



## Original article

# Knowledge and Attitude of physicians towards 2019 Novel Coronavirus (COVID-19) pandemic: A cross sectional survey from Egypt

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### Abbreviations:

**ACE:** Angiotensin Converting Enzyme

**ARDS:** Acute Respiratory Distress Syndrome

**CSG:** Coronavirus Study Group

**COVID-19:** Coronavirus Disease 2019

**HCWs:** Health Care Workers

**IRB:** Institutional Review Board

**MERS-CoV:** Middle East Respiratory Syndrome Coronavirus

**MOH:** Ministry of Health

**PHEIC:** Public Health Emergency of International Concern

**RT-PCR:** Real Time Polymerase Chain Reaction

**SARS-CoV:** Severe Acute Respiratory Syndrome Coronavirus

**WHO:** World Health Organization

## ABSTRACT

**Background:** Coronavirus disease 2019 (COVID-19) is a serious emerging public health issue and it has been identified as a major risk to human health in 2020. Egypt has more than 100 million population, of whom in poor economic conditions and with low education levels could be vulnerable to COVID-19 infection. Physicians are at the frontiers in battles against the emergence, spread, and control of COVID-19 pandemic. Research data are needed to develop evidence-based strategies to prepare health care systems to deal with the current epidemic. **Aim:** The aim of this study is to assess the level of knowledge and attitudes to COVID-19 pandemic among a group of Egyptian physicians. **Methods:** From March 15<sup>th</sup> to March 25<sup>th</sup>, 2020, we conducted a cross-sectional online survey using non-probability accessibility sampling technique. The structured questionnaire was distributed online through E-mails and social networks to identify the knowledge and attitude among a group of Egyptian physicians regarding COVID-19 pandemic. **Result:** The study included 256 physicians. Of the participants, 48% were males 49.6% were females. The mean of total score was (19.6±2.3) out of 23 gained mainly from the social media (50.7%). About 67% of the participants heard of Coronaviruses before this pandemic, 78.5% identified other Coronaviruses. All the participants correctly identified the incubation period and 81.6% correctly identified the typical clinical symptoms. Most of the participants (97.6%) could estimate the fatality of COVID-19. Approximately 95% of the respondents knew no vaccination and 88% correctly answered that no current specific treatment for COVID-19 available. Almost all 98% of the participants knew the recommended general infection control precautions. Most of the participants showed positive attitude, about (97%) agreed that health care workers must avail themselves of all information about the COVID-19. **Conclusion:** The finding of this survey indicating that, faced with the COVID-19 pandemic, this studied group of Egyptian physicians showed positive attitude and satisfactory knowledge about emerging COVID-19 infection. **Recommendations:** Although the Egyptian Ministry of Health (MOH) has taken several major steps to prepare the health care system to be ready dealing with COVID-19 pandemic, it is important to develop educational programs to ensure continuous updated knowledge of the physicians.

## Introduction

In late December 2019, a cluster of patients with pneumonia of unknown etiology was reported in Wuhan, China [1]. A new coronavirus was identified as the causative pathogen and since then, the number of cases has continued to increase spreading to all 34 regions of China [2]. On 30<sup>th</sup> January 2020, the World Health Organization (WHO) declared that the new coronavirus outbreak constitutes a Public Health Emergency of International Concern (PHEIC) [3].

The new coronavirus was initially named as 2019 novel coronavirus (2019-nCoV) by the WHO. On 11<sup>th</sup> Feb 2020, WHO named this novel coronavirus pneumonia as Coronavirus Disease 2019 "COVID-19" [4]. The Coronavirus Study Group (CSG) of the international committee on taxonomy of viruses recognized this virus as a close relative to Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV) and renamed it as SARS-CoV-2 [5].

The Coronaviruses family members are positive single-stranded enveloped large RNA viruses that infect humans and a wide range of animals. SARS-CoV-2 is the 7<sup>th</sup> member of the family of Coronaviruses and like SARS-CoV and Middle East Respiratory Syndrome Coronavirus (MERS-CoV), SARS-CoV-2 is responsible for lower respiratory infection and can cause Acute Respiratory Distress Syndrome (ARDS) [6].

Compared to the 2002/2003 SARS-CoV and the 2012–2014 MERS-CoV, the SARS-CoV-2 spreads strikingly fast. While MERS-CoV needed about two and a half years to infect 1000 people, and SARS-CoV took roughly 4 months, the new SARS-CoV-2 reached that count in just 48 days [7].

Respiratory droplets are the main route of human to human transmission. Direct or indirect contact with mucous membranes of the eyes, mouth or nose, and aerosol transmission especially in a relatively closed environment are also possible routes of transmission [8]. Digestive tract is recently considered a potential route of SARS-CoV-2 transmission via invasion of ACE2-expressing enterocytes [9].

All people are generally susceptible to infection with SARS-CoV-2 but the elderly and people with underlying chronic diseases are more likely to develop severe diseases [10]. The incubation period is estimated to be 3-7 days (range: 2-14 days) [11]. The main clinical characteristics of COVID-19 are fever, dry cough, fatigue, myalgia

and dyspnea. The less common reported symptoms are sore throat, vomiting and diarrhea. Severe cases often develop dyspnea and/or hypoxemia, septic shock, ARDS, difficult-to-correct metabolic acidosis, and coagulation disorders [12,13].

Since the complete SARS-CoV-2 genome sequences are available in Gen Bank, the novel nucleic acid could be detected by RT-PCR or by viral gene sequencing of oropharyngeal and nasopharyngeal swabs [14]. Suspected and confirmed cases should be treated in designated hospitals with effective isolation and protective conditions [8].

Egypt has more than 100 million population, of whom in poor economic conditions and with low education levels could be vulnerable to COVID-19 infection. On Other hand, physicians are facing multiple challenges: an abrupt outbreak of epidemic, a sudden increase work overload, a substantial risk of occupational exposure and violence, a high risk of infection of themselves and their family members, and insufficient supply of protective equipment.

Knowledge and attitude towards infectious diseases can affect control of the disease [15]. Attitude, for example, underestimation; overestimation; or panic behavior can affect the battle against epidemics [16]. Currently, there is no known information about the physicians' knowledge and attitude towards COVID-19 pandemic in Egypt. We therefore conducted this survey to investigate the knowledge and attitude of a convenience sample of Egyptian physicians towards COVID-19 pandemic.

## Material and Methods

### Study design and participants

This multicenter cross-sectional study was conducted during March 2020. Ethical approval was obtained from Zagazig University - Faculty of Human Medicine Institutional Review Board (ZU-IRB No.6515).

Following the current recommendations to minimize face-to-face interaction, the questionnaire was electronically sent to the participants through E-mails and social networks. Only a single response to the questionnaire was permitted for each person. Consent implied by the participant completion. According to a margin of error of 5%, level of confidence of 95% and power of study of 80%, the minimum sample size required was calculated to be 256 participants. Participants' confidentiality was

maintained all through the process of the research and the information collected by the study instruments contained no information that can be linked to any participant.

The online survey portal, Google Form, was created and participants were invited to complete and submit the form. The process of calling the participants to share answering the survey was conducted through convenient sampling technique including physicians from all the governorates of the country, all medical specialties, all levels of postgraduate studies, and different years of work experience.

### Survey development

A questionnaire was developed by the primary author using the frequently asked questions posted on WHO website. The final questionnaire was reviewed for validity by biostatistics expert and was pilot tested on 20 subjects of the target population, who were not included in the study. Cronbach's alpha was calculated to be 0.7.

The questionnaire consisted of four parts: (1) Basic demographic data of the participants including age, gender, and work experience; (2) Sixteen multiple choice knowledge questions that tested the following knowledge aspects in relation to SARS-CoV-2 infection: basic virology; first places of outbreak; mode of transmission; incubation period; clinical symptoms; fatality; infection in special patients population; treatment, vaccination; and protective measures against COVID-19. (3) Five questions about the physicians' attitude to COVID-19 pandemic; (4) one question about the major source of information.

### Statistical analysis

Data management and analysis were performed using the Statistical Product and Service Solution (SPSS) version 25 (IBM SPSS Statistics, New York, United States). Descriptive statistics were performed by reporting the number and percentages for the different categorical variables. Percentages of responses were calculated according to the number of respondents per response with respect to the number of total responses of a question. Continuous variables are expressed as mean and standard deviation (SD). Chi square test used for comparison of the categorical variables. All tests were two-tailed,  $p$  value  $\leq 0.05$  was considered statistically significant.

### Results

A total of 256 questionnaires were completed and were included in the study. Demographic data of the study participants are summarized in **table (1)**. Of the respondents, 123 (48%) were males and 127 (49.6%) were females. Approximately half of the respondents (51.4%) aged between 25-29 years old. The work experience of 55.1% of the participants was less than 5 years, 20.7% had work experience of 5-10 years, and 24.2% had >10 years working experience.

The responses to the knowledge questions are displayed in **table (2)**. Of the participants, 67.2% (n=172) heard of Coronaviruses before this pandemic, (n=201, 78.5%) could identify the Coronaviruses family members, and (n=193, 75.4%) were aware of COVID-19 basic virology. All the participants (n=256, 100%) correctly identified the incubation period and (n=209, 81.6%) correctly identified the typical clinical symptoms. Most of the participants (n=250, 97.6%) could estimate the fatality of COVID-19. Approximately 95% of the respondents knew no vaccination and 88% correctly answered that no current specific treatment for COVID-19 available. Around 98% (n=250, 97.7%) of the participants knew the recommended general infection control precautions.

Based on gender, male participants were more knowledgeable about basic virology of Coronaviruses. Ninety male participants (90/123, 73%) heard of Coronaviruses before this pandemic compared to (78/127, 61.4%) females ( $p$  value=0.04). Male participants correctly identified the members of Coronavirus family (109/123, 88.6%) compared to (86/127, 67.7%) females ( $p$  value=0.00). Ninety-nine male participants (99/123, 80.4%) correctly answered that Coronaviruses are RNA viruses compared to (89/127, 70%) females ( $p$  value=0.05). Male participants are also more knowledgeable than females (118/123, 96% vs. 113/127, 89%) respectively that COVID-19 could be caught from asymptomatic patient ( $p$  value=0.03).

Attitude of the studied sample of physicians towards COVID-19 pandemic is detailed in **table (3)**. About 95% (n=243) of the participants believes that COVID-19 is currently a serious public health issue and 99.2 % (n=254) believes that educating people about COVID-19 is important to prevent the spread of the disease. Tow hundreds and sixteen physicians (n=216/256, 84.4%) stated that they will not do any clinical rotation in a hospital without clear COVID-19 infection control policy.

About 97% (n=248) believes that HCWs must avail themselves of all information about the virus. About 83% (n=213) thought that if COVID-19 vaccine was available, they would have it. There was no statistically significant difference between male and female participants as regard their attitude. The total score for all participants is shown in **table (4)**. The mean score for all participants was  $19.6 \pm 2.3$ , the minimum score was 7 points and the maximum points for the questionnaire were 23 points obtained by 13 participants. The impact of work experience on participants' knowledge and

attitude is shown in **tables (5&6)**. Participants with > 10 years' experience had the highest knowledge in some aspects, such as being familiar with Coronaviruses before this outbreak ( $p=0.03$ ) and diarrhea as a possible manifestation of COVID-19 ( $p=0.00$ ). Participants with  $\geq 5$  years of work experience were aware that seasonal influenza vaccine is not effective against COVID-19 when compared to participants with < 5 years of experience ( $p \text{ value} = 0.03$ ). There is no statistically significant difference between participants' attitude based on their years of work experience.

**Table 1.** Baseline demographic characteristics of all participants.

Variable	Categories	No=256	%
Gender	Female	127	49.6%
	Male	123	48%
	Prefer not to say	6	2.4%
Age (Years)	25-29	131	51.4%
	30-34	57	22.4%
	35-39	60	23.5%
	$\geq 40$	7	2.7%
Years of experience	< 5 years	141	55.1%
	5-10 years	53	20.7%
	>10 years	62	24.2%

**Table 2.** Answers of all participants to the knowledge questions.

Question	Answer	No=256	%
Heard of Corona viruses before this pandemic?	Yes	172	67.2%
	No	84	32.8%
The Corona Viruses Family include....	Correct	201	78.5%
	Incorrect	46	18%
	Don't know	9	3.5%
Corona viruses are....	Correct	193	75.4%
	Incorrect	21	8.2%
	Don't know	42	16.4%
When and where COVID-19 was first identified?	Correct	252	98.4%
	Incorrect	1	0.4%
	Don't know	3	1.2%
How does COVID-19 Spread?	Correct	235	91.8%
	Incorrect	20	7.8%
	Don't know	1	0.4%
How long is the incubation period of COVID-19?	Correct	256	100%
	Incorrect	0	0%
	Don't know	0	0%
Can CoVID-19 be caught from a person who has no symptoms?	Yes	237	92.6%
	No	15	5.8%
	Don't know	4	1.6%
The most common symptoms of COVID-19 are....	Correct	209	81.6%
	Incorrect	46	18%
	Don't know	1	0.4%
Diarrhea is a possible symptom of COVID-19?	Yes	141	55%
	No	78	30.5%
	Don't know	37	14.5%

COVID-19 could be fatal?	Yes	250	97.6%
	No	4	1.6%
	Don't know	2	0.8%
What groups are likely to have severe disease?	Correct	247	96.5%
	Incorrect	7	2.7%
	Don't know	2	0.8%
Is COVID-19 the same as SARS?	Yes	186	72.6%
	No	46	18%
	Don't know	24	9.4%
Is there a vaccine for COVID- 19?	Yes	243	94.9%
	No	8	3.1%
	Don't know	5	2%
Is seasonal influenza vaccine protective against COVID-19?	Yes	232	90.6%
	No	2	0.8%
	Don't know	22	8.6%
Is there a specific drug or treatment for COVID-19?	Yes	226	88.3%
	No	14	5.5%
	Don't know	16	6.2%
What are the protective measures against the spread of the disease?	Correct	250	97.7%
	Incorrect	6	2.3%
	Don't know	0	0%

**Table 3.** Answers of all participants to attitude questions.

Attitude	Answers	No=256	%
I believe COVID-19 is currently a serious public health issue?	Agree	243	94.9%
	Disagree	11	4.3%
	Not Sure	2	0.8%
Educating People about COVID-19 is important to prevent the spread of the disease?	Agree	254	99.2%
	Disagree	2	0.8%
	Not Sure	0	0%
I will not do my clinical rotation in a hospital without clear COVID-19 infection control policy?	Agree	216	84.4%
	Disagree	40	15.6%
	Not Sure	0	0%
Health care workers must avail themselves of all information about the virus?	Agree	248	96.9%
	Disagree	8	3.1%
	Not Sure	0	0%
If COVID-19 vaccine was available, would you have it?	Agree	213	83.2%
	Disagree	23	9%
	Not Sure	20	7.8%

**Table 4.** The total score of all participants.

Score Points	Number	Percentage
7 points	1	0.4%
10 points	1	0.4%
12 points	1	0.4%
13 points	2	0.8%
14 points	2	0.8%
15 points	6	2.3%
16 points	8	3.1%
17 points	21	8.2%
18 points	26	10.2%
19 points	36	14%
20 points	45	17.6%
21 points	58	22.7%
22 points	36	14%
23 points	13	5.1%
Mean score ±SD	19.6±2.3	
Median	20	
Range	7-23	

**Table 5.** Answers to knowledge questions based on respondents' experience.

Question	Answers	Group 1 < 5 years (No=141)	Group 2 5-10years (No=53)	Group 3 >10 years (No=62)	P value
Heard of Corona viruses before this pandemic?	Yes	86 (61%)	37(69.8%)	49 (79%)	0.038
	No	55 (39%)	16(30.2%)	13 (21%)	
The Corona Viruses Family include....	Correct	110 (78%)	40(75.4%)	51(82.3%)	0.57
	Incorrect	24 (17%)	12(22.6%)	10 (16.1%)	
	Don't Know	7 (5%)	1 (2%)	1 (1.6%)	
Corona viruses are....	Correct	108(76.6)	40(75.5%)	45 (72.6%)	0.48
	Incorrect	9 (6.4%)	7 (13.2%)	5 (8%)	
	Don't Know	24 (17%)	6 (11.3%)	12 (19.4%)	
When and where COVID-19 was first identified?	Correct	138(97.9)	52(98.1%)	62 (100%)	0.76
	Incorrect	1 (0.7%)	0 (0%)	0 (0%)	
	Don't Know	2 (1.4%)	1 (1.9%)	0 (0%)	
How does COVID-19 Spread?	Correct	127 (90%)	51(96.2%)	57 (92%)	0.65
	Incorrect	13 (9.2%)	2 (3.8%)	5 (8%)	
	Don't Know	1 (0.8%)	0 (0%)	0 (0%)	
How long is the incubation period of COVID-19?	Correct	141(100%)	53 (100%)	62(100%)	1
	Incorrect	0 (0%)	0 (0%)	0 (0%)	
	Don't Know	0 (0%)	0 (0%)	0 (0%)	
Can CoVID-19 be caught from a person who has no symptoms?	Yes	129(91.5)	49(92.5%)	59 (95.2%)	0.44
	No	8 (5.7%)	4 (7.5%)	3 (4.8%)	
	Don't Know	4 (2.8%)	0 (0%)	0 (0%)	
The most common symptoms of COVID-19 are....	Correct	115(81.6)	43(81.1%)	51 (82.3%)	0.51
	Incorrect	26 (18.4%)	10(18.9%)	10 (16.1%)	
	Don't Know	0 (0)	0 (0%)	1 (1.6%)	
Diarrhea is a possible symptom of COVID-19?	Yes	69 (49%)	30(56.6%)	42(67.8%)	0.00
	No	30 (21.3%)	19(35.9%)	17(27.4%)	
	Don't Know	42 (29.7%)	4 (7.5%)	3 (4.8%)	
COVID-19 could be fatal?	Yes	136(96.5)	52(98.1%)	62 (100%)	0.56
	No	3 (2.1%)	1 (1.9%)	0 (0%)	
	Don't Know	2 (1.4%)	0 (0%)	0 (0%)	
What groups are likely to have severe disease?	Correct	135(95.7)	52(98.1%)	60 (96.8%)	0.88
	Incorrect	5 (3.6%)	1 (1.9%)	1 (3.2%)	
	Don't Know	1 (0.7%)	0 (0%)	0 (0%)	
Is COVID-19 the same as SARS?	Yes	21 (14.9%)	13(24.5%)	12 (19.3%)	0.07
	No	101(71.6)	39(73.6%)	46 (74.2%)	
	Don't Know	19 (13.5%)	1 (1.9%)	4 (6.5%)	
Is there a vaccine for COVID-19?	Yes	5 (3.5%)	2 (3.8%)	1 (1.6%)	0.68
	No	132(93.7)	51(96.2%)	60 (96.8%)	
	Don't Know	4 (2.8%)	0 (0%)	1 (1.6%)	
Is seasonal influenza vaccine protective against COVID-19?	Yes	1 (0.7%)	0 (0%)	1 (1.6%)	0.03
	No	121(85.8)	52(98.1%)	59 (95.2%)	
	Don't Know	19 (13.5%)	1 (1.9%)	2 (3.2%)	
Is there a drug or treatment for COVID-19?	Yes	7 (5%)	5 (9.4%)	2 (3.2%)	0.35
	No	123(87.2)	47(88.7%)	56 (90.3%)	
	Don't Know	11 (7.8%)	1 (1.9%)	4 (6.5%)	
What are the protective measures against the spread of the disease?	Correct	138(97.9)	52(98.1%)	60 (96.8%)	0.86
	Incorrect	3 (2.1%)	1 (1.9%)	2 (3.2%)	
	Don't know	0 (0%)	0 (0%)	0 (0%)	

**Table 6.** Answers to attitude questions based on respondents' experience.

Question	Answer	Group 1 < 5 years (No=141)	Group 2 5-10 years (No=53)	Group 3 >10 years (No=62)	P value
I believe COVID-19 is currently a serious public health issue?	Agree	133 (94.3%)	52 (98.1%)	58 (93.5%)	0.54
	Disagree	6 (4.3%)	1 (1.9%)	4 (6.5%)	
	Not Sure	2 (1.4%)	0 (0%)	0 (0%)	
Educating People about COVID-19 is important to prevent the spread of the disease?	Agree	139 (98.6%)	53 (100%)	62 (100%)	0.44
	Disagree	2 (1.4%)	0 (0%)	0 (0%)	
	Not Sure	0 (0%)	0 (0%)	0 (0%)	
I will not do my clinical rotation in a hospital without COVID-19 infection control policy?	Agree	117 (83%)	42 (79.2%)	57 (92%)	0.13
	Disagree	24 (17%)	11 (20.8%)	5 (8%)	
	Not Sure	0 (0%)	0 (0%)	0 (0%)	
Health care workers must avail themselves of all information about the virus?	Agree	137 (97.2%)	52 (98.1%)	59 (95.2%)	0.63
	Disagree	4 (2.8%)	1 (1.9%)	3 (4.8%)	
	Not Sure	0 (0%)	0 (0%)	0 (0%)	
If COVID-19 vaccine was available, would you have it?	Agree	117 (83%)	44 (83%)	52 (83.9%)	0.98
	Disagree	12 (8.5%)	5 (9.5%)	6 (9.7%)	
	Not Sure	12 (8.5%)	4 (7.5%)	4 (6.4%)	

## Discussion

Since late December 2019, COVID-19 broke out in Wuhan, China and has rapidly spread. The pathogen of this disease has been identified as novel Coronavirus, which has 86.9% nucleotide sequence homology with the SARS-CoV genome [17]. According to our knowledge, this is the first study to date to investigate the knowledge and attitude among a group of Egyptian physicians towards SARS-CoV-2 pandemic. This study had been conducted during the very early stages of COVID-19 in Egypt (March 2020).

The present study revealed a good knowledge; mainly gained by social media channels; and positive attitude regarding COVID-19 pandemic. The mean score was  $19.6 \pm 2.3$ . About 92% (n=235/256) of our participants achieved a total score  $\geq 17$  points out of 23. These findings are comparable to those reported by **Zhang et al.**, and **Huynh et al.** who reported 89% of Chinese and 88.4% of Vietnamese HCWs to have sufficient knowledge and positive attitude regarding COVID-19, respectively [18,19]. Our results also coincide with **Saqlain et al.** who reported 93.2% of HCWs from Pakistan to have a good knowledge and positive attitude to COVID-19 [20]. These findings are also in line with a study from Bangladesh that revealed good knowledge and

positive attitude of doctors towards SARS-CoV-2 pandemic [21].

However, a multinational study revealed that HCWs had insufficient knowledge but positive perceptions of COVID-19 [22]. Another study from Uganda reported only 69% of the studied HCWs (n = 94/581) had sufficient knowledge and only 21% (n = 29/581) had positive attitude [23].

This satisfactory level of knowledge reported in our study group may be attributed to widespread media coverage following the COVID-19 pandemic. The pandemic of COVID-19 is very recent and therefore there are many talks about it among the HCWs and in the community. Since, the focus is more towards symptoms and prevention; this may have increased the knowledge about the disease.

Despite the knowledge about COVID-19 is generally high, there are differences in some knowledge aspects based on sex and work experience. However, Attitude did not differ with gender or work experience. **Huynh et al.** also found that attitude regarding COVID-19 was not associated with gender or work experience [19].

We found that almost half of the respondents (n=130, 50.8%) gathered their information from the social media channels and only 28.5% (n=73) and 19.1% (n=49) mentioned the MOH website [24] and

college of medicine as their source of information, respectively. These disappointing results were also reported by several studies [19&22]. The remaining 1.6% (n=4) of our participants mentioned TV & radio as their major source of information.

Although most of the educational materials are posted online by MOH, the HCWs are now more reliant on internet technologies to gain knowledge on emerging diseases like COVID-19 [25]. **Hussein et al** studied the impact of social media on knowledge dissemination between physicians in Egypt during COVID-19 outbreak and confirmed our findings that physicians are active users of social media (e.g. Facebook and WhatsApp) and considered them as useful platforms to spread right data about diseases during pandemics [26]. However, caution must be taken when using social networks to gain healthcare knowledge because of the information overload and it is difficult to determine authenticity of the source and one can easily be misguided. It is an important issue for the Egyptian health authorities to consider official channels to update knowledge and learning materials on COVID-19.

As SARS-CoV-2 epidemic is ongoing and continues to spread, it is important to prepare health care systems to be ready dealing with this public health emergency. Our findings could be used to plan, design, and develop educational programs to ensure continuous knowledge update for the physicians aiming at handling disastrous events efficiently. Our study found gaps in specific aspects of knowledge that should be focused on in future educational programs. The participants were less knowledgeable regarding atypical presentation of the disease and only 55% (n=141/256) recognized diarrhea as a possible clinical symptom. Such unsatisfactory results highlight the need for greater efforts to raise general awareness regarding atypical symptoms of COVID-19. The training programs should also be organized according to work experience. Health authorities could consider providing smartphone-based application to provide up to date accurate health information about COVID-19 pandemic.

It is so also important to interpret the results in the context of potential study limitations. This study has several limitations. First, there is no comparable study assessing knowledge and attitude of physicians in Egypt towards COVID-19 pandemic to compare with our study; second, because of the disease pandemic and time constraints, we were unable to conduct face-to-face interviews; third, the results are limited by the use of convenience sampling

and our sample size might not be ideal to represent the awareness of all Egyptian physicians; fourth, This cross-sectional study was conducted online among physicians during a time (15<sup>th</sup>-to 25<sup>th</sup> of March 2020) when an alarming number of cases were being reported globally; this might limit generalizations. In addition, and finally, the questionnaire we used is simple that it can only provide preliminary results; further confirmation and intervention are needed. Future research studies on larger sample size should be conducted to provide data related to reporting practice, the barriers, and the needs for training amongst Egyptian physicians.

### Conclusion

This study concluded that participants have satisfactory knowledge and positive attitude towards COVID-19 pandemic and self-reported infection control practices. Incorporation of teaching courses (theories and practices) to keep updated knowledge and emergency preparedness regarding COVID-19 disastrous pandemic is advised. Further studies with larger sample sizes are required to assess HCWs preparedness at national level so that effective interventions could be designed for dealing with COVID-19 as a critical global public health issue.

### Author contributions

Dina M. Ali contributed to concept and design of the study, collection and analysis of data, and writing the manuscript. Mona S. Hamed is a co-author responsible for revision of the manuscript.

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