Knowledge, Attitudes, and Practice Related to COVID-19 Among Healthcare Workers in the United Arab Emirates: A Cross-sectional Study.

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Abstract

Objectives: The coronavirus disease-2019 (COVID-19) outbreak is a global health pandemic that continues to have an impact on many aspects of everyday life. This study investigates the Knowledge, Attitudes, and Practices (KAP) related to COVID-19 among healthcare workers in the United Arab Emirates (UAE).

Methods: This study uses a cross-sectional study design. The original data were collected using an online questionnaire distributed via a Google Forms link. Participants were healthcare workers currently working in the UAE healthcare facilities and recruited using snowball sampling. The questionnaire collected information on demographic variables and COVID-19-related knowledge, attitudes, and practice.

Results: In total, the sample of 107 healthcare workers completed the survey. About 92% of the participants worked in public institutions, 87% were from Dubai, and 67% were female. The majority were aged 31–40 years (34.6%), and 43% were radiographers. 66.4% held bachelor’s degrees and Indian nationalities were (28%) and the Philippinos were (28%). Most (90.7%) participants knew the absence of fever did not mean that the virus could not transmit from an infected person, and 84.1% agreed that wearing general medical masks prevented one from contracting COVID-19. However, only 36.4% strongly believed that wearing a well-fitting face mask was effective. In addition, only 15.9% reported confidently managing patients with symptoms of COVID-19, and 54.2% reported that they were afraid of contracting the virus from patients. Almost half of the participants avoided patients who had symptoms of COVID-19.

Conclusion: Overall, healthcare workers’ COVID-19-related knowledge, attitudes, and practices for healthcare workers in UAE healthcare facilities was very high. However, we found gaps in awareness regarding the spread of the pandemic. Our study recommends that providing healthcare workers with education programs and counseling services would help increase their confidence in treating patients with COVID-19.

1. Background

The ongoing outbreak of the highly contagious respiratory disease to as coronavirus disease 2019 (COVID-19) threatens global health. The novel coronavirus is structurally related to the virus that causes severe acute respiratory syndrome (SARS) and pneumonia [1]. The presence of pneumonia allowed COVID-19 to be identified. Close monitoring of the virus suggested a mean incubation period of 5 days; symptoms usually emerge in 1 week, including fever, cough, nasal congestion, and other signs of upper respiratory tract infection, which can progress to more severe forms such as dyspnea [2].

COVID-19 spreads via respiratory secretions of infected persons when they cough or sneeze, especially in poorly ventilated or crowded places. Patients with diabetes tend to experience more severity [3]. Although COVID-19 is a highly infectious disease, most infected recover without special treatment – a global mortality rate of about 2% [4]. However, older people and those with chronic disease conditions such as
cardiovascular, diabetes, cancer, and respiratory diseases are more likely to develop severe illnesses. For instance, diabetic patients tend to have poor health outcomes from COVID-19 and higher mortality [3].

No medicine for treating COVID-19 is currently available, although various clinical trials are being conducted to evaluate potential treatments. It means that prevention of infection is the only way to control the outbreak. The best way to prevent and slow transmission is to ensure people are well informed about COVID-19 and understand how it spreads, along with basic preventative measures. The simple daily actions that can help prevent the spread of the virus include social distancing, wearing face masks, washing hands or using alcohol-based sanitizers, staying home when experiencing any symptoms to avoid spreading illness to others.

### 1.1 Burden of Covid-19

COVID-19 has negatively affected many sectors of the economy, including health, business, education, the aviation industry, tourism, and others. In terms of the impact on society in general, a study that explored differences in the socioeconomic impact of Ebola virus disease and COVID-19 in the Eastern Democratic Republic of Congo reported that COVID-19 had a more significant adverse effect on the economy than Ebola virus disease, despite the lower mortality rate of COVID-19 [5]. This economic impact can be attributed to factors such as implementing preventive measures (e.g., social distancing, curfews) that meant people spent less time socializing spots, including in cafes and restaurants. Business owners were also adversely affected by staff issues, with staff morale affected by the uncertainty surrounding salary cuts and employment termination [6]. An analysis of the impact of the pandemic on small businesses in the United States reported that business dropped by around 13.8 million through February, March, and April 2020 [7].

Preventive measures such as social distancing and lockdowns also restricted movements of people within and across countries. Increased demand for transport resulted in higher fares and costs of transporting goods, which was catastrophic for emerging economies such as Nigeria [8]. During the second quarter of 2020, transportation dropped drastically around the world. On average, commercial travel dropped by 75% and shipping dropped by almost 50% on average from 75% in mid-April 2020 [9]. Travel restrictions also impacted tourism. It affected developed countries like Europe and less developed countries such as the Maldives or Seychelles, which experienced a massive loss of livelihood [10].

The education sector also suffered adverse consequences from the pandemic, including temporary school closures, which affected about 60% of students globally [11]. All schools in the United Arab Emirates (UAE) were temporarily closed, and new teaching methods (such as online learning) were introduced [11]. The UAE Al Qassimi Foundation indicated that students, staff, and parents experienced high stress during this time [12]. Working parents and students with special needs also faced significant difficulties with the new teaching/learning methods, although support was provided (such as free Internet packages, tutorials) [12].
The pandemic impacted social relationships through fear of contact with other people, especially as families were anxious about losing a family member to COVID-19 [13]. Limits on physical contact may have caused distress for many people, especially those separated from loved ones or trapped in foreign countries because of flight restrictions.

The COVID-19 also has had an even bigger impact on hospitals and other healthcare facilities in general [14]. For example, during the pandemic, patients with chronic conditions or those who required less urgent care resulted in many patients avoiding visiting hospitals. This in turn resulted in financial losses [15]. In response, hospitals adopted better hygiene practices because of COVID-19, although many hospitals have not sustained these practices, which in turn increased the possibility of healthcare workers getting infected [16]. Practices refer to the professional handling and treatment of patients, which may include protecting healthcare workers and effective handling and treatment of their COVID-19 and non-Covid-19 patients.

A study by Shaukat and colleagues noted that healthcare workers handling Covid-19 cases are at increased risk of negative impact on their physical and mental health [17]. Their scoping review found that this could be attributed to multiple factors, including working in high-risk areas and having close contact with patients (e.g., over 12 times per day for more than 15 hours). Common symptoms among healthcare workers were fever (85%), cough (70%), and weakness (70%), and using personal protective equipment for an extended period also led to damage of the skin (97%) and nasal bridge (83%) [17]. In addition, healthcare workers experienced high levels of depression, anxiety, insomnia, and distress, wherein nurses and female healthcare workers were found to be highly affected [17].

A recent study from Saudi Arabia showed that healthcare workers had relatively low knowledge about the causative agent of COVID-19 (45%), although knowledge of risk factors for COVID-19 (e.g., close contact with infected people) and the use of antibiotics to treat COVID-19 was higher (97% and 63%, respectively) [18]. That study also demonstrated that most healthcare workers (92%) are afraid of being carriers of the virus and being potential sources of infection to their families. Thus, most of them cleaned their hands as often as they could (87%) and wearing masks (71%) [18].

Given that their exposure to patients, healthcare workers are at risk for contracting COVID-19, and therefore essential to ensure that all healthcare workers have appropriate knowledge, attitudes, and professional practices to reduce the realise positive outcomes for themselves and their patients. The primary aim of this study is to identify the knowledge, attitudes, and practice of health professionals related to COVID-19 among healthcare workers in the UAE. This information is essential as the knowledge, attitudes and professional practices toward COVID-19 adopted by healthcare workers affect their ability to treat and manage confirmed or suspected COVID-19 cases.

2. Methods

We undertook cross-sectional study design to collect original data from healthcare workers in both public and private healthcare sectors in the UAE. Participating healthcare workers were from Sharjah, Dubai, Abu
Dhabi, Ajman and Umm al Quwain. Participants recruited were from different specialties (such as physicians), radiographers, nurses, and pharmacists.

2.1. Population and sample

The target population was healthcare workers in UAE that may encounter confirmed or suspected COVID-19 patients. The required sample size was calculated using Creative Research Systems survey software at a 5% level of error and a 95% confidence level [21]. The population of healthcare workers in the UAE was 113,000 (as of 2017) [22]. Due to challenges related to the Pandemic, we received responses from 107 respondents.

2.2. Data collection and tool

Primary data were collected using online survey questionnaire that was adapted from previous studies [18, 19, 20]. We selected questions from the above three studies and contextualized them to UAE. The questionnaire (Appendix) was then tested on 5 people as a process of validation and then updated given the feedback. Due to the ‘lockdown’ restrictions imposed by the government during the pandemic, the questionnaires were disseminated via social media and participants completed online using Google Forms.

We used the snowball sampling technique to recruit the participants for this study. This is non-probability sampling technique in which identified study participants recruit future participants from among their connections [23]. Due to COVID-19 restrictions and related issues, healthcare workers were asked to fill the survey and thereafter to forward the link to their colleagues whom they knew in other healthcare facilities.

2.3. Data analysis

Data processing and analysis were performed using Statistical Package for Social Sciences (SPSS) version 21 [24]. Descriptive statistics were utilized to present the data collected using the means, frequencies, and percentages. We also used cross-tabulation to display relationships between demographic variables and participants’ responses to the knowledge, attitude and practice variables (see the survey instrument in the appendix).

2.4. Ethical considerations

Ethical approval for this study was obtained from the University of Sharjah Research Ethics Committee (ID: REC-21-02-21-02-S). Information about the study was posted on the front page of the Google Forms questionnaire. This included a statement asking the participants to confirm that they are healthcare workers currently working in the UAE. They were then advised that by clicking on the survey link, this means that they had consented to participate in this study.
3. Results

3.1. Demographic characteristics

A total sample of 107 healthcare workers was able to complete survey study. Approximately 92% of them worked in the public health sector facilities. The mean age of participants was 40.5 ± 11 years, and 67.3% were female. Most participants (87%) worked in the Emirate of Dubai. The classification of participants by occupation as follows: specialist physicians (16.8%), radiographers (43%), nurses (23.4%), and pharmacists (8.4%), and others (8.4%). The majority of the participants had a bachelor’s degree (66.4%) as their highest level of education (Table 1).
| Characteristic       | Variable          | n (%)   |
|---------------------|-------------------|---------|
| Workplace           | Private           | 9 (8.4) |
|                     | Public            | 98 (91.6) |
| Emirate             | Dubai             | 93 (86.9) |
|                     | Sharjah           | 9 (8.4) |
|                     | Others            | 5 (4.6) |
| Gender              | Male              | 35 (32.7) |
|                     | Female            | 72 (67.3) |
| Age, years          | 21–30             | 21 (19.6) |
|                     | 31–40             | 37 (34.6) |
|                     | 41–50             | 24 (22.4) |
|                     | 51–60             | 25 (23.4) |
| Qualification       | Specialist physicians | 18 (16.8) |
|                     | Radiographers     | 46 (43.0) |
|                     | Nurses            | 25 (23.4) |
|                     | Pharmacists       | 9 (8.4) |
|                     | Others            | 9 (8.4) |
| Education           | Diploma           | 139 (12.1) |
|                     | Bachelor's        | 71 (66.4) |
|                     | Masters           | 16 (15.0) |
|                     | PhD               | 7 (6.5) |
| Characteristic                      | Variable                                                                 | n  | (%)  |
|------------------------------------|---------------------------------------------------------------------------|----|------|
| **Nationality**                    | Philippines                                                               | 30 | (28.0)|
|                                    | India                                                                     | 30 | (28.0)|
|                                    | UAE                                                                       | 14 | (13.1)|
|                                    | Others                                                                    | 33 | (30.8)|
| **Source of information on COVID-19** | Official international health organization sites such as WHO or CDC       | 84 | (78.5)|
|                                   | Official government sites and media (e.g., Ministry of Health, UAE)        | 91 | (85) |
|                                   | News media (e.g., TV, radio, magazines, newspapers)                       | 57 | (53.3)|
|                                   | Social media (e.g., WhatsApp, Facebook, Twitter, Instagram)               | 51 | (47.7)|
|                                   | Journals                                                                  | 32 | (29.9)|

### 3.2. Knowledge

Participants’ responses related to knowledge about COVID-19 are summarized in Table 2. Most participants (94%) were aware that there was no cure for COVID-19, but that early diagnosis and supportive interventions would help patients recover faster. About 21.5% of participants agreed with the statement that eating contaminated food could cause COVID-19, whereas the majority disagreed. Most participants (78.5%) agreed with the statement that not all patients with COVID-19 developed severe symptoms, and 91% agreed that the absence of a fever does not mean that the individuals with COVID-19 could not infect others.

Furthermore, 94.4% of participants knew that COVID-19 spread through the respiratory droplets of infected individuals, and 84.1% agreed with the statement that wearing a general medical mask prevented one from contracting COVID-19. Most participants (93%) agreed that children and young adults needed to take preventive measures against the disease, and 90% indicated that individuals should avoid crowded places to reduce the chance of COVID-19 infection. Furthermore, about 96% knew that the isolation of infected patients for 14 days was an effective way to reduce the spread of the virus.
Table 2  
Knowledge about COVID-19 among healthcare workers (N = 107)

| Variable                                                                 | n (%)     |
|--------------------------------------------------------------------------|-----------|
| **Major clinical symptoms of COVID-19**                                   |           |
| Fever                                                                    | 107 (100) |
| Headache                                                                 | 91 (85)   |
| Myalgia (muscle pain)                                                    | 80 (74.8) |
| Smell disturbance                                                        | 87 (81.3) |
| Sore throat                                                              | 98 (91.6) |
| Runny nose                                                               | 61 (57)   |
| Sneezing                                                                 | 56 (52.3) |
| Diarrhea                                                                 | 71 (66.4) |
| Cough                                                                    | 104 (97.2)|
| confusion                                                                | 23 (21.5) |
| **There is currently no cure for COVID-19**                              |           |
| True                                                                    | 100 (93.5)|
| False                                                                   | 4 (3.7)   |
| I don’t know                                                             | 3 (2.8)   |
| **Not all COVID-19 cases will become severe, only ones with chronic illnesses** |           |
| True                                                                    | 84 (78.5) |
| False                                                                   | 19 (17.8) |
| I don’t know                                                             | 4 (3.7)   |
| **Contaminated food and seafood would result in the COVID-19 infection** |           |
| True                                                                    | 23 (21.5) |
| False                                                                   | 68 (63.6) |
| I don’t know                                                             | 16 (15.0) |
| **COVID-19 patients cannot transmit the virus when a fever is not present** |           |
| True                                                                    | 5 (4.7)   |
| False                                                                   | 97 (90.7) |
| I don’t know                                                             | 5 (4.7)   |
| Variable                                                                 | n (%)     |
|-------------------------------------------------------------------------|-----------|
| The COVID-19 virus spreads via respiratory droplets of infected individuals |           |
| True                                                                    | 101 (94.4)|
| False                                                                   | 3 (2.8)   |
| I don’t know                                                            | 3 (2.8)   |
| Wearing masks can prevent one from acquiring infection by the virus    |           |
| True                                                                    | 90 (84.1) |
| False                                                                   | 14 (13.1) |
| I don’t know                                                            | 3 (2.8)   |
| Children and young adults should also avoid infection by the COVID-19 virus |           |
| True                                                                    | 9 (8.4)   |
| False                                                                   | 94 (87.9) |
| I don’t know                                                            | 4 (3.7)   |
| Individuals should avoid going to crowded places to avoid COVID-19      |           |
| True                                                                    | 96 (89.7) |
| False                                                                   | 10 (9.3)  |
| I don’t know                                                            | 1 (0.9)   |
| Isolation and treatment of people who are infected with the COVID-19 virus |           |
| True                                                                    | 103 (96.3)|
| False                                                                   | 3 (2.8)   |
| I don’t know                                                            | 1 (0.9)   |
| Contact with someone with an infection requires 14 days of observation |           |
| True                                                                    | 102 (95.3)|
| False                                                                   | 3 (2.8)   |
| I don’t know                                                            | 2 (1.9)   |

### 3.3. Attitudes

Table 3 presents participants’ responses regarding attitudes toward COVID-19. Approximately 25% of the participants strongly agreed or agreed that the young population was protected from acquiring COVID-19. Most participants (90%) agreed or strongly agreed that wearing a well-fitting mask effectively prevented
individuals from contracting the virus, and 88% agreed or strongly agreed that washing hands with soap could prevent one from getting the virus (Table 3). Only 43.9% of participants agreed they confidently participated in managing patients who had signs and symptoms of COVID-19. In addition, 50.5% of participants were afraid of carrying the virus from their workplace to home, and 54.2% were afraid of contracting the virus from patients. Most participants agreed (49.5%) or strongly agreed (55.1%) that their workplaces were equipped to curb the spread of COVID-19. Interestingly, 55.1% agreed, and 29.9% strongly agreed that the UAE was in a position to contain the virus.
### Table 3
*Attitudes toward COVID-19 among healthcare workers*

| Variables                                                                 | n (%)           |
|---------------------------------------------------------------------------|-----------------|
| **The young population is protective towards COVID-19 disease**           |                 |
| Strongly Disagree                                                         | 32 (29.9)       |
| Disagree                                                                  | 29 (27.1)       |
| Not Sure                                                                  | 19 (17.8)       |
| Agree                                                                     | 17 (15.9)       |
| Strongly Agree                                                            | 10 (9.3)        |
| **Wearing a well-fitting face mask is effective in preventing COVID-19**   |                 |
| Strongly Disagree                                                         | 6 (5.6)         |
| Disagree                                                                  | 2 (1.9)         |
| Not Sure                                                                  | 3 (2.8)         |
| Agree                                                                     | 57 (53.3)       |
| Strongly Agree                                                            | 39 (36.4)       |
| **Washing with soap can prevent you from getting COVID-19**                |                 |
| Strongly Disagree                                                         | 5 (4.7)         |
| Disagree                                                                  | 4 (3.7)         |
| Not Sure                                                                  | 4 (3.7)         |
| Agree                                                                     | 60 (56.1)       |
| Strongly Agree                                                            | 34 (31.8)       |
| **For COVID-19 patient, I nfidently participate in the management of the patient** |                 |
| Strongly Disagree                                                         | 10 (9.3)        |
| Disagree                                                                  | 15 (14.0)       |
| Not Sure                                                                  | 18 (16.8)       |
| Agree                                                                     | 47 (43.9)       |
| Strongly Agree                                                            | 17 (15.9)       |
| **I am afraid of carrying COVID-19 from my workplace to my home**         |                 |
| Strongly Disagree                                                         | 3 (2.8)         |
| Disagree                                                                  | 7 (6.5)         |
| Variables                                                                 | n (%)   |
|---------------------------------------------------------------------------|---------|
| Not Sure                                                                  | 11 (10.3)|
| Agree                                                                     | 54 (50.5)|
| Strongly Agree                                                            | 32 (29.9)|
| **I am afraid of contracting COVID-19 from the patients**                 |         |
| Strongly Disagree                                                         | 4 (3.7) |
| Disagree                                                                  | 18 (16.8)|
| Not Sure                                                                  | 8 (7.5)  |
| Agree                                                                     | 58 (54.2)|
| Strongly Agree                                                            | 19 (17.8)|
| **My workplace is adequately equipped to curb the spread of the pandemic**|         |
| Strongly Disagree                                                         | 2 (1.9)  |
| Disagree                                                                  | 9 (8.4)  |
| Not Sure                                                                  | 16 (15.0)|
| Agree                                                                     | 53 (49.5)|
| Strongly Agree                                                            | 27 (25.2)|
| **My workplace is adequately equipped to protect us from the pandemic**   |         |
| Strongly Disagree                                                         | 3 (2.8)  |
| Disagree                                                                  | 11 (10.3)|
| Not Sure                                                                  | 8 (7.5)  |
| Agree                                                                     | 59 (55.1)|
| Strongly Agree                                                            | 26 (24.3)|
| **UAE is in an appropriate position to contain COVID-19**                  |         |
| Strongly Disagree                                                         | 2 (1.9)  |
| Disagree                                                                  | 1 (0.9)  |
| Not Sure                                                                  | 13 (12.1)|
| Agree                                                                     | 59 (55.1)|
| Strongly Agree                                                            | 32 (29.9)|
3.4. Practices

Participants’ responses concerning practice related to COVID-19 are presented in Table 4. 97.2% of participants always wore masks during patient contact, 85% (n = 91) always refrained from shaking hands, and 91.6% always washed their hands before and after handling each patient. Surprisingly, 49.5% of the participants indicated they always avoided patients with signs and symptoms of COVID-19. Most participants (86.0%) always educated their patients about preventive measures, and 95.3% always obeyed all government rules related to the COVID-19. Moreover, 94.4% of participants always maintained social distancing.
Table 4
*Practices related to COVID-19 among healthcare workers*

| PRACTICES                                           | N (%)  |
|-----------------------------------------------------|--------|
| I have worn a mask when in contact with patients    |        |
| Always                                              | 104 (97.2) |
| Occasional                                          | 1 (0.9)  |
| Never                                               | 2 (1.9)  |
| I have refrained from shaking hands                 |        |
| Always                                              | 91 (85.0) |
| Occasional                                          | 3 (2.8)  |
| Never                                               | 13 (12.1) |
| I have washed my hands before and after handling each patient |        |
| Always                                              | 98 (91.6) |
| Occasional                                          | 8 (7.5)  |
| I have avoided patients with signs and symptoms suggestive of COVID-19 |        |
| Always                                              | 53 (49.5) |
| Occasional                                          | 28 (26.2) |
| Never                                               | 26 (24.3) |
| I educate my patients about preventive measures for COVID-19 |        |
| Always                                              | 92 (86.0) |
| Occasional                                          | 13 (12.1) |
| I obey all government rules related to the COVID-19  |        |
| Always                                              | 102 (95.3) |
| Occasional                                          | 5 (4.7)  |
| Never                                               | 0 (0.0)  |
| I always maintain social distancing                  |        |
| Always                                              | 101 (94.4) |
| Occasional                                          | 6 (5.6)  |

Only 26.2% and 24.3% of the respondents occasionally tried to avoid patients with Covid-19 symptoms, while 24.3% never tried to avoid patients with symptoms of COVID-19. Table 5 shows the relationships
between knowledge, attitudes, and practices related to COVID-19 and participants' age. We found that only participants in the group aged 31–40 years believed the statement that a person without a fever could not transmit COVID-19 to others was genuine. In addition, all respondents in the group aged 51–60 years agreed with the statement that using a general medical mask prevented infection with COVID-19, with agreement relatively high across all age groups.

### Table 5

*Relationships between knowledge, attitudes, and practice, and participants' age*

| Variables                                                                 | Age         | Total |
|---------------------------------------------------------------------------|-------------|-------|
|                                                                           | 21–30 | 31–40 | 41–50 | 51–60 |       |
| Persons with COVID-19 cannot transmit the virus to others when a fever is not present | True  | 0     | 5     | 0     | 0     | 5     |
|                                                                           | False | 21    | 29    | 22    | 25    | 97    |
|                                                                           | I don't know | 0 | 3     | 2     | 0     | 5     |
| Total                                                                     |        | 21    | 37    | 24    | 25    | 107    |
| When a patient has signs and symptoms of COVID-19, I can confidently participate in the management of the patient. | Strongly Disagree | 2 | 5     | 1     | 2     | 10     |
|                                                                           | Disagree | 2     | 4     | 6     | 3     | 15     |
|                                                                           | Not Sure | 3     | 7     | 6     | 2     | 18     |
|                                                                           | Agree   | 9     | 15    | 10    | 13    | 47     |
|                                                                           | Strongly Agree | 5 | 6     | 1     | 5     | 17     |
| Total                                                                     |        | 21    | 37    | 24    | 25    | 107    |
| In the recent days, I have avoided patients with signs and symptoms suggestive of COVID-19 | Always | 10    | 22    | 11    | 10    | 53     |
|                                                                           | Occasional | 9   | 10    | 5     | 4     | 28     |
|                                                                           | Never   | 2     | 5     | 8     | 11    | 26     |
| Total                                                                     |        | 21    | 37    | 24    | 25    | 107    |

### Discussion

The COVID-pandemic spread rapidly and had major impacts on different aspects of people's lives globally, including health, livelihoods, education, and economies in general. The rising number of patients with COVID-19 resulted in shortages of intensive care facilities, medical supplies, beds, and staff and placed a considerable burden on the health system and healthcare workers. Healthcare workers must
provide care for confirmed and suspected COVID-19 cases, and therefore remain at high risk for infection with the virus. The risk for infection associated with exposure to infected patients adversely affects healthcare workers’ physical and mental health [17]. To effectively fight against the spread of the pandemic, it is essential for healthcare workers to have sufficient knowledge and appropriate attitudes and practice related to COVID-19. Lack of knowledge and poor practices mean that healthcare workers may place themselves, their colleagues, and their patients at risk, especially if they do not adhere to appropriate precautionary measures.

Our study showed that healthcare workers in the UAE had sufficient knowledge about COVID-19, as most participants were aware that although COVID-19 had no cure, early diagnosis and supportive care helped most patients recover. These findings are supported by a previous study [20]. Furthermore, most participants believed that the absence of fever did not mean the absence of COVID-19. A study by Olum et al. had found a high level of knowledge among healthcare workers [19]. As per the study findings, only a few (8.4%) participants believed that children and young adults should avoid infection with COVID-19. This result is consistent with a study by Ferdous et al., who reported that 4% of their respondents held this belief [20]. Encouragingly, most of our participants agreed/strongly agreed that wearing a well-fitting mask effectively prevented COVID-19, which was consistent with a previous study [19]. The frequent reminders may explain the relatively high rate of knowledge about the protective effect of masks via official international and governmental websites about the importance of wearing a well-fitting mask. To enforce the use of masks, the UAE has strict rules and fines for individuals who are non-compliant with this requirement [19].

Our results also suggested that there was some debate about whether contaminated food was a source of infection. About 80% (n=96) of participants believed that avoiding crowded places contributed to protection against COVID-19, whereas only 9.3% (n=10) did not share this belief. Strong adherence to social distancing and face masks are considered effective in combatting the spread of the pandemic. Healthcare workers can have a role in guiding the public about practicing precautionary measures to help reduce the spread of the disease [19].

In our study, most healthcare workers reported fear and stress about caring for patients with COVID-19. Healthcare workers in the older age group were particularly conscious of the risk for COVID-19, which may be because of older people are susceptible to severe Covid-19 outcomes as many tend to have pre-existing conditions. We found that many of our participants were not confident in managing patients who had signs and symptoms of COVID-19, and also, 54% of participants said they always wore masks during patient contact. Our results also demonstrated that most participants refrained from shaking hands, and the majority always washed their hands before and after handling a patient. Strict rules and practices concerning hand hygiene were implemented in hospitals throughout the UAE as the pandemic worsened.

Our study showed that majority of the respondents maintain social distancing. Similarly, Ferdous et al. found that 90.8% of their participants maintained social distancing [20], which could be because of
 worldwide governmental rules and constant reminders about maintaining distance for safety. Overall, healthcare workers adhered to government rules related to preventive measures (Table 4). Similarly, Ferdous et al. reported that 92% of their participants were afraid of carrying the virus home, and 76% agreed that their institutions were well prepared for the pandemic [20]. In our study, most healthcare workers educated their patients about preventive measures for COVID-19. The WHO and related institutions guided countries on responding to COVID-19 during the pandemic, and many countries relied on these announcements and guidelines that encouraged people to follow and adhere to public health measures. The UAE established the National Crisis and Emergency Management Authority in 2010. This authority established field hospitals and devised proper plans to respond to the COVID-19 pandemic, with these plans included free PCR testing and later free vaccination for the population. Providing ongoing education and support for healthcare professionals to improve their knowledge, attitudes, and practices related to COVID-19 will help to strengthen the UAE's response to the current pandemic and similar public health issues that may arise in the future.

**Conclusion**

COVID-19 brought about unprecedented circumstances globally. The UAE government is actively expanding and strengthening its public health efforts to curb the spread of the pandemic, through restrictions and precautionary guidelines. These were implemented primarily to curb the spread of the pandemic and protect the healthcare workers from infection. This study indicates that there is a strong need for continuous professional education among healthcare workers so as to continuously and rigorously update their knowledge, attitudes and professional practice to prepare them for the unforeseeable future events and epidemics. Healthcare workers in this study believe in wearing masks and social distancing protocols to help prevent them from infection. However, it is difficult at this point to attribute the proportion of this willingness to use of the face masks and social distancing to the knowledge or attitudes of healthcare workers, other than government regulations. Indeed, some healthcare workers do not believe in using masks and social distancing. Unfortunately, this can undermine government efforts to curb COVID-19 among Healthcare workers and society in general. Interventions are needed to improve awareness among healthcare workers, such as orientation and continuing education programs.

It is therefore necessary to gauge the levels of knowledge on Covid-19; the healthcare workers’ attitudes, given their beliefs and cultural orientations from their cultural backgrounds, given that majority of healthcare workers are foreigners in the UAE. The professional practice related to COVID-19 among healthcare workers in the UAE needs to be closely monitored to better understand the factors influencing the spread of COVID-19. More research on appropriate knowledge, attitudes, and practices among healthcare workers in the UAE is essential to help government understand what they can do to improve health care and health outcomes of COVID-19 and other illnesses.

Institutions ought to enforce precautions and protective measures against COVID-19 for healthcare professionals, so that they are protected, and so are their families and the wider community. Furthermore,
the we recommend that healthcare facilities should include counseling services for their workers who are low confidence in treating patients with COVID-19. Further, having incentives in place for healthcare workers to participate in continuous professional development are essential to motivate participation. Also, healthcare worker educational institutions must embed public health measures, such as attitudes and professional practices to epidemics, in their educational programs and curricula in the UAE. Furthermore, preparedness and continuity during crises and emergencies should be introduced to the healthcare system so as to prepare and change the attitudes of healthcare workers.

The limitation of our study is that we cannot generalize our findings due to our small sample size which is not representative. Most participants were from Dubai because social distancing and other restrictions hindered our data collection. This is mainly due to public health restrictions that had been in place at the time of this study, potentially leaving out survey participants as completion of the survey requires access to the Internet.

**Abbreviations**

COVID-19: Coronavirus disease-2019

UAE: United Arab Emirates

PCR: *Polymerase chain reaction*

WHO: World Health Organisation

**Declarations**

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We would like to the University for allowing us to undertake this study

**Ethics approval and consent to participate**

Ethical approval for this study was obtained from the University of Sharjah Research Ethics Committee (ID: REC-21-02-21-02-S). Information about the study was posted on the front page of the Google Forms questionnaire. This included a statement asking the participants to confirm that they are healthcare workers currently working in the UAE. They were then advised that by clicking on the survey link, this means that they had consented to participate in this study.

**Consent for publication**

Not applicable.
Availability of data and materials

The datasets generated during the present study are not publicly available because of ethical restrictions but are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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None to declare.

Authors’ contributions

MEO, AMA and HHH led the study’s conception and design. MEO, LSK and RAK led the review of the literature. MEO and AMA handled the data analysis and interpretation. MEO AMA, HHH drafted the manuscript. All the authors read the draft, reviewed the findings, and worked on the manuscript. All the authors critically analysed the paper for important intellectual content. All authors read and approved the final manuscript.

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