Knowledge, Attitude, Behavior, and Stress Related to COVID-19 among Undergraduate Health Care Students in Jordan

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Abstract

Objectives   This study aimed to assess knowledge, attitude, and infection control measures related to the coronavirus disease 2019 (COVID-19) pandemic outbreak among Jordanian health care students. Besides, their social behavior and stress level regarding COVID-19 infection were assessed.

Materials and Methods   An online questionnaire was distributed to medical, dental, pharmacy, nursing, and applied health science students in Jordan during the COVID-19 outbreak quarantine in March 2020. The questionnaire comprised 38 questions assessing demographic data, knowledge, attitude, risk perception, and stress level toward COVID-19. Questions regarding infection control measures and social behavior after the quarantine were also included.

Statistical Analysis   Independent samples *t*-test, one-way analysis of variance (ANOVA), and chi-square at a significance level of 5% were used for data analysis.

Results   A total number of 935 responses were collected. The knowledge score of 55.72% of participants was satisfactory and it was higher for the clinical years' students compared with the basic years' students ($p = 0.000$) (descending order: sixth year > fifth year > fourth year > third year > first year > second year). Also, knowledge scores were significantly higher for medical and dental students than other disciplines (descending order: medicine, dentistry, pharmacy, nursing/applied) ($p = 0.000$). The social media (89.1%) and TV or radio (69.5%) were mainly routes through which participants heard about COVID-19. Moderate and justifiable feelings about COVID-19 were found in the majority of the participants.

Conclusion   Although the majority of students showed good knowledge scores, few of them appeared to have a serious lack of knowledge. Therefore, proper education and mentoring are necessary for students before reopening the university campuses.

Keywords
► attitude
► COVID-19
► infection control
► knowledge
► students

Introduction

Coronaviruses (CoVs) are a large group of single-stranded RNA viruses with crown-like spikes on their surface.[1] There are four main genera of CoVs: α, β, gamma, and delta.[2] Most CoVs can cause infectious diseases in both mammals and vertebrates. In humans, these viruses can cause mild to lethal respiratory tract infections.[1]

CoV infections were responsible for multiple epidemic outbreaks, started with the severe acute respiratory syndrome coronavirus (SARS-CoV) in 2002, and then the Middle East respiratory syndrome coronavirus (MERS-CoV) in 2012.[3,4] The outbreaks of respiratory diseases were originated in animals before moving to humans. SARS-CoV and MERS-CoV were transmitted from civet cats and Arabian camels to humans, respectively. The current outbreak of coronavirus disease 2019 (COVID-19, which was called initially as 2019-nCoV and later was termed as SARS-CoV-2) has started in Wuhan, Hubei Province, China after 8 years from the MERS-CoV epidemic outbreak and the Chinese horseshoe bats were mostly thought to be the origin of COVID-19 infection.[3,5] COVID-19 caused a global pneumonia outbreak and becomes a major challenging public health in almost all countries of the world and was declared as a pandemic on March 11, 2020, by the World Health Organization (WHO).[6]

Infectious disease such as CoV implies an important public health problem facing the health systems.[7] The fact that SARS-CoV-2 is highly contagious by respiratory droplets and aerosols incomparable with other viruses in the corona family, its long incubation periods in which patients could be asymptomatic disease transmitters, along with no vaccine or antiviral treatment has been implicated yet,[8-10] all these issues make preventive measures the most important interventions to control it.

In this global health crisis, the role of health care providers including health care students cannot be ignored. Health care students including medical, dental, pharmacy, and nursing are the first individuals who may have close contact with the infected people during their clinical training or their voluntary clinical roles. Moreover, they have a role in educating the public and increasing their awareness of the COVID-19 pandemic.[11] However, health care students may lack proper knowledge or have misconceptions about the disease caused by false information heavily disseminated through social media. Also, they may not be aware of COVID-19 special infection control measures relevant to their study environment and clinical practice. This may result in increased infection transmission and could increase the students' stress and anxiety levels and may negatively influence their judgment[12] and performance.[13]

Therefore, this study aimed to assess the knowledge, attitude, and awareness among health care students toward COVID-19 infection, and to evaluate their stress level during the lockdown period and its impact on their social habits. The study findings could be helpful in many aspects such as identifying any gaps in students' knowledge, understand the psychological impact of COVID-19 on students to make recommendations to improve their awareness and decrease their stress for better health and education. Of worth mentioning, such assessments have proven useful in raising awareness and education in viral outbreaks including SARS and MERS.[11,14-16]

Materials and Methods

A cross-sectional study was conducted among health care students in Jordan. Ethical approvals were obtained from the Institutional Review Board at Jordan University of Science and Technology (JUST) (Ref. No. 185/132/2020). A self-administered questionnaire using Google forms was sent online to Jordanian university students through WhatsApp and Facebook groups that are designed for distance learning during the COVID-19 outbreak. Moreover, the questionnaire link was distributed directly to students through class representatives for all academic years. The total number of the study population was estimated to be around 25,000 among the seven Jordanian universities that teach the requested fields. Using the Raosoft sample size calculator, the study power was set at 95% with a margin of error of 5 and 50% as a response distribution,[17] which resulted in a minimum sample size of 379 students. The questionnaire was distributed on March 28, 2020, and collected on April 20, 2020. The survey questions were developed after reviewing pertinent literature and the international guidelines such as the WHO, and the Centers for Disease Control and Prevention guidelines. It consisted of five sections with 38 questions in total. The first section reported the demographic characteristics of participants including age, gender, university name, discipline, year of study, presence of a health care provider in the family, and any relatives or friends who suffered from COVID-19 infection. The following section assessed the students' knowledge about the COVID-19 including nine questions: causes, incubation period, symptoms, transmission, high-risk groups, death rate, the antibiotic use as a treatment, and the protection measures. The questions' type in this section was closed ended, while multiple answer format was used for the other items in this section. To obtain a total knowledge score, each knowledge item or question was given a score of 1 or 0, where 0 represented a neutral "no idea" or incorrect answer and 1 represented a correct answer.[18] The scores of all items were summed with a maximum total score of 28. The total knowledge scores were categorized into poor (>14), satisfactory (≥14 and <21), and good (≥21). The third section included 10 items, 1 item explored the source of COVID-19 information in a multiple-choice format and another 9 items assessed the participants' attitude and risk perception when dealing with patients who are suspected of COVID-19 during and after the lockdown. The fourth section included 10 items, 5 of them explored the participants' behavior and attitudes after the COVID-19 lockdown which was reported on a 10-point Likert scale (from strongly disagree [1] to strongly agree [10]) including avoiding crowded places, canceling travel plans or social events, and changing life habits. Furthermore, five other items assessed the stress level of the participants during the COVID-19 outbreak where they were rated on a 4-point Likert scale ranging from "not

at all, rarely, sometimes, and often." Finally, the last section had two closed-ended questions about the preparedness of participants for the disease.

The questionnaire was initially designed in English, and then it was translated into Arabic. Three experienced reviewers assessed the questionnaire validity before and after translation. Language proficiency was validated and assessed. A pilot sample ($n = 40$) was applied to assess the survey reliability using participants who were not included in the final study sample. Cronbach's alpha test was conducted for all participants' behavior and stress level items[19] to assess reliability or internal consistency. The Cronbach's alpha scores were 93 and 84%, respectively, which represent acceptable reliability.

The inclusion criteria for the targeted population were as follows: (1) undergraduate students at Jordanian universities; (2) studying in one of the following fields: medicine, dentistry, nursing, applied medical science, and pharmacy; (3) any gender; (4) aged 18 years and older; and (5) currently living in Jordan.

This survey was anonymous and the information provided from the participants was treated confidentially. Participation was voluntary and participants were free to discontinue answering the survey questions at any stage. Also, informed consent was obtained from each participant before answering the questionnaire questions. The data were entered into an IBM SPSS software for statistical analysis. The normality and descriptive statistics for data were checked and obtained. The data were simply presented by numbers, percentages, and frequencies. Chi-square test was used to assess the association between different categorical variables, while one-way ANOVA and independent sample t-test were used to compare the knowledge scores among different categories of participants. A p-value of less than 0.05 was considered statistically significant.

Results

A total of 935 participants responded and completed the study questionnaire with a response rate of 81.3%. The demographics and characteristics of participants are summarized in ►**Table 1**. Most of the study participants were females (71.2%) and taking courses at JUST.

Regarding the cause of COVID-19, 45.9% of participants believed that COVID-19 infection is caused by CoV 2 (SARS-CoV-2). About 15 and 10.9% believed that the infection is caused by CoV 1 (SARS-CoV-1) and CoV (MERS-CoV), respectively. Almost 28.2% had no idea about the cause of the infection. Concerning the COVID-19 incubation period, 44.1% believed that it ranges from 2 to 14 days, while 29.9 and 25.2% believed that it ranges from 7 to 21 and 7 to 14 days, respectively. The majority of participants (84.8%) believed that antibiotics are not useful for the treatment of COVID-19. Concerning the death rate associated with COVID-19, 64% gave a response of 5%, 21.2% had no idea, while 12.5 and 1.8% believed that the death rate is 30 and 50%, respectively.

Regarding the knowledge of participants related to COVID-19's symptoms, high-risk categories, and infection

Table 1 Demographic data and characteristics of participants

	N	%
Gender		
Male	269	28.8
Female	666	71.2
Age in y		
18–20	332	35.5
21–23	462	49.4
24–26	118	12.6
27–29	15	1.6
≥30	8	0.9
University		
Jordan University of Science and Technology	700	74.9
The University of Jordan	28	3.0
Yarmouk University	63	6.7
Other	144	15.4
Discipline		
Medicine	231	24.7
Dentistry	370	39.6
Nursing and applied medical sciences	149	15.9
Pharmacology	185	19.8
Year of study		
First y	183	19.6
Second yr	85	9.1
Third y	197	21.1
Fourth y	132	14.1
Fifth y	264	28.2
Sixth y	74	7.9
Presence of a health care provider in the family		
No	513	54.9
Yes	422	45.1
Presence of a relative or a friend who suffered from COVID-19		
No	874	93.5
Yes	39	4.2
Maybe	22	2.4

Abbreviation: COVID-19, coronavirus disease 2019.

preventative measures, data are summarized in ►**Table 2**. In general, the participants showed good knowledge about the disease symptoms, high-risk categories, and the preventative measures that should be taken. Concerning personal protective equipment including goggles, masks, and gloves, the majority (86.1%) trusted that its use is useful in the protection from suspected COVID-19 patients. Concerning the importance of changing both masks and gloves to decrease the possibility of transmitting infections between patients and health care providers, 68.8 and 25.0% believed that it is "very important" and "important," respectively. The average knowledge score of participants is 19.54 (±3.15). The knowledge score of 55.72% of participants was satisfactory, 39.89% was good, and only 4.39%

Table 2 Participants' response to some of the knowledge questionnaire items

	N	%
Which of the following are symptoms of COVID-19?		
Fever	892	95.4
Cough	832	89.0
Runny nose	280	29.9
Sore throat	598	64.0
Shortness of breath	873	93.4
Joint/muscle pain	456	48.8
Red eyes	113	12.1
Skin rash	58	6.2
Diarrhea	387	41.4
Vomiting	209	22.4
May present with no symptoms	762	81.5
Which of the following categories are at high risk of acquiring COVID-19 infection?		
Health care providers	679	72.6
Elderly	808	86.4
Male gender	116	12.4
Children	236	25.2
People with immunodeficiency and chronic diseases	878	93.9
Travelers	513	54.9
Which of the following measures should be taken to prevent transmission from known or suspected COVID-19 patients?		
Wearing a face mask in the crowd	778	83.2
Maintaining good hand hygiene	896	95.8
Avoiding contact with COVID-19 cases	885	94.7
Avoiding crowded places	895	95.7
Vaccination	105	11.2
Eating boiled and cooked food	297	31.8
There are no protective measures	35	3.7

Abbreviation: COVID-19, coronavirus disease 2019.

Fig. 1 Grouped bar chart illustrating the stress level of participants related to the COVID-19 outbreak. (**A**) I think about it when I do not mean to, (**B**) I try to remove it from memory, (**C**) I have waves of strong feelings about it, (**D**) I have trouble falling asleep because of pictures or thoughts about it that come to my mind, (**E**) I have dreams about it.

was poor. Also, a significant effect was found between the knowledge score and the year of study ($p = 0.000$), the clinical years' students were higher in knowledge score than the basic years' students (descending order: sixth year > fifth year > fourth year > third year > first year > second year). It also showed a significant effect between the knowledge score and the discipline ($p = 0.000$) (descending order: medicine, dentistry, pharmacy, nursing/applied health science).

Nearly all subjects (99.0%) trusted that educating people about COVID-19 is important to prevent the spread of the disease. Besides, most of the subjects (97.2%) believed that the role of health care providers in teaching others about COVID-19 is very important. Most of the participants (86.6%) were aware of whom to contact in case of unprotected
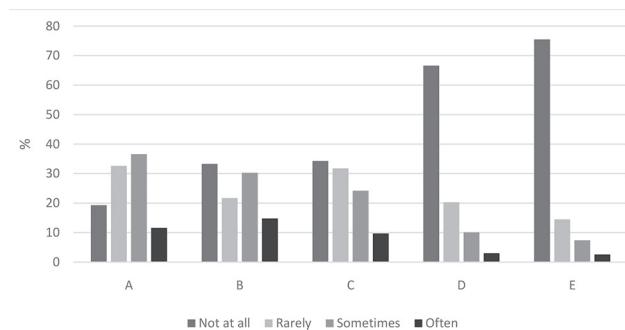
exposure to a known or suspected COVID-19 patient. Also, the majority (91.8%) were aware of what to do in case of experiencing signs or symptoms of COVID-19 infection.

Routes through which participants heard about COVID-19 were mainly social media (89.1%) and TV or radio (69.5%). Concerning perception of COVID-19, nearly half of the participants (49.1%) believed that it represents a serious public health issue, and the other half (49.5%) believed that it is moderately dangerous. Only 1.4% of participants perceived it as a nondangerous issue; 68.1% of participants believed that COVID-19 infection is self-limiting and does not require any special treatment.

Regarding the stress level of participants related to the COVID-19 outbreak, ►**Fig. 1** shows an illustrating summary of the participants' views and feelings. Most of the participants showed moderate and justifiable feelings about it and only a few participants showed strong fears to the level of "often" dreaming about it (2.6%) or not being able to sleep (3.0%).

Concerning how to deal with patients who are suspected of COVID-19 during and after the outbreak, the majority (79.7%) preferred to avoid dealing with those patients. Regarding doing a clinical rotation in a hospital where COVID-19 patients are treated, 44.8% of participants agreed on that, while 39.9% disagreed, and 15.3% showed a neutral response. Most of the participants (79.5%) believed that the usual infection control measures and equipment should be altered after the outbreak, while 18.4% believed that no change in measures or equipment is required. Moreover, a significant association was found between "I'll not do my clinical rotation in a hospital where COVID-19 patients are treated" and the year of study (chi-square = 87.997, df = 10, $p = 0.000$) and with the discipline chi-square = 50.373, df = 6, $p = 0.000$).

Regarding the attitude and behavior of participants after the COVID-19 outbreak, the mode value was used to represent the results (i.e., participants had to give a response by selecting an integer from 1 to 10, where "1" represents a "strongly disagree," while "10" represents a "strongly agree" responses). The mode values for "avoiding crowded places," "canceling traveling plans," "changing life habits," "canceling social events," and "washing hands more frequently" were 10, 10, 10, 1, and 10, respectively.

Discussion

Nowadays, COVID-19 pandemic is the most serious public health issue. It is not surprising that 98% of the students considered it as a moderate or very dangerous public health issue. Also, it is not surprising that students from JUST participated more than others as the study took place mainly at JUST where the investigators work. Unfortunately, the correct scientific knowledge of the students regarding the cause of COVID-19 was relatively low (~50%); however, all of them still know that it is a viral disease which is more important to measure their attitude about it and how to deal with such a disease. In agreement with that, most of the students declared that their main source of information about the disease was social media and TV rather than scientifically official Web sites. These sources have much contradictory news regarding the scientific knowledge of this disease where the students can be misled by the enormous inaccurate or incorrect information. Accordingly, the students' knowledge about the incubation period of the disease varies a lot and this was also expected given the contradictory findings from the various studies and reports worldwide.[20] Similar to that, the students vary a lot in their knowledge about the death rates of the disease which differ between countries and according to many studies.[21] However, most of the students still realize that no treatments are effective in facing this disease especially antibiotics giving the viral nature of the disease.[22]

On the contrary, the participants showed good knowledge about the disease symptoms, high-risk categories, and the preventative measures that should be taken since only 4.39% of the students were considered to have poor knowledge scores. Also, they were knowledgeable about who to contact when they are exposed to suspected people or if they suffered from specific signs and symptoms that may be related to the disease. This is very important in dealing with the disease outbreaks in the future especially if life to universities and courses were planned to return to the campuses rather than using the online teaching methods. As such, this small percentage still indicated that proper education and orientation should be provided to those students before returning them to the university campuses especially that this disease is highly contagious[23] and few students may disrupt any preventative measures that should be taken. In agreement with that, almost all of the students believed that proper education is critical in preventing the spread of the disease.

Regarding the stress level of the participants related to the COVID-19 outbreak, most of the participants showed moderate and justifiable feelings about it and only a few participants showed strong fears to the level of dreaming about it or even not being able to sleep. This is expected because, at the beginning of the pandemic, the stress level was relatively high.[24] Then after, and with time, Jordan took aggressive preventative measures against this pandemic. This made Jordan a very low country in terms of the numbers of infected people and the death rates.[25] Therefore, this may explain the moderate stress level among Jordanian students. Saying so, those medical students might show some stigmatizing attitude toward working with COVID-19 patients as most of them prefer not working with infected/suspected patients or avoiding them during their daily teaching hospital rotations. While this is understandable as they are trying not to be infected; however, it may explain the high level of fear for some of the students. Moreover, students from higher years of study or with more clinically oriented or interactive specialties (medicine and dentistry) were more knowledgeable and more prone to work with those patients compared with the students in their first years of study or those with less clinically oriented specialties (pharmacy, nursing, and applied medical sciences).

Furthermore, most of the students agreed that some of their activities and habits should be changed during the COVID-19 pandemic. The majority agreed that they should avoid crowded places, cancel traveling plans, change life habits, and wash hands more frequently. This was expected given the importance of social distancing in protecting the people from being infected with this virus.[26] However, the majority did not agree on canceling social events. This is also expected in the Middle Eastern cultures (including Jordan), where participating in social events especially family events is critical and very important.

Finally, it is important to highlight some of the limitations of this study. For instance, even though we might be succeeded in recruiting a representative sample, the questionnaire was not distributed to all targeted students. Also, we used an online questionnaire and not face-to-face interviews which made it difficult to assess the exact feelings and fears of the students.

Conclusion

Although most of the students showed good knowledge scores, positive attitudes, and reasonable stress related to the COVID-19 pandemic, few of them appeared to have a serious lack of knowledge. Therefore, proper education and mentoring are necessary for students before reopening the university campuses.

References

1 Yin Y, Wunderink RG. MERS, SARS and other coronaviruses as causes of pneumonia. Respirology 2018;23(2):130–137
2 Nasiri K. COVID-19 and the antiviral effect of saliva. Eur J Dent 2020;14(suppl S1):S177–S178 doi:10.1055/s-0040-1715708

3   Cascella M, Rajnik M, Cuomo A, Dulebohn SC, Di Napoli R. Features, evaluation and treatment coronavirus (COVID-19). Statpearls [internet]. StatPearls Publishing: Treasure Island, FL, USA; 2020

4   Bhagavathula A, Shehab A. The story of mysterious pneumonia and the response to deadly novel coronavirus (2019-nCoV): so far. New Emirates Med J 2020;1(1):7–10

5   Lai C-C, Shih T-P, Ko W-C, Tang H-J, Hsueh P-R. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease-2019 (COVID-19): the epidemic and the challenges. Int J Antimicrob Agents 2020;55(3):105924

6   Sohrabi C, Alsafi Z, O'Neill N, et al. World Health Organization declares global emergency: a review of the 2019 novel coronavirus (COVID-19). Int J Surg 2020;76:71–76

7   Moradi Khanghahi B, Jamali Z, Pournaghi Azar F, Naghavi Behzad M, Azami-Aghdash S. Knowledge, attitude, practice, and status of infection control among Iranian dentists and dental students: a systematic review. J Dent Res Dent Clin Dent Prospect 2013;7(2):55–60

8   Baseer MA, Rahman G, Yassin MA. Infection control practices in dental school: a patient perspective from Saudi Arabia. Dent Res J (Isfahan) 2013;10(1):25–30

9   Tada A, Watanabe M, Senpuku H. Factors influencing compliance with infection control practice in Japanese dentists. Int J Occup Environ Med 2014;5(1):24–31

10 Hamid H, Khurshid Z, Adanir N, Zafar MS, Zohaib S. COVID-19 pandemic and role of human saliva as a testing biofluid in point-of-care technology 2020. Eur J Dent:2020;14(suppl S1):S123–S129 doi:10.1055/s-0040-1713020

11 Mackay IM, Arden KE. MERS coronavirus: diagnostics, epidemiology and transmission. Virol J 2015;12(1):222

12 Kim JS, Choi JS. Middle East respiratory syndrome-related knowledge, preventive behaviours and risk perception among nursing students during outbreak. J Clin Nurs 2016;25(17-18):2542–2549

13 Andrews B, Wilding JM. The relation of depression and anxiety to life-stress and achievement in students. Br J Psychol 2004;95(Pt 4):509–521

14 Al-Mohaissen M. Awareness among a Saudi Arabian university community of Middle East respiratory syndrome coronavirus following an outbreak. East Mediterr Health J 2017;23(5):351–360

15 Blendon RJ, Benson JM, DesRoches CM, Raleigh E, Taylor-Clark K. The public's response to severe acute respiratory syndrome in Toronto and the United States. Clin Infect Dis 2004;38(7):925–931

16 Ajilore K, Atakiti I, Onyenankeya K. College students' knowledge, attitudes and adherence to public service announcements on Ebola in Nigeria: suggestions for improving future Ebola prevention education programmes. Health Educ J 2017;76(6):648–660

17 Raosoft. Sample size calculator. Available at: https://www.raosoft.com/samplesize.html. Accessed April 2020

18 Salman M, Mustafa ZU, Asif N, et al. Knowledge, attitude and preventive practices related to COVID-19: a cross-sectional study in two Pakistani university populations. Drugs Ther Perspect 2020:1–7

19 Casadonte PP, Des Jarlais DC, Friedman SR, Rotrosen JP. Psychological and behavioral impact among intravenous drug users of learning HIV test results. Int J Addict 1990;25(4):409–426

20 Lauer SA, Grantz KH, Bi Q, et al. The incubation period of coronavirus disease 2019 (COVID-19) from publicly reported confirmed cases: estimation and application. Ann Intern Med 2020;172(9):577–582

21 Li LQ, Huang T, Wang YQ, et al. COVID-19 patients' clinical characteristics, discharge rate, and fatality rate of meta-analysis. J Med Virol 2020;92(6):577–583

22 Jean SS, Lee PI, Hsueh PR. Treatment options for COVID-19: the reality and challenges. J Microbiol Immunol Infect 2020;53(3):436–443

23 Salata C, Calistri A, Parolin C, Palù G. Coronaviruses: a paradigm of new emerging zoonotic diseases. Pathog Dis 2019;77(9):ftaa006 doi:10.1093/femspd/ftaa006

24 Lum LHW, Tambyah PA. Outbreak of COVID-19 - an urgent need for good science to silence our fears? Singapore Med J 2020;61(2):55–57

25 Alqutob R, Al Nsour M, Tarawneh MR, et al. COVID-19 crisis in Jordan: response, scenarios, strategies, and recommendations. JMIR Public Health Surveill 2020;6(3):e19332

26 Wilder-Smith A, Freedman DO. Isolation, quarantine, social distancing and community containment: pivotal role for old-style public health measures in the novel coronavirus (2019-nCoV) outbreak. J Travel Med 2020;27(2):taaa020