Original Article

Assessment of understanding coronavirus disease 2019 (COVID-19) among health university students in Makkah, Saudi Arabia: A cross-sectional study

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ABSTRACT

Background: For over two years now, the coronavirus (COVID-19) pandemic detrimentally affected people worldwide, creating a research impetus since the rise of infections and deaths. While there are still many things to learn about COVID-19, it is important to consider the knowledge of medical students, as they may serve as the frontline in the future if the crisis persists.

Aim: To assess the level of knowledge on COVID-19 among health care university students of Umm Al-Qura, Mecca, Saudi Arabia.

Methods: A survey was conducted between April–July 2021 at the healthcare colleges of Umm Al-Qura University, Mecca, Saudi Arabia. A questionnaire was developed by researchers to determine students' knowledge about COVID-19 disease, etiology, symptoms, risk factors, complication, prevention, mode of transmission, incubation period, and disease management among healthcare students of Umm Al-Qura University in Mecca, Saudi Arabia. The questionnaire was designed and developed based on an extensive literature review, including recent studies about COVID-19 disease, and was modified from previously published studies.

Results: Most (91.9%) respondents had a fair knowledge of COVID-19 and were considered a moderate level. Generally, it is seen that senior students had good knowledge (30.86±6.20) compared to junior students (29.89±5.41) with (P = 0.009). With regards to the knowledge of pharmacy students about the medical questions of the COVID-19 virus, we found about half of them reported that the viral load predicts the severity of COVID-19 virus-related symptoms. Furthermore, most of the pharmacy students, 157 (67.4%), agreed that COVID-19 symptoms are worse among diabetics.

Conclusion: Health university students of Umm Al-Qura in Mecca, Saudi Arabia, had a fair knowledge of COVID-19 and were considered at a moderate level. Generally, it is seen that senior students had better knowledge than junior students.

Keywords: COVID-19, Viruses, Knowledge, Awareness

INTRODUCTION

Coronavirus is a distinct virus type classified under the family coronaviridae known to bring about several disorders, such as severe acute respiratory syndrome (SARS) and the Middle East respiratory

syndrome (MERS).[1-2] Also, coronaviruses can cause human respiratory tract infections or serious animal infections.[3-4] Around two years ago, a new strain was detected in China that caused severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infection that can lead to its disease namely coronavirus disease 2019 (COVID-19).

In 2019, the Chinese National Health Commission detected its first case of the disease in Wuhan City, China.[5] Since then, the disease has spread globally. The World Health Organization (WHO) is classified as a pandemic. Based on an update dated 9th May 2022, the WHO reports 516.476.402 confirmed cases of COVID-19, including 6.258.023 deaths. In Saudi Arabia alone, the number of infected exceeded half a million cases (MOH, Saudi Arabia), but the death rate in the kingdom has been much lower than in countries such as the US, UK, and Canada. COVID-19 infection shows symptoms such as cough, fever, and fatigue.[6-7] Moreover, it can also manifest other symptoms such as anosmia, ageusia, thermal dysregulation, myalgia, and dyspnea.[8-10] Those who had severe cases of the disease acquire Pneumonia. [11] However, a large number of others are mainly asymptomatic adults, while children are less susceptible to severe COVID-19 than older patients.[12] COVID-19 disease severity includes risk factors such as age and existing comorbidities such as cardiovascular and respiratory disease, and diabetes, which were the most significant risk factors for COVID-19 disease severity.[13-15] Additionally, many infected individuals were found to have further complications, such as large-vessel occlusion, polyneuropathy, stroke, and pulmonary embolism.[16-18] The estimated incubation period of the disease was 5–7 days.[19-21] Presently, the SARS-CoV-2 virus remains a major threat and the world is still gripped by a pandemic.

Evaluating the level of knowledge of health care students and clinicians is important for several reasons. First of all, they may act as primary frontliners, which could post them at higher risk of infection.[22] Another is their level of knowledge can impact how they handle the patients infected by the virus. In the study of Ajayi et al. (2019) on the knowledge of clinicians about the Ebola virus, they found out that the majority of their participants have generally had a high level of knowledge.[22] This is also evident among the participants in their study who belonged to the senior level in the hospitals they work for. Meanwhile, Liya et al. (2020) underlined in their review that there is already much known about the virus after one year has passed and this understanding may be attributed to numerous studies that are still ongoing until now.[2] Such understanding on a global scale can also be translated to infection control not just by clinicians or health care students but also by government leaders, which is what is done in the study by Kilic et al. (2020) in Turkey[1]. Being frontliners themselves, some doctors are also researchers themselves, thereby having a direct source of knowledge and experience about the severity of COVID-19, as depicted in the observational study of Yang et al. (2020).[4] Such a level of knowledge is not limited to clinical uses in healthcare or even academic institutions only. For example, the study by Annweiler et al. (2021) revealed a national survey of the virus among the French elderly population.[10] All of these studies can highlight the importance of evaluating the level of knowledge of medicine-related practitioners and how this could benefit in improving and expanding what we currently know in the scholarly literature and, by extension, medical practice. This study tried to assess the level of knowledge about the COVID-19 among health care students at Umm Al-Qura university, Mecca.

MATERIALS AND METHODS

A cross-sectional questionnaire was designed and developed as a tool for assessing students' level of knowledge about COVID-19. Specifically, it aims to establish the purview of understanding with regards to the etiology, symptoms, risk factors, complications, prevention, mode of transmission, incubation period, and disease management of COVID-19 among healthcare students of Umm Al-Qura University

in Mecca, Saudi Arabia. Students at the health colleges (Medicine, Applied Medical Science, Dentistry, Public Health and Health Information, Pharmacy, and Nursing) were included in the study. There were 34 questions in the questionnaire comprising two sections: general information (four questions) and the assessment of knowledge of the COVID-19 (30 questions). In the knowledge section, relevant questions were asked from the respondents about COVID-19, which includes the cause, incubation period, symptoms, risk factors, and potential treatment. The questionnaire is based on a review of literature, including recent studies about COVID-19 disease, and was modified from previously published studies.[4,22-24] A pilot study was performed to check the validity of the questionnaire on 20 students and was further validated by three academic staff from health colleges at Umm Al-Qura University. The Cronbach alpha for the knowledge survey was 0.760. The analysis of knowledge was done based on the scalar scoring method. There were two types of questions. One set was about medical information, such as incubation period, risk factors, and symptoms of COVID-19. This set is designated two points for every correct answer and zero for wrong or uncertain answers. This set had 13 questions. The second set of questions is designated one point for each correct answer and zero for uncertain answers. This set had 17 questions. Overall, the total scoring points were 43 for those who answered all questions correctly. The respondents were classified based on their scoring points. Those respondents who obtained 39 scores and above were considered as high level, while the scores between 19 and 39 were considered moderate level. Respondents who obtained 19 scores and below were classified under low level. R Programming Language, ver. 3.5.1. was utilized to perform statistics. Percentages and frequencies were presented for all categorical variables, whereas the expression mean± standard deviation (SD) was shown for all continuous variables. The Mann-Whitney test and the Kruskal-Wallis Rank Sum Test were performed to compare mean knowledge scores. The P-value of < 0.05 is set as statistically significant. For significant statistical differences, repeated Mann-Whitney tests were calculated between group levels with corrections for multiple testing.

Appropriate and informed consent, both verbal and written, was obtained from the respondents included in the study, and their details were kept anonymous. This research was done according to the guidelines for ethical scientific research at Umm Al-Qura University. Approval from the biomedical research ethics committee of Umm Al-Qura University was secured in the conduct of this study, with approval number HAPO-02-K-012-2021-03-642.

RESULTS

Out of the total 492 respondents, 260 (52.8%) were females and 232 (47.2%) males. The respondents' mean age was 20.98±1.44 years, with a margin age of 18 years and a ceiling age of 30 years. Table 1 shows the demographic information of the respondents.

Out of 492 respondents, 452 (91.9%) had a fair knowledge of COVID-19 which was considered to be at moderate level. Among the remaining respondents (8.13%) respondents, 21 students (4.2%) failed to show any knowledge of COVID-19 and were considered as low level in knowledge of COVID-19, while only 19 (3.9%) were considered as high level. Those classified as high level 4 (21.1%) belong to the college of medicine, six (31.6%) college of pharmacy, one (5.3%) college of public health and health information, and eight (42.1%) belong to the college of applied medical science.

The differences in mean knowledge scores were tested on gender, college, and education level of respondents (Table 2). According to the overall scoring of knowledge, there is no difference between males' mean knowledge score (30.14 ± 5.93) and females' mean knowledge score (30.36 ± 5.55) (P = 0.8475). Similarly, there was no significant difference detected within a college of respondents (P = 0.262). The distribution of knowledge scores among healthcare colleges is shown in Figure 1. However, there

was a significant statistical difference in the education level of respondents (P = 0.007). Figure 2 shows the distribution of the knowledge score of respondents within education levels. Generally, it is seen that senior students had good knowledge (30.86 ± 6.20) compared to junior students (29.89 ± 5.41) (P = 0.009). With regards to the knowledge of pharmacy students about the medical questions of the COVID-9 virus, it was found that half of them reported that the viral load predicts the severity of COVID-19 virus-related symptoms. Also, most [157 (67.4%)] of the pharmacy students agreed that COVID-19 symptoms are worse among diabetics (Table 3).

Table 1: General information and social profile of respondents.

Characteristics	Frequency (%)
Sex	
Male	232 (47%)
Female	260 (53%)
Age	
18-21	331 (67.3%)
22-25	158 (32.1%)
25-30	3 (0.6%)
College of respondent	
College of medicine	74 (15%)
College of applied medical science	116 (23.6%)
College of Dentistry	33 (6.7%)
College of public health and health information	18 (3.7%)
College of pharmacy	233 (47.4%)
College of nursing	18 (3.7%)
Education level of respondent	
1st year	8 (1.6%)
2nd year	201 (40.9%)
3rd year	99 (20.1%)
4th year	108 (22%)
5th year	57 (11.6%)
6th year	19 (3.9%)

Figure 1: Scoring knowledge within college respondents
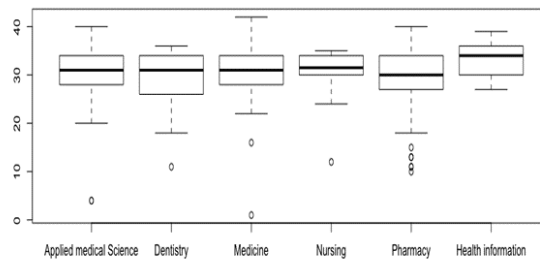

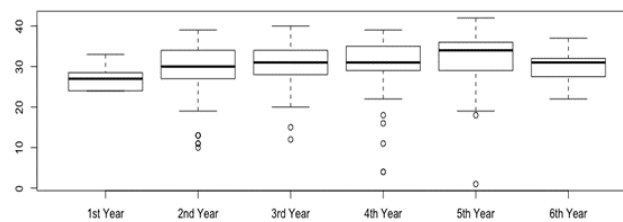**Figure 2:** Scoring knowledge within education level of respondents

Table 2: Means of scoring knowledge within gender, college of respondents, and education level of respondents.

Demographics	Mean ± SD	Median score	P-value
Sex			
Male	30.14±5.93	31	0.8475*
Female	30.36±5.55	31	
College of respondent			
College of medicine	30.72±5.81	31	
College of applied medical science	30.69±5.73	31	
College of Dentistry	28.85±6.53	31	0.262**
College of public health and health information	32.78±3.69	34	
College of pharmacy	29.89±5.69	30	
College of nursing	30.39±5.53	31.5	
Education level of respondent			
1st year	27±3.16	27	0.007**
2nd year	29.66±5.79	30	
3rd year	30.61±4.59	31	
4th year	30.74±6.23	31	
5th year	31.42±6.83	34	
6th year	29.89±3.86	31	
1st year	27±3.16	27	0.099***
2nd year	29.66±5.79	30	
1st year	27±3.16	27	0.038***
3rd year	30.61±4.59	31	
1st year	27±3.16	27	0.038***
4th year	30.74±6.23	31	
1st year	27±3.16	27	0.038***
5th year	31.42±6.83	34	
1st year	27±3.16	27	0.123***
6th year	29.89±3.86	31	
2nd year	29.66±5.79	30	0.393***
3rd year	30.61±4.59	31	
2nd year	29.66±5.79	30	0.100***
4th year	30.74±6.23	31	
2nd year	29.66±5.79	30	0.038***
5th year	31.42±6.83	34	
2nd year	29.66±5.79	30	0.831***
6th year	29.89±3.86	31	
3rd year	30.61±4.59	31	0.393***
4th year	30.74±6.23	31	
3rd year	30.61±4.59	31	0.099***
5th year	31.42±6.83	34	
3rd year	30.61±4.59	31	0.420***
6th year	29.89±3.86	31	
4th year	30.74±6.23	31	0.387***
5th year	31.42±6.83	34	
4th year	30.74±6.23	31	0.374***
6th year	29.89±3.86	31	
5th year	31.42±6.83	34	0.099***
6th year	29.89±3.86	31	

*Mann-Whitney test
** Kruskal-Wallis Rank Sum test.
*** Repeated Mann-Whitney test.

Table 3: Knowledge of pharmacy students about the medical information of the Covid-19 virus.

Variables	Frequency (%)
The severity of COVID-19 virus related symptoms could be predicted by	
viral load	117 (50.2%)
incubation period	65 (27.9%)
Not sure	51 (21.9%)

The range of incubation period for COVID-19 virus is	
(3-10) days	42 (18%)
(1-14) days	191 (82%)
Not sure	0 (0%)
An indication of how well a virus is replicating in an infected person is provided by	
viral load	69 (29.6%)
length of incubation time	115 (49.4%)
Not sure	49 (21%)
Patients with severe COVID-19 cases tend to have	
shorter virus-shedding	33 (14.2%)
longer virus-shedding	112 (48.1%)
Not sure	88 (37.8%)
Covid-19 symptoms are worse among diabetic.	
Agree	157 (67.4%)
Neutral	39 (16.7%)
Disagree	37 (15.9%)
COVID-19 can be transmitted from person to person.	
Agree	223 (95.7%)
Neutral	6 (2.6%)
Disagree	4 (1.7%)
COVID-19 can cause multiple infections.	
Agree	113 (48.5%)
Neutral	81 (34.8%)
Disagree	39 (16.7%)
A symptom of COVID-19 is myalgia or fatigue.	
Agree	200 (85.8%)
Neutral	23 (9.9%)
Disagree	10 (4.3%)
A less common symptom of COVID-19 is	
Sputum production	140 (60.1%)
Headache	39 (16.7%)
Not sure	54 (23.2%)
Diarrhea is a less common symptom of COVID-19.	
Agree	113 (48.5%)
Neutral	77 (33%)
Disagree	43 (18.5%)
COVID-19 can develop pneumonia in patients.	
Agree	191 (82%)
Neutral	34 (14.6%)
Disagree	8 (3.4%)
COVID-19 infected person can be cured.	
Agree	221 (94.8%)
Neutral	6 (2.6%)
Disagree	6 (2.6%)
Any preventive measure against COVID-19 infection.	
Agree	213 (91.4%)
Neutral	17 (7.3%)
Disagree	3 (1.3%)

DISCUSSION

This study attempted to evaluate Saudi healthcare students' level of knowledge about COVID-19. Based on the assumption, knowledge about COVID-19 in Saudi Arabia after almost two years of the pandemic has not been previously assessed. COVID-19 has been reported in almost every region in Saudi Arabia, with the Saudi government suspending physical attendance at both schools and universities. The disease has spread rapidly, which has forced the students to study via the Umm Al-Qura University online platform. It is vital to keep medical students aware of up-to-date medical knowledge about such viruses as well as the vaccinations used to overcome serious illnesses.

There are already several studies assessing the knowledge of medical students on COVID-19. For example, a cross-sectional study in Jordan by Olaimat, et al (2020) revealed a good knowledge among its respondents and those medical students displayed a higher level of it.[25] The same finding is true in the descriptive study by Khasawneh, et al (2020), which used medical students from Jordan.[26] Another study on the assessment of knowledge in Saudi Arabian medical students by Adam, et al (2021) also yielded similar results.[27] The same is true in the study by Olum, et al (2020) in Uganda where first and fifth-year medical students participated.[28] Similarly, in the study by Taghrir, Borazjani, & Shiraly (2020) using self-report measures, their medical students in Iran also showed a high level of knowledge about COVID-19.[29] Two studies in India also found the same findings in terms of knowledge and perceptions of COVID-19.[30]

Our study also clearly reflects these positive results, and, to the best of knowledge, it is also the first to research this topic. Our main aim was to measure student knowledge about the disease after two years of the pandemic. Most respondents (91.9%) had a fair knowledge of COVID-19 and were considered a moderate level. Interestingly, it is seen that senior students had a good knowledge compared to junior students. Academic progression and medical education may play a crucial role in their advanced knowledge about the disease. The current study had a limitation because it relied on data gleaned from self-reports, which are built upon subjects' honesty, and this might lead to recall bias. This research concludes that most of the subjects had satisfactory knowledge of COVID-19. The study suggests a learning gap in COVID-19 for students who scored unsatisfactorily. The results point to the relevance of enhancing subjects' COVID-19 knowledge bank via different aspects, such as health training courses on hygiene practices and infection control for COVID-19 for all students, with an enhanced understanding of viral features and epidemiologic characteristics. All these efficient strategies can be formed to improve knowledge of COVID-19 in students. Moreover, further studies should be conducted and involve a larger sample size once this disease is under control.

CONCLUSION

In this study, the healthcare university students of Umm Al-Qura in Mecca, Saudi Arabia, were found to have a medium knowledge of COVID-19 and were considered a moderate level. Generally, it is seen that senior students had better knowledge than junior students. Further studies carrying a larger sample size are suggested to see the trend and variation in knowledge at a large scale level.

Acknowledgments

Conflict of Interest

The author declares that there are no conflicts of interest relevant to this article.

REFERENCES

1. Kilic AU, Kara F, Alp E, Doganay M. New threat: 2019 novel Coronavirus infection and infection control perspective in Turkey. *North Clin Istanb*. 2020;7(2):95-98.
2. Liya G, Yuguang W, Jian L, et al. Studies on viral pneumonia related to novel coronavirus SARS-CoV-2, SARS-CoV, and MERS-CoV: a literature review. *APMIS*. 2020;128(6):423-432.
3. Marty AM, Jones MK. The novel Coronavirus (SARS-CoV-2) is a one health issue. *One Health*. 2020;9:100123.

4. Yang X, Yu Y, Xu J, et al. Clinical course and outcomes of critically ill patients with SARS-CoV-2 pneumonia in Wuhan, China: a single-centered, retrospective, observational study [published correction appears in Lancet Respir Med. 2020 Apr;8(4):e26]. *Lancet Respir Med*. 2020;8(5):475-481.

5. National Health Commission of the People's Republic of China. (2019). 'News'.   Retrieved 2 October 2021, from http://en.nhc.gov.cn/

6. Larsen JR, Martin MR, Martin JD, Kuhn P, Hicks JB. Modeling the Onset of Symptoms of COVID-19. *Front Public Health*. 2020;8:473.

7. Oxley TJ, Mocco J, Majidi S, et al. Large-Vessel Stroke as a Presenting Feature of Covid-19 in the Young. *N Engl J Med*. 2020;382(20):e60.

8. Klopfenstein T, Kadiane-Oussou NJ, Toko L, et al. Features of anosmia in COVID-19. *Med Mal Infect*. 2020;50(5):436-439.

9. Menni C, Valdes AM, Freidin MB, et al. Real-time tracking of self-reported symptoms to predict potential COVID-19. *Nat Med*. 2020;26(7):1037-1040. doi:10.1038/s41591-020-0916-2

10. Annweiler C, Sacco G, Salles N, et al. National French Survey of Coronavirus Disease (COVID-19) Symptoms in People Aged 70 and Over. *Clin Infect Dis*. 2021;72(3):490-494.

11. Velavan TP, Meyer CG. The COVID-19 epidemic. *Trop Med Int Health*. 2020;25(3):278-280.

12. Kawasuji H, Takegoshi Y, Kaneda M, et al. Transmissibility of COVID-19 depends on the viral load around onset in adult and symptomatic patients. *PLoS One*. 2020;15(12):e0243597.

13. Esai Selvan M. Risk factors for death from COVID-19 [published correction appears in Nat Rev Immunol. 2020 Jun 12;:]. *Nat Rev Immunol*. 2020;20(7):407.

14. Jordan RE, Adab P, Cheng KK. Covid-19: risk factors for severe disease and death. *BMJ*. 2020;368:m1198.

15. Rod JE, Oviedo-Trespalacios O, Cortes-Ramirez J. A brief-review of the risk factors for covid-19 severity. *Rev Saude Publica*. 2020;54:60.

16. Akel T, Qaqa F, Abuarqoub A, Shamoon F. Pulmonary embolism: A complication of COVID 19 infection. *Thromb Res*. 2020;193:79-82.

17. Hanafi R, Roger PA, Perin B, et al. COVID-19 Neurologic Complication with CNS Vasculitis-Like Pattern. *AJNR Am J Neuroradiol*. 2020;41(8):1384-1387.

18. Trejo-Gabriel-Galán JM. Stroke as a complication and prognostic factor of COVID-19. Ictus como complicación y como factor pronóstico de COVID-19. *Neurologia (Engl Ed)*. 2020;35(5):318-322.

19. Lauer SA, Grantz KH, Bi Q, et al. The Incubation Period of Coronavirus Disease 2019 (COVID-19) From Publicly Reported Confirmed Cases: Estimation and Application. *Ann Intern Med*. 2020;172(9):577-582.

20. Quesada JA, López-Pineda A, Gil-Guillén VF, Arriero-Marín JM, Gutiérrez F, Carratala-Munuera C. Período de incubación de la COVID-19: revisión sistemática y metaanálisis [Incubation period of COVID-19: A systematic review and meta-analysis]. *Rev Clin Esp (Barc)*. 2021;221(2):109-117.

21. Zaki N, Mohamed EA. The estimations of the COVID-19 incubation period: A scoping reviews of the literature. *J Infect Public Health*. 2021;14(5):638-646.

22. Ajayi NA, Ojide CK, Ajayi IA, Ukwaja KN. Evaluation of clinicians' knowledge of and attitudes to Ebola virus disease in Ebonyi State, Nigeria. *J Virus Erad*. 2019;5(3):145-151.

23. LeDuc JW, Barry MA. SARS, the First Pandemic of the 21st Century. *Emerg Infect Dis* 10(11): e26-e26

24. Rothe C, Schunk M, Sothmann P, et al. Transmission of 2019-nCoV Infection from an Asymptomatic Contact in Germany. *N Engl J Med*. 2020;382(10):970-971.

25. Olaimat AN, Aolymat I, Shahbaz HM, Holley RA. Knowledge and Information Sources About COVID-19 Among University Students in Jordan: A Cross-Sectional Study. *Front Public Health*. 2020;8:254.

26. Khasawneh AI, Humeidan AA, Alsulaiman JW, et al. Medical Students and COVID-19: Knowledge,

Attitudes, and Precautionary Measures. A Descriptive Study From Jordan. *Front Public Health*. 2020;8:253.

27. Adam M, Gameraddin M, Alelyani M, et al. 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. *Adv Med Educ Pract*. 2021;12:789-797.

28. Olum R, Kajjimu J, Kanyike AM, et al. Perspective of Medical Students on the COVID-19 Pandemic: Survey of Nine Medical Schools in Uganda. *JMIR Public Health Surveill*. 2020;6(2):e19847.

29. Taghrir MH, Borazjani R, Shiraly R. COVID-19 and Iranian Medical Students; A Survey on Their Related-Knowledge, Preventive Behaviors and Risk Perception. *Arch Iran Med*. 2020;23(4):249-254.

30. Gohel KH, Patel PB, Shah PM, Patel JR, Pandit N, Raut A. Knowledge and perceptions about COVID-19 among the medical and allied health science students in India: An online cross-sectional survey. *Clin Epidemiol Glob Health*. 2021;9:104-109.