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ORIGINAL RESEARCH

Knowledge and Perceptions of COVID-19 Among Health Care Professionals, Medical Students, and Dental Students in the GCC Region: A Cross-Sectional Correlational Study

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Purpose: The aim of this study was to assess the levels of awareness and knowledge regarding COVID-19 among healthcare professionals and students in Kuwait and the Gulf Cooperation Council (GCC) region.

Materials and Methods: An online cross-sectional survey using a previously validated questionnaire was used to assess the awareness and knowledge levels of COVID-19 in this study, which was distributed via various online platforms to include as many participants as possible. The study targeted medical doctors, dentists, medical students, and dental students from the GCC region. Participants were at least 18 years old, voluntarily consented to complete the questionnaire, and were assured that their responses would remain anonymous. Permission was obtained using a previously validated and applied questionnaire to assess their level of awareness and knowledge regarding COVID-19. To compare the proportional responses between groups in descriptive statistics, a proportion Z-test was used to find any significant differences, with a statistical significance set at $p < 0.05$.

Results: A total of 1621 participants responded to our questionnaire. Almost two-thirds of the respondents were female (64.4%), and the majority were less than 25 years old (67.2%). Dentists accounted for 12.6% of the total population, and their clinical experience ranged from 0.25 to 52 years (median: 3 years, IQR: 1–10 years). Meanwhile, medical doctors accounted for 24.5% of the responses, and their clinical experience ranged from 0 to 50 years (median: 13 years, IQR: 3–23 years). Among the dental students, 42.3% were in the pre-clinical years, while 57.7% were in the clinical years of study. However, among medical students, 57.5% were in the pre-clinical years, while 42.5% were in the clinical years of study.

Conclusion: Our results demonstrated that dental students, medical doctors, and medical students exhibited higher odds of having satisfactory COVID-19 perception scores than dentists.

Keywords: coronavirus, SARS-CoV-2, pandemic, COVID-19, knowledge, perception, healthcare, survey, healthcare worker, medical students

Introduction

The outbreak of coronavirus SARS-CoV-2 (COVID-19) in Wuhan (China) last December 2019 exceeded previous virus outbreaks, such as severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV), spreading globally with a great impact on social life.[1–3] In

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fact, more than 152,200,000 COVID-19 cases and more than 3,192,000 deaths have been reported worldwide as of May 2, 2021.[4] To prevent further virus spread and to flatten the infection curve, curfews and restrictions on social activities have been recommended and implemented in most countries.[5] As a result, global economies have been shut down, schools and higher education have been suspended, and stricter modifications to daily practices particularly within the medical/dental fields have been implemented. For instance, saliva as a biofluid has been shown to be a major transmission medium through the generation of aerosols, prompting the use of proper modifications to lower disease transmission risk.[6] Another emerging modification during the pandemic was the implementation of teledentistry, which has been widely utilized to remotely assess and triage patients to minimize exposure.[7]

The effect of the COVID-19 pandemic has been vast, and ramifications on health care systems, educational systems, economic structures, trade and finance, and our societies remain catastrophic.[8] Due to the nature of medical and dental education, major challenges are to be expected in the post-pandemic era.[9–11] Thus, many issues and arrangements need to be considered for medical and dental educators, healthcare professionals, and students to cope with the possible intensive teaching curricula.

Many studies have investigated the mental status of students and healthcare professionals by evaluating their anxiety and stress levels in response to clinical learning and practice modifications.[12–14] Moreover, many studies have evaluated their knowledge and awareness regarding COVID-19 according to WHO's information database.[15–18] However, despite the large number of studies, there is still a gap in literature on the knowledge and awareness of students and healthcare professionals in Kuwait and the Gulf Cooperation Council (GCC) region. Therefore, the aim of this study was to assess the levels of awareness and knowledge regarding COVID-19 among healthcare professionals and students in the aforementioned areas.

Materials and Methods

Research Design and Setting

An online cross-sectional survey was conducted using Google Forms, which the participants completed between May 15 and June 28, 2020. The study aimed to target all healthcare professionals and students in the following categories - dental and medical students, dentists, and medical doctors – from the Gulf Cooperation Council (GCC), which includes Kuwait, the Kingdom of Saudi Arabia, the Kingdom of Bahrain, the United Arab Emirates, and Qatar.

Research Instrument and Data Collection

Permission was obtained using a previously validated and applied questionnaire to assess the awareness and knowledge levels of COVID-19.[19,20] The Google Forms survey was distributed via e-mails, WhatsApp groups, and other social media platforms. The URL of the online survey is accessible through https://drive.google.com/file/d/1SQqGu7kSx7-19iSlmE1fS1cYnGnscl6y.

Ethical Considerations

Ethical approval was obtained from the Kuwait University Health Sciences Center Ethical Committee on June 13, 2020, according with the Declaration of Helsinki. Participants who voluntarily consented to complete the questionnaire were required to at least be 18 years old. All participants in the electronic survey accepted participation by selecting to participate prior to enrolment in the survey and were assured that their responses would remain anonymous.

Statistical Analysis

To compare the proportional responses between groups in descriptive statistics, a proportion Z-test was used to find any significant differences, with a statistical significance set at $p < 0.05$.

Statistical analyses were performed using SPSS version 23 (IBM Corp. Released 2015. IBM SPSS Statistics for Macintosh, Version 23.0. Armonk, NY: IBM Corp.). Survey responses are outlined in the following tables, wherein knowledge and perception scores were considered satisfactory if >70% of the questions in each group were answered correctly. Categorical data are presented as counts and percentages and were compared using either the chi-square test or Fisher's exact test (when cell counts <5). Meanwhile, continuous data are presented as medians and interquartile ranges (IQR) and were compared using either the Mann–Whitney *U*-test or Kruskal–Wallis *H*-test (if the data were abnormally distributed). Normally distributed continuous data are presented as mean (± standard deviation) and were compared using either Student's *t*-test or the analysis of variance test.

Univariate and multivariate logistic regression analyses were performed to examine the associations between satisfactory knowledge and perception scores, and demographic variables. The multivariate analysis covariates included gender, age group, profession, country, whether they had heard about COVID-19, and whether they had attended any lectures/discussions on COVID-19, which were all selected a priori. These results are presented as odds ratios (ORs) and 95% confidence intervals (95% CIs), with a statistical significance set at $p < 0.05$.

Results

Demographics

In total, 1621 participants responded to the questionnaire. Of these, 19 were excluded since the respondents were not dentists, dental students, medical doctors, or medical students, and an additional 23 individuals were excluded due to incomplete information regarding their country of residence or profession. Therefore, only 1579 responses were included in the final analysis.

Table 1 outlines the demographic variables of the study population. Almost two-thirds of the respondents were female (64.4%), and the majority were less than 25 years old (67.2%). Dentists accounted for 12.6% of the total population, and their clinical experience ranged from 0.25 to 52 years with a median of 3 years (IQR: 1–10 years). Meanwhile, medical doctors accounted for 24.5% of the responses, and their clinical experience ranged from 0 to 50 years with a median of 13 years (IQR: 3–23 years). Among the dental students, 42.3% were in the pre-clinical years, while 57.7% were in the clinical years of study. On the other hand, among medical students, 57.5% were in the pre-clinical years, while 42.5% were in the clinical years of study.

Among the areas within the GCC, Kuwait (44.5%), the Kingdom of Saudi Arabia (23.9%), and the Kingdom of Bahrain (19.2%) were the most represented countries in this survey, with fewer respondents living in the United Arab Emirates (6.6%), Oman (3.8%), and Qatar (2%). Furthermore, almost all respondents (96.5%) have heard about COVID-19 at the time of the survey, while only 60.2% had attended a discussion or lecture about the virus.

Table 1 Demographics

Variable	n = 1579
Gender	
Male	562 (35.6%)
Female	1017 (64.4%)
Age Group	
<25 years	1061 (67.2%)
25–44 years	356 (22.5%)
≥45 years	162 (10.3%)
Profession	
Dentist	199 (12.6%)
Dental Student	222 (14.1%)
Medical Doctor	387 (24.5%)
Medical Student	771 (48.8%)
Location	
Kuwait	702 (44.5%)
Kingdom of Saudi Arabia	378 (23.9%)
Kingdom of Bahrain	303 (19.2%)
United Arab Emirates	104 (6.6%)
Oman	60 (3.8%)
Qatar	32 (2.0%)
Heard about COVID-19	
Yes	1523 (96.5%)
No	56 (3.5%)
Attended Lectures or Discussions about COVID-19	
Yes	950 (60.2%)
No	629 (39.8%)

Source of Information

Table 2 outlines the main sources cited by respondents as their source for reliable COVID-19 information, showing government websites (47.1%) and social media websites (39.8%) as the most used ones. Traditional news media

Table 2 Respondent Sources of Reliable Information About COVID-19 (n = 1579)

Response	News Media, n (%)	Social Media, n (%)	Government Websites, n (%)	Family and Friends, n (%)
Least used	373 (23.6%)	211 (13.4%)	110 (7.0%)	532 (33.7%)
Sometimes	536 (33.9%)	386 (24.4%)	231 (14.6%)	612 (38.8%)
More often	421 (26.7%)	354 (22.4%)	495 (31.3%)	285 (18.0%)
Most used	249 (15.8%)	628 (39.8%)	743 (47.1%)	150 (9.5%)

Table 3 Survey Responses of Dentists, Dental Students, Medical Doctors, and Medical Students Regarding Knowledge of COVID-19

	Total (n = 1579)	Dentists (n = 199)	Dental Students (n = 222)	Medical Doctors (n = 387)	Medical Students (n = 771)	p-value
What is the incubation period of Novel coronavirus? (Correct Answer: 2–14 days)						
Correct	820 (51.9%)	97 (48.7%)	108 (48.6%)	180 (46.5%)	435 (56.4%)	0.006
Incorrect	759 (48.1%)	102 (51.3%)	114 (51.4%)	207 (53.5%)	336 (43.6%)	
Symptoms of novel coronavirus (SAR-COV-19) are all except? (Correct Answer: Skin Rash)						
Correct	1183 (74.9%)	122 (61.3%)	152 (68.5%)	293 (75.7%)	616 (79.9%)	<0.001
Incorrect	396 (25.1%)	77 (38.7%)	70 (31.5%)	94 (24.3%)	155 (20.1%)	
Novel Coronavirus (SAR-COV-19) origin is thought to be from? (Correct Answer: Bats)						
Correct	1252 (79.3%)	146 (73.4%)	176 (79.3%)	305 (78.8%)	625 (81.1%)	0.123
Incorrect	327 (20.7%)	53 (26.6%)	46 (20.7%)	82 (21.2%)	146 (18.9%)	
Novel Coronavirus (SAR-COV-19) transmission occur through? (Correct Answer: All of the above)						
Correct	485 (30.7%)	66 (33.2%)	62 (27.9%)	130(33.6%)	227 (29.4%)	0.325
Incorrect	1094 (69.3%)	133 (66.8%)	160 (72.1%)	257 (66.4%)	544 (70.6%)	
What are the complications with Novel Coronavirus (SAR-COV-19)? (Correct Answer: All of the above)						
Correct	1406 (89.0%)	174 (87.4%)	198 (89.2%)	372 (96.1%)	662 (85.9%)	<0.001
Incorrect	173 (11%)	25 (12.6%)	24 (10.8%)	15 (3.9%)	109 (14.1%)	
What is the treatment for Novel coronavirus (SAR-COV-19)? (Correct Answer: Supportive Care)						
Correct	1361 (86.2%)	179 (89.9%)	181 (81.5%)	357 (92.2%)	644 (83.5%)	<0.001
Incorrect	218 (13.8%)	20 (10.1%)	41 (18.5%)	30 (7.8%)	127 (16.5%)	
How to reduce the risk of transmission? (Correct Answer: All of the above)						
Correct	1310 (83.0%)	154 (77.4%)	177 (79.7%)	321 (82.9%)	658 (85.3%)	0.028
Incorrect	269 (17%)	45 (22.6%)	45 (20.3%)	66 (17.1%)	113 (14.7%)	
Knowledge						
Score	5.0 (±1.2)	4.7 (±1.2)	4.7 (±1.3)	5.06 (±1.1)	5.02 (±1.1)	<0.001
Satisfactory	1062 (67.3%)	103 (51.8%)	132 (59.5%)	272 (70.3%)	555 (72%)	<0.001
Unsatisfactory	517 (32.7%)	96 (48.2%)	90 (40.5%)	115 (29.7%)	216 (28%)	

was also cited, while family and friends were accounted as the least used source of reliable information.

Knowledge of COVID-19

Table 3 presents the responses of dentists, dental students, medical doctors, and medical students pertaining to the knowledge portion of the COVID-19 questionnaire. Medical students were the only group wherein more than half of the respondents knew the correct COVID-19 incubation period (p = 0.006), and medical doctors and medical students were better able to identify COVID-19 symptoms (p <0.001) than dentists and dental students. All groups scored reasonably well regarding the suspected origins of COVID-19 being bats (p = 0.123), and all groups were similarly poor in their responses regarding COVID-19 transmission (p = 0.325). Moreover, medical doctors were most aware of the potential COVID-19 complications (p <0.001), while medical doctors and dentists were similarly knowledgeable regarding COVID-19 treatment when compared with the student groups (p <0.001). Notably, medical students scored the highest regarding methods of reducing COVID-19 transmission (p = 0.028). Overall, medical doctors and medical students exhibited higher median knowledge scores (5.06 ± 1.1 and 5.02 ± 1.1, respectively) than dentists and dental students (4.7 ± 1.2 and 4.7 ± 1.3, respectively) (p <0.001). Medical doctors and medical students also had significantly higher rates of satisfactory knowledge scores

than dentists and dental students ($p < 0.001$). Table 4 presents this similar information, but these are analyzed based on gender, age group, and country. Males and females displayed similar levels of satisfactory COVID-19 knowledge ($p = 0.117$), with males having slightly higher raw scores (5.0 ± 1.3 vs 4.9 ± 1.1, $p = 0.026$). Regarding age, no significant difference was observed between the various age groups in terms of satisfactory knowledge ($p = 0.055$). Among the countries, respondents from the United Arab Emirates performed the poorest in terms of adequate COVID-19 knowledge, with only 38.5% receiving a satisfactory score ($p < 0.001$).

Perceptions of COVID-19

In general, respondents answered the perceptions portion of the questionnaire more successfully than the knowledge section, with 97.2% of all respondents scoring >70%. Overall, medical doctors scored the highest ($p < 0.001$) and had the highest proportion of satisfactory scores (98.2%), while dentists scored the lowest proportion of satisfactory perception scores ($p = 0.003$). Table 5 outlines the differences in perception responses according to gender, age, and country. Notably, there were no significant differences between the proportion of satisfactory perception scores for either sex ($p = 0.914$) or age group ($p = 0.055$). Compared to the other countries, the United Arab Emirates once again scored lowest for respondents' perception of COVID-19 in this questionnaire ($p = 0.017$).

Univariate and multivariate logistic regression analysis results in relation to satisfactory knowledge scores and demographic variables are presented in Table 6. No differences were observed between the sexes in either the univariate or multivariate analyses, and the 25–44 age group had the lowest odds for achieving satisfactory knowledge among the other age groups (univariate OR: 0.74, 95% CI: 0.57–0.95, $p = 0.016$ and multivariate OR: 0.58, 95% CI: 0.35–0.94, $p = 0.029$). For the professional groups, there was no significant difference between dentists and dental students in terms of knowledge; however, medical doctors had greater odds of achieving satisfactory knowledge scores (multivariate OR: 2.76, 95% CI: 1.85–4.12, $p < 0.001$) than medical students (multivariate OR: 2.11, 95% CI: 1.28–3.48, $p = 0.003$). Regarding countries, there was no significant difference between the respondents from Kuwait and Oman; however, respondents from the Kingdom of Saudi Arabia scored higher (multivariate OR: 1.63, 95% CI: 1.20–2.21, $p = 0.002$), while those from the Kingdom of Bahrain, the United Arab Emirates, and Qatar performed more poorly ($p = 0.044$, $p < 0.001$, and $p = 0.004$, respectively). Having heard about and attending lectures/discussions about COVID-19 also predicted higher odds of satisfactory knowledge scores ($p = 0.010$ and $p < 0.001$, respectively).

Dental students (multivariate OR: 5.56, 95% CI: 1.21–-25.63, $p = 0.028$), medical doctors (multivariate OR: 3.75, 95% CI: 1.25–11.24, $p = 0.018$), and medical students (multivariate OR: 4.61, 95% CI: 1.22–17.40, $p = 0.024$) achieved higher odds of having satisfactory perception scores in relation to COVID-19 than dentists.

Discussion

The COVID-19 pandemic continues to have devastating medical, social, and economic impacts, posing significant challenges for healthcare professionals worldwide. As of late October 2020, there have been more than 152 million confirmed COVID-19 cases and more than 3 million deaths since the start of the outbreak.[4] Additionally, multiple SARS-CoV-2 variants are being discovered through viral sequencing around the world, raising more concerns about their clinical impact.[21] Unsurprisingly, new information about COVID-19 is available on a daily basis according to new trials, observations, and clinical data. Therefore, healthcare professionals (as main frontline workers) are obliged to learn about and be aware of emerging evidence and updates regarding this novel disease. However, in that same regard, they should be fully aware of the inflating COVID-19 misinformation as well as research methodological flaws, which are being evident recently.[22] Therefore, this study showed certain variations in the awareness and knowledge levels of COVID-19 among healthcare professionals and students in Kuwait and the GCC region.

This study revealed that medical doctors and students generally had significantly higher median knowledge scores and satisfactory knowledge rates than dentists and dental students ($p < 0.001$). While there was no significant difference between dentists and dental students in terms of knowledge, medical doctors and medical students had greater odds of achieving satisfactory knowledge scores ($p < 0.001$ and $p = 0.003$, respectively). In addition, higher odds of satisfactory knowledge scores were predicted when respondents had heard about or attended COVID-19 lectures or discussions ($p = 0.010$ and $p < 0.001$, respectively). Interestingly, this study indicated that approximately 52% of the participants responded correctly regarding the COVID-19 incubation period, while

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Table 4 Knowledge of COVID-19 Analyzed According to Gender, Age Group, and Country

	Gender			Age (years)				Country						
	Male (n = 562)	Female (n = 1017)	p	<25 (n = 1061)	25–44 (n = 356)	≥45 (n = 162)	p	Kuwait (n = 702)	Kingdom of Saudi Arabia (n = 378)	Kingdom of Bahrain (n = 303)	United Arab Emirates (n = 104)	Oman (n = 60)	Qatar (n = 32)	p
What is the incubation period of Novel coronavirus? (Correct Answer: 2–14 days)														
Correct	330 (58.7%)	490 (48.2%)	<0.001	576 (54.3%)	158 (44.4%)	86 (53.1%)	0.005	367 (52.3%)	222 (58.7%)	141 (46.5%)	40 (38.5%)	34 (56.7%)	16 (50%)	0.002
Incorrect	232 (41.3%)	527 (51.8%)		485 (45.7%)	198 (55.6%)	76 (46.9%)		335 (47.7%)	156 (41.3%)	162 (53.5%)	64 (61.5%)	26 (43.3%)	16 (50%)	
Symptoms of novel coronavirus (SAR-COV-19) are all except? (Correct Answer: Skin Rash)														
Correct	447 (79.5%)	736 (72.4%)	0.002	821 (77.4%)	246 (69.1%)	116 (71.6%)	0.005	516 (73.5%)	288 (76.2%)	245 (80.9%)	64 (61.5%)	46 (76.7%)	24 (75%)	0.005
Incorrect	115 (20.5%)	281 (27.6%)		240 (22.6%)	110 (30.9%)	46 (28.4%)		186 (26.5%)	90 (23.8%)	58 (19.1%)	40 (38.5%)	14 (23.3%)	8 (25%)	
Novel Coronavirus (SAR-COV-19) origin is thought to be from? (Correct Answer: Bats)														
Correct	438 (77.9%)	814 (80%)	0.323	862 (81.2%)	276 (77.5%)	114 (70.4%)	0.004	572 (81.5%)	282 (74.6%)	252 (83.2%)	72 (69.2%)	50 (83.3%)	24 (75%)	0.004
Incorrect	124 (22.1%)	203 (20%)		199 (18.8%)	80 (22.5%)	48 (29.6%)		130 (18.5%)	96 (25.4%)	51 (16.8%)	32 (30.8%)	10 (16.7%)	8 (25%)	
Novel Coronavirus (SAR-COV-19) transmission occurs through? (Correct Answer: All of the above)														
Correct	176 (31.3%)	309 (30.4%)	0.700	307 (28.9%)	111 (31.2%)	67 (41.4%)	0.006	192 (27.4%)	132 (34.9%)	81 (26.7%)	40 (38.5%)	20 (33.3%)	20 (62.5%)	<0.001
Incorrect	386 (68.7%)	708 (69.6%)		754 (71.1%)	245 (68.8%)	95 (58.6%)		510 (72.6%)	246 (65.1%)	222 (73.3%)	64 (61.5%)	40 (66.7%)	12 (37.5%)	
What are the complications with Novel Coronavirus (SAR-COV-19)? (Correct Answer: All of the above)														
Correct	502 (89.3%)	904 (88.9%)	0.791	930 (87.7%)	323 (90.7%)	153 (94.4%)	0.018	623 (88.7%)	354 (93.7%)	247 (81.5%)	96 (92.3%)	54 (90%)	32 (100%)	<0.001
Incorrect	60 (10.7%)	113 (11.1%)		131 (12.3%)	33 (9.3%)	9 (5.6%)		79 (11.3%)	24 (6.3%)	56 (18.5%)	8 (7.7%)	6 (10%)	0 (0%)	
What is the treatment for Novel coronavirus (SAR-COV-19)? (Correct Answer: Supportive Care)														
Correct	480 (85.4%)	881 (86.6%)	0.502	896 (84.4%)	315 (88.5%)	150 (92.6%)	0.007	629 (89.6%)	330 (87.3%)	256 (84.5%)	72 (69.2%)	50 (83.3%)	24 (75%)	<0.001
Incorrect	82 (14.6%)	136 (13.4%)		165 (15.6%)	41 (11.5%)	12 (7.4%)		73 (10.4%)	48 (12.7%)	47 (15.5%)	32 (30.8%)	10 (16.7%)	8 (25%)	
How to reduce the risk of transmission? (Correct Answer: All of the above)														
Correct	459 (81.7%)	851 (83.7%)	0.310	883 (83.2%)	293 (82.3%)	134 (82.7%)	0.920	575 (81.9%)	324 (85.7%)	255 (84.2%)	88 (84.6%)	48 (80%)	20 (62.5%)	0.024
Incorrect	103 (18.3%)	166 (16.3%)		178 (16.8%)	63 (17.7%)	28 (17.3%)		127 (18.1%)	54 (14.3%)	48 (15.8%)	16 (15.4%)	12 (20%)	12 (37.5%)	
Knowledge														
Score	5.0 (± 1.3)	4.9 (± 1.1)	0.026	5.0 (± 1.2)	4.8 (± 1.2)	5.1 (± 1.1)	0.078	4.9 (± 1.2)	5.1 (± 1.0)	4.9 (± 1.2)	4.5 (± 1.3)	5.0 (± 1.1)	5.0 (± 1.2)	0.001
Satisfactory	392 (69.8%)	670 (65.9%)	0.117	732 (69%)	221 (62.1%)	109 (67.3%)	0.055	479 (68.2%)	288 (76.2%)	195 (64.4%)	40 (38.5%)	44 (73.3%)	16 (50%)	<0.001
Unsatisfactory	170 (30.2%)	347 (34.1%)		329 (31%)	135 (37.9%)	53 (32.7%)		223 (31.8%)	90 (23.8%)	108 (35.6%)	64 (61.5%)	16 (26.7%)	16 (50%)	

Table 5 Perceptions of COVID-19 Analyzed According to Gender, Age Group, and Country

	Gender			Age (Years)				Country						
	Male (n = 562)	**Female (n = 1017)**	**p**	**<25 (n = 1061)**	**25–44 (n = 356)**	**≥45 (n = 162)**	**p**	**Kuwait (n = 702)**	**Kingdom of Saudi Arabia (n = (n = 378)**	**Kingdom of Bahrain (n = 303)**	**United Arab Emirates (n = 104)**	**Oman (n = 60)**	**Qatar (n = 32)**	**p**
It is believed that symptoms of the novel coronavirus (SAR-COV-19) may appear in as few as 2 or as long as 14 after exposure. (Correct Answer: True)														
Correct	512 (91.1%)	934 (91.8%)	0.614	962 (90.7%)	334 (93.8%)	150 (92.6%)	0.159	648 (92.3%)	342 (90.5%)	286 (94.4%)	88 (84.6%)	58 (96.7%)	24 (75%)	0.053
Incorrect	50 (8.9%)	83 (8.2%)		99 (9.3%)	22 (6.2%)	12 (7.4%)		54 (7.7%)	36 (9.5%)	17 (5.6%)	16 (15.4%)	2 (3.3%)	8 (255)	
If anyone contracts novel coronavirus (SAR-COV-19), there is no possibility of survival. (Correct Answer: False)														
Correct	547 (97.3%)	983 (96.7%)	0.460	1030 (97.1%)	339 (95.2%)	161 (99.4%)	0.035	688 (98%)	360 (95.2%)	294 (97%)	96 (92.3%)	60 (100%)	32 (100%)	0.011
Incorrect	15 (2.7%)	34 (3.3%)		31 (2.9%)	17 (4.8%)	1(0.6%)		14 (2%)	18 (4.8%)	9 (3%)	8 (7.7%)	0 (0%)	0 (0%)	
Even in areas experiencing outbreaks, meat products can be safely consumed if these items are cooked thoroughly and properly handled during food preparation. (Correct Answer: True)														
Correct	544 (96.8%)	971 (95.5%)	0.203	1015 (95.7%)	339 (95.2%)	161 (99.4%)	0.031	671 (95.6%)	366 (96.8%)	292 (96.4%)	96 (92.3%)	58 (96.7%)	32 (100%)	0.379
Incorrect	18 (3.2%)	46 (4.5%)		46 (4.3%)	17 (4.8%)	1 (0.6%)		31 (4.4%)	12 (3.2%)	11 (3.6%)	8 (7.7%)	2 (3.3%)	0 (0%)	
If anyone has a fever, cough, and difficulty breathing seek medical care early and share previous travel history with the health care providers. (Correct Answer: True)														
Correct	515 (91.6%)	938 (92.2%)	0.676	980 (92.4%)	329 (92.4%)	144 (88.9%)	0.299	646 (92%)	342 (90.5%)	281 (92.7%)	96 (92.3%)	56 (93.3%)	32 (100%)	0.523
Incorrect	47 (8.4%)	79 (7.8%)		81 (7.6%)	27 (7.6%)	18 (11.1%)		56 (8%)	36 (9.5%)	22 (7.3%)	8 (7.7%)	4 (6.7%)	0 (0%)	
If anyone works in a "wet market" it is recommended to disinfect the equipment and working area at least once a day. (Correct Answer: True)														
Correct	553 (98.4%)	1004 (98.7%)	0.600	1047 (98.7%)	348 (97.8%)	162 (100%)	0.109	687 (97.9%)	372 (98.4%)	302 (99.7%)	104 (100%)	60 (100%)	32 (100%)	0.223
Incorrect	9 (1.6%)	13 (1.3%)		14 (1.3%)	8 (2.2%)	0 (0%)		15 (2.1%)	6 (1.6%)	1 (0.3%)	0 (0%)	0 (0%)	0 (0%)	
As per WHO guidelines for the novel coronavirus, you only need to wash your hands when they are visibly dirty. (Correct Answer: False)														
Correct	502 (89.3%)	903 (88.8%)	0.746	948 (89.3%)	314 (88.2%)	143 (88.3%)	0.798	621 (88.5%)	354 (93.7%)	264 (87.1%)	88 (84.6%)	54 (90%)	24 (75%)	0.003
Incorrect	60 (10.7%)	114 (11.2%)		113 (10.7%)	42 (11.8%)	19 (11.7%)		81 (11.5%)	24 (6.3%)	39 (12.9%)	16 (15.4%)	6 (10%)	8 (25%)	
If anyone had a flu shot, vaccination against the novel coronavirus (SAR-COV-19) is sufficient. (Correct Answer: False)														
Correct	518 (92.2%)	960 (94.4%)	0.084	1001 (94.3%)	322 (90.4%)	155 (95.7%)	0.018	657 (93.6%)	342 (90.5%)	287 (94.7%)	104 (100%)	56 (93.3%)	32 (100%)	0.002
Incorrect	44 (7.8%)	57 (5.6%)		60 (5.7%)	34 (9.6%)	7 (4.3%)		45 (6.4%)	36 (9.5%)	16 (5.3%)	0(0%)	4 (6.7%)	0(0%)	
Perception														
Score	7 (6–7)	7 (6–7)	0.357	7 (6–7)	7 (6–7)	7 (6–7)	0.477	7 (6–7)	7 (6–7)	7 (6–7)	7 (6–7)	7 (7–7)	7 (5.5–7)	0.549
Satisfactory	546 (97.2%)	989 (97.2%)	0.914	1033 (97.4%)	341 (95.8%)	161 (99.4%)	0.055	681 (97%)	366 (96.8%)	300 (99%)	96 (92.3%)	60 (100%)	32 (100%)	0.017
Unsatisfactory	16 (2.8%)	28 (2.8%)		28 (2.6%)	15 (4.2%)	1 (0.6%)		21 (3%)	12 (3.2%)	3 (1%)	8 (7.7%)	0 (0%)	0 (0%)	

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Table 6 Univariate and Multivariate Logistic Regression Between Satisfactory Knowledge and Demographic Variables

Variable	Univariate OR (95% CI)	p-value	Multivariate OR (95% CI)	p-value
Gender				
Male	1.0 (ref.)		1.0 (ref.)	
Female	0.84 (0.67–1.05)	0.117	0.89 (0.70–1.14)	0.374
Age group				
<25 years	1.0 (ref.)		1.0 (ref.)	
25–44 years	0.74 (0.57–0.95)	0.016	0.58 (0.35–0.94)	0.029
≥45 years	0.92 (0.65–1.32)	0.662	0.64 (0.34–1.20)	0.166
Profession				
Dentist	1.0 (ref.)		1.0 (ref.)	
Dental Student	1.37 (0.93–2.01)	0.113	1.44 (0.81–2.54)	0.211
Medical Doctor	2.20 (1.55–3.14)	<0.001	2.76 (1.85–4.12)	<0.001
Medical Student	2.40 (1.74–3.30)	<0.001	2.11 (1.28–3.48)	0.003
Country				
Kuwait	1.0 (ref.)		1.0 (ref.)	
Kingdom of Saudi Arabia	1.49 (1.12–1.98)	0.006	1.63 (1.20–2.21)	0.002
Kingdom of Bahrain	0.84 (0.63–1.12)	0.230	0.73 (0.54–0.99)	0.044
United Arab Emirates	0.29 (0.19–0.45)	<0.001	0.23 (0.15–0.37)	<0.001
Oman	1.28 (0.71–2.32)	0.415	1.27 (0.69–2.34)	0.434
Qatar	0.47 (0.23–0.95)	0.035	0.33 (0.15–0.70)	0.004
Heard about COVID-19				
Yes	2.29 (1.33–3.89)	0.003	2.06 (1.19–3.58)	0.010
No	1.0 (ref.)		1.0 (ref.)	
Attended Lectures or Discussions about COVID-19				
Yes	1.43 (1.16–1.77)	0.001	1.56 (1.23–1.98)	<0.001
No	1.0 (ref.)		1.0 (ref.)	

approximately 36% of healthcare professionals correctly responded to the same question in other studies.[18,20] These figures clearly demonstrate that different healthcare workers may have insufficient COVID-19 knowledge, which could result in delayed diagnoses, disease transmissions, and poor infection control practices.[23,24] For instance, only 30.7% of respondents correctly identified all of the SARS-CoV-2 transmission routes (air, contact, and feco-oral). Being aware of its nature is crucial, as the potential risk of SARS-CoV-2 transmission associated with aerosol-generating procedures places healthcare professionals and students at greater risk, especially in the dental field.[25,26] Thus, focusing on improving the level of knowledge among healthcare professionals and students should be prioritized, as a positive linear correlation has been found between knowledge and attitudes toward COVID-19.[27,28] On the other hand, responses about COVID-19 perceptions generally yielded better satisfactory scores than the knowledge scores in this study, wherein medical doctors scored the highest ($p < 0.001$), while dentists had the lowest proportion of satisfactory perception scores ($p = 0.003$). Additionally, statistical analyses showed that dental students ($p = 0.028$), medical doctors ($p = 0.018$), and medical students ($p = 0.024$) exhibited higher odds of having satisfactory COVID-19 perception scores than dentists.

Bhagavathula et al[20] argued that the superior knowledge and perception of medical doctors might be attributed to the more rigorous education on infectious diseases and pharmacotherapy for continued professional development when compared with that of other healthcare professionals, which is a debatable claim. Looking into the COVID-19 information resources, this study found that government (47.1%) and social media websites (39.8%) were accounted as the most used channels of information by healthcare professionals. Although social media provides

a great opportunity for disseminating the latest COVID-19 information, it is also a platform that promotes misinformation and fake news.[29,30] Critically appraising COVID-19 information on social media to ensure validity and credibility should always be implemented as a part of evidence-based practice by healthcare professionals. Further, the findings of this study suggest that there are certain limitations related to COVID-19 knowledge that warrant further investigation and education.

Limitations of the Study

One of the study's limitations was that it only targeted medical and dental professionals and students, foregoing to include nursing personnel. Another limitation was the low number of participants yielded from some countries, which may have altered their inferences and affected our findings.

Conclusion

Our results demonstrated that dental students, medical doctors, and medical students exhibited higher odds of having satisfactory COVID-19 perception scores than dentists. This conclusion provides us with evidence that more educational materials should be provided to improve their awareness to a satisfactory level.

Abbreviations

COVID-19, coronavirus disease 2019; GCC, Gulf Council Countries; SPSS, Statistical Package for Social Sciences; WHO, World Health Organization.

Data Sharing Statement

The raw data is available via this URL: https://drive.google.com/file/d/1_QOqUad-lPrmKMKiCFG9AoFbW0mtwptv.

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Disclosure

The authors report no conflicts of interest in this work.

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