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ORIGINAL RESEARCH

Awareness Toward COVID-19 Precautions Among Different Levels of Dental Students in King Saud University, Riyadh, Saudi Arabia

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Purpose: The risk of acquiring coronavirus disease 2019 (COVID-19) among dental professionals is high because they are exposed to aerosol production and body fluids during dental procedures. Therefore, the aim of the study was to determine the level of awareness among the dental students regarding COVID-19.

Materials and Methods: An online cross-sectional questionnaire with three sections (knowledge, attitudes, practice) was completed by 412 postgraduate and undergraduate dental students and interns from King Saud University in Saudi Arabia.

Results: The overall mean survey score was 9.56±1.19 out of 15. A mean score of 2.31 ±0.32 was recorded for level of knowledge among the dental professionals that indicated a fair level of knowledge among the participants. Similarly, a mean score of 6.5±0.45 was recorded for attitude of dental professionals towards COVID-19 that indicated a moderate level of attitude. "Novel COVID-19 virus transmits through droplets," and "masks should be worn most of the time to prevent infection spread," had the lowest correct answer rates. The practice had a low mean score of 0.81±0.22. The results depicted statistically significant differences in knowledge, with postgraduate students having the highest mean scores, followed by interns and undergraduate students.

Conclusion: Despite attaining fair scores on knowledge and attitudes, the low practice scores highlight the need for urgent strategies to prevent infection among dental students, including mandatory crash courses and hands-on protection measures.

Keywords: attitudes, COVID-19, dental students, knowledge, practice

Introduction

Presently, the world is facing unprecedented virulence and fatal consequences because of the outbreak of Coronavirus disease 2019 (COVID-19).[1] The major symptoms of COVID-19 are fever, fatigue, dry cough, and shortness of breath. There is an increased risk of developing complications due to this disease spread specifically among elderly individuals, along with those suffering from multiple medical conditions like diabetes, heart disease, and asthma.[2]

The name coronavirus has been derived from a Latin word *corona* that means a crown. Coronaviruses constitute a subfamily of *Orthocoronavirinae* containing positive-sense single-stranded RNA-genome and helical nucleocapsid symmetry. This family of viruses classifies as an s-enveloped type virus.[2–4] The genome size ranges from 27–34 Kilobases, and is one of the largest RNA viruses among different types.[5,6] When considering its appearance, this nomenclature resembles

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a crown or virions (ie, virus particles) with club-shaped protein spikes covering the surface when viewed under two-dimensional transmission electron microscopy.[7] These viruses have been reported to cause diseases in mammals and birds. However, these viruses cause respiratory tract infections in humans, with the presentation of mild illness such as the common cold, to more severe and lethal infections like Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS).[8,9]

The spread of COVID-19 was initiated in China on November 17, 2019 and was later regarded as a pandemic, as it has affected more than 100 countries across the globe. In Saudi Arabia, the outbreak of COVID-19 was first recorded on March 2, 2020.[10] As a result, the Saudi government took strict measures for avoiding the disease spread and detering the viable overwhelming of the health system. One of the main challenges of these measures include to spread social awareness among different populations, as it has been as influential in the prevention of the disease. Considering the ongoing situation, it is crucial to measure the level of awareness among the Saudi population regarding the current global implications and precautions required to overcome this pandemic crisis.

Considering the overall frequency of the global transmission of the disease, dental professionals are at the greatest risk of getting infected because they are exposed to body fluids like blood, saliva, and multifarious aerosol/droplets during dental procedures.[11] Studies have shown that direct contact with oral fluids, mucus membrane, contaminated surfaces/instruments or inhalation of aerosol/droplets from infected individuals during dental procedures favors transmission of this disease.[12–14] Following this, dental students in training should be more aware of this critical situation and understand all standard of practices (SOPs).

Therefore, the present study aims to evaluate and measure the current awareness of Coronavirus Disease (COVID-19) precautions among dental interns, undergraduate and postgraduate, students studying or practicing in King Saud University during the outbreak of coronavirus infection in Riyadh, Saudi Arabia.

Materials and Methods

Study Design, Setting, and Participants

The study employed a cross-sectional survey design approach to conduct the procedures between March 10 to April 1, 2020 (3 weeks). The participants included undergraduate and postgraduate dental students and interns from the dental college of King Saud University, Riyadh, Saudi Arabia. The survey was sent to the participants through email and social media applications.

Sample Size Determination

The sample size was determined considering an alpha of 0.05, 95% confidence interval, and a power of 0.85. The actual calculation was based on targeted sample size and was estimated to 300 participants (R), as suggested by Pourhoseingholi et al[15] in their study. However, to avoid a low response rate, a large sample was targeted. A purposive sampling technique was applied to select a final sample of 400 participants.[16]

Ethical Considerations

The study was conducted in accordance with the Declaration of Helsinki of 1975, revised in 2013. The Institutional Committee of Research Ethics at the College of Dentistry Research Center (CDRC), King Saud University, Riyadh, Saudi Arabia approved the protocol used in this study (E-20-4793). Moreover, the institutional review board of King Saud University granted permissions for data collection. Permission to participate and consent forms were collected voluntarily. All participants completed the informed consent forms prior to starting the survey questionnaires. The objective of the study was explained. The anticipated time to complete the consent form and questionnaire was approximately 30 minutes.

The purpose and procedures involved in this study were explained in a cover letter, followed by a copy of the informed consent form, which emphasized the right to self-determination, confidentiality and anonymity, benefits, and risks of the study. Finally, numerical codes replaced the participants' names to ensure confidentiality.

Inclusion and Exclusion Criteria

Dental students, interns, and postgraduate students from different specialties and certification programs with an exposure to clinical practice and patients' service at King Saud University, Riyadh Saudi Arabia were included.

Instrument

A modified version of a questionnaire for this study was derived from the survey developed by Askerian et al[17] and Jain et al.[18] It followed the guidelines provided by CDC to evaluate awareness of airborne isolation precautions

among the dental professionals. Modifications included the following; Questions 1, 2, 3, 4, 9, and 10 were added based on CDC guidelines, while, in question 7, which was related to the research based findings regarding COVID-19, patients were replaced with carriers. A two-step procedure was performed to adjust and validate the instrument to fulfill the aim of this study. First, the modified version was sent to survey experts in the dental field to get feedback and opiniond about its clarity and easiness, as well as recommendations for further adjustments. As a second step, a small sample of 20 students was chosen for the pre-testing of the final version. This step showed that there was still a need for making the questionnaire shorter and simpler. The participants also offered some amendments in the questionnaire that were considered and catered. The questionnaire was finalized after in-depth discussion among the authors. The modified version was administered to a sample of 50 dental students in a pilot study. The k value for inter-participants agreement was calculated to be found as 0.91, indicating an "almost perfect" agreement as per the study of Cohen.[19]

The questionnaire was divided into four parts with a total of 13 questions. The first part gathered demographic details of the participants including their age, gender, and education level. The knowledge, attitude, and practice of dental students regarding COVID-19 was assessed in the second, third, and fourth parts, respectively. The responses were elicited on 10 questions with a total score of 15. The knowledge was assessed through four questions yielding two different levels of responses. A score of 1 was given when the answer to a question was in agreement with the guidelines provided by CDC, while a score of 0 was given if any other answer was selected. Therefore, the score for knowledge ranged between all wrong answers, with a score of 0, to all correct answers, with a score of 4. A cut-off level of ≥3 was set for good knowledge and <2 for poor knowledge. The attitude of dental students towards COVID-19 was assessed at three possible levels (ie, Correct, Incorrect, I do not know) through five questions. The correct responses were assigned a score of 2, while any other answer was scored as 0. Thus, the aggregate score ranged from 0 to 10. A cut-off level of ≥6 was set for positive attitude and <6 for negative attitude. Two levels of responses were utilized in the practice section by assigning a score of 1 for the correct answer and a score of 0 for all other responses. Hence, the total practice score was ranging between 0 and 1. A cut-off level of ≥1 was set for good practice and <1 for poor practice level. This tool was previously used to demonstrate knowledge, attitude, and practice towards droplet and airborne isolation precautions among dental healthcare professionals in several other countries: Iran (α=0.86), India (α=0.97), and China (α=0.90).

Statistical Analysis

Kolmogorov–Smirnov and Shapiro–Wilks tests were applied to check the normality distribution of data. The data was entered and analyzed using SPSS version 21. Findings were presented through frequencies, percentages, mean, and standard deviation values for the knowledge, attitude, and practice scores. Finally, the study variables were analyzed by applying inferential statistics of the Kruskal Wallis tests and Mann–Whitney *U*-test, at statistically significant *P*-value of <0.05.

Results

The response rate for this study was 91.55%, as 412 out of 450 participants responded to the questionnaire. All study participants worked in the dental clinics of King Saud University, where the majority of participants were Saudis. Concerning gender distribution, a semi-equal number was observed. Nearly half of the sample were male (n=210; 50.9%) and the other half constituted female (n=202; 49.1%) participants. More than half of the sample were between 22–31 years old (55.8%). Also, 48.3% participants were undergraduate students, while interns and postgraduates had nearly equal distribution (Table 1).

Table 2 provides the distribution of participants' responses corresponding to their knowledge, attitude, and practice on COVID-19 precautions. Results of the study revealed an overall mean score of 9.56±1.19 out of 15. When scoring was observed in each section, the mean score for knowledge among participants was 2.31±0.32, indicating a fair level of knowledge.

Table 3 provides findings related to the participant's level of knowledge, attitude, and practice on COVID-19 precautions. Findings indicate that the majority of participants, ie, 69.66%, showed a low level of awareness related to the mode of disease transmission. In total, 82.73% of participants were aware of the main symptoms of the disease, and the majority of participants showed correct answers for the following item: "The main symptoms of COVID-19 include all the following except runny nose."

With respect to the participants' attitude towards COVID-19, the findings of the study indicated that 76.83% participants had a negative attitude towards the

Table 1 Demographic Profile of the Study Sample

Demographic Characteristics		Frequency (N)	Percentage (%)	95% CI
Age	19–21	92	22.33	0.17–0.27
	22–31	230	55.83	0.29–0.39
	32–41	90	21.84	0.11–0.21
Gender	Male	210	50.97	0.22–0.32
	Female	202	49.03	0.29–0.39
Education Level	Undergraduate	199	48.30	0.54–0.64
	Intern	107	25.97	0.38–0.48
	Postgraduate	106	25.73	0.39–0.49

Note: Descriptive statistics.

Table 2 Frequency Distribution of Total Scores Among the Sample

Total Score	Frequency (N)	Percentage (%)
1	3	0.7
2	4	1
3	25	6.1
4	8	1.9
5	13	3.2
6	15	3.6
7	18	4.4
8	22	5.3
9	41	10
10	74	18
11	84	20.4
12	65	15.8
13	20	4.9
14	8	1.9
15	12	2.9
Total	412	100

Note: Descriptive statistics.

safety precautions, ie, "Mask should be worn most of the time to prevent infection spread." However, 83.25% of participants reflected a positive attitude towards the use of a mask specifically for the carriers with a droplet spread disease.

As far as safety practices related to COVID-19 are concerned, 77.3% of participants showed their agreement towards the statement "Taking a shower with hot water to kill COVID-19 attached to the body surface is considered a false myth".

Students' *t*-test showed a statistically significant difference in practice among gender, as females showed a better mean score (0.83±0.06) when compared to males (0.71 ±0.04), even though mean total scores in this section were considered low ($P<0.02$). Furthermore, multiple comparisons were performed through Kruskal–Wallis test with Bonferroni-Holm corrected Mann–Whitney post hoc tests. The analysis showed statistically significant differences in participants' knowledge with respect to the education levels, as the highest mean score was presented by postgraduate level students (2.8±0.51) when compared to interns (2.4±0.44) and undergraduate level students (2.2 ±0.21) ($P<0.05$). However, no other demographic characteristics showed any statistically significant differences (Figures 1 and 2).

Discussion

The present study has assessed the level of COVID-19 awareness among dental students practicing in the dental college of King Saud University during its outbreak in Saudi Arabia. Findings and total scores revealed an overall fair score of awareness. The analysis of mean scores for knowledge, attitude, and practice of dental students towards COVID-19 revealed that all subgroups had a fair level of knowledge and attitude; while low scores for the level of practice were observed. This disparity can be explained by the environmental circumstances among which the survey was conducted. The country was under mass quarantine, where most participants were isolated and reducing the risks of their exposure to COVID-19.

On the other hand, due to psychological attention given to the pandemic, participants exhibited an increased level of knowledge and adoption of precautionary measures by following daily news, updates, and information available in the published articles. Besides, participants' awareness level in these subscales can be explained by uncertainty and ongoing scientific updates addressing COVID-19's etiology, therapy, and prevention measures.[20–22] By close examination of data, gender-related differences were observed highlighting that the practice subscale was

Table 3 Knowledge, Attitude, and Practice on COVID-19 Precautions

Question Item	Subscale: Knowledge			
	Incorrect		Correct	
	N	%	N	%
1. Novel COVID-19 virus transmits through droplets.	287	69.66	125	30.34
2. The main symptoms of COVID-19 include all the following except runny nose.	72	17.27	340	82.73
3. After exposure to COVID-19, active symptoms may appear; 2–14 days post-exposure.	142	34.15	270	65.85
4. According to CDC guidelines, to be protected from COVID-19, the duration of washing hands and cleaning surfaces should not be less than 20 seconds.	203	49.02	209	50.98
	Subscale: Attitude			
5. Patients with a droplet spread disease should be isolated in a private room.	96	22.93	316	77.07
6. Patients with a droplet spread disease should be kept at a distance of at least 150 cm.	131	31.46	281	68.54
7. Carriers with a droplet spread disease should wear a mask during transport.	69	16.75	343	83.25
8. Mask should be worn if or when a subject is within a 90 cm distance from a patient under droplet precaution care.	112	27.18	300	72.82
9. Mask should be worn most of the time to prevent infection spread.	317	76.83	95	23.17
	Subscale: Practice			
10. Taking a shower with hot water to kill COVID-19 attached to the body surface is considered a false myth.	95	22.68	317	77.32

Note: Descriptive statistics.

statistically higher in female participants in comparison to males. Despite having an overall poor score, a possible explanation is the psychological nature of the female gender to be prepared for any incidence that may take place at the time of crises.[23,24]

In relation to the knowledge subscale, postgraduate students showed a statistically higher level of knowledge when compared to other groups. This difference might be predicted by their higher experience and more advanced skills in information search, critical reading, as well as problem focused observation.[25] The findings of the present study are in line with the study of Quadri et al,[26,] who evaluated the awareness of COVID-19 in the Saudi population. Findings reported that the overall knowledge of COVID-19, especially among dental healthcare workers, is considered adequate (above the mean score).[27] Another study conducted by Al-Nerabiah et al[28] evaluated the level of dental practitioners' knowledge, attitude,and practice related to COVID-19 definition, incubation period, and prevention measures. Findings of the study reported that dental practitioners in the region who had a sufficient level of knowledge about the disease on the one hand presented with limited attitude and practice regarding COVID-19 symptoms, mode of transmission, and management. A similar level of knowledge among dental healthcare providers was also reported by studies conducted in other regions, including Turkey,[29] Bangladesh,[30] and India.[31]

Finally, a study conducted in Norway reported proper management of urgent dental healthcare was conducted, reflecting a decent level of knowledge and practice among dental healthcare workers in the region.[32] Additional training of the dental staff in adequate infection prevention and step-by-step procedures may be needed. These results may be used to improve the dental health service's response to future outbreaks.

Amid the ongoing health crisis, the Saudi Ministry of Health (MOH) has permitted healthcare providers including dental professions and students to provide their services.[33,34] The ministry further provided sufficient information about the disease, including precautionary measures stated by the World Health Organization (WHO) and United Nations International Children's Emergency Fund (UNICEF).[35–39] Furthermore, several informative guideline papers had been published to increase awareness about the current situation. Such types of contributions are effective and may help in overcoming the shortage of healthcare professionals, while enabling them to potentially provide more extensive care to a large number of patients.[10] The current situation demands we strengthen awareness to deal with COVID-19 and urgent development of strategies to prevent infection among healthcare providers by introducing mandatory crash courses and hands-on protection measures.

The limitations of the current study include sampling from only one institute in Riyadh, which does not truly

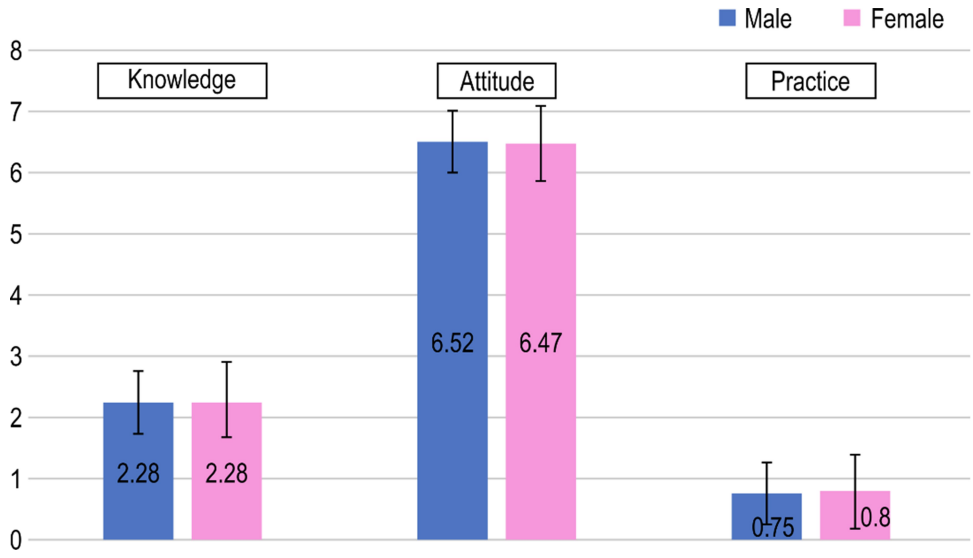

Figure 1 Correlation between gender distribution among subscales in the questionnaire.

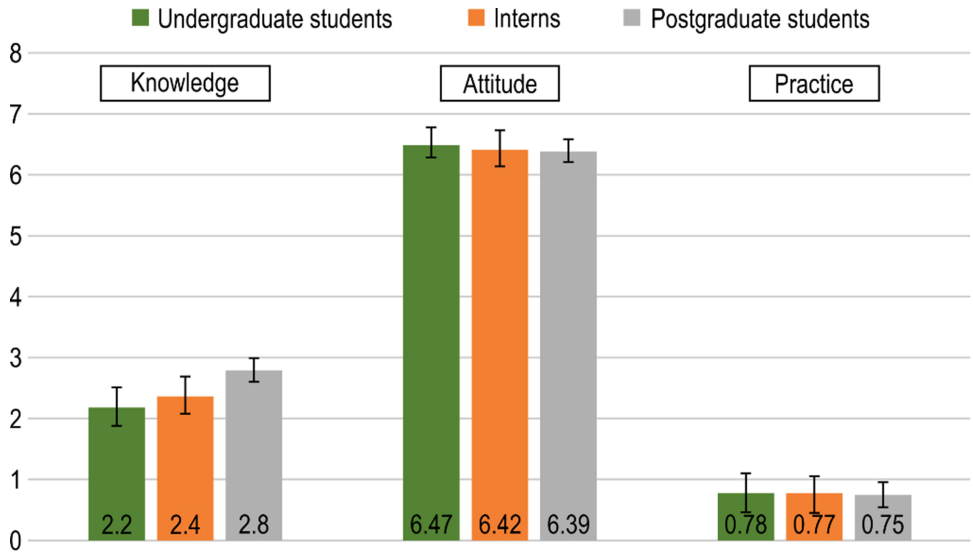

Figure 2 Correlation between education level distribution among subscales in the questionnaire.

represent the awareness among dental students in the overall region. Furthermore, measuring outcomes through the virus-related information that is reiteratively updated is another limitation as many protection measures are still under global investigation.

Conclusions

The study concludes that awareness about COVID-19 among dental students from three different levels studying in King Saud University, Riyadh, Saudi Arabia was fair, when considering the quarantine-based obligations and the pandemic situation in the country. This notion implicates the importance of improving the presiding level of awareness for further protection and safety measures among these students with high-risk exposure. Future researchers are recommended to construct online courses to update dental students and overall dental healthcare workers about current information on COVID-19 and updates regarding protection protocols, especially in dental clinics.

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Disclosure

The authors declare no competing interests.

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