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ORIGINAL RESEARCH

Assessment of Knowledge, Attitude, and Practice Concerning COVID-19 Among Undergraduate Students of Faculty of Applied Medical Sciences at King Khalid University, Abha, Kingdom of Saudi Arabia: A Cross-Sectional Surveyed Study

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Background and Objective: The Kingdom of Saudi Arabia has exerted great efforts to prevent the spread of COVID-19. This research aims to scrutinize the outlook, awareness, and customs of Saudi undergraduate students regarding COVID-19.

Methods: The current cross-sectional study comprises 178 undergraduate students in the Faculty of Applied Medical Sciences. The data were collected from online Google form questionnaires. The differences were picked out of the questionnaires, and the mean scores of the differences were duly assessed. The variables associated with knowledge, attitude, and practice toward COVID-19 were evaluated; moreover, a comparative study was conducted on these variables in different faculty departments. ANOVA, Student's t-test, and binary logistic regression analysis were used to assess the data on knowledge, attitude, and practice.

Results: Most of the undergraduate students were well acquainted with COVID-19. We obtained the mean knowledge score for COVID-19 to be $3.08 \pm .82$ (range: 1–5), indicating good knowledge. The attitude means the score was $3.02 \pm .61$ (range: 0–4), implying good positive attitudes. On assessing the mean score of practices, it was found $5 \pm .47$ (range: 0–7), pointing towards perfect practices. There were no significant differences between males and females regarding knowledge, attitudes, and practice toward COVID-19 (p-value < 0.05).

Conclusion: Students of Applied Medical Sciences are knowledgeable about COVID-19. Health education programs should be focused on protection and safety from COVID-19 for Applied Medical Sciences students, especially Medical Rehabilitation Sciences and Radiology. Hand hygiene awareness programs must be conducted for undergraduate students. Infection control should be part of the undergraduate applied for medical sciences curriculum program.

Keywords: knowledge, attitude, practice, COVID-19, students

Introduction

An outbreak of COVID-19 emerged in the city of Wuhan, China, at the end of 2019. It has been declared a pandemic disease by the World Health Organization (WHO) on 11 March 2020. In the meantime, destabilizing the healthcare services all over the world, the pandemic has spread to more than 213 countries[1]. Until today, it has been estimated 116,778,730 people have been infected by COVID-19

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with at least. So far, 2,579,067 deaths globally according to the report on 08/03/2021. Side by side, the positive cases in Saudi Arabia have reached around 435,027, with 7188 deaths[2] as of May 19, 2021 according to Worldometer corona virus reporting. Healthcare workers are much more prone to coronavirus-2 (SARS-CoV-2) infection due to a lack of proper health training, low income, and lack of proper health services.[3]

The virus is distinguished by its rapid flare-up in which the infection transmits through close contact with the persons who is already infected.[4–8] Knowledge, attitude, and practice (KAP) survey is a crucial suitable method for assessing existing programmers and evaluating effective behavioral change strategies in the community. Currently, few studies are demonstrating the level of awareness among students in Saudi Arabia. This is probably the first research to evaluate KAP of the Saudis applied medical undergraduate students in the Abha, Asir region concerning COVID-19. Medical and para-medical students are vulnerable to infection of COVID-19 since their training in the hospitals let them to be in close contact to the infected patients. Therefore, they should be aware of the prevention tools and protected from this fatal disease. This survey study aims at assessing students' attitude, knowledge and practices regarding COVID-19 within undergraduate students in the college of applied medical sciences.

The results of this investigation are anticipated to give away beneficial understanding to health policymakers about KAP of the Saudi students, at this desperate juncture. The outcomes could also be essential for education institution for planning to control the COVID-19 outbreak.

Materials and Methods
Subjects and Methods
Clinical Study Design and Sampling
The cross-sectional survey was carried out in the college of applied medical science in the King Khalid University, Abha from October to December 31, 2020. After obtaining the ethical approval from Deanship of Research, we have given the link for questionnaires to the students that they belong to College of Applied Medical Sciences. The questionnaire was designed with the help of extensive review of literature considering the most commonly used questions to gauge knowledge, attitude, and practice (KAP). Secondly, link was displayed on the College website; to scrutinize the students that they belong to College of Applied Medical Sciences, we screen through their students ID. We designed

questionnaire with the help of extensive review of literature and considered most commonly used question to gauge knowledge attitude and practice (KAP). The responses were collected on five-point Likert scale for all questions. The scoring range was determined by taking average of all responses in each category. Reliability and Validity of the questionnaire was checked prior to survey. In three departments, total number of students were 600 and questionnaire were sent to all; out of these 200 responded, some of the responses were incomplete, and repeated. Total of 178 undergraduate students (29.6% is the response rate) of total students in three departments were selected using convenient sampling method from three different departments who responded the online questionnaire. The data was collected using an online survey, to assess their KAP associated with COVID-19. After scrutiny, complete questionnaires (n = 178) were included in the study. The survey instrument consisted of demographic characteristics, self-administered questionnaire having about 16 questions based on guidelines established by (WHO) to deal with COVID-19. Five items on knowledge, 4 items on attitude, and 7 items on practice were answered. Data was collected online; the survey was distributed to the participants by WhatsApp groups and e-mails. The participants were selected using a non-probability convenient sampling method. The selected sample size participated and achieved the study goals and sufficient statistical power.

Data Analysis and Measurement Tool
The authors designed the questionnaire, in accordance with following the guidelines of the Ministry of Health of KSA for COVID-19 disease, and WHO.[9–11] The questionnaire is composed of four essential parts. The first part of the questionnaire collected information on students' socio-demographic characteristics including gender, age, and departments. The second part of it obtained students' knowledge of COVID-19. This section comprises 5 components: 1. the name of virus causing COVID-19, 2. preferred method of hand hygiene for visibly soiled hand, 3. knowledge about the guidelines established by (WHO) to deal with COVID-19 or suspected COVID-19, and 4. Personal protective equipment (PPE). The third part assessed students' attitude toward COVID-19, the questions ranged from 0 to 4; they were coded as one for the correct answer and zero for the incorrect response. Score was estimated by averaging the students' answers to the four statements. The questions included participants' satisfaction with their training in basic infection prevention and control measure, their attitude

in situation to indicate medical advice, awareness of participant about the standard infection control precautions within the health-care system, and about the uses of mask. In the fourth part, the questionnaires were about the practices of the candidates. This section was a collection of 7 different questions related to practices; it included the causes of the virus transmissions, practice of social distancing, reception of a formal training on hygiene, the best performed method of hand hygiene, the most effective method for protection of COVID-19 infection, and finally the recommendation from isolation of patient with confirmed COVID-19. The simple scores of the survey were evaluated by making and average of the participants' responses to the questionnaire. Cronbach's α was used for analyzing the reliability test of the questions. The estimated constant value of Cronbach's alpha was 0.79 indicating good reliability.

Analysis Methods

Binary logistic regression statistical tests, Student *t*-test, ANOVA, chi-square, and were used to analyze the data. They were utilized to assess and compare differences in mean values for KAP scores between males and females and among the departments.

Ethical Approval

This research was ethically certified by the Research Ethics Committee of the College of Medicine, King Khalid University (ECM#2020-217), (HAPO-06-B-001). Before the formal survey, the participants were informed, and their consents were received. All the participants were requested to completely answering the questionnaire. The students under observation were familiarized with the objectives and background of the research. The participants were also enlightened that they could withdraw from the study without any prior appraisal; and participants data was kept confidential.

Results

Among 178 participants, all of them completed the questionnaire and they were undergraduate students selected using the convenient sampling technique. A total of 102 (57.3%) were males, and 76 (42.7%) were females. The undergraduate

Table 1 Demographic Characteristics of the Participants

Variables	Frequency	Percent
Gender		
Male	102	57.3
Females	76	42.7
Age groups		
18–21	26	1.1
22–25 years	152	98.9
Departments		
Radiological sciences	107	60.1
Medical Rehabilitations science	20	11.2
Clinical Laboratory sciences	51	28.7

students were 107 (60.1%) from the department of Radiological sciences, 20 (11.2%) from the department of Medical Rehabilitations science, and 51 (28.7%) from laboratory science department. Table 1 summarizes the demographic aspects of the population. According to Table 1, most of the participants were males 102 (57.3%), while females were 76 (42.7%); and most participants were in the age group of 22–25 years. Most of the students were in Radiological sciences 107 (60.1%) compared to the other departments. Table 2 summarizes the participants' attitude towards COVID-19. It revealed that 72 (40.4%) agreed with the satisfaction of training method for COVID-19, 59 (33.1%) disagree with the situation to medical advice, 56 (31.5%) agree with the usage of mask, and 83 (47.6%) agreed with the clinical management towards COVID-19. Table 3 summarizes the students' responses towards knowledge and practice for COVID-19. It was observed that the majority (79.2%) were knowledgeable of WHO guidelines and aware of the standard method of infection control of COVID-19. About 149 (83.7%) of the students did not identify the scientific name of the COVID-19 virus, and 107 (60.1%) responded correctly for the cause of transmission of the disease. About 136 (76%.4%) answered correctly for the PPE used for the COVID-19 protection.

Regarding the practice for COVID-19, most of the students responded correctly for an effective method for the diseases protection (51.1%), a measure of infection

Table 2 Responses of the Participants for the Attitude Towards COVID-19

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Satisfied with the training	15 (8.4%)	25 (14.0%)	38 (21.3%)	72 (40.4%)	28 (15.7%)
Situation indicate to medical advice	29 (16.3%)	59 (33.1%)	31 (17%)	29 (21.9%)	30 (11.2%)
The use of mask	33 (18.5%)	39 (21.9%)	27 (15.2%)	56 (31.5%)	23 (12.9%)
Clinical management for COVID-19	5 (2.8%)	8 (4.5%)	35 (19.7%)	83 (46.7%)	47 (26.4%)

Table 3 Frequency of Participants' Responses to Knowledge and Practice Regarding COVID-19

	Yes Frequency (%)	No Frequency (%)	Correct Frequency (%)	Incorrect Frequency (%)
Q1: WHO guidelines for COVID-19	141 (79.2%)	37 (20.8%)		
Q3: Awareness of the standard infection control	141 (79.2%)	37 (20.8%)		
Q4: The scientific name of virus cause COVID-19			29 (16.3%)	149 (83.7%)
Q5: The most cause of transmissions of COVID-19 viruses			107 (60.1%)	71 (39.9%)
Q13: Personal protective equipment (PPE)			136 (76.4%)	42 (23.6%)
Responses to the practice				
Q8: Receiving formal training in hand hygiene	62 (34.8%)	116 (65.2%)		
Q9: Hand hygiene action presents transmissions on work			75 (42.1%)	103 (57.9%)
Q10: The best preferred method of hand hygiene			75 (42.1%)	103 (57.9%)
Q12: The most effective method for protection of COVID-19 infection			91 (51.1%)	87 (48.9%)
Q14: Isolation of patient with confirmed COVID-19			94 (52.8%)	84 (47.2%)
Q15: Infection control measure			119 (66.9%)	59 (33.1%)
Q17: A recommended infection prevention			147 (82.6%)	31 (17.4%)

control (66.9%), and isolation of patients with confirmed COVID-19 (52.8%). The practices towards hand hygiene were incorrect (57.9%), as shown in Table 3.

Cronbach's α was used for analyzing the reliability test of the questions. The estimated constant value of Cronbach's alpha was 0.60 indicating acceptable reliability.

Knowledge Assessment

The mean knowledge score about COVID-19 remained 3.08±0.82 (range: 0–5), and its accuracy rate maintained 61.64% (3.08/5 × 100), indicating average knowledge. In comparison to knowledge score with undergraduate students at radiology departments, Rehabilitations science and clinical laboratory sciences was demonstrated in Table 4. They were not statistically significant in age groups, gender, and departments (p-values < 0.05).

Attitude Assessment

The mean attitude score concerning COVID-19 remained 3.02±.61 (range: 0–4), and its accuracy rate maintained 75.5% (3.02/4 × 100), indicating a good attitude. There was

also no significant difference regarding the attitude scores among the age, gender, and departments for the undergraduate students (p-values (p-value < 0.05) according to Table 5.

Practical Assessment

The mean practices score stood 5±0.47 (range: 0–7), and its accuracy rate maintained 71.4% (5/7 × 100), indicating good practices. A noticeable variance was spotted within the departments in a score of practice towards COVID-19 among Saudi undergraduate students (p-value= 0.001), as shown in Table 6. However, gender and age had no significant difference regarding the practice (p-value < 0.05). The mean practice score of students in the Radiology department was significantly higher than that of medical Rehabilitations science (3.72 vs 2.85, p-value= 0.004). The mean practice score of students in Clinical Laboratory sciences was considerably higher than the students of Medical Rehabilitation science (4.09 vs 2.85, p-value < 0.001), as demonstrated in Table 7. There was no significant difference in mean practice score between students in the clinical laboratory department and Radiology

Table 4 Knowledge Score Towards COVID-19 Among Saudi Undergraduate Students During the Infection Period of the COVID-19 Outbreak

Characteristics		Number of Participants	Total Score (Mean ± Standard Deviation)	t/F	P-values
Gender	Males	102	3.05±.72	−0.661	0.509
	Females	76	3.13±.94		
Age groups (years)	18–20	26	3.35±.93	1.767	0.079
	21–25	152	3.039±.79		
Departments	Radiological sciences	107	3.08± 0.93	0.024	0.976
	Medical Rehabilitations science	20	3.05±.89		
	Clinical Laboratory sciences*	51	3.10±.50		
Knowledge score = 3.08 ± 0.82					

Note: *Statistically significant.

Table 5 Score of Attitudes of Towards COVID-19 Among Saudi Undergraduate Students During the Infection Period of the COVID-19 Outbreak

Characteristics		Number of Participants	Total Score (Mean± Standard Deviation)	t/F	p-value
Gender	Males	102	1.87±.64	−0.450	0.653
	Females	76	1.92±.79		
Age groups (years)	18–20	26	1.88±.65	−0.067	0.947
	21–25	152	1.89±.72		
Departments	Radiological sciences	107	1.87±.75	1.049	0.353
	Medical Rehabilitations science	20	1.75± 0.91		
	Clinical Laboratory sciences*	51	2.00±.49		
Attitude score= 3.021±.61					

Note: *Statistically significant.

Table 6 Score of Practice Towards COVID-19 Among Saudi Undergraduate Students During the Infection Period of the COVID-19 Outbreak

Characteristics		Number of Participants	Total Score (Mean ± Standard Deviation)	t/F	P
Gender	Males	102	3.72±1.29	−0.179	0.858
	Females	76	3.70±1.22		
Age groups (years)	18–20	26	3.81±1.02	0.338	0.736
	21–25	152	3.72±1.30		
Departments	Radiological sciences	107	3.72±1.18	7.580	0.001
	Medical Rehabilitations science	20	2.85±1.38		
	Clinical Laboratory sciences*	51	4.09±1.20		
Practice score= 5± 0.47					

Note: *Statistically significant.

Table 7 Comparison of Mean Practice Score Among the Departments Regarding COVID-19

Departments		Standard Error	P-value	95% CI
Medical Rehabilitations science	Radiological sciences	0.296	0.004	0.2851–1.4541
	Clinical Laboratory sciences	0.321	< 0.001	−1.8811– −0.6150
Radiological sciences	Clinical Laboratory sciences	0.207	0.069	−0.7867 –0.0299

department and (4.09 vs 3.72, p-value = 0.069). Increased practice score reflects prevention from COVID-19 infection.

It was found that the practice on the method of protection from COVID-19 infection was significantly different among the departments (p-value < 0.001, 95% CI). For instance, students of the laboratory department are more likely to apply the protection method from COVID-19 by 2.5 times than students of Radiology and Rehabilitation departments. On the other hand, students in the age group of 21–25 years are more likely to apply the protection method from COVID-19 by 1.3 times than students in the age group of 18–20 years (Table 8).

The students were asked about the best method of hand hygiene; the correct response was lower than incorrect answers with significant differences among the students in different departments (p-value < 0.001), as shown in

Table 8 Results of Binary Regression on Factors Associated with Method of Protection from COVID-19 Infection

	B	S.E.	P-values	OR	95% CI
Gender (males vs females)	−0.435	0.351	0.215	0.647	0.325–1.288
Age groups	0.269	0.470	0.567	1.309	0.521–3.289
Departments	0.950	0.213	< 0.001	2.586	1.704–3.925

Table 9. The students of the Radiology department revealed higher significant correct responses than the other students. Regarding the most effective method for protection from Covid-19, most students reported incorrect answers, especially the students in radiology departments with significant differences compared to students in the other departments (p-value <0.001), as shown in Table 10.

Discussion

COVID-19 is an emerging endemic infectious disease and presents as a considerable threat to the human being. In the absence of a vaccine for COVID-19, preventive tools play an effective role in decreasing rates of infection and controlling the spread of the virus. Therefore, it is necessary for public health to target on medical students to prevent and control measures which are affected by their KAP.

The present study indicated that most of undergraduate students were knowledgeable about COVID-19. The participants performed a mean of 61% in the knowledge score, and there was no significant difference between the three departments in knowledge towards COVID-19. This finding agreed with other previous studies that reported significant levels of knowledge across the Saudi people. Like our findings, Quadri et al reported that the basic knowledge on COVID-19 among dental Doctors and dental interns in Saudi Arabia is acceptable.[12] Al-Hanawi et al reported high-level score of knowledge towards

Table 9 Comparison of Responses Among the Departments Regarding Method of Hand Hygiene for Prevention from COVID-19

Departments	Q10: What is Best Preferred Method of Hand Hygiene		Total
	Incorrect	Correct	
Radiological sciences	47	60	107
Medical Rehabilitation science	15	5	20
Clinical Laboratory sciences	41	10	51
Total	103	75	178
Significance	p-value < 0.001, χ2= 21.551		

Table 10 Comparison of Responses Among the Departments Regarding the Protection from COVID-19

Departments	Q12:The Most Effective Method for Protection of COVID-19 Infection		Total
	A Void Exposure	Vaccination	
Radiological sciences	68	39	107
Medical Rehabilitation science	11	9	20
Clinical Laboratory sciences	8	43	51
Total	87	91	178
Significance	p-value < 0.001, χ2= 32.006		

COVID-19 among Saudi population.[13] Furthermore, Javed et al reported similar results to our finding.[14] They reported a mean knowledge score of 67.3% among dental faculty members of Qassim University. The high rate or acceptable score among the participants is not surprising due to the intensive awareness and knowledge about COVID-19 and its transmission via social media, news, and television. In comparison to the international records, positive association was found between knowledge and individual educational background which supported our findings.[15,16] Therefore, our findings were not so different from previous studies although our study confined in College of Applied Medical Sciences.

The participant's attitude score towards COVID-19 was positive. There was no significant difference between males and females and among the departments regarding the attitude. The students have positive attitude, and they were aware of cause of transmission of virus and recommended method for isolation of patient with confirmed COVID-19. In contrast, 75 (42%) of the participants showed positive attitude towards the best preferred method of hand hygiene, while 103 (57%) showed negative attitude. In comparison to previous studies, the student's attitude in this study was not different from previous studies conducted in Saudi Arabia which reported a positive and optimistic attitude towards COVID-19.[17–20] These results contribute to show the gap in students' attitude towards the virus, which enables health-educators to design training programs to educate students to improve their attitude towards dealing with the pandemic to limit its spread.

The participants have achieved good score of practice regarding protection from COVID-19. Significant predictors of students practice in this study were type of department and age of the students. Based on the results of this study, the existing evidence demonstrates that the practice on method of protection from COVID-19 infection was significantly different among the departments (p-value < 0.001, 95% CI. It was observed that students of Clinical laboratory department are more likely to apply method of protection from COVID-19 by 2.5 times than students of Radiology and Rehabilitation departments. It was not surprising that students of Clinical laboratory department are more likely to apply method of protection from COVID-19 since they have more intensive courses regarding infection control than the others. The results were consistent with the recent studies that have reported considerable levels of knowledge of protection among the university level across Saudi Universities.[21–24] Respondents achieved safe and good practices which

attributed to great efforts provided by Saudi Arabia's health authorities to increase public awareness of the disease and improve behavioral change.

The importance of these results lies in the fact that they showed the extent of students' knowledge of the virus. The gained knowledge reflected the importance of the role of supplementing different health authorities, especially after the WHO found that COVID-19 is a pandemic disease. The current situation of medical students helps the specialists in designing various programs to focus and increase knowledge of this virus.

Limitation of the Study

This study has some limitations. Firstly, it was single-center study conducted in a period of shutdown as Universities were locked. Secondly, the nature of online survey may have affected by recall ability, which may be subjected to recall bias due to COVID-19 related restrictions and lockdown. The survey was conducted in confined to one college, so the results may not be generalizable to other colleges. Additionally, the limited number of items may affect the accuracy measurement of knowledge, attitude, and protection. Further studies are needed among university students.

Conclusion

Students of Applied Medical Sciences are knowledgeable about COVID-19. Health education programs should be focused on protection and safety from COVID-19 for Applied Medical Sciences students especially Medical Rehabilitation Sciences and Radiology. Hand hygiene awareness programs must be conducted for undergraduate students. Infection control should be the part of undergraduate applied medical sciences curriculum program. The findings of the study are helpful for health policymakers and professionals to provide extra training for the Applied Medical Sciences students for the prevention of COVID-19.

Institutional Review Board Statement and Informed Consent

The study was conducted according to the guidelines of the Declaration of Helsinki and approved by the Ethical Committee of the Scientific Research, King Khalid University via Approval Number "(ECM#2020-217), (HAPO-06-B-001)".

Informed consent was obtained from all participants involved in the study.

Data Sharing Statement

The data of this study are available from the corresponding author on request.

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.

References

1. Wu F, Zhao S, Yu B, et al. A new coronavirus associated with human respiratory disease in China. *Nature*. 2020;579(7798):265–269. doi:10.1038/s41586-020-2008-3
2. Coronavirus.https://www.worldometers.info/coronavirus/. Worldometer; 2021. Accessed July 13, 2021.
3. MacIntyre CR, Chughtai AA, Rahman B, et al. The efficacy of medical masks and respirators against respiratory infection in healthcare workers. *J Educ Eval Health Prof*. 2020;17:10. doi:10.3352/jeehp.2020.17.10
4. Shereen MA, Khan S, Kazmi A, Bashir N, Siddique R. COVID-19 infection: origin, transmission, and characteristics of human coronaviruses. *J Adv Res*. 2020;24:91–98. doi:10.1016/j.jare.2020.03.005
5. Phan LT, Nguyen TV, Luong QC, et al. Importation and human-to-human transmission of a novel coronavirus in Vietnam. *N Engl J Med*. 2020;382(9):872–874. doi:10.1056/NEJMc2001272
6. Parry J. China coronavirus: cases surge as official admits human to human transmission. *BMJ*. 2020;368:m236. doi:10.1136/bmj.m236
7. Li Q, Guan X, Wu P, et al. Early transmission dynamics in Wuhan, China, of novel coronavirus–infected pneumonia. *N Engl J Med*. 2020;382(13):1199–1207. doi:10.1056/NEJMoa2001316
8. World Health Organization. Coronaviruses (COVID-19); 2020. Available from: https://www.who.int/news-room/q-a-detail/q-a-coronaviruses. Accessed April 1, 2020.).

9. Khan AA, Alsofayan YM, Alahmari AA, Alowais JM, Algwizani AR, Alserehi HA. COVID-19 in Saudi Arabia: the national health response. *East Mediterr Health J*. In press 2021. doi.10.26719/emhj.21.048
10. Ministry of Health – Kingdom of Saudi Arabia. COVID-19 Guidelines. MOH Publications; 2020. Available from: https://www.moh.gov.sa/en/Ministry/MediaCenter/Publications/Pages/covid19.aspx. Accessed July 13, 2021.
11. Nazar W, Leszkowicz J, Pieńkowska A, et al. Knowledge and perception of COVID-19 pandemic: Before-and-after online community survey. *Research Square*. In press 2020. doi:10.21203/rs.3.rs-28712/v1
12. Quadri MF, Jafer MA, Alqahtani AS, et al. Novel corona virus disease (COVID-19) awareness among the dental interns, dental auxiliaries and dental specialists in Saudi Arabia: a nationwide study. *J Infect Public Health*. 2020;13(6):856–864. doi:10.1016/j.jiph.2020.05.010
13. Al-Hanawi MK, Angawi K, Alshareef N, et al. Knowledge, attitude and practice toward COVID-19 among the public in the kingdom of Saudi Arabia: a cross-sectional study. *Front Public Health*. 2020;8:217. doi:10.3389/fpubh.2020.00217
14. Javed MQ, Khan AM, Nawabi S. Dental faculty's knowledge and attitude regarding COVID-19 disease in Qassim, Saudi Arabia; 2020. doi:10.21203/rs.3.rs-25306/v1.
15. Azlan AA, Hamzah MR, Sern TJ, Ayub SH, Mohamad E. Public knowledge, attitude and practices towards COVID-19: a cross-sectional study in Malaysia. *PLoS One*. 2020;15(5):e0233668. doi:10.1371/journal.pone.0233668.D12
16. Lingam L, Suresh Sapka R. COVID-19, physical distancing and social inequalities: Are we all really in this together? *Int J Commun Soc Dev*. 2020;2(2):173–190. doi:10.1177/2516602620937932
17. Saquib SA, Al-Harthi HM, Khoshhal AA, Shaher AA, Al-Shammari AB, Khan A. Knowledge and attitude about basic life support and emergency medical services amongst healthcare interns in University Hospitals: a Cross-Sectional Study. *Emerg Med Int*. 2019;2019:1–8. doi:10.1155/2019/9342892
18. Hamza MS, Badary OA, Elmazar MM. Cross-sectional study on awareness and knowledge of COVID-19 among senior pharmacy students. *J Community Health*. 2020. doi:10.1007/s10900-020-00859-z
19. Al-Hazmi A, Gosadi I, Somily A, Alsubaie S, Saeed AB. Knowledge, attitude and practice of secondary schools and university students toward middle east respiratory syndrome epidemic in Saudi Arabia: a cross-sectional study. *Saudi J Biol Sci*. 2018;25(3):572–577. doi:10.1016/j.sjbs.2016.01.032
20. Humran MB, Alahmary K. Assessment of knowledge, attitude, and practice of hand hygiene among medical and health profession students at King Saud Bin Abdulaziz University for Health Sciences in Saudi Arabia. *Saudi Crit Care J*. 2018;2(4):66–72. doi:10.4103/sccj.sccj_6_19
21. Ramanathan K, Antognini D, Combes A, et al. Planning and provision of ECMO services for severe ARDS during the COVID-19 pandemic and other outbreaks of emerging infectious diseases. *Lancet Respir Med*. 2020;8(5):518–526. doi:10.1016/S2213-2600(20)30121-1
22. Alqrache AT, Mostafa MM, Atta HM. Knowledge and attitude towards covid-19 among students Of King Abdulaziz University. *Era J Med Res*. 2020;7(1):21–29. doi:10.24041/ejmr2020.4
23. Almofada SK, Alherbisch RJ, Almuhraj NA, et al. Knowledge, attitude, and practices toward COVID-19 in a Saudi Arabian population: a cross-sectional Study. *Cureus*. 2020;12(6):e8905. doi:10.7759/cureus.8905
24. Baig M, Jameel T, Alzahrani SH, et al. Predictors of misconceptions, knowledge, Attitude, and practices of COVID-19 pandemic among a sample of Saudi population and its impact: a cross-sectional study; 2020. doi:10.1101/2020.05.22.20110627

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