Electronic Journal of General Medicine
2022, 19(6), em415
e-ISSN: 2516-3507
https://www.ejgm.co.uk/

MODESTUM

Original Article

OPEN ACCESS

Knowledge, attitudes, practices, and their associated factors against the growing threat of COVID-19 among medical students

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Citation: Ketata N, Ben Ayed H, Trigui M, Maamri H, Ben Hmida M, Ben Jemaa M, Baklouti M, Yaich S, Kassis M, Feki H, Damak J. Knowledge, attitudes, practices, and their associated factors against the growing threat of COVID-19 among medical students. Electron J Gen Med. 2022;19(6):em415. https://doi.org/10.29333/ejgm/12465

ARTICLE INFO

Received: 01 Jun. 2022

Accepted: 31 Aug. 2022

ABSTRACT

Background: Coronavirusdiseasese 2019 (COVID-19) pandemic has affected the world deeply. Successfully control and minimization of related morbidity and mortality require changing the behavior, which is influenced by knowledge and perceptions. This study aimed to explore the level of knowledge, attitude, and practice of medical students (MS) regarding COVID-19 and to identify their associated factors.

Methods: A cross-sectional study involving 431 ungraduated MS was conducted in Sfax Medical School, Southern Tunisia, in November 2020.

Results: The global scores of COVID-19 knowledge, attitude and practice among MS were 74.6±13, 69±10.2, and 78.8±13.6/100, respectively. Prevalence of good knowledge, positive attitude and good practice was 47.1%, 19.3%, and 61.3%, respectively. In multivariate analysis, the independent factors of good knowledge were current smoking (adjusted odds ratio [AOR]=1.8; p=0.04), assistance to training sessions (AOR=1.5; p=0.04) and specialized residency education level (AOR=2.4; p=0.02). History of chronic disease was an independant predictor of positive attitude (AOR=2.4; p=0.009), while current smoking (AOR=0.4; p=0.01) wasindependantly associated with negative attitude. Social media used as a main source of information about COVID-19 was independently associated with poor knowledge (AOR=0.5; p=0.01) and negative attitude (AOR=0.4; p=0.008). Independant factors of good practice were specialized residency education level (AOR=2.4; p=0.01), being in close contact exposure with COVID-19 cases (AOR= 2.1; p=0.04) and having good knowledge (AOR=2.2; p<0.001).

Conclusion: Tunisian MS had satisfactory knowledge and practice about COVID-19, butthey had lower positive attitude rates towards this emergent disease. Thus, development of interactive courses on emerging diseases and travel epidemiology are higly recommended.

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

INTRODUCTION

Coronavirus diseasese 2019 (COVID-19) pandemic, generated by the novel coronavirus SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) has affected the world deeply [1] and was declared as a public health emergency of international concern by the World Health Organization (WHO). This pandemic has become a global public health threat and has evolved to become a crisis around the world [2], which called for collaborative efforts of all countries to prevent its rapid spread [3]. Over 75 million of COVID-19 cases and 1.6 million of deaths have been registered worldwide by 22 December 2020 [4]. In Tunisia, the first confirmed case was reported on March 2020 [5]. By the end of August, the National Observatory of Emerging Diseases stated that the situation is more and more worrying [6]. Until 25 December 2020, there were 126,752 positive individuals, including 4,324 (3.4%) related deaths in Tunisia [7]. The spread of COVD-19 is still alarmingly increasing from day to day. Although applying the preventive measures to control COVID-19 infection is the most critical intervention in Tunisia to curb the spread of the virus and rapid human-to-human transmission in healthcare settings, much about this virus remained unknown. Then, adherence to control and prevention steps is paramount for ensuring a complete success over COVID-19 [8]. In fact, poor understanding of the disease among healthcare professionals, service providers and medical sciences students, who are on the frontline of treating COVID-19 patients, may carry a potential risk and be implicated for this increase in the spread of the infection and death toll [9]. Therefore, successfully control and minimization of morbidity and mortality due to COVID-19 require changing the behavior, which is influenced by knowledgeand perceptions, especially of the healthcare staff and the future practionneers. In many cases, the accuracy of these beliefs may determine different behaviors about

prevention and could vary in the population. The knowledge, attitudes, and practices (KAP) studies, as an important cognitive key in public health regarding health prevention and promotion [10], provide a range of beliefs to determine the type of intervention that may be required to change misconceptions about the virus, notably for the future doctors. In light of the scarcity of studies assessing KAP towards COVID-19 in Tunisia, the current study aimed to explore the level of KAP of medical students (MS) in Sfax, Southern Tunisia regarding COVID-19 and to identify their associated factors.

MATERIAL AND METHODS

Study Design and Settings

A cross-sectional study involving ungraduated MS was conducted at the starting of the second wave of COVID-19 in Tunisia from 1 October 2020 to 10 November 2020 in Sfax Medical School, Southern Tunisia. In our country, medical curses contain three levels of studies, first-five academic years of basic and clinical studies, followed by one year of internship, and then three to five years of residency for specialized doctors, after which MS get their graduate degree.

Inclusion Criteria

MS from the three levels of the studies were eligible for the study. All enrollees of this survey were invited for voluntary participation in the study. They were informed of the survey purpose, modalities and were insured about the anonymity and confidentiality of their responses. Students who refused to answer the questionnaire or who had incompleted or missing data were ruled out from the study.

Sampling Procedures

The study protocol was rigorously written, with clear and precise objectives by expert teams. The study tools were standardized for all the participants and the sample size was previously calculated in order to minimize selection bias. To obtain a representative sample of MS, they were randomly selected from an exhaustive list of MS accessible at official platforms, proportionally to the number of MS at each level. The sample size was calculated by using the online sample size calculator RaoSoft®. Based on a total estimated population of 2300 MS in Sfax Medical School, and on the anticipated response of 50%, the minimum required sample size was 330 participants, with a confidence level of 95% and a 5% margin of error. To achieve an optimal response rate, keeping in mind a 20% dropout, a total of 460 MS were approached.

Data Collection and Study Tool

Data collection was performed online using Google Forms through an online questionnaire consisting of demographics and questions related to KAP regarding COVID-19. The questionnaire was first tested through a pilot study then validated by a team of experts in epidemiology. For internal validity, Cronbach's alpha coefficient was calculated and indicated acceptable internal consistency (0.8). The call for participation was posted online on several official platforms at each level accessible to MS, by class representatives for each academic year. Participants were allowed to answer the questionnaire just once. Selected participants were sent individualized emails that included a statement informing that participation is important, but at the same time is completely and their identities will stay anonymous to the reaserch team to maintain privacy and that their responses will be strictly confidential. The correct responses for all the questions were determined from the guidelines developed by the WHO for general public and healthcare workers [11]. The questionnaire consisted of two main parts, the first one included sociodemographic informations of MS such as gender, age, marital status, medical education level, and medical speciality for residents. Informations about current smoking, history of chronic disease, close contact with infected persons, previous training about COVID-19 and sources of information, such as social media, google search and medical search engines, family, and friends or from healthcare workers were also collected. The second part, which was developed after reviewing litterature, comprised questions about knowledge, attitude, and practices of COVID-19. Knowledge was assessed using a 21-item-questionnaires composed of yes or no questions. It included five items (one to five) to evaluate potential sources and modes of transmission of the virus (contaminated air, touching virus-contaminated objects, contact with an infected animal, inhalation of infectious droplets or by the fecal-oral transmission). The main clinical symptoms of COVID-19 were evaluated by five items (six to 10) including fever, anosmia, digestives symptoms, local infection affecting lungs, meningitis. Virus virulence items (11 to 15) assessed percentage of severe forms, fatality rate, healing rate, speed of contagiosity of the virus and its probability of severe respiratory disease. For prevention and control items (16 to 20), hand washing, mask wearing, social distancing, glove wearing and avoiding touching the face were evaluated. The last item (21) assessed the at-risk population of COVID-19. The subjects' attitude and risk perception towards COVID-19 was assessed through five items: following recommendation of the health' ministry (item 1), COVID-19 as a serious disease (item 2), standard precautions as a preventive measure (item 3), optimistic attitude toward COVID-19 (item 4) and confidence in public hospitals (item 5). As for practice section, it was composed of 11 items dealing with preventive measures (item 1 to 5), personal hygiene practices (item 6 to 9) and infectious patient's care modalities (item 10 and 11).

Scoring Methods

Scores for the knowledge, attitude and practice sections were calculated, as follows: For knowledge, each correct answer was given one point and zero point for incorrect answers. The higher the points, the more knowledgeable the student is. For attitudes, response to each item was recorded on the 5-point Likert scale from 1 to 5 (1=strongly disagree, 2=disagree, 3=uncertain, 4=agree, 5=strongly agree). As for practice, the assessement of the participant's response was composed of two behaviors "yes" or "no." Answers that reflected good practice were given one point, while zero was given for bad practice. For each section, a score was calculated by summing up the answers of each item. Then, a global KAP score was generated by the sum of the three scores of knowledges, attitudes, and practices. These scores ranged from zero to 21 for knowledge, from five to 25 for attitude, from zero to 11 for practice and from five to 57 for KAP scores. Then, these scores were adujsted out of 100 points. Subsequently, using Bloom's cut-off of 80% [10], respondents were categorized according to their scores into good (>17) and bad (<17) knowledge, having positive (>20) and negative (<20) attitude, good (>9) and bad (<9) practice and having good KAP (>46) or bad (<9) KAP.

Table 1. Description of the study population (n=431)

Variables	n	%
Gender		
Male	136	31.6
Female	295	68.4
Marital status		
Single	388	90.0
Married	43	10.0
Studies level		
First-five academic years	319	74.0
Medical interns	47	10.9
Specialized residents	65	15.1
Resident's specialty		
Fundamental	15	23.1
Medical	28	43.1
Surgical	13	20.0
Emergency/ resuscitation	9	13.8
Current smoking		
No	70	16.2
Yes	361	83.8
History of chronic diseases		
No	365	84.7
Yes	66	15.3
Close contact exposure with positive COVID-19 subject		
No	304	70.6
Yes, in community	51	11.8
Yes, in a healthcare environment	76	17.6
Assistance to a training session		
No	225	52.2
Yes	206	47.8
Main source of information about COVID-19		
Social media	173	40.1
Google search	46	10.7
Scientific research	75	17.4
Family and friends	23	5.3
Healthcare workers	114	26.5

Note. COVID-19: Coronavirus disease-19

Statistical Analysis

The data from the Google forms was imported to SPSS (version 24.0) to perform statistical analysis. The results of continuous variables were presented as mean±standard deviation. This study employed primarily univariate logistic regression (crude odds ration [COR] 95% confidence interval [CI], p) to determine factors associated with KAP.Then, all variables with p<0.2 in the univariate analysis were entered into a multivariate model using a binary logistic regression analysis (backward stepwise) [adjusted odds ratio (AOR); 95% CI, p] in order to determine the independent factors associated with good knowledge, positive attitude, or good practice. Hosmer-Lemeshow was used to test the model goodness of fit. p-values lower than 0.05 were considered statistically significant.

Ethical Considerations

Ethical considerations were conducted according to the Declaration of Helsinki. Data was collected without patient contact and with confidentially and anonymity. This study did not involve human beings or experiments.

RESULTS

Participants' Characteristics

A total of 431 MS responded to the questionnaire (93.7%). The mean age was 22.4±3.3 years. As shown in **Table 1**, 295 participants were females (68.4%), giving a male to female ratio of 0.46. According to the studies level, 319 subjects (74%) were in the first-five academic years. History of chronic disease was noted in 66 students (15.3%). There were 127 (26.2%) cases who had close contact exposure with positive COVID-19 cases, among whom 76(59.8%) students were in a healthcare environment. Out of all participants, 225 cases (52.2%) had undergone a training session about COVID-19. The major source used to gain information on COVID-19 outbreak was social media 173 (40.1%).

Knowledge, Attitude, and Practice Towards COVID-19

The overall scores of COVID-19 knowledge, attitude, and practice among MS were 74.6±13, 69±10.2, and 78.8±13.6 out of 100, respectively (**Table 2**).

Knowledge items with higher scores were noted for main clinical symptoms of COVID-19 as well as for prevention and control of infection items (86.1±18.2; 86.1±12.8). For attitude items, the perception of COVID-19 as a serious disease and efficiency of standard precautions as preventive measures had the highest scores (78.7±17.7 and 77.2 ± 18, respectively). On the other hand, confidence in public hospitals had the lowest

Table 2. Description of knowledge, attitude, and practice scores among medical students towards COVID-19

KAP items	Number of items	Composite scores (mean±SD)	AS (mean±SD)
Total knowledge score (/21)	**1-21**	**15.9±2.0**	**74.6±13.0**
Sources and modes of transmission of the virus: score/5	1-5	3.3±0.9	67.7±17.9
Main clinical symptoms of COVID-19: Score/5	6-10	4.3±0.9	86.1±18.2
The virus virulence: Score/5	11-15	3.3±1.0	65.9±20.5
Prevention and control of infection: Score/5	16-20	4.3±0.6	86.1±12.8
Risk factors of COVID-19: Score/1	21	0.6±0.4	67.0±47.0
Total attitude score (/25)	**1-5**	**17.2±2.5**	**69±10.2**
Following recommendations of the health' ministry: Score/5	1	3.6±1.0	73.2±21.4
COVID-19 as a serious disease: Score/5	2	3.9±0.8	78.7±17.7
Standard precautions as a preventive measure: Score/5	3	3.8±0.9	77.2±18.0
Optimistic attitude toward COVID-19: Score/5	4	3.3±0.9	65.8±18.6
Confidence in public hospitals: Score/5	5	2.5±1.2	50.2±25.3
Total practice score (/11)	**1-11**	**8.6±1.4**	**78.8±13.6**
Preventive measures: Score/5	1-5	3.7±1.0	74.1±20.3
Personal hygiene practices: Score/4	6-9	3.2±0.7	81.9±18.0
Patient's care modalities: Score/2	10-11	1.3±0.2	68.3±13.8
Total KAP score (/57)	**1-57**	**42.0±3.6**	**73.5±6.3**

Note. COVID-19: Coronavirus disease-19; KAP: Knowledge, attitude, and practice; SD: Standard deviation; & AS: Adjusted scores/100

Table 3. Factors associated with knowledge, attitude, and practice towards COVID-19 among medical students: Results of univariate analysis

Variables	Good knowledge		Positive attitude		Good practice		Good KAP	
	COR (95% CI)	p	COR (95% CI)	p	COR (95% CI)	p	COR (95% CI)	p
Gender								
Female	1	**0.039**	1	0.170	1	0.800	1	0.300
Male	1.5 [1.1-2.3]		1.4 [0.8-2.5]		0.9 [0.6-1.4]		1.2 [0.8-2]	
Marital status								
Single	1	**0.002**	1	0.700	1	0.230	1	**0.030**
Married	2.8 [1.4-5.6]		0.9 [0.4-1.9]		1.5 [0.7-3]		2 [1.1-4]	
Studies level								
First-five academic years	1	**<0.001**	1	0.900	1	**<0.001**	1	**0.010**
Medical interns	3.2 [1.6-6.1]	**0.001**	1[0.4-2.1]	0.900	1.5 [0.7-2.8]	0.200	1.2 [0.6-2.6]	0.400
Specialized residents	2.9 [1.6-5.1]	**<0.001**	1[0.5-2]	0.800	3.8 [1.9-7.6]	**<0.001**	2.3 [1.2-4]	**0.005**
Resident's specialty								
Emergency/resuscitation	1	0.300	1	0.780	1	0.600	1	0.500
Medical	0.7 [0.1-4.1]	0.700	0.5 [0.08-3.8]	0.500	0.4 [0.4-4.4]	0.500	0.3 [0.06-1.5]	0.400
Surgical	0.2 [0.3-1.6]	0.150	1.01 [0.1-8]	0.900	0.4 [0.03-4.8]	0.400	0.3 [0.06-2]	0.100
Fundamental	0.5 [0.8-3.8]	0.500	1.2 [0.1-8]	0.800	1.7 [0.9-31]	0.700	0.5 [0.1-2.8]	0.200
Current smoking								
No	1	**<0.001**	1	0.070	1	0.500	1	0.200
Yes	2.68 [1.5-4.6]		0.4 [0.9-4.4]		1.1 [0.6-1.9]		1.4 [0.7-2.5]	
History of chronic disease								
No	1	0.090	1	**0.010**	1	0.300	1	**0.007**
Yes	2 [1.2-3.5]		2 [1.2-3.7]		1.3 [0.7-2.3]		2.1 [1.2-3.8]	
Close contact exposure								
No	1	**<0.001**	1	**<0.001**	1	**0.010**	1	**<0.001**
Yes, in community	1.2 [0.6-2.1]	0.500	1.5 [0.7-3.3]	0.200	1.1 [0.6-2]	0.700	2.1 [1.1-4.2]	**0.020**
Yes, in healthcare environment	4.4 [2.5-7.7]	**<0.001**	3.1 [1.8-5.5]	**<0.001**	3.4 [1.8-6.3]	**<0.001**	3.5 [2.1-6.2]	**<0.001**
Assistance to a training session								
No	1	0.070	1	0.500	1	**0.005**	1	**<0.001**
Yes	1.7 [1.1-2.4]		1.1 [0.7-1.8]		1.7 [1.2-2.5]		2.5 [1.5-4.1]	
Main source of information about COVID-19								
Scientific research	1	**0.038**	1	**0.050**	1	0.200	1	**<0.001**
Google search	0.4 [0.2-0.9]	**0.020**	0.4 [0.1-1.1]	0.080	0.4 [0.3-1.1]	0.050	0.3 [0.1-0.8]	0.020
Social media	0.4 [0.2-0.7]	**0.020**	0.4 [0.2-0.7]	**0.005**	0.5 [0.3-1]	0.050	0.1 [0.1-0.3]	**<0.001**
Family and friends	0.5 [0.2-1.4]	0.200	0.2 [0.1-0.7]	0.900	0.5 [0.2-1.3]	0.100	0.06 [0.01-0.5]	0.010
Healthcare workers	0.5 [0.3-0.9]	**0.030**	0.7 [0.4-1.4]	0.300	0.6 [0.3-1.1]	0.100	0.5 [0.3-1.1]	0.050
Good knowledge								
No	-	-	1	0.300	1	**<0.001**	1	**<0.001**
Yes	-		1.2 [0.7-2]		2.7 [1.8-4]		7.7 [4.3-13.6]	

Note. COVID-19: Coronavirus disease-19; KAP: Knowledge, attitude, and practice; COR: Crude odds ratio; & CI: Confidence interval

score (50.2±25.3). As for practice, personal hygiene item had the highest score (82±18). The total score of KAP about COVID-19 was 73.5±6.3.

According to this scoring system, students were classified into having good knowledge in 203 cases (47.1%), positive attitude in 83 (19.3%) cases, good practice in 264 (61.3%) cases and good KAP in 95 (22%) cases.

Factors Associated with Good Knowledge, Positive Attitude, and Good Practice

Univariate analysis

Univariate analysis showed that higher education level and close contact exposure with positive COVID-19 subject in a health care environment were respectively associated with good knowledge (p<0.001 & p<0.001), good practice (p<0.001 & p=0.01), and good KAP (p=0.01 & p<0.001) scores (**Table 3**).

Furthermore, significant predictors of good knowledge were male gender (p=0.039), married status (p=0.002) and current smoking (p<0.001). Positive attitude towards COVID-19 was statistically associated with history of chronic disease (p=0.01) and close contact exposure in a healthcare environment (p<0.001). Assistance to a training session was significantly associated with good practice (p=0.005) and good KAP (p<0.001). Other predictors of good KAP included married status (p=0.03), history of chronic disease and good knowledge (p<0.001). Otherwise, using social media as a main source of information about COVID-19 was significantlyassociated with lower rates of good knowledge (p=0.02), positive attitude (p=0.005) and good KAP (p<0.001).

Multivariate analysis

In multivariate analysis, the independent factors of good knowledge were current smoking (AOR=1.8; p=0.04), assistance to a training session (AOR=1.5; p=0.04), specialized residents (AOR=2.4; p=0.02), and medical interns (AOR=2.5; p=0.01) levels (**Table 4**). History of chronic disease was an independent predictor of positive attitude (AOR=2.4; p=0.009), while current smoking was independantly associated with lower rate of positive attitude (AOR=0.4; p=0.01).

Otherwise, independant factors of good practice were specialized residents (AOR=2.4; p=0.01), being in close contact exposure with COVID-19 subjectin a healthcare environment (AOR=2.1; p=0.04), assistance to a training session (AOR=1.5; p=0.04) and having good knowledge on COVID-19 (AOR=2.2; p<0.001). Concerning good KAP, it was found that close contact

Table 4. Factors associated with knowledge, attitude, and practice towards COVID-19 among medical students: Results of multivariate analysis

Variables	Good knowledge		Positive attitude		Good practice		Good KAP	
	AOR (95% CI)	p	AOR (95% CI)	p	AOR (95% CI)	p	AOR (95% CI)	p
Studies level								
First-five academic years	1	**0.001**	-	1	**0.030**	**1**	**0.010**	1
Medical interns	2.5 [1.2-5]	**0.010**	-	0.8 [0.3-1.7]	0.600	1.3 [0.6-2.6]	0.500	2.5 [1.2-5]
Specialized residents	2.4 [1.4-4.4]	**0.020**	-	2.4 [1.1-5.1]	**0.010**	2.3 [1.3-4.1]	**0.005**	2.4[1.4-4.4]
Current smoking								
No	1	**0.040**	1	**0.010**	-	-	1	0.200
Yes	1.8 [1.1-3.3]		0.4 [0.2-0.8]		-		1.4 [0.7-2.4]	
History of chronic disease								
No	-	-	1	**0.009**	-	-	1	**0.007**
Yes	-		2.4 [1.2-4.5]		-		2.1 [1.2-3.8]	
Close contact exposure								
No	-	-	-	-	1	**0.100**	1	**0.020**
Yes, in community	-	-	-	-	1.1 [0.5-1.9]	0.900	2.3 [1.1-4.7]	**0.020**
Yes, in healthcare environment	-	-	-	-	2.1[1.1-4.6]	**0.040**	2.6 [1.4-4]	**0.001**
Assistance to a training session								
No	1	**0.040**	-	-	1	**0.040**	1	**0.001**
Yes	1.5 [1.1-2.2]		-		1.5 [1.1-2.2]		2.4 [1.4-4.1]	
Main source of information about COVID-19								
Scientific research	1	0.100	1	0.070	-	-	1	**<0.001**
Google search	0.5 [0.2-1.1]	**0.080**	0.5 [0.2-1.2]	0.100	-	-	0.4[0.1-1.1]	0.060
Social media	0.5 [0.2-0.8]	**0.010**	0.4 [0.2-0.8]	**0.008**	-	-	0.2 [0.1-0.4]	**<0.001**
Family and friends	0.7 [0.3-2]	0.600	0.9 [0.3-2]	0.900	-	-	0.1[0.01-0.7]	**0.020**
Healthcare workers	0.5 [0.3-1]	0.060	0.8 [0.4-1.6]	0.500	-	-	0.5 [0.3-1.1]	0.090
Good knowledge								
No	-	-	-	-	1	**<0.001**	-	-
Yes	-	-	-		2.2[1.4-3.4]		-	

Note. COVID-19: Coronavirus disease-19; KAP: Knowledge, attitude, and practice; COR: Crude odds ratio; & CI: Confidence interval

exposure in community (AOR=2.3, p=0.02) as well as in healthcare environment (AOR=2.6; p=0.001) and assistance to a training session (AOR=2.4; p=0.001) were independently associated with good KAP.Using social media as a main source of information about COVID-19 was independently associated with lower rates of good knowledge (AOR=0.5; p=0.01), positive attitude (AOR=0.4; p=0.008) and good KAP (AOR=0.2; p<0.001).

DISCUSSION

To the best of our knowledge, this is the first study in Tunisia examining the KAP towards COVID-19. In the current study, about a quarter of participants were medical interns and specialized residents, which are in Tunisia important health-care providers because they often manage patients in major referral hospitals immediately after hospitalization. Thus, they are always at risk of infectious diseases and the spread of the SARS-COV-2 has increased the risk several times. MS are responsible to aware people and educate them about how to manage their diseases. Therefore, it is important to assess their knowledge aboutthe virus, to understand their risk perception and attitude and to evaluate their practice. With such information, health policy makers can make the proper planning.

It was not surprising that social media was the main source of information about COVID-19 among MS, wheras scientific research, which should reflect reliable source of information, were less commonly used as source of information. This was in accordance with a similar study in Jordan conducted on 2020, where MS had online sources as a major information source for learning about COVID-19 [12]. It was the same finding of another Asian study, conducted on 2020, that found that Facebook was the commonest source of MS' information aboutan other infectious disease [13]. This result indicated a need for improving visibility of reliable sites especially for MS who should be educated to use evidence-based medicine resources.

Almost the half of the subjects included in our original studyhad a good level of knowledge concerning COVID-19. It was striking how the success percentages for COVID-19 knowledge score lowered. These results differed from those obtained by other studies, conducted in 2020 among university students [14-16], whose percentage of good knowledgeable participants in their studies came close to 80%, above 85% and above 90%, respectively. This finding could be explained by using wrong source of information, which could provide fake news about this emergent disease. A higher knowledge score for prevention and controle of infection' items was noted, this was in line with an Irakian study showing that knowledge toward infection prevention was better [14]. COVID-19 is still a preventive emergency, thus, higher rates for prevention items seem reasonable.

Our study showed that less than 20% had positive attitude toward overcoming COVID-19 among MS. This was lower than similar studies result regarding MS in Uganda [15] (74%) and in Iran [16] (30.8%). This huge difference could be explained by the time of the different studies, both Iranian and Ugandan studies were conducted in the first wave of COVID-19 pandemic while our study was conducted at the starting of the sharprise of COVID-19 cases in Tunisia. the COVID-19 pandemic could be a condition that leads to a greater risk of increasing the level of anxiety in the university students and especially MS. It could be due to the interdisciplinary nature of their training and the potential proximity of being exposed to the virus during their

clinical studies [17]. It is note worthy that confidence in public hospitals' item had the lowest score with 50.2 out of 100, which was not far from another Egyptian study among healthcare workers finding just 60% of confidence in hospitals dealing and treating COVID-19 patients [9]. These findings could be related to the unprecedented raise of COVID-19 cases in the country after a great control period of pandemic virus, which enhances students's dought in winning the battle against the virus.

A finding of considerable concern in this survey is that above the half of MS had good practices scores. This result was supported by another study finding score around 50% among MS on 2020 [15]. Although percentage of good knowledge and positive attitude of participants regarding COVID-19 seemed disoppinting, this did not translate into low good practice score.

Interestingly, high level of studies was independently associated with good knowledge, positive attitude, and good practice. Likewise, this finding was reported by another study on 2020 that found that older students had more sufficient knowledgeand practice score [15]. This may be due to work duties or affiliations directly related to efforts against spread of this virus. Thus, younger students who had less knowledge, are important target groups for advanced educational programs about the disease. Students who assisted to a training session about COVID-19 and those who used scientific research were significantly moreknowledgeble than those who used social media. Although these platforms provide an easy information, they could also be a source of fake news. Thus, it is highly suggested for MS to seek information from reliable sources.

Our study had several key findings. Current smoking had a significant correlation with good knowledge but was associated withnegative attitudes towards COVID-19. In fact, smoking causes many chronic diseases, decreases the quality of life, and is one of the most preventable causes of mortality [18]. Current evidence suggests that several mechanisms might increase the risk of respiratory tract infections in smokers, thus, the severity of COVID-19 disease is higher among smokers [19]. It was reported in a Turkish study conducted on 2020 that the COVID-19 outbreak was effective on smoking cessation [18]. Our results are important since they may denote that more efforts should be exerted to encourage this category, which may reduce tobacco use during this pandemic and hopefully long after. As well for chronic disease, it was also independently asscіated with positive attitude and good KAP.Previous studies have demonstrated that patients with comorbidities had greater disease severity compared with those without [15]. As a well aware population of comorbidities, it was expected that MS having chronic disease, having very high risk of infection, and developing its severe form, would be more aware about this novel virus.

Our study provides evidence that good knowledge is anindependent predictor ofgood practice among MS. This indicated that good knowledge is important to enable individuals to have better practices in COVID-19 risk reduction. Furthermore, it was worthy of note that there was no significant association between attitude scores and practice scores. Thus, positive attitude scores alone did not predict good practice. This had substantial implications for public health educators and planners in implementing pandemic preparedness plans.

CONCLUSION

Tunisian MS had satisfactory knowledge and practice about COVID-19, butthey had lower positive attitude rates towards this emergent disease. Their knowledge was mainly gained from social media, which was a significant predictor of decreased level of knowledge andattitude. The findings of the current study pointed out the need for the development of interactivecourses on emerging diseases and travel epidemiology for undergraduate MS. Facilitation of MS'volunteer working in preparedness of important emerging diseases with health authorithiesis required.

Author contributions: NK, HBA, MT, HM, MBH, MBJ, & MB: substantial contribution to conception and design of the study, to data acquisition, or to data analysis and interpretation; **NK, HBA, & MT:** wrote the article and/or revised the article for important intellectual content; & **NK, HBA, SY, MK, HF, & JD:** read and approved the final version of the submitted manuscript. All authors have agreed with the results and conclusions.

Ethical statement: The authors state that ethical considerations were conducted according to the Declaration of Helsinki. Data was collected without patient contact and with confidentially and anonymity. Authors further state that the study did not involve human beings or experiments.

Funding: No funding source is reported for this study.

Declaration of interest: No conflict of interest is declared by authors.

Data sharing statement: Data supporting the findings and conclusions are available upon request from the corresponding author.

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