

# The Role of Medical Students During COVID-19 Era. A Review

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**Abstract:** *Background and aim of the work:* Since December 2019, the world has been facing the coronavirus disease 2019 (COVID-19) pandemic. Medical students could not remain uninvolved. Our aim is to investigate the impact of COVID-19 on their mental health, and to evaluate their awareness and aptitude for contributing to the fight against COVID-19. *Methods:* An in-depth search of the literature was performed in Pubmed database, for studies investigating the preferred source of information about COVID-19, the knowledge on virus transmission, COVID-19 clinical symptoms and preventive measures against its spread, and the impact of COVID-19 on mental health among medical students. Their potential roles during the COVID-19 pandemic were also investigated. *Results:* Twenty studies were included. The majority of medical students prefer social media to acquire knowledge about COVID-19. They are adequately informed about COVID-19 transmission and symptoms, as well as preventive measures against COVID-19, although wearing a face-mask is not so popular among them. Their mental health is affected, mainly expressed as a fear of infection. Possible alternative roles of students during pandemic may be providing information to the public and tracing contacts of infected people. *Conclusions:* Medical students have an adequate level of knowledge upon COVID-19 and implement proper strategies to prevent its spread. Further training is essential to improve some aspects in this field. Despite the negative impact of COVID-19 on their mental health, they could assist healthcare systems under appropriate precautions. ([www.actabiomedica.it](http://www.actabiomedica.it))

**Keywords** COVID-19, medical students, mental health, preventive behavior

## Introduction

Since December 2019, humanity came face to face with the new emergency situation of Coronavirus Disease 2019 (COVID-19), caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) (1). World Health Organization (WHO) characterized the crisis as a pandemic on 11<sup>th</sup> of March 2020 (2). A theory on COVID-19 origin indicates that the first transmission among humans came from animals, as a significant amount of peo-

ple who visited an animal market in Wuhan, China were infected (1). This highly infectious virus is now easily transmitted from human to human via close contact and respiratory droplets and COVID-19 is mainly presented with fever, dry cough and difficulty in breathing (3,4).

As there is no specific medication or vaccine against COVID-19 yet, the WHO carried out unprecedented, aggressive measures such as nationwide mandatory lockdowns, in order to interrupt and decelerate further transmission (1,5). Another measure

is the recruitment of a significant number of medical students (MSs) in the battle against COVID-19 in several roles (6).

Our purpose is to assess COVID-19 related knowledge, preventive behaviors and mental health among MSs and to propose ways on how they can safely be involved against COVID-19.

## Methods

A literature review was conducted via PubMed electronic database using the following terms: “medical students and COVID-19”, “mental health of medical students and COVID-19”, “knowledge of medical students and COVID-19”, “preventive behavior of medical students and COVID-19”.

An independent investigator screened the titles and abstracts. Only information that refers to MSs' roles and behaviors during COVID-19 pandemic and studies in English language were included. No restriction on article type, publication date or text availability was applied. A second investigator evaluated full texts. Relative data were also extracted.

## Results

A total of twenty articles met inclusion criteria, five of which assess the sources which MSs prefer to be informed about COVID-19, eight assess knowledge of MSs on COVID-19, seven present whether they demonstrate appropriate preventive behavior according to international guidelines and seven examine the impact of the pandemic on their mental health. Some articles combine more than one of the previously mentioned domains. The researchers of the included articles based their results on questionnaires answered by MSs. Five studies consider their role on the side of trained and certified healthcare workers.

### *Sources of Information Related to COVID-19 among Participants*

The major sources of information that MSs preferred in order to update their knowledge on the COVID-19 outbreak were investigated (Table 1).

The majority of the participants used social media (SM) and news (TV/radio/newspapers/journals) to acquire knowledge regarding COVID-19 (55.9% and 38.8% respectively). Less than 35% of MSs relied on medical search engines (like PubMed, MEDLINE, Google Scholar, EMBASE, etc.) and official websites (like National Ministry of Health official websites and WHO official website) for their information.

### *Knowledge on Transmission of COVID-19 among Medical Students*

Awareness among participants on potential ways for transmission of SARS-CoV-2 was assessed (Table 2).

The majority of MSs knew that SARS-CoV-2 can be transmitted through coughing and sneezing, through close contact (kissing/handshaking) with infected people and through contact with a contaminated surface (90.7%, 89.4% and 82.9%, respectively). Only 39.0% of the responders were aware that the virus can be transmitted through the contact with infected animals.

### *Knowledge on Clinical Symptoms of COVID-19 among Medical Students*

An estimation of the MSs' awareness of the clinical presentation of SARS-CoV-2 was conducted (Table 3).

Most of the students (92.1%) were acquainted with fever, fatigue and dry cough as common clinical symptoms of COVID-19, while a respective percentage (88.7%) knew that the disease could manifest with dyspnea. Only 38.3% of the respondents were aware that diarrhea is a less typical symptom.

### *Preventive Behaviors Implemented by Medical Students against COVID-19*

An evaluation of the strategies adopted by MSs to protect themselves and people around them from SARS-CoV-2 was carried out (Table 4).

The top four preventive behaviors implemented were covering nose/mouth when cough or sneeze (91.9%), staying at home (87.8%), avoiding crowded areas (83.8%) and avoiding close contacts (like shaking

**Table 1.** Responses of medical students to questions on sources of information related to COVID-19.

Reference	Social media	News	Official websites	Medical search engine
Khasawneh et al. (3) (n=1404)	531	501	432	379
Taghrir et al. (4) (n=240)	–	–	–	68
Ikhlaq et al. (5) (n=384)	204	42	26	–
Olum et al. (7) (n=741)	518	438	354	–
Çaliskan et al. (8) (n=860)	642	–	349	138
Total, % (n/N)	55.9 (1895/3389)	38.8 (981/2529)	34.3 (1161/3389)	23.4 (585/2504)

**Table 2.** Responses of medical students to questions on knowledge of transmission of COVID-19.

Reference	Coughing and sneezing	Animals	Close contact (kissing/handshaking)	Contaminated surface
Echoru et al. (1) (n=52)	49	13	42	46
Khasawneh et al. (3) (n=1404)	1277	597	1322	1368
Taghrir et al. (4) (n=240)	223	198	220	–
Ikhlaq et al. (5) (n=384)	–	–	374	–
Olum et al. (7) (n=741)	734	–	735	667
Çaliskan et al. (8) (n=860)	777	189	–	774
Gao et al. (9) (n=388)	388	–	175	275
Modi et al. (10) (n=517)	363	–	–	154
Total, % (n/N)	90.7 (3811/4202)	39.0 (997/2556)	89.4 (2868/3209)	82.9 (3284/3962)

**Table 3.** Responses of medical students to questions about COVID-19 clinical symptoms.

Reference	Fever, fatigue, dry cough	Dyspnea	Diarrhoea
Echoru et al. (1) (n=52)	41	39	–
Taghrir et al. (4) (n=240)	216	216	216
Ikhlaq et al. (5) (n=384)	353	353	140
Olum et al. (7) (n=741)	667	649	67
Çaliskan et al. (8) (n=860)	–	–	–
Gao et al. (9) (n=388)	386	–	248
Total, % (n/N)	92.1 (1663/1805)	88.7 (1257/1417)	38.3 (671/1753)

hands, kissing etc.) (82.5%). Additionally, more than 70% of the MSs adopted behaviors like washing hands regularly with soap and water or using disinfectants. Avoiding touching face and wearing a face mask were the less popular precautionary measures among them, with a percentage of 61.7% and 46.7% respectively.

#### *Impact of COVID-19 on medical students' mental health*

The degree of the psychological impacts amongst participants due to the widespread disease was also investigated (Table 5).

**Table 4.** Responses of medical students to questions on implemented preventive behaviors for protection against COVID-19.

Reference	Cover when cough/sneeze	Avoid close contacts	Face masks	Avoid crowded areas	Wash hands regularly	Disinfectants	Avoid touching face	Stay home
Echoru et al. (1) (n=52)	50	41	49	44	41	18	–	16
Haque et al. (2) (n=704)	645	652	542	662	669	552	604	619
Khasawneh et al. (3) (n=1404)	–	1040	136	1067	1222	966	–	1167
Taghrir et al. (4) (n=240)	–	227	–	239	232	–	–	–
Olum et al. (7) (n=741)	–	631	170	–	–	–	359	–
Rzymiski & Nowickib (11) (n=85)	–	–	37	–	–	–	–	–
Xiao et al. (12) (n=933)	–	–	898	–	303	–	504	914
Total, % (n/N)	91.9 (695/756)	82.5 (2591/3141)	46.7 (1832/3919)	83.8 (2012/2400)	74.0 (2467/3333)	71.0 (1536/2160)	61.7 (1467/2378)	87.8 (2716/3093)

**Table 5.** Impact of COVID-19 on medical students' mental health.

Reference	Fear of COVID-19/ infection	Stress/anxiety	Depression
Ikhlaq et al. (5) (n=384)	215	–	–
Liu et al. (13) (n=217)	–	48	77
Çaliskan et al. (8) (n=860)	556	–	–
Xiao et al. (12) (n=933)	–	160	236
Nguyen et al. (14) (n=5423)	3370	416	–
Meo et al. (15) (n=530)	171	206	125
Liet al. (16) (n=764)	–	190	–
Total, % (n/N)	59.9 (4312/7197)	13 (1020/7867)	26.1 (438/1680)

Fear of infection by COVID-19 is evident among a large part of MSs (59.9%). The results also demonstrate that the prevalence of depression is 26.1%, while 13% of MSs experience some state of anxiety/stress.

### Contribution of medical students to the pandemic

Many authors agree that MSs could provide updated information about the disease, correcting at the

same time common misconceptions (17,18,19,20). Moreover, they supported the opinion that MSs could raise public's awareness about the importance of preventive behaviors, by explaining why such measures are useful against the pandemic (17,18,19,20). They could work in call centers by answering calls of concerned people and providing guidance and instructions (6,17,18,19,20). Furthermore, it is proposed that MSs could aid healthcare professionals with childcare and other personal responsibilities that might distract

them from work (17,18,20). It had been noticed that MSs' assistance in tracing contacts of infected people and screening was of immense value, while a study suggested that they could work in COVID-19 labs focused on testing and results distribution (6,18).

## Discussion

Inevitably, MSs could not remain uninvolved in the fight against COVID-19. The present study evaluates the related knowledge on COVID-19, preventive behaviors and mental health among MSs, as well as ways they can be involved in efforts to curb the SARS-CoV-2 pandemic.

As far as acquisition of knowledge about COVID-19 is concerned, a considerable number of MSs (55.9%) relied on SM, whereas a lesser portion used verified sources of information like Medical search engines or health organization official websites (23.4% and 34.3% respectively). This could be a worrying trend when imagining MSs' information-seeking behaviors as future practicing physicians. It should raise governments' awareness regarding the major role that SM play in public information and at the same time underlines the need of making reliable sources of information more attractive (3).

The majority of MSs display an adequate level of knowledge about COVID-19. More than 89% identified fever, cough, fatigue and difficulty in breathing as the most common manifestations of the disease, while only 38.3% were aware that diarrhea is also a symptom. The last may be due to the fact that diarrhea appears at a lower rate among symptoms and in its insufficient promotion by SM (5).

Perception of MSs on ways of transmission of COVID-19 was higher in the order of "Coughing and sneezing" > "Close contact (kissing/handshaking)" > "Contaminated surface" > "Animals", which confirms that they are aware of the main pathways of transmission, so they are able to protect themselves and others from getting infected. More specifically, 91.9% of the participants cover their mouth/nose when coughing/sneezing while approximately 83% avoid close contacts and crowded areas or prefer to stay home at a rate of 87.8%. More than 70% of MSs responded that

they wash their hands regularly and use disinfectants. These findings conform to the opinion that there is a connection between someone's level of education and precautionary measures adopted (2). Nevertheless, an unexpectedly low percentage (46.7%) reported wearing a mask when being outside as a preventive measure. This could be explained by differences in policies imposed by governments, differences in the level of education, attitudes and cultures, previous exposures to similar situations or by the misguided perception that people who wear masks are infected and should be avoided (3,11). A higher level of training is crucial as far as protection provided by face-masks is concerned (3).

Only a minority of MSs had to deal with mental disorders including stress/anxiety and depression (13% and 26.1% respectively). It seems that they cope appropriately with the pandemic's pressure and its aftermaths (15). The same is not true about the feeling of fear; approximately 60% of MSs were afraid of the virus and had thoughts that they or their family could be infected. It is noted that as the level of training raises, fear diminishes proportionally (8). Again, better education is essential for the establishment of a better attitude against COVID-19. Nguyen et al. noticed that there are some predisposing factors which render participants more vulnerable to the sense of fear, such as first academic years, female gender, limited capability of affording remedies and lower level of health training (14). In addition, the extended misinformation about COVID-19, as well as MSs' suddenly increased workload and rearrangement of their academic program, could disrupt their mental balance and make them feel stressed (13).

During COVID-19 pandemic, a significant number of MSs felt the need to support national healthcare systems (6). Even if they are not certified physicians, their contribution could be of paramount importance. However, it has been suggested that their valuable assistance should be restricted outside hospitals, as they do not have the appropriate experience and knowledge - especially in the preclinical stage of education - to take over patients and responsibilities on their own without supervision (6,19). Additionally, participating within the front line of this battle by treating infected people in hospitals means that MSs are exposed to

great danger of infection. In this way, they could be the major link in the chain of SARS-CoV-2 transmission among hospital patients, their families and people with whom they socialize (6,18,20). For these reasons, many authors recommend that they should volunteer in other ways, like providing up-to-date information about COVID-19, setting themselves as examples by adopting the recommended precautionary behaviors and urging the public to implement these measures (17,18,19,20). They could also volunteer in call centers responding to public's questions and clarifying potential misconceptions that may cause distress (6,17,18,19,20). Moreover, it is proposed that they could relieve healthcare workers from personal daily responsibilities (17,18,20). Finally, handling, sampling and distribution of results in labs, or even assistance in tracing contacts of infected people and screening, may be alternative ways for MSs to reinforce the fight against COVID-19 (6,18).

In conclusion, this study identifies MSs to be well informed regarding COVID-19 transmission and symptoms, even if they select SM as the primary source of information. The preventive behaviors they have adopted are adequate, excluding wearing a mask, which is not such a popular measure among them. A significant proportion admitted being afraid of the virus or getting infected, while the minority dealt with depression or anxiety disorders. During this difficult period, MSs who have a sense of duty can still contribute to the mission for which they signed up for, without danger of being infected, by informing the public of the importance of proper precautions and volunteering in labs or call centers.

**Conflict of Interest:** Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article

## References

- Echoru I, Kasozi KI, Usman IM, et al. University Lecturers and Students Could Help in Community Education About SARS-CoV-2 Infection in Uganda. *Health Serv Insights*. 2020;13:1178632920944167.
- Haque A, Mumtaz S, Khattak O, Mumtaz R, Ahmed A. Comparing the preventive behavior of medical students and physicians in the era of COVID-19: Novel medical problems demand novel curricular interventions. *Biochem Mol Biol Educ*. 2020;10.1002/bmb.21406.
- 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.
- 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.
- Ikhlaq A, Bint-E-Riaz H, Bashir I, Ijaz F. Awareness and Attitude of Undergraduate Medical Students towards 2019-novel Corona virus. *Pak J Med Sci*. 2020;36 (COVID19-S4):S32-S36.
- Hagana A, Cecula P. Medical Students in the Time of COVID-19: Opportunities and Challenges. *AEM Educ Train*. 2020;4(3):291.
- 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.
- Çalışkan F, Mıdık Ö, Baykan Z, et al. The knowledge level and perceptions toward COVID-19 among Turkish final year medical students. *Postgrad Med*. 2020;1-9.
- Gao Z, Ying S, Liu J, Zhang H, Li J, Ma C. A cross-sectional study: Comparing the attitude and knowledge of medical and non-medical students toward 2019 novel coronavirus. *J Infect Public Health*. 2020;S1876-0341(20)30561-X.
- Modi PD, Nair G, Uppe A, et al. COVID-19 Awareness Among Healthcare Students and Professionals in Mumbai Metropolitan Region: A Questionnaire-Based Survey. *Cureus*. 2020;12(4):e7514.
- Rzymiski P, Nowicki M. COVID-19-related prejudice toward Asian medical students: A consequence of SARS-CoV-2 fears in Poland. *J Infect Public Health*. 2020;13(6):873-876.
- Xiao H, Shu W, Li M, et al. Social Distancing among Medical Students during the 2019 Coronavirus Disease Pandemic in China: Disease Awareness, Anxiety Disorder, Depression, and Behavioral Activities. *Int J Environ Res Public Health*. 2020;17(14):5047.
- Liu J, Zhu Q, Fan W, Makamure J, Zheng C, Wang J. Online Mental Health Survey in a Medical College in China During the COVID-19 Outbreak [published correction appears in *Front Psychiatry*. 2020 Aug 14;11:845]. *Front Psychiatry*. 2020;11:459.
- Nguyen HT, Do BN, Pham KM, et al. Fear of COVID-19 Scale-Associations of Its Scores with Health Literacy and Health-Related Behaviors among Medical Students. *Int J Environ Res Public Health*. 2020;17(11):4164.
- Meo SA, Abukhalaf AA, Alomar AA, Sattar K, Klonoff DC. COVID-19 Pandemic: Impact of Quarantine on

- Medical Students' Mental Wellbeing and Learning Behaviors. *Pak J Med Sci.* 2020;36(COVID19-S4):S43-S48.
16. Li Y, Wang Y, Jiang J, et al. Psychological distress among health professional students during the COVID-19 outbreak. *Psychol Med.* 2020;1-3.
  17. Long N, Wolpaw DR, Boothe D, et al. Contributions of Health Professions Students to Health System Needs During the COVID-19 Pandemic: Potential Strategies and Process for U.S. Medical Schools. *Acad Med.* 2020;10.1097/ACM.0000000000003611.
  18. Guragai M. Nepalese Medical Students in the COVID-19 Pandemic: Ways Forward. *JNMA J Nepal Med Assoc.* 2020;58(225):352-354.
  19. Hjiej G, Fourtassi M. Medical students' dilemma during the Covid-19 pandemic; between the will to help and the fear of contamination. *Med Educ Online.* 2020;25(1):1784374.
  20. Khamees D, Brown CA, Arribas M, Murphey AC, Haas MRC, House JB. In Crisis: Medical Students in the COVID-19 Pandemic. *AEM Educ Train.* 2020;4(3):284-290.

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Received: 29 October 2020

Accepted 13 November 2020

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