Knowledge, attitude, practices, seroprevalence and vaccination status concerning hepatitis B, hepatitis C, human immunodeficiency virus among health care students

Sağlık bölümü öğrencilerinde hepatit B, hepatit C, insan bağışıklık yetmezliği virüsü ile ilgili bilgi, tutum, uygulama, seroprevalans ve aşılanma durumu

Zeyneb Irem Yuksel Salduz[1], Aclan Ozder[1]

[1] Department of Family Medicine, Faculty of Medicine, Bezmialem Vakıf University

Abstract

Aim: Students of all departments that serve patients during their education are in the risk group in terms of parenterally transmitted microorganisms. This study aims to evaluate the knowledge level and serologic status of healthcare students about viral hepatitis and Human Immunodeficiency Virus (HIV) infection.

Methods: A sociodemographic questionnaire consisting of 29 questions was applied to 262 students who presented to the medico-social outpatient clinic between January 2015 and December 2020. Additionally, hepatitis B surface antigen (HBsAg), hepatitis B surface antibody (Anti HBs), hepatitis B core antibody (Anti HBc total), hepatitis C virus antibody (Anti HCV), HIV antibody (Anti-HIV) serum levels were investigated. The obtained information was evaluated with descriptive statistics and chi-square test in statistical package for the social sciences package program version 20. Results were given as frequency and percentage.

Results: The mean age of the study group (230 female and 32 male) was 21.29 ± 2.2 years. According to the questionnaire, 43.9% of students stated that they had HBV vaccination, while 56.1% of the students stated that they were not vaccinated. The rate of the student who checked antibodies after vaccination was 14.1%. While 74% of students stated that they took lessons about hepatitis risk factors, 26% of students did not take any lessons. According to the laboratory results, Anti HBs positivity was found in 235 students (89.7%). Anti-HBc total positivity was found in 5 students (1.9%). HBsAg positivity was found in 2 students (0.8%). Anti-HCV and Anti-HIV were negative in all our students.

Conclusion: Our results indicate that high prevalence of Anti HBs seropositivity among healthcare students. This result can be explained by our successful vaccination program in Turkey. As a preventive medicine perspective, it should be ensured that students studying at these schools should be trained, screened, and guided to become immune.

Keywords: Health care; hepatitis B; hepatitis C; HIV; seroprevalence; students

Öz

Amaç: Eğitimleri süresince hastalara hizmet veren tüm bölümlerin öğrencileri parenteral yolla bulaşan mikroorganizmalar açısından risk grubundadır. Bu çalışmanın amacı, sağlık hizmeti öğrencilerinin viral hepatitler ve insan immün yetmezlik virüsü (HIV) enfeksiyonu hakkındaki bilgi düzeylerini ve serolojik durumlarını değerlendirmektir.

Yöntemler: Ocak 2015-Aralık 2020 tarihleri arasında mediko-sosyal polikliniğine başvuran 262 öğrenciye 29 sorudan oluşan sosyodemografik anket uygulandı. Ek olarak, hepatit B yüzey antijeni (HbsAg), hepatit B yüzey antikoru (Anti HbS), hepatit B çekirdek antikoru (Anti HBc total), hepatit C virus antikoru (Anti HCV), insan immün yetmezlik virus antikoru (Anti-HIV) serum seviyeleri araştırıldı. Elde edilen bilgiler sosyal bilimler için istatistik paketi sürüm 20 programında tanımlayıcı istatistikler ve ki-kare testi ile değerlendirildi. Sonuçlar frekans ve yüzde olarak verildi.

Bulgular: Çalışma grubunun (230 kadın ve 32 erkek) yaş ortalaması 21.29 ± 2.2 idi. Ankete göre öğrencilerin %43,9'u hepatit B aşısı olduğunu belirtirken, aşı olmadığını belirtenlerin oranı %56,1 idi. Aşı sonrası antikor kontrolü yapan öğrenci oranı ise %14,1 idi. Öğrencilerin %74'ü hepatit risk faktörleri ile ilgili ders aldıklarını belirtirken, öğrencilerin %26' sı hiç ders almamıştı. Laboratuvar sonuçlarına göre, Anti HBs pozitifliği 235 öğrencide (%89,7) bulundu. Beş öğrencide (%1,9) Anti HBc total pozitifliği saptandı. İki öğrencide (%0,8) HBsAg pozitifliği saptandı. Tüm öğrencilerimizde Anti HCV ve Anti-HIV negatifti.

Sonuç: Sonuçlarımız sağlık hizmeti öğrencileri arasında Anti HBs seropozitifliğinin yüksek prevalansına işaret etmektedir. Bu sonuç, Türkiye'deki başarılı aşılama programımızla açıklanabilir. Koruyucu hekimlik bakış açısıyla bu okullarda okuyan öğrencilerin bağışıklık kazanmaları için eğitilmeleri, taranmaları ve yönlendirilmeleri sağlanmalıdır.

Anahtar Sözcükler: Hepatit B, hepatit C; insan immün yetmezlik virüsü; sağlık hizmeti; seroprevalans; öğrenciler

Received/*Geliş* : 14.12.2022
Accepted/*Kabul*: 02.02.2023

DOI: 10.21673/anadoluklin.1219187

Corresponding author/*Yazışma yazarı*

Zeyneb İrem Yüksel Salduz

Bezmialem Vakıf Üniversitesi, Tıp Fakültesi, Aile Hekimliği Anabilim Dalı, Topkapı Mahallesi, Adnan Menderes Vatan Bulvarı, No:113, Fatih, İstanbul, Türkiye
E-mail: iremsalduz@hotmail.com

ORCID

Zeyneb İ. Y. Salduz: 0000-0001-7730-1029
Aclan Özder: 0000-0003-2254-1812

INTRODUCTION

Hepatitis B and Hepatitis C are common public health problems affecting people worldwide, causing acute liver infection, cirrhosis, and liver cancer. Acute hepatitis B virus (HBV) and hepatitis C virus (HCV) can be treated, long-term infection and even death may occur in patients with chronic HBV and HCV (1). Human immunodeficiency virus (HIV) is a contagious disease that was defined in 1981, negatively affects the immune system, the quality of life of patients, and has a high risk of morbidity and mortality all over the world. (2). All these viruses are commonly transmitted through blood, body fluids, needlestick injury, sharing the razors, sexual activity and from infected mother to child (3). There is no vaccine for HCV and HIV. However, despite the availability of an effective vaccine and treatment, HBV infection remains a public health burden.. World Health Organization (WHO) recommends special consideration of health care workers and medical students for Hepatitis B virus screening and vaccination (4).

Furthermore, WHO estimates that two million injuries cause about sixty-six thousands HBV, sixteen thousands HCV and about one thousand HIV infections among 35 million healthcare workers each year (5). Blood-borne infections remain the major global public health problem. For medical and health science students; HBV, HCV, and HIV infections have always been up to date as occupational diseases. Especially, final-year clinical practice students who work in closer contact with patients can get this disease from their patients as well as transmit it to their patients through their work. Frequent invasive interventions increase the risk. Students studying in the medical field have a higher risk of contracting blood-borne infections from infected patients (6).

In our research, we planned to determine the HBV, HCV, and HIV seroprevalence of healthcare students, who have an important place among risk groups, and to have the students vaccinated when deemed necessary and to draw attention to the subject. Moreover, we aimed to analyze the awareness level and the protection methods of the students about blood-borne viral infection.

MATERIALS AND METHODS

This descriptive cross-sectional study among healthcare students of Bezmialem University was conducted between January 2015 and December 2020. Bezmialem University was established in 2010 to offer higher education in health sciences including Medicine, Dentistry, Pharmacy, Nursing, and other related disciplines. Two hundred and sixty two students who applied to the medico-social outpatient clinic from different health fields were included in the study. The inclusion criteria for our study was health care students in all academic years in the faculty of Bezmialem University. The exclusion criteria for our study was students of English preparatory classes of faculties and those who refused to participate in the study.

A sociodemographic questionnaire consisting of 29 questions was conducted to the same 262 students who applied to the medico-social outpatient clinic control. The questionnaire consisted of three parts: (i) demographic features of the participants (12 questions); (ii) Hepatitis B testing and vaccination status (3 questions); (iii) knowledge and risk situations about HBV, HCV and HIV infection (14 questions). The questionnaire assessed the sociodemographic status of the participants, whether they are a carrier of Hepatitis B, their vaccination status, and assessment the knowledge about the modes of transmission, risk factors, and preventive measures of the virus infections, through self-reporting. The questionnaire was tested among 20 students in the same school who were excluded from the final study to improve data quality and accuracy. All spelling mistakes and inconsistencies in the questions were corrected before the final draft of the questionnaire.

Hepatitis B surface antigen (HBsAg), Hepatitis B surface antibody (Anti HBs), Hepatitis B core antibody (Anti HBc total), Hepatitis C virus antibody (Anti HCV), Human immunodeficiency virus antibody (Anti-HIV) levels were determined retrospectively with the last six-month control appointment from the hospital data software . Anti HBs levels were defined as mIU/mL. An optimal range of quantification is 10–1000 mIU/mL. A level of Anti HBs above 10 mIU/mL was considered as protective against HBV in-

fection. Anti HBs level was considered negative below 10 mlU/ml. HbsAg, Anti HCV, Anti-HIV, Anti HBc total levels were considered negative or positive as a result of laboratory.

This study was ethically approved by the Non-Interventional Research Ethics Committee of Bezmialem Vakıf University (date: 10.10.2017, protocol no: 19940). Written informed consent was obtained from each participant after participants were fully informed about the study. Privacy and confidentiality of the participants were ensured.

Statistical analysis

Data were analyzed by using the Statistical Package for the Social Sciences (SPSS), version 20.0 (SPSS Inc., Chicago, IL, USA). The results were given as percentage frequency and mean. A Chi square test was used to analyze categorical variables. P values was considered significant under the 5% level.

Sample size was calculated by using an online tool designed according to formulas in Sample Size Calculations in Clinical Research by Chow at al (7,8).

RESULTS

Questionnaire results

The mean age of the study group, which consisted of 230 female and 32 male students, was 21.29 ± 2.2. The students in our study were single except for 3 students. The average Body Mass Index (BMI) of the students was 21.47 ± 3.14. The distribution of the participants according to their departments is 50 students in Medicine, 49 in Dentistry, 5 in Pharmacy, 77 in Nursing, 3 in Audiology, 33 in Anesthesia, 2 in Pathology, 2 in FTR, 8 in Oral and Dental Health, 10 in Medical Laboratories, 19 in Emergency First Aid, 4 in Radiotherapy students.The number of students attending the 1st, 2nd, 3rd, 4th, 5th, and 6th grades of their school was 91, 37, 37, 74, 15, and 8 respectively. Two hundred thirteen students were staying at home with their families, 18 students were staying at home, 14 students were living alone at home, 17 students were living in the dormitory. The parents of 92.7% of the students were alive and together, 3.4% of the parents were alive and apart, 0.8% had their mother dead, and 3.1% had their father dead. When their mother and father's education status are evaluated separately and respectively, the university graduate rate was 22.1% and 37%, high school graduates' rate was 24.8% and 24.8%, middle school graduates' rate was 10.7% and 12.2%, elementary school graduates' rate was 39.6% and 25.6%, illiterate rate was 2.8% and 0.4%. 92% of the students were receiving family support, 3.4% of them were working for a living, and 4.6% were both working and receiving family support **(Table 1)**.

When we asked about having hepatitis and/or being a carrier, 3 students stated that they were carriers, while 153 students stated that they did not have the disease and were not carriers, and 106 students stated that they had no information about their situation. When we question about whether there is a Hepatitis B carrier in the family was questioned, 2 students stated that there was a carrier in the family, while 260 students stated that there was no carrier in their family. While 52.7% of the students considered themselves in the risk group, 47.3% thought they did not carry any risk.

While 43.9% of the students stated that they had HBV vaccine, 56.1% stated that they were not vaccinated.14.1% of the group checked for antibodies after vaccination, and 85.9% of the group did not get tested for antibodies. The rate of participants who stated taking lessons about hepatitis was 74% while the rate of not taking lessons was 26%. When the transmission route was questioned; 94.7% of the students stated that it can be transmitted by blood, 64.5% by transmission from mother to baby, 72.9% by sexual contact, 53.8% by body fluids, and 9.2% stated that it is possible to be transmitted by respiratory. The answer to the question 'What is the protection method in the clinic against hepatitis viruses?' was vaccination in 18%, vaccination and standard protection such as using gloves and masks in 34.7%, only standard protection in 47.3% **(Table 2)**.

Test results

-HBsAg positivity was found in 2 students (0.8%) which means carrier for the disease. These two students had a family history of hepatitis carriage in their families ($p < 0.05$).

-Anti HBs positivity was found in 235 students (89.7%) which means they have immunization against HBV via vaccination or getting sick with HBV. Twenty-

Table 1. Sociodemographic information of students and their families according to the survey

		n	%
Place of stay	At home with family	213	81.2
	At home with friends	18	6.9
	Alone at home	14	5.4
	At dormitory	17	6.5
Father education	University	97	37
	High school	65	24.8
	Middle school	32	12.2
	Elementary school	67	25.6
	Not lettered	1	0.4
Mother education	University	58	22.1
	High school	65	24.8
	Middle school	28	10.7
	Elementary school	104	39.6
	Not lettered	7	2.8
Social status of the family	Parents right together	243	92.7
	Parents right apart	9	3.4
	Mother died	2	0.8
	Father died	8	3.1

n: Number

Table 2. Students' knowledge of hepatitis carrier, vaccination, transmission, and prevention methods according to the questionnaire

		n	%
Hepatitis carrier status	Yes	3	1.1
	No	153	58.4
	Unknown	106	40.5
Hepatitis risk awareness	Yes	138	52.7
	No	124	47.3
Hepatitis B vaccination status	Yes	115	43.9
	No	147	56.1
Antibody testing after vaccination	Yes	37	14.1
	No	225	85.9
Taking a course on hepatitis factors	Yes	194	74.0
	No	68	26.0
HBV transmission route information	Transmitted through blood	248	94.7
	Transmitted through sexual intercourses	191	72.9
	Transmitted through body liquid	141	53.8
	Transmitted during pregnancy	169	64.5
	Transmitted respiratory way	24	9.2
How to prevent hepatitis	With the vaccine	47	18
	With standard methods*	124	47.3
	With vaccine and standard methods	91	34.7

HBV: Hepatitis B virus, n: Number, * Medical face masks, gloves etc.

Table 3. Distribution of students' serological results according to laboratory results

		n	%
HBsAg	Positive	2	0.8
	Negative	260	99.2
Anti HBs	Positive	235	89.7
	Negative	27	10.3
Anti HBc total	Positive	5	1.9
	Negative	257	98.1
Anti HCV	Positive	0	0
	Negative	262	100
Anti HIV	Positive	0	0
	Negative	262	100

Anti HBc total: hepatitis B core antibody total, Anti HBs: Hepatitis B surface antibody, Anti HCV: Hepatitis C virus antibody, Anti-HIV: Human immunodeficiency virus antibody, HBsAg: Hepatitis B surface antigen, n: Number

Table 4. Distribution of some sociodemographic characteristics of students according to HBsAg positivity

	n (Positive)	n (Negative)	n (Total)	*p*
Department				
Dentistry and oral health	0	57	57	0.45
Others*	2	203	205	
Class				
≤ 2	1	129	130	0.99
>2	1	131	132	
Gender				
Male	0	32	32	0.59
Female	2	228	230	
Age				
<20	0	64	64	0.42
≥20	2	196	198	
Body Mass Index				
<25	2	228	230	0.59
≥25	0	32	32	

n: Number, *Medicine, pharmacy, nursing, audiology, anesthesia, pathology, physical therapy and rehabilitation, medical laboratory, emergency first aid, radiotherapy

seven students were negative in our cohort in terms of Anti HBs, although current knowledge suggests that all students vaccinated in time according to the national immunization program.

-Anti-HBc total positivity was found in 5 students (1.9%) which means 5 students had gotten sick with HBV.

-Anti-HCV and Anti-HIV were negative in all our students (Table 3).

Table 5. Distribution of some risk situations of students according to HBsAg positivity

	n (Positive)	n (Negative)	n (Total)	*p*
Carrier of hepatitis in the family				
Yes	2	19	21	***0.001***
No	0	241	241	
Common use of nail clippers or razors				
Yes	1	37	38	0.15
No	1	223	224	
History of surgery				
Yes	1	79	80	0.54
No	1	181	182	
Administration of blood or blood products				
Yes	0	16	16	0.93
No	2	244	246	
Contact with someone else's blood or wound				
Yes	1	65	66	0.71
No	1	195	196	
Tattooing or skin piercing				
Yes	1	52	53	0.29
No	1	208	209	
Intravenous therapy				
Yes	2	164	166	0.55
No	0	96	96	
Penetration of the used needle into the body				
Yes	1	54	55	0.31
No	1	206	207	
Dental treatment				
Yes	2	211	213	0.49
No	0	49	49	

HBsAg: Hepatitis B surface antigen, n: Number

Regarding sociodemographic features, department, class, gender, age, and BMI had no effect on the HBsAg positivity ($p > 0.05$) **(Table 4)**. Regarding risky behaviors, common use of nail clippers or razors, history of surgery, administration of blood and blood products, contact with someone else's blood or wound, tattooing or skin piercing, intravenous therapy, penetration of the used needle into the body, dental treatment had no effect on the HBsAg positivity ($p > 0.05$). HBsAg positivity was found to be higher in those with family history of hepatitis carriage ($p < 0.05$) **(Table 5)**.

DISCUSSION

When healthcare students are evaluated in terms of preventable blood-borne infection diseases, they should protect both themselves and their patients. The recommendation of the American Advisory Committee's healthcare staff's vaccination guide and our local guide is to evaluate the infectious diseases of health care students at regular intervals and to screen their vaccination status (9,10). In addition to this, it is very important to provide regular training on the prevention and transmission routes of these infectious diseases.

In this study, we determined HbsAg, Anti HBs, Anti HCV, Anti-HIV, Anti HBc total levels and the knowledge regarding HBV, HCV, and HIV infection, its mode of transmission, signs and symptoms, and prevention.

Eastern Mediterranean Regional Office (EMRO) of The World Health Organization (WHO) estimates the prevalence of HBV 4.3 million in this area. WHO categorizes the prevalence of HBV as high (>8%), medium (2% to 8%), and low (<2%) (11). In recent studies, the prevalence of HBsAg in healthcare workers was reported at 16% in Sudan, 1% in Morocco, and 0.2% in Iran, respectively (12-14). On the other hand, the recent studies in Turkey, HBsAg positivity varies between 2-8 % in the general population and healthcare workers (15-17). In our study, HBsAg positivity was found 0.8%. These differences between studies may be related to the socioeconomic levels of the countries. It was found that this rate decreased over the years and HBsAg rate in our study was consistent with recent studies in our country. When the relationship of HBsAg positivity with all factors is examined, HBsAg positivity was found to be higher in those with a family history of hepatitis carriage than those without in our study. This result makes us think that HBsAg positivity may have been acquired from family environment rather than hospital.

In our study, Anti HBs positivity was found at 89.7%. When we questioned whether they had hepatitis B vaccine, only 115 (43.9%) of the students stated that they had hepatitis B vaccine, and 147 (56.1%) students did not. Anti-HBc total positivity was 1.9% in all students. That is, the high Anti-HBs antibody rate seemed to be associated with the high vaccination rate rather than having the disease. In our study, the percentage of Anti HBs seropositivity in healthcare students was lower than in some countries, such as the United States, Poland, and Mexico (18-20); nevertheless, it was higher than the results of studies from Saudi Arabia and Palestine (21,22). Anti-HBs seropositivity of healthcare students is widely distributed (41.2 to 81.4%) previous studies in Turkey (17). Variation in the prevalence of Anti-HBs seropositivity in other studies conducted in different countries, may be relevant to differences in the study groups as data collection dates or sanitary conditions. The higher Anti-HBs seropositivity in our study according to other studies in Turkey may be relevant to compliance with the immunization program or age of the study group. Additionally, high level of Anti-HBs seropositivity in our country could be due to the application of hepatitis B vaccination since 1998. In our university, the high level of Anti HBs can be explained by regular serological checks in our medico social outpatient clinic for students who missed the opportunity to be vaccinated and directing them to vaccination according to the results.

In studies, Anti-HCV positivity rates vary between 0-1% and Anti-HIV positivity is not shown in Turkey (15,17). Other studies conducted in Saudi Arabia, the United Arab Emirates, Brazil and Palestine have under 1% percentage in terms of Anti-HCV and Anti-HIV positivity in medicine and health science students (21,22). In our study, consistent with studies in our country and other countries; Anti HCV and Anti-HIV were negative in all of our students. According to these results, HCV and HIV infection was less important health issue than HBV among health care students.

Our results showed that, knowledge regarding HBV infections and their all mode of transmission varied among the students. Regarding the mode of transmission, the majority knew about transmission through contaminated blood (94.7%), body fluids (53.8%), infected mother-to-fetus transmission (64.5%), and unprotected intercourse (72.9%). The mean knowledge level about virus transmission was 71.5% in our study. When we compared the reported percentage of transmission knowledge among the students was slightly different from the other studies in the literature. A study performed at Haramaya University Medical Science College in Ethiopia reported that the knowledge level of the students about virus transmission as 56.2% (23). Another study that investigated student knowledge about virus transmission conducted at seven different medical schools in Karachi, Pakistan, reported this level as 57.1% (24). A similar percentage (57.85%) was reported at Tanta University, Egypt (25). However, next two studies reported higher knowledge levels than our study. In the study conducted in Ethiopia and Cameroon the rate was 86.2% and 83.2% respectively (26,27). Besides

that, in our study, very few participants (9.2%) stated that respiratory transmission is a way of contagious even though it is not a way of transmission in HBV, HCV and HIV infection. The differences of the level of knowledge could be related with different educational program of the universities.

It plays an important role for health department students to have knowledge about prevention methods and risk factors in controlling the risk of HBV, HCV, and HIV infections during their vocational training. Results of our students about risky behaviors were common use of nail clippers or razors; 14.5%, history of surgery; 30.5%, administration of blood and blood products; 6.1%, contact with someone else's blood or wound; 25.1%, tattooing or skin piercing; 20.2%, intravenous therapy; 63.3%, penetration of the used needle into the body; 20.9%, dental treatment; 81.2%, respectively. Our findings are consistent with the findings of other study conducted in Aljouf University and in Quassim University to assess knowledge about hepatitis and prevention of the disease (28,29). Our study revealed that participants had safe practices against hepatitis B, despite the lack of preschool knowledge about this life-threatening disease. Safety practices among the study participants were good, with only 20.9 % having history of needlestick injury. This was lower than the 49.9% needlestick injury reported among medical students of Karachi medical colleges/universities in Pakistan and 48% among Nigerian University medical students (24,30). The low prevalence of needlestick injury in the presence of good knowledge regarding preventive measures in our study indicates that not the knowledge alone is sufficient but the implementation of the acquired knowledge that will prevent the health care students from the risks.

This study has some limitations. We used of a self-report questionnaire. This may have resulted some bias. Also, the study sample relatively small cohort was restricted to health care students from one university in one city; therefore, the results cannot be generalized to other college students from the same city who are also exposed to the risk of HBV, HCV and HIV infections.

It is well known that health care students and workers have higher blood-borne infection rates. This requires that awareness and educational programs should be more common in healthcare students. All healthcare students can be recommended to take effective courses about these serological diseases and organize conferences to raise their awareness. Our results indicate that high prevalence of Anti HBs seropositivity among healthcare students. This result can be explained by our successful vaccination program in Turkey. Besides that; from a preventive medicine perspective, it should be ensured that students studying at these schools should be screened in terms of blood-borne infections and guided to become immune.

Conflict-of-interest and financial disclosure

The authors declare that they have no conflict of interest to disclose. The authors also declare that they did not receive any financial support for the study.

REFERENCES

1. Jayakiruthiga S, Rajkamal R, Gopalakrishnan S, Umadevi R. Knowledge, attitude and practices concerning hepatitis B infection, among medical students in urban area of Chennai, Tamil Nadu. Int J Community Med Public Health. 2018;5(3):635-8.
2. Khan SA, Liew ML, Omar H. Role of ethical beliefs and attitudes of dental students in providing care for HIV/AIDS patients. Saudi Dent J. 2017;29(1):7-14.
3. Afihene MY, Duduyemi BM, Hannah-Lisa A, Khatib M. Knowledge, attitude and practices concerning hepatitis B infection, among healthcare workers in Bantama, Ghana: A cross sectional study. Int J Community Med Public Health. 2017;2(3):244-53.
4. Shrestha DB, Khadka M, Khadka M, Subedi P, Pokharel S, Thapa BB. Hepatitis B vaccination status and knowledge, attitude, and practice regarding Hepatitis B among preclinical medical students of a medical college in Nepal. PLoS One. 2020;15(11):e0242658.
5. Bouya S, Balouchi A, Rafiemanesh H, at al. Global prevalence and device related causes of needle stick injuries among health care workers: a systematic review and meta-analysis. Ann Glob Health. 2020;86(1):35.
6. Chhabra D, Mishra S, Gawande K, Sharma A, Kishore S, Bhadoria AS. Knowledge, attitude, and practice study on hepatitis B among medical and nursing undergraduate students of an apex healthcare institute at Uttarakhand foothills: A descriptive analysis. J Family Med Prim

Care. 2019;8(7):2354-60.
7. HyLown Consulting LLC, Atlanta, GA. . Available from: http://powerandsamplesize.com/Calculators/Test-1-Proportion/1-Sample-Equality [Date of access:22.12.2022].
8. Chow SC, Shao J, Wang H, Lokhnygina Y. Sample Size Calculations in Clinical Research (3rd ed.). Chapman and Hall/CRC (2017).
9. Schillie S, Vellozzi C, Reingold A, at al. Prevention of hepatitis B virus infection in the United States: recommendations of the Advisory Committee on immunization practices. MMWR Recomm Rep. 2018;67(1):1-31.
10. Ozisik L, Tanriover MD, Altınel S, Unal S. Vaccinating healthcare workers: level of implementation, barriers and proposal for evidence-based policies in Turkey. Hum Vaccin Immunother. 2017;13(5):1198-206.
11. Babanejad M, Izadi N, Alavian SM. A systematic review and meta-analysis on the prevalence of HBsAg in health care workers from Eastern Mediterranean and Middle Eastern countries. Int J Prev Med. 2019;144(10):1-10.
12. Elsheikh TAE, Balla SA, Bashir AA, Abdalla AA, Elgasim MAEA, Swareldahab Z. Conditional probabilities of HBV markers among health care workers in public hospitals in White Nile State, Sudan; 2013. Glob J Health Sci . 2017;9(5):10-7.
13. Djeriri K, Laurichesse H, Merle JL, at al. Hepatitis B in Moroccan health care workers. Occup Med (Lond). 2008;58(6):419-24.
14. Binesh F, Mehrparvar AH, Atefi A. Seroprevalence of HBV and immunity status of health care workers in a referral community hospital in central Iran. World Appl. Sci. J.. 2015;33(2):263-6.
15. Tozun N, Ozdogan O, Cakaloglu Y, at al. Seroprevalence of hepatitis B and C virus infections and risk factors in Turkey: a fieldwork TURHEP study. Clin Microbiol Infect. 2015;21(11):1020-6.
16. Kahraman HG, Ozbek OA, Emek M, Atasoylu G, Sekreter O, Unal B. Hepatitis B seroprevalence and the relationship between being hepatitis B vaccinated and infected with social determinants of health: Manisa, 2014. Hepat Mon. 2018;18(7):e65395.
17. Boşnak VK, Karaoğlan İ, Namıduru M, Şahin A. Seroprevalences of hepatitis B, hepatitis C, HIV of the healthcare workers in the Gaziantep university Sahinbey research and training hospital. Viral Hepat J. 2013;19(1):11-4.
18. Spradling PR, Williams RE, Xing J, Soyemi K, Towers J. Serologic testing for protection against hepatitis B virus infection among students at a health sciences university in the United States. Infect Control Hosp Epidemiol. 2012 ;33(7):732-6.
19. Slusarczyk J, Małkowski P, Bobilewicz D, Juszczyk G. Cross-sectional, anonymous screening for asymptomatic HCV infection, immunity to HBV, and occult HBV infection among health care workers in Warsaw, Poland. Przegl Epidemiol. 2012;66(3):445-51.
20. Cárdenas-Perea ME, Gómez-Conde E, Santos-López G, at al. Hepatitis B surface antibodies in medical students from a public university in Puebla, Mexico. Hum Vaccin Immunother. 2016;12(7):1857-62.
21. Alqahtani JM, Abu-Eshy SA, Mahfouz AA, El-Mekki AA, Asaad AM. Seroprevalence of hepatitis B and C virus infections among health students and health care workers in the Najran region, southwestern Saudi Arabia: the need for national guidelines for health students. BMC Public Health. 2014;14(1):1-7.
22. Dumaidi K, Al-Jawabreh A. Persistence of Anti-HBs Among Palestinian Medical Students After 18-22 Years of Vaccination: A Cross-Sectional Study. Hepat Mon. 2015;15(11):e29325.
23. Mesfin YM, Kibret KT. Assessment of knowledge and practice towards hepatitis B among medical and health science students in Haramaya University, Ethiopia. PLoS One. 2013;8(11):e79642.
24. Khan N, Ahmed SM, Khalid MM, Siddiqui SH, Merchant AA. Effect of gender and age on the knowledge, attitude and practice regarding hepatitis B and C and vaccination status of hepatitis B among medical students of Karachi, Pakistan. J Pak Med Assoc. 2010;60(6):450-5.
25. Atlam SA, Elsabagh HM, Shehab NS. Knowledge, attitude and practice of Tanta University medical students towards hepatitis B and C. Int J Res Med Sci. 2016;4(3):749-56.
26. Abdela A, Woldu B, Haile K, Mathewos B, Deressa T. Assessment of knowledge, attitudes and practices toward prevention of hepatitis B virus infection among students of medicine and health sciences in Northwest Ethiopia. BMC Res Notes. 2016;9(1):1-7.
27. Noubiap JJ, Nansseu JR, Kengne KK, Tchokfe Ndoula S, Agyingi LA. Occupational exposure to blood, hepatitis B vaccine knowledge and uptake among medical students in Cameroon. BMC Med Educ. 2013;13:148.
28. Al-Hazmi A. Knowledge, attitudes, and practice of medical students regarding occupational risks of hepatitis B

virus in college of medicine, Aljouf university. Ann Med Health Sci Res. 2015;5(1):13-9.
29. Al Wutayd O, AlRehaili A, AlSafrani K, Abalkhail A, AlEidi SM. Current Knowledge, Attitudes, and Practice of Medical Students Regarding the Risk of Hepatitis B Virus Infection and Control Measures at Qassim University. Open Access Maced J Med Sci. 2019;7(3):435-9.
30. Okeke EN, Ladep NG, Agaba EI, Malu AO. Hepatitis B vaccination status and needlestick injuries among medical students in a Nigerian University. Niger J Med. 2008;17(3):330-2.