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Major Article

Knowledge, attitude, and practice of Iranian health sciences students regarding hepatitis B and C virus infections: A national survey

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Background: The World Health Organization seeks to achieve the goal of viral hepatitis elimination by 2030 and lack of general knowledge about viral hepatitis seems to be a barrier to reaching this goal. This study was designed to evaluate the knowledge, attitude, and practice (KAP) regarding hepatitis B virus (HBV) and hepatitis C virus (HCV) infections among Iranian health sciences students in 12 Iranian medical sciences universities using a national survey.

Methods: This survey was conducted during the second Hepatitis Awareness Campaign, which was held during the Iranian National Hepatitis Week (October 22-28, 2016). Students who visited our booths and were willing to participate in our survey were selected using convenience sampling and their HBV- and HCV-related KAP were evaluated.

Results: Two thousand one hundred fifty-six health sciences students with mean age of 21.24 years participated in our survey. The mean KAP scores were 7.35 (out of 10), 4.88 (possible score, -20 to +20), and 5.67 (out of 9). Students with experience of accidental exposures to blood (21.6%) had better KAP scores compared with the students without such experiences. The mean KAP scores were associated with subjects' year of education, field of study, university, and province ($P < .05$).

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Concept and design and statistical analysis were conducted by HKS; data collection, drafting, and approval of the manuscript were conducted by all authors; and critical revision of the manuscript and study supervision were conducted by SMA.

Conflicts of interest: SMA is director, Iran Hepatitis Network.

Conclusions: Our study showed that HBV- and HCV-related KAP in a sample of Iranian health sciences students was not satisfying. The results also demonstrated priority of needing intervention regarding KAP in some subject areas, lower years of education, and some universities compared with others. © 2017 Association for Professionals in Infection Control and Epidemiology, Inc. Published by Elsevier Inc. All rights reserved.

Hepatitis B virus (HBV) and hepatitis C virus (HCV) infections are major health problems.^{1,2} HBV infection in the general population of Iran has been estimated to be <2%.² The result of an expanded vaccination program for neonates and adolescents that improved knowledge of the general population and the country's socioeconomic status, the burden of HBV infection has been decreased significantly in Iran.^{2,3} Prevalence of HCV infection in the general population of Iran is <0.6%.¹

Health care workers (HCWs) are at high risk of contracting bloodborne infections in health care settings⁴ because they have a high probability of accidental exposure to blood.⁵ Health sciences students and HCWs during their training years have a higher risk for acquiring these infections compared with other HCWs.⁴ Needlestick injuries occur in up to 70% of Iranian medical sciences students.^{5,6}

Iranian health sciences students have little knowledge regarding HBV and HCV infections, and previous studies have suggested interventions to increase this knowledge.⁷⁻⁹

The World Health Organization wants to achieve the goal of viral hepatitis elimination by 2030.¹⁰ One of the important steps for viral hepatitis elimination is increasing general knowledge,¹¹ and educational interventions are needed to increase knowledge and awareness. We need an exact evaluation of the current status of hepatitis knowledge, attitude, and practice (KAP) among target groups before beginning these educational interventions.

According to our knowledge, there is no published national survey of KAP regarding HBV and HCV among Iranian health sciences students. There is only some limited local evidence⁷⁻⁹ in dental students¹² and medical specialists.¹³ This study was designed to evaluate the KAP regarding HBV and HCV among Iranian health sciences students in 12 Iranian universities of medical sciences using a national survey.

METHODS AND MATERIALS

Study population

This cross-sectional survey was conducted during the second Iran Hepatitis Awareness Campaign held during Iranian National Hepatitis Week (October 22-28, 2016). This campaign was conducted simultaneously by trained health sciences students at awareness booths in 17 facilities of medical sciences.¹⁴ Medical sciences students who visited the campaign booths at each university were considered the study population. Students willing to participate in our survey were selected using a convenience sampling technique.

Questionnaire design

The first draft of the KAP questionnaire was prepared in simple Persian language by a gastroenterologist and a statistician. The questionnaire was sent to 8 other gastroenterologists to check its content validity. Gastroenterologists were asked to score each item on the questionnaire for necessity, relevance, clarity, and simplicity. Then, content validity ratio (CVR) ($CVR = [n_e - N/2] / [N/2]$) and relevance content validity index (CVI), clarity CVI, and simplicity CVI were calculated for each item of questionnaire. The significance level for CVI and CVR is 0.75 according to the Lawshe table for scoring with 8 specialists, and questions scoring < 0.75 should be revised

or removed from the questionnaire. Only 1 question was removed because it scored < 0.75 for CVR and CVI. All other questions remained in the questionnaire due to reaching > 0.75 CVR and CVI.

The questionnaire has 4 parts, including the subjects' demographic and educational information, as well as their KAP. The knowledge section contains 10 yes-or-no questions about transmission routes, prevention, and treatment strategies for HBV and HCV infections. The attitude section has 10 Likert-like questions with strongly agree, agree, no idea, disagree, and strongly disagree choices. The score for each question ranged between +2 and -2 if the fact was true, whereas it ranged between -2 and +2 when the fact was not true. The practice section contains 9 yes-or-no questions about correct practice about preventive and treatment strategies.

One score was considered for any correct answer in knowledge and practice sections, and there was no negative score for incorrect choices in these 2 sections. The total score for the knowledge and practice sections was the mean (\pm standard deviation) proportions of correct answers for individual questions, and for the attitude section it was the sum of the individual scores. The range of total scores was 0-10 for knowledge, from -20 to +20 for attitude, and 0-9 for practice sections.

Survey

The selected students completed the questionnaire within our booths. Because the aim of booths was to increase knowledge and awareness regarding viral hepatitis infections, questionnaires were filled out before giving any explanation regarding hepatitis.

Ethical consideration

The study was approved by Baqiyatallah Research Center for Gastroenterology and Liver Diseases and the Ethics Committee of Baqiyatallah University of Medical Sciences (October 2016; IR.BMSU.REC.1395.199). Students answered the questionnaire anonymously and participation in the study was voluntary.

Statistical analysis

SPSS version 21 (IBM-SPSS Inc, Armonk, NY) software was used to analyze the data. All quantitative variables were checked for normality by 1-sample Kolmogorov-Smirnoff test and rechecked by Q-Q plot. Then, quantitative variables were compared within the subgroups by independent samples *t* test and 1-way analysis of variance (with Fisher exact and Tukey post-hoc tests) if they had normal distribution. Mann-Whitney and Kruskal-Wallis tests were used if the quantitative variables had nonnormal distribution. Pearson or Spearman partial correlation tests were used to check the correlation between 2 quantitative variables. The significance level for *P* values was .05.

RESULTS

Subjects' characteristics

Two thousand one hundred fifty-six health sciences students with mean age of 21.24 ± 2.9 years participated in our survey (810 men and 1346 women). They were students of medicine (38.3%), nursing

Table 1
Characteristics of participating students

Variable	Total	Field of study				
		Medicine	Nursing	Paramedicine	Dentistry	Midwifery
Total	2,156 (100)	825 (38.3)	465 (21.6)	454 (21.1)	253 (11.7)	159 (7.4)
Age, y	21.24 ± 2.9	20.82 ± 2.2	21.23 ± 3.2	21.68 ± 3.8	21.63 ± 2.9	21.60 ± 3.1
Gender						
Male	810 (37.6)	334 (39.2)	196 (42.2)	144 (31.7)	130 (51.4)	0 (0)
Female	1,346 (62.4)	491 (57.8)	269 (57.8)	310 (68.3)	123 (48.6)	159 (100)
Year of education						
1	554 (25.7)	183 (22.2)	157 (33.8)	128 (28.2)	52 (20.6)	34 (21.4)
2	668 (31.0)	286 (37.7)	149 (32.0)	122 (26.9)	62 (24.5)	49 (30.8)
3	508 (23.6)	225 (27.3)	93 (20.0)	107 (23.6)	46 (18.2)	37 (23.3)
4	225 (10.4)	55 (6.7)	49 (10.5)	65 (14.3)	29 (11.5)	27 (17.0)
5	88 (4.1)	33 (4.0)	7 (1.5)	16 (3.5)	27 (10.7)	5 (3.1)
6 and beyond	113 (5.2)	43 (5.2)	10 (2.2)	16 (3.5)	37 (14.6)	7 (4.4)
University of Medical Sciences						
Tehran	345 (16.0)	109 (13.2)	106 (22.8)	94 (20.7)	8 (3.2)	28 (17.6)
Islamic Azad	324 (15.0)	109 (13.2)	101 (21.7)	52 (11.5)	1 (0.4)	61 (38.4)
Shahed	207 (9.6)	61 (7.4)	39 (8.4)	28 (6.2)	79 (31.2)	0 (0)
Tabriz	203 (9.4)	172 (20.8)	0 (0)	27 (5.9)	4 (1.6)	0 (0)
Iran	185 (8.6)	78 (9.5)	92 (19.8)	4 (0.9)	0 (0)	11 (6.9)
Semnan	169 (7.8)	72 (8.7)	14 (3.0)	66 (14.5)	17 (6.7)	0 (0)
Arak	154 (7.1)	51 (6.2)	34 (7.3)	24 (5.3)	22 (8.7)	23 (14.5)
Gorgan	151 (7.0)	56 (6.8)	13 (2.8)	29 (6.4)	27 (10.7)	26 (16.4)
Shahid Beheshti	142 (6.6)	65 (7.9)	3 (0.6)	16 (3.5)	58 (22.9)	0 (0)
Guilan	100 (4.6)	0 (0)	23 (4.9)	71 (15.6)	0 (0)	6 (3.8)
Zanjan	100 (4.6)	0 (0)	16 (3.4)	43 (9.5)	37 (14.6)	4 (2.5)
Dezful	76 (3.5)	52 (6.3)	24 (5.2)	0 (0)	0 (0)	0 (0)

Values are presented as mean ± standard deviation or n (%).

(21.6%), paramedicine (21.1%), dentistry (11.7%), and midwifery (7.4%) from 12 medical sciences universities. Students are described in Table 1.

Subjects' knowledge

The mean knowledge score was 7.35 ± 1.53 (out of 10) in the study subjects. The students' knowledge and number of correct answers for each question are described in Table 2. This score was significantly higher in medicine students compared with paramedicine students ($P = .025$), but there were no significant differences re-

garding knowledge score between other fields of study ($P > .05$) (Fig. 1A). Knowledge scores were significantly higher in students in their fourth and fifth year of education compared with first, second, third, and sixth year ($P < .05$) (Fig. 1B). There was no significant difference regarding knowledge score between men and women ($P = .139$) (Fig. 1C). Students attending Arak University had the highest level of knowledge, whereas students attending Islamic-Azad University had the lowest level of knowledge compared with other universities ($P < .05$) (Fig. 1D). Also, students from Tehran Province had lower levels of knowledge compared with students from other provinces ($P < .001$) (Fig. 1E).

Table 2

The proportion of subjects providing the correct answer for each individual question in the knowledge and practice sections and total score for both parts

Question	Correct answers
Knowledge	15,843 (73.5)
Can kissing transmit hepatitis B and C infections? Yes/No*	1,824 (84.6)
Can hepatitis B and C infections be transmitted by sharing toothbrushes? Yes*/No	1,646 (76.3)
Can sexual intercourse transmit hepatitis B infection? Yes*/No	1,966 (91.2)
Can a hepatitis B-infected patient marry? (without compromising the partner) Yes*/No	1,649 (76.5)
Can a hepatitis B-infected woman become pregnant and have a healthy child? Yes*/No	1,655 (76.8)
Is it possible to prevent hepatitis B infection by vaccination? Yes*/No	1,954 (90.6)
Is it possible to prevent hepatitis C infection by vaccination? Yes/No*	1,342 (62.2)
Do all types of hepatitis B infections require medical treatment? Yes/No*	1,372 (63.6)
Is there a definite treatment for hepatitis C? Yes*/No	681 (31.6)
Is it possible to prevent liver damage resulting from hepatitis B and C? Yes*/No	1,754 (81.4)
Knowledge score (0-10)	7.35 ± 1.53
Practice	12,215 (62.95)
I will avoid kissing a hepatitis B- or C-infected person. Yes/No*	1,455 (67.5)
I may use the toothbrush of a hepatitis B- or C-infected person. Yes/No*	1,783 (82.7)
I will avoid a healthy person had unprotected sex with a hepatitis B-infected person. Yes*/No	1,816 (84.2)
I will avoid a healthy person married to a hepatitis B-infected person. Yes/No*	1,279 (59.3)
I will advise a hepatitis B-infected person not to become pregnant. Yes/ No*	1,377 (63.9)
Are you vaccinated against hepatitis? (All 3 doses) Yes*/No	1,476 (68.5)
Have you ever checked the sufficiency of immunity against hepatitis after the vaccination? Yes*/No	756 (35.1)
I will advise medical treatment for all hepatitis B-infected people. Yes/No*	976 (45.3)
I will advise medical treatment for all hepatitis C-infected people. Yes*/No	1,297 (60.2)
Practice score (0-9)	5.67 ± 1.56

Values are presented as n (%) or mean ± standard deviation.

*Correct answer.

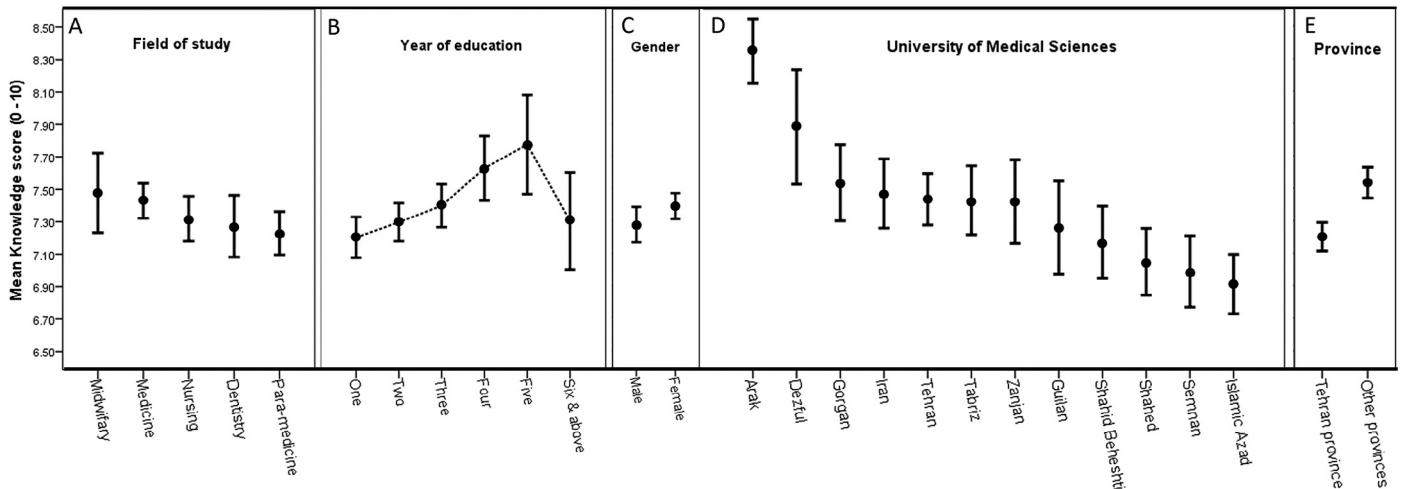


Fig 1. Description of knowledge score subgrouped by subjects' (A) field of study, (B) year of education, (C) gender, (D) university, and (E) province.

Table 3

The proportion of answers for each individual question in the attitude section and total attitude score regarding hepatitis B and C virus infections

Attitude	Strongly agree	Agree	No idea	Disagree	Strongly disagree
It is possible to become infected by kissing a person with hepatitis B or C infections*	99 (4.6)	276 (12.8)	324 (15.0)	884 (41.0)	573 (26.6)
It is possible to become infected by using the toothbrush of a person with hepatitis B or C infections†	507 (23.5)	1115 (51.7)	265 (12.3)	204 (9.5)	65 (3.0)
It is possible to become infected by having sexual intercourse with a person with hepatitis B infection†	798 (37.0)	975 (45.2)	273 (12.7)	90 (4.2)	20 (0.9)
It is highly possible to transmit hepatitis B infection if a healthy person marries a hepatitis B patient even when preventative measures are taken*	108 (5.0)	589 (27.3)	611 (28.3)	682 (31.6)	166 (7.7)
It is highly possible to transmit hepatitis B infection to a baby if a hepatitis B-infected woman becomes pregnant even when preventative measures are taken*	114 (5.3)	655 (30.4)	607 (28.2)	630 (29.2)	150 (7.0)
There is a vaccine for hepatitis B, and it is possible to be immune against this disease†	739 (34.3)	951 (44.1)	341 (15.8)	102 (4.7)	23 (1.1)
There is a vaccine for hepatitis C, and it is possible to be immune against this disease*	136 (6.3)	494 (22.6)	631 (29.3)	607 (28.2)	288 (13.4)
All types of hepatitis B infections require medical treatment*	153 (7.1)	582 (27.0)	612 (28.4)	657 (30.5)	152 (7.1)
There is a definite treatment for hepatitis C†	175 (8.1)	666 (30.9)	767 (35.6)	443 (20.5)	105 (4.9)
There are treatments to prevent liver failure resulting from hepatitis B and C infections†	211 (9.8)	1092 (50.6)	694 (32.2)	140 (6.5)	19 (0.9)
Attitude score (-20 to +20)			4.88 ± 4.38		

Values are presented as n (%) or mean ± standard deviation.

*False.

†True.

Subjects' attitude

The mean attitude score was 4.88 ± 4.38 (range, -20 to +20) in the study subjects. The students' attitudes and the details of answers for each question are described in Table 3. This score was significantly higher in midwifery students compared with students of other fields of study ($P < .05$) (Fig. 2A). The first-year students had the lowest level of attitude, whereas fifth-year students had the highest level of attitude compared with students in other years of education ($P < .05$) (Fig. 2B). Female students had higher levels of attitude compared with male students ($P = .010$) (Fig. 2C). Students from Arak University had the highest levels of attitude, whereas students from Semnan University and Shahid-Beheshti University had the lowest levels of attitude compared with students from other universities ($P < .05$) (Fig. 2D). Students from Tehran Province had lower levels of attitude compared with students from other provinces ($P < .001$) (Fig. 2E).

Subjects' practice

The mean practice score was 5.67 ± 1.56 (out of 9) in study subjects. The students' practices and number of correct answers for each question are described in Table 2. This score was significantly higher in midwifery students compared with students of other fields of

study ($P < .05$) (Fig. 3A). The first- and second-year students had the lowest level of practice, whereas fifth-year students had a higher level of practice compared with students in other years of education ($P < .05$) (Fig. 3B). Female students had higher practice levels compared with male students ($P < .001$) (Fig. 3C). Students from Arak University had highest levels of practice compared with students from other universities ($P < .05$) (Fig. 3D). Students from Tehran Province had lower levels of practice compared with students from other provinces ($P < .001$) (Fig. 3E).

Knowledge was correlated with attitude ($P < .001$; $r = 0.524$) and practice ($P < .001$; $r = 0.392$). Attitude was also significantly correlated with practice ($P < .001$; $r = 0.428$).

Subject age was not correlated with knowledge ($r = 0.028$; $P = .199$), attitude ($r = 0.041$; $P = .059$), or practice ($r = 0.042$; $P = .050$) scores. The subjects' year of education was significantly correlated with their knowledge ($r = 0.048$; $P = .026$), attitude ($r = 0.084$; $P < .001$), and practice ($r = 0.109$; $P < .001$) scores.

Four hundred sixty-five students (21.6%) had experienced at least 1 accidental unprotected exposure to blood and its products in clinical settings. Students who experienced accidental exposures had better levels of knowledge (7.5 vs 7.3; $P = .015$), attitude (5.6 vs 4.7; $P < .001$), and practice (5.8 vs 5.6; $P = .058$) compared with students without such experiences.

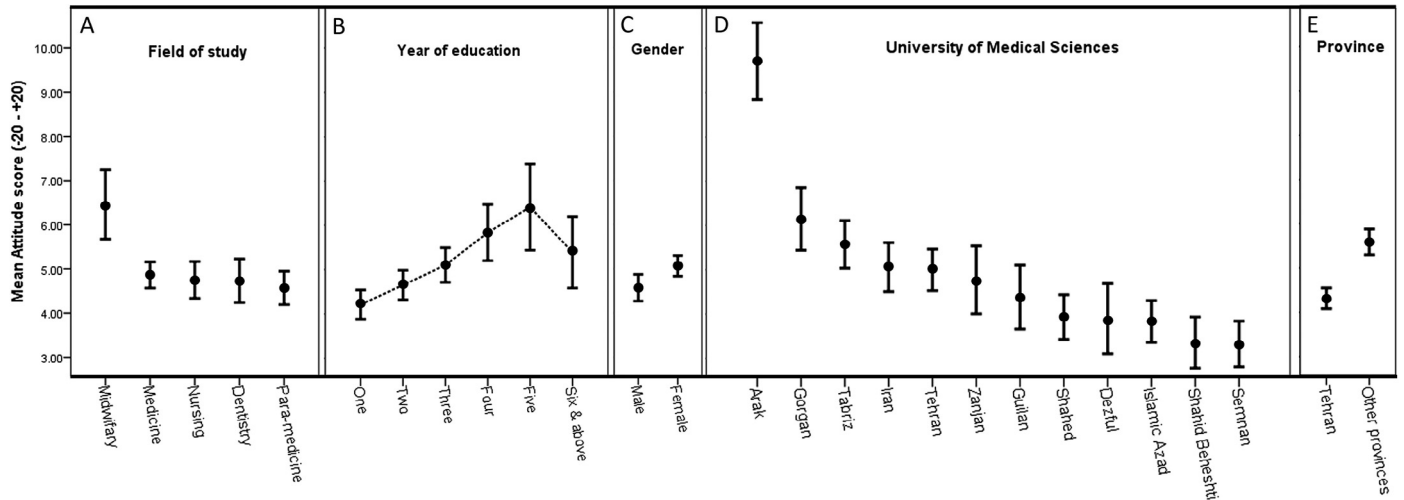


Fig 2. Description of attitude score subgrouped by subjects' (A) field of study, (B) year of education, (C) gender, (D) university, and (E) province.

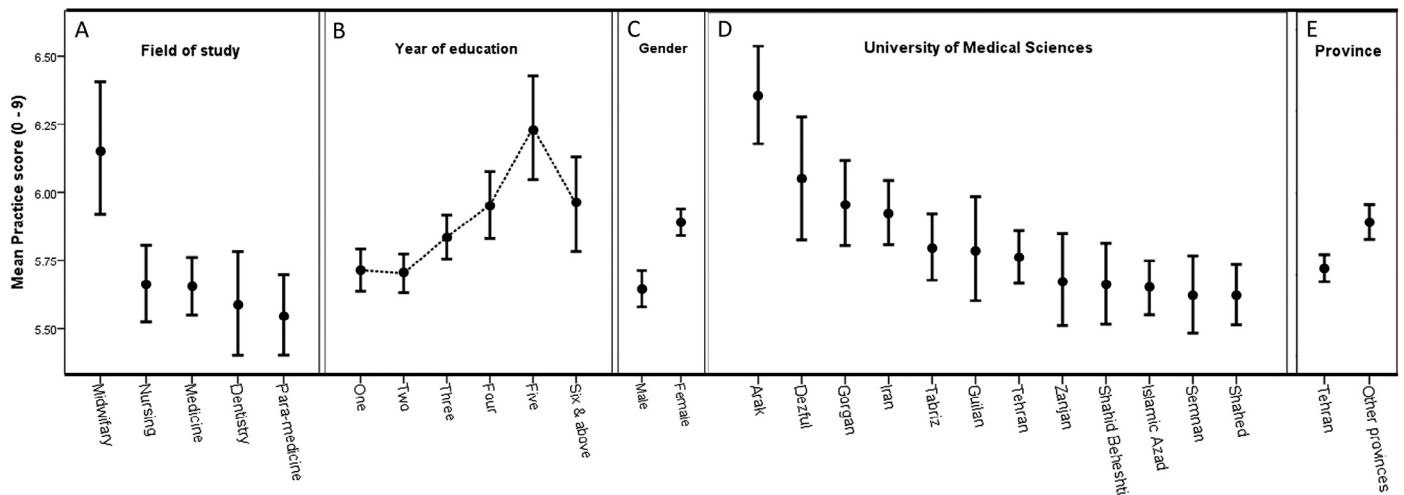


Fig 3. Description of practice score subgrouped by subjects' (A) field of study, (B) year of education, (C) gender, (D) university, (E) and province.

DISCUSSION

Our study was a survey on HBV and HCV infections-related KAP among Iranian health sciences students experiencing close contact with patients or blood products. The mean KAP scores were 7.35 (out of 10), 4.88 (possible range, -20 to +20), and 5.67 (out of 9), respectively, in our study subjects.

The World Health Organization has set a goal of viral hepatitis elimination by 2030,^{10,15} and lack of general knowledge and awareness seem to be a barrier to reaching this important goal.^{11,16} Raising awareness, hygiene modification, and reducing viral exposure are also mentioned as important primary prevention strategies for HBV and HCV infections elimination.¹⁷

An intervention is needed to increase awareness regarding HBV and HCV infections, especially in high-risk groups.^{14,18} We need to evaluate the current status before starting educational interventions.

The fact is that HCWs and health sciences students are at higher risk of getting HBV and HCV infections than the general population.^{19,20} Also, a majority of chronic HCV infection is caused by iatrogenic transmission.²¹

Our study showed different levels of student knowledge score among the included universities. Sixty-eight percent were unaware

of curative treatment options for HCV infection. About 59%-64% of students did not know accurate HBV-prevention strategies from mother to child or how to avoid within-family transmissions. They were not aware that not all HBV-infected people need treatment, did not know about curative treatment for HCV infection, and not know about the existence of a vaccine to prevent HCV infection. Only 35% of students had checked their HBS-Ab titer and 59% of students mentioned avoiding marriages between a healthy person and an HBV-infected person.

A proportion of 2%-27% of medical sciences students in Vientiane were aware of HBV infection risk factors, main symptoms, complications, transmission avenues, and being at risk of getting infected.¹⁹

In a sample of Cameroonian medical students, 83% and 97% knew HBV infection risk factors and existence of a vaccine against HBV, 55% knew that HBV vaccine has 3 doses, 34% knew the importance of checking immune response after vaccination, and 78% were aware of having a higher risk of getting infected compared with the general population.²²

A proportion of 84%-97% of Ethiopian medical sciences students were aware of transmission through blood and body fluids, unsterile medical equipment, needles, and unsafe sexual contact.

Also, 85% knew that HBV has a vaccine, 67% knew that HBV has postexposure prophylaxis, 77% were aware of being at risk for HBV infection, and 83% knew possibility of protecting against HBV infection.²³

In another study, 44% of Ethiopian medical science students had poor HBV knowledge, 56%-90% knew the ways of transmission from mother to child, unsafe sex, unsterilized surgical equipment, needles, blood, and blood products. Also, 52% and 78% knew that skin contact and water or food are not ways that HBV is transmitted, 93% knew that HBV has a vaccine, and 52% knew that HBV has postexposure prophylaxis.²⁴

Among Iranian dental students, all were aware of the probability of HBV transmission from patients to dentists, and 14% stated that they would not treat HBV-infected people.¹²

HCV-related awareness was poor in 30% and fair in 70% of fourth-year medical students in Saudi Arabia. The awareness was better regarding HCV clinical presentations and complications, whereas it was lower about ways the infection is transmitted.²⁵

Our students were 87% vaccinated as a result of a national vaccination program for neonates being in place since 1994 and 8% were vaccinated as part of the national vaccination program for adolescents in Iran.²⁶ But only 68.5% of students were sure about receiving all 3 HBV vaccine doses, and only 35% were sure about their HBs-Ab titer. Other Iranian studies also showed that 97% of medical sciences students and 81% of dental students received all 3 HBV vaccine doses and 3% were aware of their HBs-Ab titer.^{7,12} The rate of full vaccination was 44% in a sample of Syrian medical students,²⁷ 21% in students from Vientiane,¹⁹ 18% in Cameroonian students,²² and 2% in Ethiopian students.²³ The rate of partial immunization was 9.5% in Vientiane,¹⁹ 31% in Cameroon,²² and 5%-13% in Ethiopia.^{23,24} Only 2% of Cameroonian students had checked their postvaccination HBs-Ab titer.²²

Our study showed more levels of attitude and practice in women compared with men. Subject gender was not associated with HBV knowledge in studies of medical sciences students and dental students.^{12,19} HCV awareness was not associated with subject gender in Saudi Arabia.²⁵ Male dental students were more willing to treat HBV-positive patients in a study by Alavian et al.¹² HBV knowledge was higher in men compared with women in Ethiopian students.²⁴ HBV knowledge and HBV- and HCV-related attitude were higher in women compared with men in Iranian medical sciences students of Guilan Province.⁷ HCV-related knowledge was higher in women compared with men in Isfahan Province, but the behavior was not associated with gender.⁸

Subject age was not correlated with knowledge and practice in Ethiopian students or in our study subjects.²⁴ HCV knowledge was positively correlated with subjects' age in health sciences students of Isfahan Province, but subjects' age was not correlated with their behavior.⁸ The HBV-related knowledge was higher in medical sciences students older than age 25 years compared with students younger than age 25 years in a study by Pathoumthong et al.¹⁹ HBV and HCV knowledge levels were negatively correlated with subjects' age in Iranian health sciences students of Guilan Province.⁷

Students in the earlier years of education seem to be a priority target for educational intervention in our study population, especially in the nursing, midwifery, and paramedical students who experience the clinical field earlier than medicine and dentistry students.

Postgraduate students had higher levels of HBV knowledge compared with undergraduate students.¹⁹ Knowledge regarding symptoms, transmission routes, and being at risk for transmission were associated with year of education in Syrian medical students.²⁷ Year-4 medical students were less vaccinated against HBV compared with fifth- and sixth-year students.²² Year of education was not associated with HBV knowledge and vaccination status in

a sample of Iranian dental students, whereas checking immune response to vaccine was more frequent in dental students in later years of education.¹² Total practice level was also more in sixth-year dental students compared with third-, fourth-, and fifth-year students.¹² Awareness about vaccination status was associated with year of education in Syrian medical students.²⁷ HBV-related knowledge was positively associated with subjects' year of education in Indian dental students.²⁸ Year-2 Ethiopian health sciences students had lower levels of HBV knowledge compared with third-, fourth-, fifth- and sixth-year students, but there was no association between practice score and year of education among them.²⁴ Education level was positively correlated with subjects' HCV knowledge, but it was not correlated with practice score.⁸ HCV knowledge was more in fourth-year students compared with lower years of education in another study.⁷

In another study,¹⁹ HBV knowledge was higher in students affiliated with faculties of medicine compared with other faculties. Nursing, midwifery, and anesthesia students had lower HBV knowledge and attitude compared with medicine students in Ethiopia.²³ Another study in Iran showed better HBV knowledge in nursing students compared with operating room technicians, midwifery, anesthesia, medical laboratory, and radiology students, but HCV knowledge was higher in operating room technicians compared with students in other fields of study.⁷ HBV knowledge was lower in psychiatry and medical laboratory students compared with medicine, public health, nursing, and midwifery students, and HBV-related practice was lower in psychiatry students compared with students in other fields of study.²⁴ There was no association between HCV knowledge and field of study in Isfahan Province.⁸

Accidental exposure to blood was 56% in Cameroon²² and 27% in Ethiopia.²³ Other Iranian studies showed that 39% of Iranian health sciences students experienced a needlestick injury,²⁹ and 35% of Iranian medical interns had at least 1 definite needlestick injury, and 67% had at least 1 possible needle exposure during their training years.³⁰ HBV knowledge was more in students who had experienced a needlestick injury.⁷

Our study was unable to weight different questions in the questionnaire and we think all had the same value. Also, our sampling was convenience, which could cause a kind of unavoidable selection bias. Future evaluations will be better by resolving these limitations.

CONCLUSIONS

Our study showed that HBV- and HCV-related KAP in a sample of Iranian health sciences students were not satisfying. Educational interventions are needed to increase the hepatitis-related KAP and help its elimination. The results also demonstrated lower KAP in some subject areas, earlier years of education, and some universities compared with others. These data could be used for future educational interventions. Future studies should be repeated in a randomly selected sample of students.

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References

1. Collaborators, The Polaris Observatory HCV. Global prevalence and genotype distribution of hepatitis C virus infection in 2015: a modelling study. *Lancet Gastroenterol Hepatol* 2017;doi:10.1016/S2468-1253(16)30181-9.
2. Salehi-Vaziri M, Sadeghi F, Hashiani AA, Fesharaki MG, Alavian SM. Hepatitis B virus infection in the general population of Iran: an updated systematic review and meta-analysis. *Hepat Mon* 2016;16.

3. Alavian SM. Hepatitis B virus infection in Iran; changing the epidemiology. *Iran J Clin Infect Dis* 2010;5:51-61.
4. Prüss-Üstün A, Rapiti E, Hutin Y. Estimation of the global burden of disease attributable to contaminated sharps injuries among health-care workers. *Am J Ind Med* 2005;48:482-90.
5. Askarian M, Malekmakan L. The prevalence of needle stick injuries in medical, dental, nursing and midwifery students at the University Teaching Hospitals of Shiraz, Iran. *Indian J Med Sci* 2006;60:227.
6. Karimi-Sari H, Alavian SM. Needlestick injury against viral hepatitis elimination. *J Hosp Infect* 2017;doi:10.1016/j.jhin.2017.04.024.
7. Mansour-Ghanaei R, Joukar F, Souti F, Atrkar-Roushan Z. Knowledge and attitude of medical science students toward hepatitis B and C infections. *Int J Clin Exp Med* 2013;6:197-205.
8. Daniali SS, Bakhtiari MH, Nasirzadeh M, Aligol M, Doaei S. Knowledge, risk perception, and behavioral intention about hepatitis C, among university students. *J Educ Health Promot* 2015;4.
9. Karimiankankolaki Z, Baghianimoghadam MH, Gerayllo S, Samani NS, Hadipour H. A survey of knowledge, individual perceived risk, general perceived risk, and behavioral intentions regarding hepatitis B among students in the faculty of Nursing, Midwifery and Health at Shahrekord Islamic Azad University in 2014. *Hepat Mon* 2016;16.
10. Towards elimination of viral hepatitis by 2030. *Lancet* 2016;doi:10.1016/S0140-6736(16)31144-8. Elsevier.
11. Karimi-Sari H, Tajik M, Bayatpoor ME, Alavian SM. Increasing the awareness of the general population: an important step in elimination programs of viral hepatitis. *Am J Gastroenterol* 2017;112:393-5.
12. Alavian SM, Mahboobi N, Mahboobi N, Savadrudbari MM, Azar PS, Daneshvar S. Iranian dental students' knowledge of hepatitis B virus infection and its control practices. *J Dent Educ* 2011;75:1627-34.
13. Ali K, SeyedVahid T, Siamak K, Shahram A, HosseinFaghihi KA, Mehrdad M, et al. Knowledge, attitudes and practice of Iranian medical specialists regarding hepatitis B and C. *Hepat Mon* 2010;2010:176-82.
14. Karimi-Sari H, Bayatpoor ME, Alavian SM. Awareness campaign in (Bio) medical students in Iran: a model for increasing the knowledge regarding hepatitis B and C. *Clin Microbiol Infect* 2016;doi:10.1016/j.cmi.2016.11.022.
15. Brahm J, Castera L, Hou J, Lindor K. Joint society statement for elimination of viral hepatitis. *Ann Hepatol* 2017;1:6-7.
16. Hesamizadeh K, Sharafi H, Rezaee-Zavareh MS, Behnava B, Alavian SM. Next steps toward eradication of hepatitis C in the era of direct acting antivirals. *Hepat Mon* 2016;16.
17. Pfaender S, Hahn T, Steinmann J, Ciesek S, Steinmann E. Prevention strategies for blood-borne viruses—in the era of vaccines, direct acting antivirals and antiretroviral therapy. *Rev Med Virol* 2016;26:330-9.
18. Karimi-Sari H, Tajik M, Bayatpoor ME, Sharafi H, Alavian SM. Public awareness campaign and knowledge of Iranian (Bio)medical students regarding hepatitis B and C. *Hepat Mon* 2017;doi:10.5812/hepatmon.45929.
19. Pathoumthong K, Khampanisong P, Quet F, Latthaphasavang V, Souvong V, Buisson Y. Vaccination status, knowledge and awareness towards hepatitis B among students of health professions in Vientiane, Lao Pdr. *Vaccine* 2014;32:4993-9.
20. Beltrami EM, Williams IT, Shapiro CN, Chamberland ME. Risk and management of blood-borne infections in health care workers. *Clin Microbiol Rev* 2000;13:385-407.
21. Foster GR. Chronic hepatitis C: less of a problem than first thought? *Lancet Gastroenterol Hepatol* 2017;doi:10.1016/S2468-1253(16)30209-6.
22. Noubiap JN, Nansseu JRN, Kengne KK, Ndoula ST, Agyingi LA. Occupational exposure to blood, hepatitis B vaccine knowledge and uptake among medical students in Cameroon. *BMC Med Educ* 2013;13:148.
23. 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;9:410.
24. 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:e79642.
25. Almansour AH, Darwish MA, Wahab MMA. Hepatitis C infection awareness among fourth year medical students at University of Dammam. *J Family Community Med* 2017;24:49.
26. Alavian SM, Zamiri N, Gooya MM, Tehrani A, Heydari ST, Lankarani KB. Hepatitis B vaccination of adolescents: a report on the national program in Iran. *J Public Health Policy* 2010;31:478-93.
27. Ibrahim N, Idris A. Hepatitis B awareness among medical students and their vaccination status at Syrian Private University. *Hepat Res Treat* 2014;2014.
28. Mahesh R, Arthi C, Victor S, Ashokkumar S. Hepatitis B infection awareness among dental graduate students: a cross-sectional study. *Int Sch Res Notices* 2014;2014.
29. Ghasemzadeh I, Kazerooni M, Davoodian P, Hamedy Y, Sadeghi P. Sharp injuries among medical students. *Glob J Health Sc* 2015;7:320.
30. Shariati B, Shahidzadeh-Mahani A, Oveysi T, Akhlaghi H. Accidental exposure to blood in medical interns of Tehran University of medical sciences. *J Occup Health* 2007;49:317-21.