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**COVID-19 Knowledge, Attitudes, and Practices of United Arab Emirates
Medical and Health Sciences Students: A Cross Sectional Study**

Original article

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25 **Abstract (216 words)**

26 COVID-19 pandemic is the largest unprecedented viral pandemic of the 21st century. We
27 aimed to study the COVID-19 knowledge, attitudes, and practices (KAP) among medical and health
28 sciences students in the United Arab Emirates (UAE). We performed a cross-sectional study between
29 2nd June and 19th August 2020. The survey was developed using online Survey Monkey. The link
30 was distributed via UAE University to all students and via WhatsApp© groups. The self-
31 administered questionnaire was conducted in English and comprised of two parts: socio-
32 demographic characteristics and KAP towards COVID-19. A total of 712 responses to the
33 questionnaire were collected. 90% (n=695) were under-graduate, while 10% (n=81) were post-
34 graduate students. Majority (87%, n=647) stated that they obtained COVID-19 information from
35 multiple reliable sources. They were highly knowledgeable about COVID-19 pandemic but 76%
36 (n=539) did not recognize its routes of transmission. 63% (n=431) were worried of getting COVID-
37 19, while 92% (n=633) were worried that a family member could get infected with the virus. 97%
38 (n=655) took precautions when accepting home deliveries, 94% (n=637) had been washing their
39 hands more frequently, and 95% (n=643) had been wearing face masks. In conclusion, participants
40 showed high levels of knowledge and awareness about COVID-19. They were worried about getting
41 infected themselves or their family members, and had good practices against COVID-19.

42

43 **Key words:** COVID-19, Pandemic, KAP, Medical Student, UAE

44

45 **Introduction**

46 COVID-19 is the largest unprecedented viral pandemic of the 21st century. COVID-19
47 virus (SARS-CoV-2) was first discovered after it caused a cluster of fatal cases of pneumonia in
48 Wuhan, China. The virus has swiftly spread worldwide [1-3]. This pandemic has major impact on
49 global health and economy. Currently there are around 90 million infected persons worldwide, and
50 two million deaths [4-5]. We have to adopt clear effective public health measures so as to mitigate
51 this crisis [6], till we find a proper vaccination [7]. This can not be achieved without evaluating
52 knowledge, attitudes and practices (KAP) towards preventing this disease. This is even more
53 important for role models in the community (like leaders, doctors and medical students) [8]. A
54 study conducted among health care workers in China, during the early stages of the outbreak has
55 shown that around 90% had sufficient knowledge of COVID-19 who followed proper preventative
56 practices. 85% were afraid of getting infected [9]. We thought that it was essential to evaluate the
57 KAP of COVID-19 among medical and health sciences students in the United Arab Emirates
58 (UAE) so to mitigate the effects of this pandemic on them. We aimed to evaluate the knowledge
59 of COVID-19, awareness of preventive behaviors, practice, and risk perception among medical
60 students and allied health sciences in the UAE.

61

62 **Materials and methods**

63 **Ethical considerations**

64 Ethical approval was obtained from the UAEU Social Research Committee [UAEU
65 ERS_2020_6119]. Participants' data were anonymized at the point of registration. No personal
66 identifiable data were collected.

67 **Study Design**

68 This is a cross-sectional study which was conducted among medical and health sciences
69 students in the UAE between 2nd June and 19th August 2020. The survey was developed online
70 using Survey Monkey. The link was distributed via UAE University to all students and via
71 WhatsApp© groups.

72

73 **Sample size**

74 The estimated population of UAE is 9,948,495 [10]. Using Raosoft sample size calculator,
75 having a confidence interval of 95%, a marginal error of 5%, and a response distribution of 50%,
76 the calculated sample size was 385 participants [11]. Accordingly, we aimed to collect 800
77 participants to assure reaching our objectives.

78

79 The online questionnaire was aimed to reach the target population. We used the snowball
80 sampling technique. The study invitation and survey link were directly sent to the medical and
81 health sciences colleges and universities in the UAE through the e-mail and circulated on multiple
82 social media outlets. The participants were encouraged to forward the link to their fellow medical
83 and health sciences students and post it on their social media platforms to maximize enrolment of
84 potential participants. The study invitation included an introduction, a brief description of the study
85 and the link to the questionnaire. The survey was piloted on 10 students and validated by
86 epidemiologists before sharing it with the study population.

87

88 **Questionnaire design**

89 The questionnaire was designed and referenced from previous similar studies and modified
90 to our study population [12,13]. The questionnaire started with a consent page which provided a
91 brief description of the study, the voluntary nature of participation and declaration of anonymity.
92 Online informed consent was obtained prior proceeding to the questionnaire response. The self-
93 administered questionnaire was conducted in English and comprised of two parts: socio-
94 demographics characteristics and KAP towards COVID-19. The demographic variables included
95 age, gender, nationality, place of residence, if they are currently studying medicine or health
96 sciences, their year of study and specialty, if they suffer from chronic diseases or live with someone
97 who has a chronic disease, if they tested positive for COVID-19, their source of COVID-19
98 information, and if they attended any COVID-19 educational courses. The KAP part consisted of
99 3 sections and a total of 34 questions. These included

100

101 *Knowledge*

102 This section included 12 questions which assessed the participants' knowledge about
103 COVID-19, and the questions were answered on a multiple choice and true/false basis. The items
104 included etiology of the disease, transmission of the virus, symptoms, incubation period,
105 diagnostic tests, treatment options, and prevention. In the knowledge section, respondents were
106 given options to answer as true, false, or don't know.

107

108 *Attitude*

109 This section included 6 questions which assessed the participants' attitudes towards the
110 COVID-19 pandemic using a Likert scale. This was coded as follows: strongly disagree=1,

111 disagree=2, undecided=3, agree=4, strongly agree=5. This included fear of getting infected, stigma
112 around infected individuals, government measures, and their confidence towards the measures.

113

114 *Practice*

115 This section included 16 questions which assessed the participants' practices towards
116 COVID-19 using multiple-choice questions, yes/no questions, and a Likert scale. The items were
117 related to practices and compliance to preventative measures and precautions implemented by the
118 government such as social distancing, wearing face masks and hand washing.

119

120 **Statistical Analysis**

121 Simple summary descriptive statistics were used. Continuous were presented as mean (SD)
122 while categorical data were presented as number (%). Percentages were calculated from actual
123 available responses. We used the Statistical Package for the Social Sciences (IBM-SPSS version 26,
124 Chicago, Il) for statistical analysis.

125

126 **Results**

127 A total of 712 responses to the questionnaire were collected. **Table 1** shows the detailed
128 demography of the participants. 90% (n=695) of respondents were under-graduates, while 10 %
129 (n=81) were post-graduate. The majority of respondents (87%, n=647) stated that they obtained
130 COVID-19 information from multiple sources. Social Media was the main source for COVID-19
131 information (7%, n=52) of the respondents while the rest (6%, n=48) relied on medical platforms,
132 healthcare professionals, government media briefings, and university newsletters. 406 respondents
133 (57%) attended webinars to learn more about COVID-19.

Table 1. Characteristics of respondents of the KAP survey collected between 2nd June and 19th August 2020

Variables	Number	(%)
Age (years) mean (SD)	21.4	4.06
Gender		
Male	108	14%
Female	690	86%
Nationality		
UAE	480	60%
Non-UAE	315	40%
Emirate of residence		
Abu Dhabi	421	54%
Dubai	125	16%
Sharjah	94	12%
Ajman	60	8%
Ras Al Khaimah	55	7%
Fujairah	15	2%
Um Al Quwain	6	1%
Academic affiliation		
UAE University (CMHS)	247	32%
Fatima College of Health Sciences	169	22%
RAK Medical & Health Sciences University	116	15%
Sharjah University	77	10%
Mohammed Bin Rashid University	48	6%
Gulf Medical University	46	6%
Ajman University	24	3%
Other Colleges	49	6%
Speciality		
Medicine	431	56%
Nursing	117	15%

Pharmacy	49	6%
Physiotherapy	45	6%
Dental	44	6%
Radiology and Medical Imaging	21	3%
Biomedical Sciences	20	3%
Medical Laboratory Technology	17	2%
Others	29	4%

134

135 **Table 2** shows the comorbidities and COVID-19 history of the participants. 8% of the participants

136 who were tested for COVID-19 were positive. 85% (n=506) had a family member or friend who

137 got tested for COVID-19, of which 15% (n=89) tested positive.

Table 2. Comorbidities and COVID-19 history of the KAP survey respondents

Variable	n	(%)
Personal chronic condition		
Asthma	28	37%
Diabetes	10	13%
Hypertension	5	7%
Inflammatory bowel disease	3	4%
Migraine	3	4%
Polycystic ovary syndrome	3	4%
Others	24	32%
Personal history of COVID-19		
Tested for COVID-19= yes	160	92%
Tested positive= yes	13	8%
Household history of COVID-19		
Asymptomatic	16	19%
Quarantined with mild symptom	57	67%
Admitted to hospital with severe symptoms	6	7%
Admitted to ICU with severe symptoms	3	4%
Died	3	4%

139 **Knowledge**

140 A total of 712 respondents completed the knowledge section of the survey (Table 3). 76% (n=539) of participants did not
 141 recognize the correct routes of transmission of COVID-19, while the majority of respondents correctly recognized its symptoms, average
 142 incubation period, best diagnostic test, and its management (95%, 85%, 89%, 89% and 70% respectively). The majority of the
 143 respondents were aware of the COVID-19 preventative measures including methods to reduce viral spread, isolation of positive cases,
 144 N95 mask use limited to health care workers, and the necessity of preventative precautions among young adults and children (83%,
 145 92%, 84%, and 87% respectively).

Table 3. Responses to the survey on COVID-19 knowledge

Statement	Correct		Incorrect/ Uncertain		Total*
	n	(%)*	n	(%)*	
COVID-19 is a new disease caused by virus SARS-CoV-2.	570	80%	142	20%	712
Which animal is most likely to transmit this virus to human?	633	89%	79	11%	712
SARS-CoV-2 can be transmitted between humans by the following routes?	173	24%	539	76%	712
Which of the following are COVID-19 symptoms?	679	95%	33	5%	712

What is the average incubation period of COVID-19?	602	85%	110	15%	712
What is the best diagnostic test for COVID-19?	636	89%	76	11%	712
COVID-19 can be treated by using the following:	500	70%	212	30%	712
Which of the following can reduce the spread of COVID-19?	591	83%	121	17%	712
People who are asymptomatic and COVID-19 test positive must stay at home until they are free of the infection:	653	92%	59	8%	712
Who should wear N95 masks?	601	84%	111	16%	712
Persons with COVID-19 cannot transmit the virus to others when a fever is not present.	635	89%	77	11%	712
It is not necessary for children and young adults to take measures to prevent infection from COVID-19 virus.	616	87%	96	13%	712

Percentages may not total 100 because of rounding

*Percentages were calculated out of 712, which is the total number of respondents who completed the knowledge items

147 **Attitude**

148 A total of 686 respondents completed the attitudes section of the survey (**Table 4**). 63% (n=431) of participants were worried
 149 of getting COVID-19 infection, while the vast majority (92% (n=633)) were worried that a family member could get infected with the
 150 virus. 67% (n=461) of the respondents thought that infection with the virus is associated with stigma. 83% (n=570) agreed that the
 151 current measures taken by the UAE government are effective in stopping the spread of the infection and 89% (n=614) were confident
 152 that the UAE will be able to stop the spread of the virus. Nevertheless, 60% (n=288) thought that more measures could be implemented
 153 such as aggressive screening, full lockdown, further education to the public, monitoring the media, and fighting rumors. Some went
 154 against the lockdown and suggested to loosen the restrictions.

Table 4. Responses to the survey on COVID-19 Attitude

Attitudinal Statement	Strongly disagree		Disagree		Undecided		Agree		Strongly agree		Total*
	n	(%)*	n	(%)*	n	(%)*	n	(%)*	n	(%)*	
Attitude with negative feeling											
You are worried that you will get COVID-19	40	6%	151	22%	64	9%	330	48%	101	15%	686
You are worried that a family member can get infected with this virus	8	1%	29	4%	16	2%	303	44%	330	48%	686
Infection with the virus is associated with stigma	53	8%	118	17%	54	8%	300	44%	161	23%	686

Attitude with positive feeling

The current measures taken by the UAE

government are effective in stopping the spread of the infection 16 2% 57 8% 43 6% 295 43% 275 40% 686

You are confident that the UAE will be able to stop the spread of the virus 4 1% 27 4% 41 6% 263 38% 351 51% 686

Percentages may not total 100 because of rounding

*Percentages were calculated out of 686, which is the total number of respondents who completed the Attitude items

155

156 Practices

157 A total of 677 respondents completed the practices section of the survey. 60% (n=407) did not attend family gatherings, did not
158 visit shopping malls, coffee shops, industrial areas, hospitals or COVID-19 facilities for volunteering. 97% (n=655) took precautions
159 when accepting home deliveries, 94% (n=637) had been washing their hands more frequently, and 95% (n=643) had been wearing face
160 masks. Concurrently, out of 666 respondents, nearly all of them followed curfew timings set by the UAE government (99% (n=658)).
161 Overall, most medical students and allied health sciences students followed proper practices.

162

Table 5. Responses to the survey on COVID-19 Practices

Practice Statement	Good Practice		Bad Practice		Total
	n	(%)	n	(%)	
Have you visited any of the following places? Shopping mall, Supermarkets, Family gatherings, coffee shops, industrial areas, hospitals for treatment, or COVID-19 facilities for volunteering	407	60%*	270	40%*	677
Do you take precautions when accepting home deliveries?	655	97%*	22	3%*	677
Have you been washing your hands more frequently?	637	94%*	40	6%*	677
Have you been wearing face masks?	643	95%†	33	5%†	676
Do you follow the curfew timings set by the UAE government?	658	99%‡‡	8	1%‡‡	666
Did you discuss COVID-19 with anyone since the pandemic started?	664	99.7%‡‡	2	0.3%‡‡	666

Percentages may not total 100 because of rounding

*Percentages were calculated out of 677, which is the total number of respondents who completed that practice item

†Percentages were calculated out of 676

‡‡ Percentages were calculated out of 666

164 **Discussion**

165 Our study has shown that the majority of medical and allied health students at UAE were
166 well knowledgeable about COVID 19, worried about getting infected or having a member of their
167 family infected, and had proper practices and precautionary measures for preventing COVID-19.

168

169 The high knowledge on COVID-19 of the medical and allied health students in the UAE is
170 similar to those reported from Pakistan [14]. This may be attributed to the use of multiple reliable
171 medical platforms, healthcare professionals, government media briefings, and university
172 newsletters. These resources may have enforced proper knowledge. Furthermore, it may be related
173 to the training they received as volunteers in the healthcare system [15]. The majority of the
174 respondents were aware of COVID 19 symptoms, the incubation period, diagnostic testing,
175 management, and the preventative measures. However, only 24% in our study correctly recognized
176 COVID-19 route of transmission compared with other studies in which undergraduate students were
177 quite knowledgeable about the route of transmission [14, 16]. COVID-19 is transmitted by
178 respiratory droplets; however, airborne transmission may be possible in case of a medical procedure
179 that generates aerosols [17]. This was unexpected, given the fact that majority of our respondents
180 depended on reliable medical resources for their information.

181

182 Furthermore, our study has shown that participants had both negative and positive feelings
183 regarding the pandemic. Majority was worried that they or a member of their family may get
184 infected. It is important to note that this study was conducted during the period of the rapid increase
185 of COVID-19 cases in the UAE. 67% of the participants believed that infection with the virus is

186 associated with stigma. This may lead to high-risk behaviors that increase infection such as
187 gatherings, poor hand hygiene, poor social distancing and not following the government
188 guidelines. Interestingly, most of the participants were confident that the UAE will be able to stop
189 the spread of the virus. They also believed that the current measures taken by the UAE government
190 are effective in stopping the spread of the infection. This positive attitude can be explained by the
191 drastic measures taken by the UAE government to contain the spread of the virus. These measures
192 included the introduction of teleworking, distance learning, lockdowns, country-level coordination,
193 risk communication, community engagement, surveillance, rapid response teams, case investigation,
194 infection prevention and control, and operational support and logistics [18].

195

196 Majority of participants had proper practices and precautionary measures against COVID-
197 19. 60% did not visit shopping malls, family gatherings, coffee shops, industrial areas and hospitals;
198 and the majority reported good preventative practices including hand washing, wearing face masks,
199 and abiding by curfew timings. These findings could be attributed to the strict lockdown when the
200 survey was launched, access to trusted medical resources, and training in medical fields. These
201 results are similar to those reported on undergraduate students in China, medical students in Pakistan,
202 and clinical year medical students in Iran [13-16].

203

204 **Limitations**

205 We have to acknowledge that our study has certain limitations. First, this study was
206 conducted using an online survey; consequently, the results of the questionnaire all depended on the
207 participants self-reported behaviors, with no means of confirming whether the responses were

208 exaggerated as a result of social desirability bias. Second, the respondents were predominantly
209 females and medical students. This may be a selection bias with its effect on the results. Finally, this
210 study was conducted in the early stages of the pandemic when the UAE was under lockdown and
211 continued for a while after the restrictions were lifted. Since then, more information about the
212 pandemic has been published and likewise public health measures in the UAE have changed. Thus,
213 the results of the study may not represent the current COVID-19 KAP of the medical and health
214 sciences students.

215

216 **Conclusions**

217 Medical and health sciences students in the UAE showed high levels of knowledge and
218 awareness about COVID-19. Although they were confident in the public health measures taken to
219 mitigate the COVID-19 pandemic, they were worried about getting infected themselves or their
220 family members, and had good practices against COVID-19.

221

222

223 **Abbreviations**

224 SARS-CoV-2: Severe acute respiratory syndrome coronavirus 2

225 COVID-19: Coronavirus disease 2019

226 HCW: Healthcare workers

227 ICU: Intensive care unit

228 ILO: International Labour Organization

229 IFAD: The International Fund for Agricultural Development

230 WHO: World health organization

231 FAO: Food and Agriculture Organization

232 KAP: knowledge, attitudes, and practices

233 UAE: United Arab Emirates

234 UAEU: United Arab Emirates University

235

236

237 **Declarations**

238 **Ethics approval:** Ethical approval was obtained from the UAEU Social Research Committee
239 (UAEU ERS_2020_6119).

240 **Consent for publication:** Not applicable

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242 paper.

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245 Nouf Al Kaabi, and Suad Ajab formulated the research question, developed the protocol, collected
246 and coded the data, and wrote the first draft. Michal Grivna and Muhammad Abid contributed to the
247 questionnaire design and revised the first manuscript. M. Sheek-Hussein, Supervised, the project
248 including the questionnaire design, the analysis and drafting of the first version of the paper. Fikri
249 Abu Zidan, supervised the analysis of the data of the questionnaire and writing the first version of
250 the paper, and extensively edited the paper. All authors contributed, revised the final manuscript,
251 and approved.

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