV infections. A meta-analysis conducted in Turkey between 1999 and 2009 revealed an estimated overall population prevalence of 4.57 with a 95% confidence interval (CI) of 3.58 to 5.76[11]. A more recent study (TURHEP) conducted in 2009 – 2010 with a nationally representative sample of 5460 people reported a seropositivity rate for hepatitis B surface antigen (HBsAg) of 4.0%[12] This gives an estimated 3.2 million people living with chronic hepatitis B infection today in Turkey.

Hepatitis B vaccine was included in the national childhood immunization programme in 1998, in Turkey. Since 2003, infants have received the vaccine within the first 72 hours after birth, followed by two additional doses at the end of the first and the sixth months of age. In addition, there have been catch-up vaccinations in 2005 to 2009 to vaccinate children aged 8 to 17. Largely as a result of this work there is a decrease in the incidence of hepatitis B since 2005.[13]

Another prevention strategy is injection, blood and surgical safety. According to WHO, transmission of viral hepatitis B and C in health care settings can be stopped through the rigorous application of universal precautions for all invasive medical interventions, promotion of injection safety measures and securing the safe supply of blood products.[2]

HBV vaccination for medical and nursing students is mandatory in some European countries, and it is a recommendation in others.[14] Although hepatitis B vaccination and confirmation tests after the vaccination is recommended for the healthcare workers by the Ministry of Health of Turkey since 1998,[7] there is no clear national vaccination policy for students of health occupations, which is not a sound approach since the risk might be probably higher in students than in healthcare workers

as young and un-experienced professionals are generally more susceptible to occupational risk.[15] There is no vaccination policy in universities where studies are carried out. The aim of this study is to assess the presence of anti-hepatitis B antibodies and frequency of needle stick injuries among the students of health occupations in Mustafa Kemal University to propose a national policy for their protection.

Methods

Study population and sample: In this cross-sectional study, we reached 613 (63%) out of the total population of 973 of first and last year students of health occupations in the faculties of medicine, nursing and allied health professions in Mustafa Kemal University, in 2015. Allied health professions include technicians of emergency care, radiology, medical laboratory, anaesthesia, medical documentation and secretarial.

We used a structured questionnaire that includes information on age, gender, school, year of attendance, hepatitis B immunization and experience of needle-stick injury. The students filled the questionnaires in class and a total of 415 blood samples (67.7%) were collected. Implementation of the questionnaires and blood collection was performed during 11-22 May 2015. The number of variables in the questionnaire was 42, but fifteen of them were about the hepatitis A and C. The data collected together with a thesis on Hepatitis A.

Informed consent was obtained from all participants, including an explicit consent for the blood test. The study protocol was approved by the Ethical Committee of Mustafa Kemal University (Date/Number 18.02.2015/9). There is no conflict of interest. There is no financial support in this study.

Blood sampling and analysis: Blood samples were collected from each participant into dry tubes, centrifuged at a speed of 3000 RPM on the same day, and were stored at −20 ◦C in the Microbiology Department of Mustafa Kemal University. Anti-HB_S test was performed at the Central Laboratory of Çukurova University. Serum Hepatitis B surface antibody levels were assessed using immunoassay system, and the titers > 10 mIU/mL were accepted as positive.[7]

Statistical analysis: Chi-square test was used to compare groups in terms of anti-HB_S and needle-stick injury parameters. A p value of < 0.05 was accepted as statistically significant.

Results

The total of students who responded to the questionnaire was 613, and it was presented in Table 1 by schools and years. Last year refers to 2 years in Allied health professional, 4 years in Nursing and 6 years in Medicine.

The participating students' mean age (standard deviation) was 20.9 (2.7), minimum age was 18 and maximum age was 39. The birthdates of the 95% students were between 1990 and 1997. Of the subjects, 68.5% were female (Table 2).

Participants were asked whether they have ever had a needle-stick injury since they entered their current school. The results are shown in Table 2 by school type and school year. The overall frequency of needle-stick injury was 29.0% with nursing students having the lowest and allied health professionals students having the highest proportions of 17.8% and 35.6% respectively ($p<0.001$). Within the school of allied health professionals needle-stick injury rates were significantly higher in emergency and anaesthesia departments ($p<0.001$). Needle-stick injuries are significantly more frequent in the last year students than the first year students ($p <0.001$).

Table 1. The distribution of the students by schools and years

	First year		Last year		Total	
Schools	n	%	n	%	n	%
Medical	76	47.2	85	52.8	161	26.3
Nursing	67	49.6	68	50.4	135	22.0
Allied health professionals	188	59.3	119	40.7	317	51.7
Total	331	54.0	282	46.0	613	100.0

Table 2. Needle-stick injury by schools, school year and gender

Schools	**Needle-stick injury**						**Statistics**
	Yes		**No**		**Total**		
	n	**%***	**n**	**%***	**n**	**%****	
Medical	41	25.5	120	74.5	161	26.3	χ^2 = 16.02
Nursing	24	17.8	111	82.2	135	22.0	**p<0.001**
Allied health professionals	113	35.6	204	64.4	317	51.5	
Emergency[a]	68	65.4	36	34.6	104	17.0	
Anaesthesia[a]	29	61.7	18	38.3	47	7.7	
Medical Laboratory[a]	7	13.0	47	87.0	54	8.8	
Medical Documentation and Secretarial[a]	7	9.9	64	90.1	71	11.6	
Radiology[a]	2	4.9	39	95.1	41	6.7	
School year							
First year	73	22.1	258	77.9	331	54.0	χ^2=17,03
Last year	105	37.2	177	68.2	282	46.0	**p<0.001**

Table 2 continue

Gender							
Male	43	22.3	150	77.7	193	31.5	X^2=6.24
Female	135	32.1	285	67.9	420	68.5	**p=0.012**
Total	178	29.0	435	71.0	613	100.0	

[a]Departments of school of allied health professionals *row percentage **column percentage

Participants' anti-HBs status by vaccination status, school year, age, gender and needle-stick injury are presented in Table 3. Overall, 54.5% of participants were anti-HBs positive. Students reporting hepatitis B vaccination had higher levels of anti-HBs antibodies ($p<0.05$). Anti-HB_s by school year, age groups, gender and needle-stick injury were not significant ($p>0.05$).

Discussion

Anti-HB_S could be negative if a person is susceptible to the hepatitis B virus or has an acute or chronic infection; and it could be positive if the person is immune either due to natural infection or hepatitis B vaccination. Since the only serological marker which was assessed for this study was anti-HB_S, we interpret a negative result as susceptibility for current or future infection.

The overall frequency of anti-HB_S positivity in this study was 54.5%. This means almost half of the study participants were susceptible to a hepatitis B infection. Other studies from Turkey report rates from 5.3% to 17.0%. [16,17,18] A more recent study, however, reports a positivity rate for anti-HB_S of 89.5% among health occupations students in Bozok University.[19] This difference could be due to the fact that the population of the last study was within the immunized cohorts born after 1998.

Looking at similar populations in different countries, we can see high percentages of anti-HB_S negativity. A study carried out on health occupations students in 2015 in Italy, 49.6% had protective antibody levels.[20] In a cross-sectional study conducted at the Arab American University in Palestine in 2014, the overall rate of immunity was 75.5% in students born after 1992, and vaccinated against hepatitis B, at 0, 1 and 6 months of age.[21] In Tunisia, the overall rate of anti-HBs seroprotection in vaccinated students aged between 12-17 years was 68.9%.[22] The insignificant levels of anti-HB_S negativity after vaccination in these studies highlight the need for confirming the protection in students of health occupations before they start practicing.

This study shows, expectedly, higher anti-HB_S positivity rates in students who reported having been vaccinated for hepatitis B. However, 37.3% of the vaccinated group was still anti-HB_S negative. Such negative results among vaccinated students varied between 30.0% and 50.4% in previous studies.[16,20,22,23] However, two studies reported higher positivity rates in vaccinated groups: an 83.9% seroconversion rate was observed after a mean of 10 years between vaccine receipt and anti-HBs evaluation;[24] among medical students receiving 2 or 3 doses of the vaccine, anti-HB_S positivity rate was 93.2%.[25] These variations could be related to many reasons including the number of doses received and the time since vaccination. Studies show the importance of confirmation after the vaccination.

Table 3. Anti-HB_S status by hepatitis B vaccination history. school year and gender

	Anti – HB_S						**Statistics**
	Positive		Negative		Total		
	n	%*	n	%*	n	%**	
Gender							
Male	61	50.0	61	50.0	122	29.4	X^2= 1.38, p=0.239
Female	165	56.3	128	43.7	293	70.6	
Age Groups							
18-19	100	54.9	82	45.1	182	43.9	
20-24	112	54.4	94	45.6	206	49.6	X^2= 0.09, p=0.950
> 25	14	51.9	13	48.1	27	6.5	
Vaccination Status							
Yes	96	62.7	57	37.3	153	36.9	X^2 =6.72, **p=0.035**
No	39	50.0	39	50.0	78	18.8	
Unknown	91	49.5	93	50.5	184	44.3	
School Year							
First year	147	54.4	123	45.6	270	65.1	X^2= 0.00, p=0.994
Last year	79	54.5	66	45.5	145	34.9	
School							
Medical	55	52.4	50	47.6	105	25.3	X^2= 4.11, p=0.128
Nursing	54	64.3	30	35.7	84	20.2	
Allied health professionals	117	51.8	109	48.2	226	54.5	

Table 3 continue

Needle-stick injury							
Yes	67	59.8	46	40.2	112	27.0	X^2= 1.77, p=0,182
No	159	52.5	144	47.5	303	73.0	
Total	226	54.5	189	45.5	415	100.0	

*Row percentage **Column percentage

Needle-stick injury is one of the most important risk factors for blood-borne diseases, including hepatitis B, C and HIV. Almost one third of participating students in this study reports at least one needle-stick injury after they entered their respective schools. This is more prevalent in the final year students than the first year students. 30% of third and fourth-year medical students at Washington University School of Medicine reported needle-stick injuries[26] In Germany, needle-stick injuries were reported from 29.5% of medical students.[27] In another study from Germany, the lifetime prevalence of needle-stick injuries was 23%, ranging from 12% in first year students to 41% in fourth year students.[28] The prevalence of needle-stick injuries was 22.4% among medical students in a General Hospital in Malaysia.[29] In a study carried out at three nursing schools in three universities from Turkey, Talas reported that the rate of needle-stick/sharp injuries was 49.0%.[30] Taiwan reported a 61.9% in final-year nursing students from 16 hospitals in 1997.[31] Needle-stick injuries among nurses was 49.6% in Iran, in 2005.[32]

In our study, the highest rate of needle-stick injuries was among the students of allied health professions. Emergency medical care and anaesthesia students had higher risks than the others. In a study with emergency medical technicians and paramedics in Istanbul, 52.2% reported at least one needle-stick injury in the past two years.[33] The most common causes for such injuries provided by respondents were working in a cruising ambulance and the need to do things quickly.

Turkey's catch up vaccination programs from 2005 to 2009 in addition to the introduction of the hepatitis B vaccine to infants in 1998 and the birth-dose in 2003 provide an excellent protection for those cohorts born after 1990 (Figure 1). However, it should be noted that in the first five years of the immunization program, the coverage rates were below the targeted 80%. The gray shaded area in Figure 1 indicates the cohorts currently in health occupations schools, in 2018. Green shaded areas indicate HB vaccinations years in Turkey.

Turkey provides the hepatitis B vaccine free of charge to infants and those at higher risk groups including healthcare workers. However, there is no specific policy to cover students of health occupations who are as a rule, exposed to clinical environments prior to graduation and may in fact be at a higher risk than healthcare workers. In the school year 2016-17, there were a total of 157,517 medical and nursing students in Turkey.[35] This number is higher if all students of health occupations are considered.

WHO recommends hepatitis B vaccine for all healthcare workers who have not received a complete primary series.[4] For Turkey, this includes those born before 1999 if we consider the catch-up vaccination as an incomplete series. Three doses of vaccine

were administered to each child during the catch-up vaccinations. However, no coverage data were obtained from the literature and Ministry of Health Reports (Figure 1).

Date of birth	Hepatitis B infant vaccination schedule and coverage*	Hepatitis B birth dose vaccine and coverage*	Catch up vaccination (2005-2009)
1990			
1991			
1992			
1993			
1994			
1995			
1996			
1997			
1998			
1999			
2000	71		
2001	77		
2002	72		
2003	68	78	
2004	77	88	
2005	85	94	
2006	82	95	
2007	96	96	
2008	92	96	
2009	94	96	
2010	96	97	
2011	96	97	

Figure 1. Visualization of birth cohorts in Turkey of 1990 to 2011 in terms of hepatitis B vaccine coverage[34]

And considering the low levels of vaccination coverage between 2000 and 2004, this group may be considered at higher risk also. It should also be remembered that there might be considerable regional variations in those born before 2000. For example a study looking at vaccination coverage in the South-Eastern Region in those born in 1999 and 2000 found a hepatitis B third dose coverage of 44%.[36]

This study provides an opportunity to emphasize that the students of health occupations should be vaccinated upon entering school and before they receive any clinical training/exposure. They should receive a post vaccination test 1-2 months after the last dose to ensure protection. Since the vaccination coverage rates are consistently higher after 2005, students entering schools of health occupations from 2024 onwards, may be tested first for presence of anti-HB_S and then offered vaccination in case they are negative. However, until then, all students of health occupations should be offered the hepatitis B vaccine before they start clinical practice. This should be accompanied by an initial training on core components of infection prevention and control.[37]

It should be noted that healthcare workers are an important group to address not only for protecting them from disease but also protecting the people who seek their help and guidance.

Limitations

This study only assessed the anti-HB_S levels in participants due to financial constraints. It would have been preferable to assess the hepatitis B surface and core antigens to get a better understanding of the infection at the individual level. However, students were provided with a short training session on hepatitis B and blood-borne infections and they were encouraged to get tested further to assess own protection. Another limitation is the limited study population; it includes only one university. Finally, we do not have information on the reasons of the students who refuse to give blood sample.

Conclusion

Nearly half of the participants of this study were negative for anti-HBs and one in three had a needle-stick injury. These numbers are alarming in the absence of a preventive policy for students of health occupations. The Ministry of Health and universities should collaborate to set up a system where students of health occupations are vaccinated and receive adequate training before they are exposed to clinical settings

Conflict interest: There is no conflict of interest in the study.

Author contributions to the study

Tacettin Inandi: Study planning, data collection, data analysis, article writing

Nazan Savaş: Study planning, data collection, article writing

Ersin Peker: Study planning, data collection, article writing

Nizami Duran: Study planning, data collection, article writing

Hande Harmancı: Study planning, data analysis, article writing

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