



Knowledge, Attitude, and Behavior of Egyptian Medical Students Toward the Novel Coronavirus Disease-19: A Cross-Sectional Study

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Abstract

BACKGROUND: People in times of pandemics, crave after any medical field member (including medical students) to gain their knowledge and correct their behaviors.

AIM: We aimed to assess medical students' coronavirus disease (COVID)-19 related knowledge, attitude, and behavior (KAB).

METHODS: The study is an exploratory cross-sectional study, conducted among medical students using an online survey. Medical students were classified according to their current academic year into either early year's group (first 3 years in the medical school) or final year's group (past 3 years in the medical school).

RESULTS: A total of 2255 students completed the questionnaire. Regarding their COVID-19 related knowledge; 63.4% gave unsatisfactory responses (answered <75% of the questionnaire items correctly). Most of males (62.9%) and females (64.1%) gave unsatisfactory responses.

CONCLUSION: Most of students had unsatisfactory responses of the current pandemic; however, the final year's group had a significantly higher score in nearly all questionnaire (KAB) subsections than the early year's group. The majority of both groups significantly believed that there are undeclared numbers in Egypt. Facebook and other platforms were the most common sources of information.

Edited by: Mirko Spiroski

Citation: Abd El Fatah SAM, Salem MR, Abdel Hakim AS, El Desouky ED. Knowledge, Attitude, and Behavior of Egyptian Medical Students Toward the Novel Coronavirus Disease-19: A Cross-Sectional Study. Open Access Maced J Med Sci. 2020 Nov 07; 8(T1):443-450. <https://doi.org/10.3889/oamjms.2020.5279>

Keywords: Attitude; Behavior; Coronavirus disease-19; Medical students; Knowledge

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Received: 18-Jul-2020

Revised: 24-Oct-2020

Accepted: 28-Oct-2020

Copyright: © 2020 Shaimaa A.M. Abd El Fatah, Marwa Rashad Salem, Ahmed Sallam Abdel Hakim, Eman D. El Desouky

Funding: Publication of this article was financially supported by the Scientific Foundation SPIROSKI, Skopje, Republic of Macedonia

Competing Interests: The authors have declared that no competing interests exist

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Introduction

Coronavirus (CoV) disease (COVID-19), the new comer to the viral, droplet infectious disease family has aroused attention of millions of researchers and physicians all over the world [1].

Worldwide, since pneumonia of unknown cause detected in Wuhan, China; and up till now (Mid May 2020); 216 territories or countries have reported cases. The total confirmed cases are 4,248,389; the total recovered cases are 1,521,397, and finally the total deaths are 292,046 [2], [3].

Egypt, with more than 105 million citizens, is the most populous country in North Africa, Arab region, and the Middle East. This big number of citizens could be correlated with a grave, drastic risk of spread, and mortality [4]. In Egypt, the official figures brought out by Egyptian Ministry Of Health and Population (MOHP) exhibit that the total infected cases are 10,431, the total recovered cases are 2172, and finally the total deaths are 556 [5].

The epidemiological profile of COVID-19 is currently under vigorous investigations; starting from causative organism origin, prevention (General and specific), treatment, and finally control measures [6]. The WHO carefully monitors this emerging pandemic and information is updated continuously as more evidence becomes available [7].

Medical students are the future healthcare workers (HCWs) and the volunteers in times of need. Addressing their current knowledge, attitude, and behavior (KAB) of this newly emerging pandemic is a vital necessity, not only to be able to protect themselves but also to disseminate the correct information to their local communities [8]. People in times of pandemics, and sever fright crave after any medical field member (including medical students) to gain their knowledge and correct their behaviors [9], [10].

Infection Prevention and Control (IPC) recommendations can only be set after recognizing how HCW and in the heart medical students, perceive COVID-19 virus and translate their knowledge into practical

guidelines to minimize risk of infection [11], [12]. That is why we urged to perform this survey among medical students to assess their COVID-19 related KAB.

Methods

Study design and setting

The study is an exploratory cross-sectional study, performed among medical students to assess their COVID-19 related KAB. An online survey through Google Form was created, and disseminated through the Facebook application, one of the most frequently utilized social media in Egypt. To attain a high response rate, groups with large numbers of medical students were approached by the researchers. To obtain permission to spread this survey, requests were sent to administrators of these groups. Then, the link of the survey with an encouraging statement including its purpose was posted by the researchers.

Sample size and sampling technique

A total of 2255 medical students were recruited by consecutive sampling technique during the study duration from March 1, 2020, to April 1, 2020. Participants were excluded from the study if they were not medical students.

Data collection tool

A pre-tested electronic questionnaire was used to collect data from the study participants. It included four sections:

Socio-demographic characteristics

Age, sex, education, university, and educational year.

Medical students involved in this study were classified according to their current academic year into either the early year's group (first 3 years in the medical school) or final years group (last 3 years in the medical school).

Knowledge of study participants regarding COVID-19

Composed of a total of 30 items addressed modes of transmission, the symptoms, and complications (12 questions), and prevention and treatment (18 questions). The questions formatted in close-ended with yes, no, and do not know options. The

questions were coded so that true answers were given a score of 1, while wrong answers or answering with I don't know were given a score of 0. The total raw score (if all answers are correct) was 30. Percent score was calculated by dividing the raw score over 30 (maximum achievable score) and then multiplying the result by 100.

Knowledge status was classified into satisfactory and unsatisfactory

Satisfactory knowledge: considered when the students gave correct answers to 75% or more of the questionnaire items.

Questions used in this section were adopted from the available literature [13], [14].

For further assessment of study participants' attitude toward COVID-19; six questions were used to assess medical student's attitude toward COVID-19. The questions formatted in close-ended with yes, no, and do not know options. Questions used in this section were adopted from the available literature [13], [14].

Attitude questions included inquiry on

Possibility to prevent infection by following the methods of prevention declared by the MOHP, undeclared numbers in Egypt, readiness to take corona vaccination if present, ability of government in Egypt to control the spread of the disease, if this virus is a biological warfare.

Five questions were used to assess behavior formatted in close-ended with yes, no. Questions used in this section were adopted from the available literature [13], [14].

Behavior questions included inquiry on

Worries that someone in family will be ill, wearing gloves, wearing masks in daily activities, using alcohol or sterile gel to cleanse hands constantly, washing hands many times a day, using diluted chlorine with water to cleanse the surfaces.

Sources of knowledge about COVID-19; using multiple options format, which included scientific websites, literature, colleagues and or health-care providers, television, internet, Facebook, WhatsApp, WHO website, CDC, MOHP, and others including Twitter, and Instagram.

A pilot test was performed to test the clarity of the questions by interviewing ten participants (not included in the study). The required modifications were applied. The content of the questionnaire was validated by four faculty members who are experts in public health and the required modifications were done. Reliability was tested using internal consistency and a Cronbach's Alpha ranging from 0.59 to 0.80 was found for the 30 knowledge questions.

Statistical analysis

Statistical Package for the Social Science program (SPSS, version 24) was applied for data analysis. The median and interquartile range were utilized to sum up quantitative variables while frequency and percentage were utilized, to sum up qualitative variables. Chi-square test and cross-tabulations were done for bivariate analysis. Meanwhile, Mann–Whitney test was used for quantitative data analysis. $p < 0.05$ was considered statistically significant.

Ethical considerations

Study approval was acquired from the Research Ethics Committee, Faculty of Medicine, Cairo University under number F-15-2020.

Informed consent was attained directly from the study participants after clarification of the study aim and importance of the online-form before data collection. Only those who agreed were included and those who refused were excluded from the study by submitting empty form after answering “Not willing to participate.” All procedures for data collection were treated with confidentiality according to the Helsinki Declarations of biomedical ethics.

Results

A total of 2255 students completed the questionnaire; about half of them were males (44.9%). About two-thirds of the students (66.7%) belonged to the early year’s group. Regarding their response to the questionnaire item; 63.4% gave unsatisfactory knowledge responses. Most of males (62.9%) and females (64.1%) gave unsatisfactory responses ($p = 0.564$). Similarly, most of the early years group (67.1%) and the final years group (56.6%) significantly gave unsatisfactory responses ($p < 0.001$) (Figure 1).

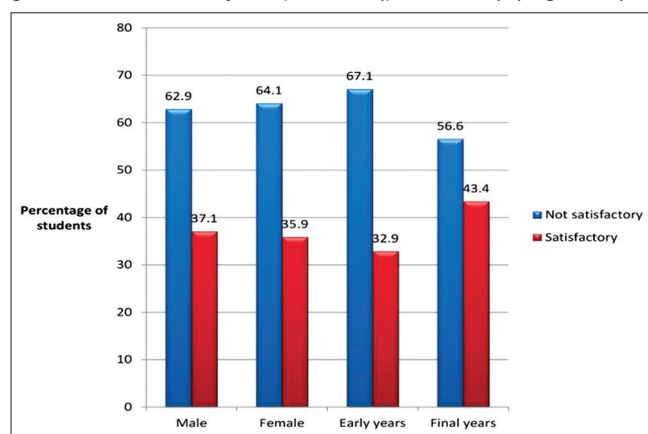


Figure 1: Summarization of the level of knowledge about coronavirus disease-19 among medical students, Egypt

Figure 2 shows that the Facebook was most common source of medical students’ information about COVID-19 virus regardless of their academic year, whereas TV (57.4%) and WhatsApp groups (18.7%) were significantly the major sources of information for early years group, the doctors (or colleagues) (54.7%), and the WHO (16.8%) were the major sources of information for final years group ($p < 0.001$).

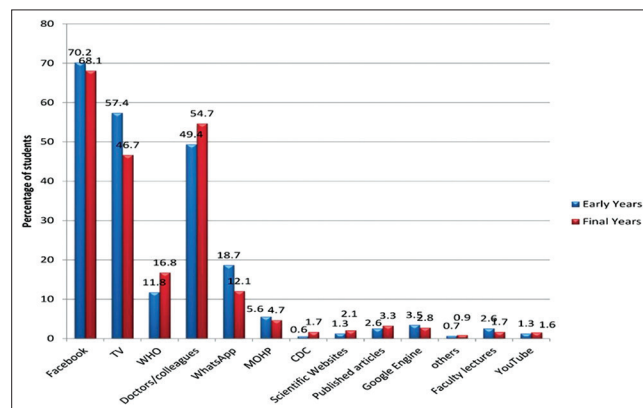


Figure 2: Source of information about coronavirus disease-19 among medical students, Egypt

Concerning students’ knowledge about COVID-19 transmission, symptoms, and testing; most of the final years group significantly and correctly responded to most of the questionnaire items; $p < 0.001$. Whereas most of the early years group responded significantly and correctly to only three questions as follows: Direct contact without protection with infected wild animals (60.1%), the possibility of infecting young people are less than the elderly (55.2%) and COVID-19 testing is done for returnees from traveling from countries with societal prevalence even without the appearance of symptoms (86.5%); $p < 0.001$. The difference in the median of the total knowledge score across the 12 items of this questionnaire section between the early and final year’s groups was not significant (Table 1).

As for students’ knowledge about COVID-19 prevention and treatment; most of the final year’s group correctly responded to almost all questionnaire items except for only five questions where the early year’s group surpassed them. The five questions were about: Eating more nutritious foods to strengthen the immune system (96.8%), covering nose and mouth during coughing (99.1%), abstinence from touching sick animal (79.6%), good cooking of meat and heating milk to avoid transmission of the disease (79.2%), and possibility to treat COVID-19 with regular cold medication in cases without complications (36.5%). The difference in the median of the total knowledge score across the 18 items of this questionnaire section between the early and final years groups was statistically significant; $p < 0.001$ (Table 2).

The attitude assessment section of the survey disclosed that the majority of both the final year’s group (84.8%) and the early year’s group (78.2%) believed that there are undeclared numbers in Egypt with a statically

Table 1: Comparison between early and final years medical students regarding COVID-19 related knowledge (Disease transmission, symptoms, and testing)

Disease transmission, symptoms, testing	Correct answer	Early years (n = 1503) No. (%)	Final years (n = 752) No. (%)	p-value*
Direct contact without protection with infected wild animals	Yes	903 (60.1)	343 (45.6)	<0.001*
The virus is transmitted between humans by droplets (sneezing)	Yes	1447 (96.3)	740 (98.4)	0.005*
The incubation period is from 2 to 14 days	Yes	1405 (93.5)	730 (97.1)	<0.001*
Fever, coughing, and shortness of breath are symptoms of infection with the new coronavirus	Yes	1483 (98.7)	748 (99.5)	0.081
COVID-19 symptoms could be self-limited?	Yes	1054 (70.1)	631 (83.9)	<0.001*
Complications of the disease are more severe in the elderly and people with chronic diseases such as diabetes	Yes	1471 (97.9)	745 (99.1)	0.040*
The possibility of infecting young people is less than elderly	Yes	829 (55.2)	357 (47.5)	0.001*
Is it possible for the patient to be infected without any symptoms?	Yes	1258 (83.7)	693 (92.2)	<0.001*
COVID-19 testing is done for contacts of positive cases without the appearance of symptoms?	No	273 (18.2)	169 (22.5)	0.015*
COVID-19 testing is done for contacts of positive cases when symptoms appear during active surveillance?	Yes	1035 (68.9)	543 (72.2)	0.102
COVID-19 testing is done for returnees from traveling from countries with societal prevalence even without the appearance of symptoms	Yes	1300 (86.5)	575 (76.5)	<0.001*
COVID-19 testing is done for suspected cases, provided symptoms occur	Yes	805 (53.6)	439 (58.4)	0.030*
Total score				
Median (IQR)		9 (8–10)	9 (8–10)	0.288

*p < 0.05. COVID: Coronavirus disease.

Table 2: Comparison between early and final years medical students regarding COVID-19 related knowledge (Disease prevention and treatment)

Disease prevention and treatment	Correct answer	Early year's (n = 1503) No. (%)	Final year's (n = 752) No. (%)	p-value
One of the methods to prevent spread is good ventilation living places	Yes	1230 (81.8)	662 (88.0)	<0.001†
Staying away from crowded places and keep safe distances	Yes	1497 (99.6)	750 (99.7)	0.616
Eating more nutritious foods to strengthen the immune system	Yes	1455 (96.8)	713 (94.8)	0.021†
Washing hands with soap and water helps to prevent transmission of the disease	Yes	1476 (98.2)	746 (99.2)	0.063
Covering nose and mouth during coughing	Yes	1489 (99.1)	740 (98.4)	0.164
Maintaining surfaces clean	Yes	1492 (99.3)	749 (99.6)	0.345
Abstinence from touching sick animal	Yes	1196 (79.6)	486 (64.6)	<0.001†
Good cooking of intentioned meat and heating milk to avoid transmission of the disease	Yes	1190 (79.2)	478 (63.6)	<0.001†
There is a vaccination for the new coronavirus	No	1229 (81.8)	682 (90.7)	<0.001†
COVID-19 can be cured	Yes	1286 (85.6)	679 (90.3)	0.002†
Antibiotics are the first means to treat disease	No	1013 (67.4)	631 (83.9)	<0.001†
Is it possible to treat COVID-19 with regular cold medication in cases without complications?	No	549 (36.5)	155 (20.6)	0.089
Confirmed cases should go to hospitals regardless the severity of symptoms	No	642 (42.7)	491 (65.3)	<0.001†
Home isolation must be done for contacts with confirmed cases	Yes	1233 (82.0)	681 (90.6)	<0.001†
Hospital quarantine must be done for contact with confirmed cases	No	375 (25.0)	349 (46.4)	<0.001†
Home insolation is done for positive cases	No	930 (61.9)	499 (66.4)	0.037†
Quarantine must be done for confirmed cases	Yes	1411 (93.9)	716 (95.2)	0.197
Hydroxychloroquine is a prophylaxis drug for COVID-19	No	436 (29.0)	387 (51.5)	<0.001†
Total score				
Median (IQR)		14 (12–15)	14 (13–15)	<0.001†

†p < 0.05. COVID: Coronavirus disease.

Table 3: Comparison between early and final year's medical students regarding COVID-19 related attitude and behavior

Attitude and behavior	Early years (n = 1503) No. (%)	Final years (n = 752) No. (%)	p-value
Attitude			
Is it possible to prevent it by following the methods of prevention declared by the Ministry of Health			
Yes	1452 (96.6)	737 (98.0)	0.172
No	26 (1.7)	7 (0.9)	
I don't know	25 (1.7)	8 (1.1)	
If the corona vaccination is present, you will take it or not			
Yes	1350 (89.8)	665 (88.4)	0.596
No	84 (5.6)	47 (6.3)	
I don't know	69 (4.6)	40 (5.3)	
Do you think that there are Undeclared no. in Egypt			
Yes	1176 (78.2)	638 (84.8)	0.001†
No	131 (8.7)	51 (6.8)	
Can the government in Egypt control the spread of the disease?			
I don't know	196 (13.0)	63 (8.4)	
Yes	610 (40.6)	222 (29.5)	<0.001†
No	445 (29.6)	297 (39.5)	
I don't know	448 (29.8)	233 (31.0)	
Do you think this virus is a biological warfare?			
Yes	568 (37.8)	189 (25.1)	<0.001†
No	615 (40.9)	376 (50.0)	
I don't know	320 (21.3)	187 (24.9)	
Behavior			
Are you worried that someone in your family will be ill?			
Yes	1360 (90.5)	706 (93.9)	0.006
No	143 (9.5)	46 (6.1)	
Do you wear gloves in your regular daily activities now?			
Yes	580 (38.6)	172 (22.9)	<0.001†
No	923 (61.4)	580 (77.1)	
Do you wear masks in your daily activities now?			
Yes	681 (45.3)	288 (38.3)	0.002†
No	822 (54.7)	464 (61.7)	
Do you use alcohol or sterile gel to cleanse hands constantly?			
Yes	1194 (79.4)	621 (82.6)	0.076
No	309 (20.6)	131 (17.4)	
Do you wash your hands many times a day?			
Yes	1442 (95.9)	742 (98.7)	<0.001†
No	61 (4.1)	10 (1.3)	
Do you use diluted chlorine with water to cleanse the surfaces?			
Yes	1229 (81.8)	628 (83.5)	0.307
No	274 (18.2)	124 (16.5)	

†p < 0.05. COVID: Coronavirus disease.

significant difference between early and final year's groups. Most of both groups either completely did not believe or did not know whether the government in Egypt could control the spread of the disease and whether this virus is a biological warfare or not; $p < 0.001$ (Table 3).

Regarding the behavior section of the survey disclosed the early year's group significantly outreached the final year's in wearing gloves (38.6%), and wearing masks (45.3%) in regular daily activities; $p < 0.001$. However, the final year's group significantly outreached them in washing their hands many times a day ($p = 0.001$) (Table 3).

Discussion

We assessed the (KAB) of some Egyptian medical students regarding COVID-19. Our study displayed that knowledge and attitude responses toward COVID-19 were not significantly different with regard to socio-demographic variables such as gender and years of experiences. Particularly, gender findings goes in accordance with a recent Egyptian COVID-19 survey among the general public which demonstrated similar and non-significant differences in the knowledge mean scores between male and female participants [15]. Furthermore, our gender findings go in consonance with the disclosures of a previous Malaysian survey among final year medical students which investigated their knowledge of mandatory notifiable infectious diseases (TD) [9]. In developing countries, this is particularly important because the students' future role as HCWs in the country's disease surveillance system is one of the major constituents to fight against TD.

The current study divulged that Facebook and other internet sources were the most widespread sources of students' information. Our findings are in accordance with many national studies which reported that more than seventy percent of participants used the Facebook as the main social media platform in Egypt [15], [16].

More than 75% of Facebook users in Egypt are in the youth age groups between 18 and 40 years including medical students. In 2019, Facebook platform users increased from 33 million in 2016 to more than 40 million [17].

In the same time, many international studies similarly reported social media and television as the chief information sources [18], [19], [20].

Meanwhile, this differs from the findings of a regional study in Saudi Arabia, where 50% of the participants relied on the official Ministry of Health website as the principal information source about Middle East respiratory syndrome (MERS) [10]. Taken together, these findings endorse the weightiness of using such platforms for propagation the health information and

educational messages about COVID-19 transmission, prevention, and control. Due to increased awareness of policymakers about the importance of social media platforms, the Egyptian MOHP started recently using COVID-19 sponsored ads on Facebook [15]. Although social media platforms provide an affluent and at hand methods of obtaining information, likewise they can be an origin of misinformation. An eminent example includes fake news on Facebook about potential drugs, and vaccines [21]. Alertness while using these platforms must be regarded, to avoid the circulation of rumors and fabricated data.

As expected, the final years group had a significantly higher score in nearly all knowledge questionnaire (disease transmission, symptoms, and testing) subsections than the early years group. This goes in concordance with a recent Indian COVID-19 awareness survey among health care professionals, where the medical undergraduate students sub-group gave the highest percentage of correct responses (74.10%) [22]. Final year's group enjoys acceptable knowledge level due to multiple information sources starting from formal curricular teaching, self-directed learning, and informal bedside practice [23]. Moreover, other than formal curriculum teaching, the raised knowledge testified among final year's students may be on account of their previous knowledge regarding the outbreak of MERS-CoV which occurred in neighboring Gulf countries in 2015 [24], [25]. Meantime, the fact that more than half of the early year's students believed the possibility of infecting young people are less than the elderly, goes hand in hand with the Egyptian general public COVID-19 survey where great majority of participants believed that the disease complications are more severe in the elderly and people with chronic diseases as diabetes [15]. In China, many studies were published affirming these facts about the disease [26], [27].

Our results uttered that most of early years medical students had a lower level of knowledge about COVID-19 prevention and control subsections. These finding are matching with the disclosures of three analogous survey studies performed at different times in neighboring Saudi Arabia. They all investigated knowledge and information sources among medical students regarding MERS-CoV and ID control [13], [20], [23]. The first one investigated knowledge and attitudes toward (MERS-CoV) and exhibited that the majority of students had significantly lower knowledge compared with the physicians and nurses [13]. The second survey investigated knowledge, attitude, and practice of secondary schools and university students toward (MERS-CoV) epidemic in Saudi Arabia [20]. The third one which investigated medical students' (KAB) regarding standard precautions and infection control, at a Saudi university, were much subsidiary than expected [23]. Causes behind COVID-19 poor knowledge resides in the nature of the disease itself, being a newly emerging pandemic disease, information concerning threats of infection and control

are still explored and investigated rigorously by many scientists in many parts of the world [28], [29].

Saudi Arabia and India had previously reported similar findings among medical students while investigating Zikavirus outbreaks which caused venerable morbidity and mortality in several countries since its epidemic started in Brazil in 2015 [18], [30]. With respect to staying away from crowded places and keep safe distances, almost all our students gave correct answer. This goes in conformity with the Indian COVID-19 awareness survey where the highest number of correct responses regarding correct definition of "close contact" was from the medical undergraduate students [22]. Awareness of the correct "close contact" definition (like the US CDC one) is particularly important for all paramedical personnel such as medical students or managerial staff [31]. Although these groups are not dynamically plunged in patient management, there is high potentiality of having patient contact at certain point in the health-care facilities and accordingly at hazard of contracting and propagation of the infection.

The fact that almost all early years group surpassed in their knowledge regarding the importance of general preventive measures such as covering nose and mouth during coughing (by wearing face masks), reflects the cautious wary among those students more than their older counter fellows. These matches with the Egyptian general public COVID-19 survey where about three quarters of participants believed that putting a face mask can protect from infection [15].

The CDC recently commended putting cloth face masks for the public, especially in regions where there is grave, exalted possibilities of community-based transmission [32]. During the current pandemic time, it is commended that preventive measures guidelines must be set by governments and local public health authorities. Although constant exploitation of masks creates a burden on the limited, available resources, the WHO commends the continuous use of medical masks by HCW and caregivers in areas of known or suspected community transmission regardless of whether direct care to COVID-19 patients is being provided or not [33], [34].

The majority of both early and final year's students correctly believed that home isolation not hospital quarantine must be done for contacts with confirmed cases. This disagrees with the findings of the Egyptian general public COVID-19 survey where nearly sixty percent were willing to stay in the hospital if they contacted an infected case [15].

Another strong predictor of a higher total knowledge score was accomplishment of an ID clinical round which is vital in adapting and retaining ID transmission, prevention, and control knowledge. Many of the early year's students who yielded unsatisfactory replies to questions of the survey lacked clinical experiences due to not yet obtaining their ID clinical rotation [35].

Meantime, the attitude questions where the early year's group significantly outreached the final year's group focused on using personal protective equipment (PPE) such as wearing masks and gloves. In the current study, the most well-distinguished spheres were the general concepts of standard precautions, hand hygiene, and PPE. This is because the medical curricula were rectified to maximize the highlighting of these spheres. Moreover, IPC conveyance is currently early commenced to health sciences students [23], [36], [37]. This goes in concurrence with the Indian COVID-19 awareness survey. For example, the highest number of correct responses regarding awareness of the right sequence for the mask application and hand hygiene was from the undergraduate medical students (42.2%) [22]. In our study, the majority of medical students significantly believed that there are undeclared numbers in Egypt. A finding of considerable concern which arises from inadequate, under reporting of COVID-19 cases. Due to a combination of insufficient diagnostic kits and tools provided by MOHP and/or the societal stigma associated with COVID-19 infection. Stigma arises due to fear from mortality and the high communicability which results in negative attitudes toward those infected. This can be worked out through meriting education, awareness, and transparency of health-care policies [38]. This goes in accordance with the Egyptian general public COVID-19 survey where 23% of participants thought the infection of the virus is associated with stigma [15]. Most of students either completely did not believe or did not know whether the government in Egypt could control the spread of the disease. Again, this could be explained by the increased effectiveness of the messages provided by the different social media platforms when used as a source of information. Sometimes, the negative assumptions dominate these platforms for example that media are exaggerating the COVID-19 risk [15]. In addition to, the ambiguity in distinguishing the validity and scientific purport of the official MOHP announcements as well as the likelihood of misinformation being expounded by local health departments [39]. Such departments behave in this way to minimize their responsibility over the disease spread in light of the minimal available resources (inadequately equipped hospitals, few diagnostic tools, and few HCW manpower) to combat COVID-19 spread. Again, most of students either completely did not believe or did not know whether this virus is a biological warfare or not. This goes hands in hands with the Egyptian COVID-19 survey among the general public where only quarter of their participants thought that the virus started as a biological weapon. This reflects the raising consciousness of the public when discussing controversial matters [15]. Many sounds lately have suggested that MOHP should temporarily permit senior grades medical undergraduates to treat COVID-19 patients. Such call has been previously made in developing country like India [40]. This initiative

could help plugging up the insufficiency of HCW and conceivably provide care to larger numbers of people.

Conclusion

In this study, most of students had unsatisfactory responses of the current pandemic; however, the final year's group had a significantly higher score in nearly all questionnaire (KAB) subsections than the early year's group. The majority of both groups significantly believed that there are undeclared numbers in Egypt. Facebook and other platforms were the most common sources of information. During epidemic time, a safe tool for educational interventions and awareness campaigns about COVID-19, arranged by health-care authorities; is through conducting "periodic webinars" for managing health team which also include medical students.

Limitations

Our study was "online" limited to the students active on social media who reached the survey, thus the results displayed here may not be generalizable to the rest of the country. Participation bias is also of a concern. Therefore, rounding off further on ground large-scale studies from other governorates (faculties of medicine and university hospitals) in Egypt is important to further inquire on (KAB) of medical students at the national level.

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