Assessing Knowledge, Attitude, Practice, and Risk Perception towards COVID-19, among Dental Students in Southern Iran

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Abstract

Aims: Coronavirus Disease 2019 (COVID-19), affecting a large number of people worldwide, has been declared as a public health emergency. The goal of this study was to assess the Knowledge, Attitude, Practice (KAP), and risk perception of dental care during the covid-19 among dental students.

Methods: An online questionnaire was sent to 4th- 6th-year dental students. The questionnaire was divided into 5 sections. The first part contained questions regarding demographic information, whereas the other sections each assessed knowledge (18 questions), attitudes (5 questions), practices (7 questions), and risk perception (2 questions) of dental students.

Findings: Among 314 participants, 69.43% were female. The mean scores for Knowledge, Attitude, Practice and Risk Perception were 70.06 ± 8.95 (range: 0-100), 8.86 ± 1.70 (range: 5-15), 5.59 ± 1.86 (range: 0-7) and 4.72 ± 1.92 (range: 2-6), respectively. The mean knowledge score was not significantly different across gender ($P \geq 0.05$), females had a lower attitude score ($P= 0.017$) while their practice score was significantly higher ($P=0.009$). Based on the linear regression results, higher scores of risk perception were associated with gender (female vs. male: $B=0.653$, $P=0.001$). A significant positive correlation was found between practice and risk perception ($r=0.215$, $p=0.007$). Moreover a negative correlation between attitude and risk perception ($r= -0.192$, $p=0.016$).

Conclusions: This study revealed that the overall scores of KAP among the dental students were good, however, their knowledge about the extra precautionary measures requires further educations.

Keywords: *Coronavirus, knowledge, attitude, practice, risk perception.*

Introduction

COVID-19 is a newly emerged viral infection that first appeared in Wuhan, China in late 2019 and it has dreadfully spread among people from all over the world ever since. On 11 March 2020, the Director-General of the World Health Organization (WHO) declared the COVID-19 outbreak a pandemic. [1]

The virus responsible for COVID-19 has been named "Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)" by the International Committee on Taxonomy of Viruses, given its genetic relativity to the SARS-CoV which caused an epidemic in 2003. [2, 3] Studies have shown that SARS-CoV-2 is very similar to SARS-CoV-like coronaviruses. Since it can be transmitted from non-human animals to humans,

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bats are most likely to be the origin of COVID-19. [4]

The clinical manifestations of COVID-19 may vary from the presence of fever, dry cough, tiredness, or less common symptoms including loss of taste or smell, red eyes, sore throat, headache, skin rash, diarrhea, and nasal congestion to more severe symptoms such as dyspnea, confusion, high temperature above 38°c. [5] This newly discovered disease appears to have a much lower fatality rate than diseases caused by Middle East Respiratory Syndrome Coronavirus (MERS-CoV) and SARS-CoV[6]; however, it is more contagious. [7, 8] Three main ways of the virus transmission in oral health care setting are 1-direct transmission through inhalation of droplets generated through sneezing or coughing; 2- direct transmission via exposure of mucous membranes such as nasal, oral mucosa, or eye to infectious droplets; and 3- indirect transmission via contaminated surfaces such as door handles, chairs, phones, and reception desks. [9]

As COVID-19 is a very recent and rapidly evolving disease, there is yet no definitive treatment. [1] Therefore, adhering to the standard precautions and preventive procedures is of great importance for protecting the individuals from hazardous outcomes of COVID-19. [10] Based on March 2021 updated WHO report, the degree to which the vaccines can protect not only against the disease but also against the infection and the transmission is not clear, so being vaccinated does not mean that people can throw caution to the wind and put themselves and others at risk. [11]

Dentistry is on the list of high-risk jobs due to inevitable close contact, production of a great amount of aerosol and droplets during routine dental procedures, such as using an ultrasonic scaler, and high and low-speed headpiece. Dentists, dental assistants, dental staff, and patients all are at high risk. [12] During the pandemic COVID-19, dental care should be performed while taking the mandatory precautions. It is recommended to minimize aerosol-generating procedures (AGPs), or using high-level evacuation and utilizing a rubber dam throughout AGPs. [13, 14]

Dentists and dental students must follow the practical international guidelines including the World Health Organization (WHO) [15], Center for Disease Control (CDC) [16, 17], and American Dental Association (ADA) [13], to minimize the risk of transmitting this dangerous disease. The amount of adherence to preventive measures during dental care is affected by the knowledge, attitude, and practice (KAP) of dentists. [18]

The purpose of the present study is to determine KAP and risk perception of dental care during the COVID-19 pandemic among dental students from southern Iran.

Methods

A cross-sectional survey was conducted in 2020 on Iranian dental students. An online questionnaire using Google forms was used to collect the data anonymously to maintain confidentiality. The target group was 4th-6th year dental students from different Universities of Medical Sciences from southern provinces of Iran, who have entered the phase of clinical treatments in university dental clinic. The majority of the participants included students from Shiraz, Boushehr, and Yasooj. The link of the questionnaire was posted on several social media platforms such as Instagram, Whatsapp, Telegram, and some relevant forums. The first question was designed to get the students' consent and inform them that participating in this survey was fully voluntary. Among the students who had agreed to participate, only those who had completely filled the questionnaire were selected as reliable and eligible members to be considered in the study. This survey was approved by the Ethics Committee of Shiraz University of Medical Sciences (IR.Sums.Rec1399.600).

Using the information from the websites of WHO, CDC, ADA, and the ministry of health and education (Iran), 35 questions were designed in Farsi. The final questionnaire was divided into 5 sections; the first section was devoted to assessing demographic and general characteristics including gender, age, and years of practice. The second section contained 18 questions regarding the dentists' knowledge of COVID-19. In this section, each correct answer was scored 1 and each incorrect answer was scored 0. Then, the total score which ranged from 0 to 18 was converted into a percentile. The scores above 75% were considered as

high, 50-75% as moderate, and below 50% as low. The third section consisted of 5 questions regarding attitude towards COVID-19. Each question contained 3 choices using a 3-point Likert scale including low, moderate, and high, and once chosen by the participants, they were scored 1,2, and 3 points respectively ranging from 5 to 15 in total. Scores below 8 were regarded as low, 8 to 12 as moderate, and above 12 as high. The fourth section was about assessing practice which contained 7 yes or no questions. As for the scores, choosing yes was scored 1, and choosing no was scored 0. The total score for this section was in the range of 0-7. Afterward, the score was converted into a percentile. A score above 75% was considered as high, 50-75% as moderate, and below 50% as low. Finally, in the fifth section, the participant was asked about risk perception regarding COVID-19 in 2 questions. Using a 3-point Likert spectrum, the options were as follows: a) low which was scored 1, b) moderate which was scored 2, and c) high which was scored 3. The overall score for each participant was calculated which ranged from 2 to 6. A score below 3 was considered as low, 3 to 5 as moderate, and above 5 as high. A pilot study was conducted on 30 students to assess the reliability of the questionnaire and its Cronbach's alpha was obtained 0.79, which represents good levels of internal consistency.

In order to assess the content and the validity of the questionnaire, it was given to four experts in relevant fields (including two epidemiologists, one expert in infection control and one dental public health specialist). They reviewed the questions to ensure they were associated with the topic and added more related questions if necessary. The confusing questions were enhanced based on the reviewers' comments.

Statistical Analysis

The normality of data was assessed using the Kolmogorov-Smirnov test. Means and standard deviations (SDs) were calculated for continuous variables and percentages were used for categorical variables. Independent t-test or one-way analysis of variance (ANOVA) was used to compare the mean values of KAP and risk perception scores between the groups of demographic variables. Multiple linear regression and ordinal logistic regression analyses were conducted to recognize the factors associated with attitude, practice, and risk perception. Moreover, the Pearson correlation test assessed the relationship between major variables. Data were analyzed using the IBM SPSS version23.

Results

A total of 346 dental students participated in the present survey (86.93% response rate); among their responses, 32 subjects were excluded due to incomplete answers to the questionnaire. According to the demographic characteristics of the participants, as shown in Table1, females were 218 (69.43%). The 4th,5th, and 6th graders were 94 (29.94%), 120 (38.22), and 100 (31.84%), respectively. Their mean age was 24.07 years (SD: 2.73, Min:21, Max:43). Their initial source of information was the social network (77.6%) followed by the media (49.1%), standards guidelines (48.4%), family members and friends (29.8 %), and academic courses (4.3 %).

Table 1.Comparison of the major variables between the groups of demographic variables

Variable	n (%)	M ± SD			
		Knowledge (Range: 0-100 %)	Practice (Range: 0-7)	Attitude (Range: 5-15)	Risk perception (Range: 2-6)
Total		70.06 ± 8.95	5.59 ± 1.86	8.86 ± 1.70	4.72 ± 1.92
Gender					
Female	218 (69.43)	70.08 ± 8.55	5.83 ± 1.80	8.68 ± 1.66	4.95 ± 1.09
Male	96 (30.57)	70.02 ± 9.91	5.04 ± 1.91	9.25 ± 1.73	4.21 ± 1.27
P		0.495	0.009	0.017	<0.001
Education level		1.607			
4	94 (29.94)	71.63 ± 9.21	5.19 ± 1.94	8.87 ± 1.71	4.74 ± 1.21
5	120 (38.22)	68.80 ± 9.04	5.92 ± 1.57	8.92 ± 1.66	4.55 ± 1.13
6	100 (31.84)	70.11 ± 8.54	5.58 ± 2.07	8.77 ± 1.76	4.90 ± 1.25
P		0.232	0.236	0.988	0.306
Work to serve the patients					
No	178 (56.69)	69.91 ± 9.01	5.62 ±1.95	8.39 ± 1.49	5.04 ± 1.01
Yes	136 (43.31)	70.26 ± 8.94	5.56 ± 1.76	9.47 ± 1.77	4.29 ± 1.28
P		0.550	0.682	<0.001	<0.001
Work under compulsory rules of the clinic or the university					
No	108 (34.39)	70.68 ± 8.32	5.24 ± 1.78	9.63 ± 1.65	4.20 ± 1.56
Yes	206 (65.61)	69.74 ± 9.29	5.78 ± 1.89	8.45 ± 1.59	4.99 ± 1.12
P		0.918	0.013	<0.001	<0.001
Get news and information regarding COVID-19 through social media					
No	72 (22.93)	72.07 ± 9.25	5.67 ± 1.79	8.46 ± 1.46	4.31 ± 1.21
Yes	242 (77.07)	69.47 ± 8.82	5.57 ± 1.89	8.98 ± 1.75	4.84 ± 1.16
P		0.083	0.549	0.093	0.017

Knowledge

The mean COVID-19 knowledge score of students was 70.06% (SD: 8.95, min: 22.22, max: 88.89) which was not significantly different across gender and level of education (P ≥ 0.05). As shown in Table 2, the vast majority of the students were aware of the modes of transmission (98.1%) and common symptoms of COVID-19 (96.9%). The respondents had low knowledge scores regarding how far the aerosols spread (26.5%) and the standard means of disinfecting the room air (42.4%).

Table 2: Correct answers to the questionnaire (N:158)

Variable	Question				Correct Answer N(%) / Mean ± SD
Knowledge	Sources of information regarding COVID-19			Social network (Instagram, WhatsApp, etc)	242 (77.6%)
		Media (television, radio, newspaper, etc)	152 (48.1%)		
		Family members and friends	94 (29.8%)		
		Guidelines presented by WHO, CDC, ADA, or the ministry of health	152 (48.1%)		
		Academic training courses	14 (0.044%)		
	Common symptoms				306 (96.9%)
	Incubation period				184 (58.2%)
	Modes of transmission				310 (98.1%)
	Social distancing				230 (72.7%)
	Regarding aerosols	The permanence in ambient air			184 (62.0) %
		The length of spreading			84 (26.5%)
		Aerosol generating procedures			170 (53.7%)
		The standard indoor ventilation			134 (42.4%)
	Regarding PPE	About Masks	Protection from different types		238 (75.3%)
		Wearing surgery masks under full-face shields	236 (74.6%)		
		The correct sequence of wearing			226 (71.3%)
		The proper eye protection			300 (94.9 %)
	Prescription of the more preferable:	Radio graph			306 (96.8%)
		Mouthwash prior treatment			160 (50.6%)
	The proper time of disinfecting prosthetic shipments to the laboratory				286 (90.5%)
	Regarding treating a suspected COVID-19 patient	The primary management in a patient enduring pulpal pain			204 (64.5%)
		Prescribing ibuprofen for pain control			204 (64.5%)
	possible duration of the virus presence in the saliva of recovered COVID-19 patients				178 (56.3%)

Cont... **Table 2: Correct answers to the questionnaire (N:158)**

Attitude	Perception of COVID-19			2.667 ± .48
	Willingness to treat a dental emergency for a suspected case			1.252 ± .47
	Confidence confronting a suspected case			1.538 ± .63
	The efficiency of the distancing project and using PPE			1.785 ± .80
	The efficiency of fever assessment and disinfecting hands before entering the room			1.643± .70
	The reason for performing dental treatment during the pandemic Compulsory rules of the university 204 (64.5%)		Serving patients	136 (43%)
Practice	Tele-screening patients before setting up appointments			254 (80.3%)
	Explaining preventing measures to patients			280 (88.6%)
	Using personal protection equipment (PPE)			278 (87.9%)
	Asking the visitors		Follow the distancing project	260 (82.2%)
		Disinfect their hands before entering the room	240 (75.9%)	
	Assessing patients' fever before entering the room			198 (62.6%)
	Using a rubber dam			246 (78.8%)
Risk perception	Perception of the risk of getting infected with COVID-19 as a dentist			2.669±.63
	The degree of fear of getting infected with COVID-19			2.051±.79
Data were presented as N (%) for Knowledge and practice, and Mean ± SD for Attitude and Risk Perception(range 1-3)				

Attitude

The mean score of the attitude of the participants was 8.86 (SD: 1.70, min:6, max:13)(Table2) which was significantly different between males and females (P = 0,017). Females had lower attitude scores. There was no significant difference among the students of different levels of education (p ≥ 0.05). According to linear regression results, higher scores of attitude were associated positively with work to serve the patients (β = 0.818, P = 0.005) and age of respondents (β = 0.100, P = 0.043) and negatively with work under compulsory rules of the university (β = -0.733, P = 0.023) (Table 3). The mean score of the attitude of the students toward the willingness to treat dental emergencies for suspected patients was 1.25.

Table 3. Multiple linear regression results for practice, attitude, and risk perception as dependent variables

Variable	Dependent Variable					
	Practice		Attitude		Risk perception	
	β (SE)	P	β (SE)	P	β (SE)	P
Age			0.100 (0.049)	0.043	0.097 (0.032)	0.003
Gender (female vs. male)					0.653 (0.192)	0.001
Education level (5th grade vs. 4th grade)	0.780 (0.371)	0.038			-0.473 (0.207)	0.024
Education level (6th grade vs. 4th grade)						
Work to serve the patients (Yes vs. No)			0.818 (0.288)	0.005	-0.450 (0.193)	0.021
Work under compulsory rules of the clinic or the university (Yes vs. No)			-0.733 (0.318)	0.023	0.443 (0.215)	0.041
Get news and information regarding COVID-19 through social media (Yes vs. No)			0.694 (0.303)	0.024	0.546 (0.200)	0.007
Knowledge						
Practice					0.126 (0.046)	0.007
Attitude						
Risk perception	0.385 (0.145)	0.009				

SE: Standard error

p: p value (significance level: < 0.05)

According to the ordinal logistic regression results (Table 4), those participants whose reason for treating COVID-19 suspected patients was not compulsory rules of universities were less likely to express greater levels of willingness (β = 0.804, P=0.028). The respondents without a desire to serve their patients reported lower levels of willingness (β =-1.988, P<0.001).

Table 4. Ordinal logistic regression results for the dependent variable (How willing are you to treat a dental emergency for a suspected COVID-19 patient?)

Cumulative intercepts	Model1		Model2	
	β (SE)	P	β (SE)	P
Intercept1 (Not much)	0.267 (0.600)	0.657	0.892 (1.647)	0.588
Intercept2 (To some extent)	3.171 (0.798)	<0.001	3.932 (1.737)	0.024
Independent variables				
Work to serve the patients (ref = Yes)				
No	-1.988 (0.482)	<0.001	-2.045 (0.491)	<0.001
Work under compulsory rules of the clinic or the university (ref = Yes)				
No	0.804 (0.365)	0.028	0.646 (0.375)	0.085
Control variables				
Age			0.051 (0.065)	0.437
Gender (ref = male)				
Female			-1.012 (0.358)	0.005
Education level (ref = 4th grade)				
5th grade			0.072 (0.386)	0.852
6th grade			-1.313 (0.617)	0.033

SE: Standard error

p: p value (significance level: < 0.05)

Model 1: A model that only includes the reason for performing dental treatment during the pandemic as independent variables

Model 2: A complimentary model for model 1 that also includes demographic variables.

In Model 2, all independent and control variables were involved in the regression. The results showed that females compared to males and 6th graders compared to 4th graders expressed higher levels of willingness to treat dental emergencies for suspected patients. After introducing all control variables, serving the patients' reason remained the most effective, whereas the effect

of the reason for the compulsory rules on the dependent variable was no longer significant.

Practice

The mean self-reported preventive behavior score of the students was 5.59 (SD: 1.86, min: 0, max: 7). The practice score was significantly higher in females (P = 0,009). More than 80% of the participants declared that they would use Tele-screen the patients before setting up an appointment, explain preventive measures to the patients, use PPE, and follow social distancing. 78.8% of the students showed their willingness to use a rubber dam during treatments in the COVID-19 pandemic (Table 2).

According to linear regression results, good scores of practice were associated with the education level (5th grade vs. 4th grade) (β =0.780, P = 0.038) and risk perception score (β = 0.385, P = 0.009).

Risk perception

The mean cumulative score of risk perception was 4.72 (SD: 1.92, min:2, max: 6). Based on the linear regression results, higher scores of risk perception were associated with, work under compulsory rules of the university (Yes vs. No) (β =0.443, P=0.041), practice score (β =0.126, P=0.007), age of respondents (β =0.097, P=0.003), and gender (females vs. males: β =0.653, P=0.001). Lower scores of risk perception were associated with the reason of *willingness for dental treatment during the Covid-19 pandemic* (Yes vs. No) (β = -0.450, P = 0.021) and *education level* (5th grade vs. 4th grade: β =0.-473, P=0.024) (Table 3)

According to the Pearson correlation coefficient analysis, a significant and positive correlation was found between practice and risk perception (r=0.215, P = 0.007). Moreover, there was a negative and significant correlation between risk perception and attitude (r = -0.192, P = 0.016).

Discussion

The rapid spread of COVID-19 has affected the lives of people around the world. The long asymptomatic incubation period of COVID-19 (as long as 14 days), makes it harder to minimize the probability of exposure to this new coronavirus. [19] Dentistry is categorized into very high-risk jobs during the pandemic; hence, the dentists and dental health care workers are more likely to get infected and further spread the virus. Based on WHO updated on 3 August 2020, effective prevention of oral problems and self-care remain a high priority during the COVID-19 pandemic. [14] To reduce the risk of transmission of COVID-19 in dental offices and schools, dentists and students must follow valid and reputable guidelines such as CDC, WHO, and ADA.

In the present assessment, the number of students who participated from year 4th-6th was almost equal; however, females (69.43% vs. 30.57% for males) were predominant which could be associated with the higher number of female students in the investigated dental schools.

The initial source of information among students was social networks (78.1%), followed by media (48.1%). These findings are in line with the results of the Kamate et al.' study. [18] However, these sources are always reachable and valuable for increasing public awareness, reliable sources such as reports of international health organizations and scientific health articles are recommended to be the main informative sources.

In the present study, we found out that dental students had relatively good knowledge (70.06±8.95%) toward COVID-19 however it was less than recent similar studies by Kamate et al. (92.7% among multinational dental practitioners) and Zhong et al. (90% among Chinese residents). [18, 20]. This is probably related to different questionnaires (specialized vs general) and also different study populations (students vs. dentist). Since the COVID-19 is an emerging, rapidly evolving situation and also there is a lack of an educational course, it was expected that there would be no difference in the knowledge of different education levels, which was confirmed in this study. Moreover, less than 50% of the students mentioned valid guidelines as their source of information which could affect the results. The vast majority of students had a wealth of knowledge about

the generalities of the COVID-19 pandemic. [14] More than 96% of students were aware of the main symptoms of COVID-19, which is essential for students to screen the patients and, if possible, postpone the dental care of suspected cases. Reportedly, about 80% of COVID-19 patients show only mild symptoms or no symptoms at all, especially during the incubation period of the virus; thus, they might be left undiagnosed. (19) Awareness of the COVID-19 modes of transmission is mandatory for effective infection control, especially against undiagnosed cases. In this study, modes of transmission were identified well (98.1%) which is in agreement with the previous studies. [18, 19, 21] 72.7% of dental students were aware of social distancing in the workplace which is a measure to reduce the risk of infection and is determined 6 feet according to published guidelines [16]. In another study that has similarly assessed the knowledge and attitude of Iranian dental students during the COVID-19 pandemic, a different result has been achieved and reported (43%). [22] This difference can be justified by the fact that our population included only 4th-6th-year students, while their population consisted of a wider range of students with younger average age.

Approximately, half of the students had correct information on the following topics: the probable duration of the virus presence in the saliva of recovered COVID-19 patients and recommended mouthwash before dental treatment. Compared to the study of Imran et al., which had reported that only 38.9% of the students had correct information about the preferred mouthwash to eradicate the COVID-19 virus, the present study revealed a higher knowledge level of the participants (50.6%) in this regard, which is not still a satisfying value [14]. These not high percentages narrate from the dearth of knowledge regarding the best choice of mouthwash, while the clinicians have a wide assortment of mouthwashes with different active ingredients.

Only 64.6% of students were informed of primary management and the controversy about ibuprofen administration in suspected patients. Students should be trained to assess a true emergency and discern how to manage an emergency during the COVID-19 outbreak.

The results showed some gaps in the knowledge about how far aerosols spread in the air (26.5%) and a gold standard for indoor ventilation (42.4%). According to the literature, there is no evidence regarding the transmission of COVID-19 via the generated aerosols in dental practices. However, guidelines have been recommended given the urgency and taken special precautionary measures targeted toward aerosol transmission to prevent and control the spread of this highly contagious disease. [23, 24] Aerosols containing SARS-COV-2 travel over a great distance and could be suspended in the air for many hours, so the importance of good indoor ventilation which is best provided with a negative pressure room to maintain a healthy environment for the patients and the dental team is highlighting. [15, 16]

In the present survey, the level of dental students' attitude was in the moderate range although they had almost good knowledge. Most of the students perceived COVID-19 as a very dangerous disease and were not willing enough to perform dental treatment for a suspected patient (Table 2). These findings are consistent with the findings of the study conducted by Arabian dentists about SARSCOV-2 [25]. The reason for this finding may be related to the high number of patients diagnosed positively for COVID-19, together with local and global reported deaths according to the lack of antiviral treatment or vaccine for the whole population. Moreover, most of the students expressed a high risk of getting infected with COVID-19 as dentists and have considered measures like disinfecting hands, observing social distance, and using PPE, not very much effective in preventing the transmission of the disease. (Table 2) Other probable reasons may be related to their belief that following the protection protocol completely is difficult in dental schools due to a large number of patients and students.

As shown in Table 4, females (compared to males) and 6th graders (compared to 4th graders) were more willing to treat a dental emergency for a suspected COVID-19 patient. Moreover, students who anticipated performing dental treatment for suspected patients with the purpose of "serving the patients" expressed more

desire to treat a dental emergency for a suspicious patient. The ordinal logistic regression coefficients revealed that the reason for serving the patients was the most effective predictor of willingness.

A high level of students' practice was seen in this study. 80% of the students reported they would perform Tele-screening and health triages of patients at the time of scheduling appointments. Based on the latest edition of the CDC guideline, patients should be instructed to call ahead and discuss the need to reschedule their appointment if they have symptoms of COVID-19 on the day they are scheduled to be seen. [22] Most of the students expressed that they ask patients to keep social distance and disinfect their hands in a waiting room. About 88% of the students would wear PPE and explain the risk of COVID-19 and its preventive ways to their patients (Table 2). These findings are in agreement with the previous studies [18, 20, 25]. This good preventive behavior as claimed by the respondents could be related to their good knowledge about COVID-19. Moreover, none of the respondents had considered COVID-19 to be non-dangerous.

The cumulative score of risk perception was 4.72 ±1.92 out of 6 which was in the moderate range. It was significantly associated with gender. Females reportedly had more risk perception scores and better practice scores compared to males; however, their knowledge scores did not differ significantly. Students in the 4th grade showed higher risk perception and lower practice scores than the 5th graders. Students who expressed higher risk perceptions selected "compulsory rules of the university". (Table 4) Improving the proper knowledge of dental students by following reputable guidelines can reduce their stress level and fear of getting infected with COVID-19. They would observe cross-infection control protocols and more precautions against any suspicious patient to decrease the risk of exposure to the virus.

A significant positive relationship was found between risk perception and practice scores. Besides, there was a substantial negative correlation between risk perception and attitude scores, which revealed the role of risk perception in the students' motivation and performance.

Despite the valuable results and the strengths of this study like its questionnaire -regarding COVID-19 considerations in dentistry compared to general questionnaires in similar articles-, some limitations are worth mentioning. This survey could not assess all aspects of KAP related to dental care during the COVID-19 outbreak. Another limitation of this cross-sectional study was the inability to supervise the students' practice; therefore, we ought to trust their statements.

As future work, it is recommended to study a different population of dental health practitioners, including professional dentists and specialists. Moreover, to generalize the results obtained in the studies, future investigations on wider populations of dental students are needed to be performed in future works.

Conclusion

In conclusion, the overall score of the dental students' knowledge was good, however, a particular course seems necessary to be included in the curriculum of the dental students based on the updated guidelines. The mean score of their self-expression practice was at a high level, but their attitudes were in the moderate range. The risk perception score had a significant negative correlation with the attitude score and a significant positive correlation with the practice score. Improving awareness helps reduce the risk perception followed by a higher attitude and better practice of dental students during the COVID-19 outbreak.

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Ethical Clearance:

This study was approved by the Ethics Committee

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