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Original Research

Pharmacists' knowledge, attitude and practice in the UAE toward the public health crisis of COVID-19: A cross-sectional study

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Abstract

Objectives: Internationally, pharmacists have shown a pivotal role in alleviating the unprecedented spread of the COVID-19 as they are the first touchpoint to patients. The aim of this study to evaluate the UAE pharmacists' knowledge about and practice in the global COVID-19 pandemic. **Methods:** A quantitative cross-sectional study was conducted during a period from August 2020 to January 2021. A well-designed standardized English-based questionnaire was developed based on current literature and employed for this study. **Findings:** The results showed that 45.7% of the participated pharmacists expected to have a good level of knowledge about COVID-19 transmission, symptoms and treatment. Among the participated community pharmacists, around 25.7% educated their patients and 17.0% counseled the public about the current available therapeutic options for managing COVID-19 symptom. Most practiced activities hospital pharmacists (17.4%) was exploring new drug therapies or uses, while few hospital pharmacists (13.0%) participated in the antimicrobial stewardship programs and monitored antibiotic uses for COVID-19 cases and co-infections. Pharmacists at age ≥40 years old and have an experience of ≥10 years in the pharmacy field were more knowledgeable about COVID-19 with higher scores ($p < 0.001$ and $p = 0.001$; respectively). **Conclusions:** The study revealed an appropriate average knowledge and practice toward COVID-19 among community and hospital pharmacists.

Keywords: Pharmacists; Knowledge; Attitude; Practice; UAE; COVID-19; Cross-sectional

INTRODUCTION

Local efforts and pharmaceutical care amid COVID-19

On 30 January 2020, the World Health Organization (WHO) declared that Coronavirus disease of 2019 is the sixth public health emergency of international concern.[1] The uncontrolled growing number of COVID-19 cases is attributed to the fast human-to-human spread of a novel respiratory virus called as: "SARS-CoV-2", which results in mild to severe clinical manifestation including cough, fever, shortness of breath and/or loss of smell and taste.[2,3] The first COVID-19 cases detected in the United Arab Emirates (UAE) were reported on 29th of January 2020, and based on latest COVID-19 updates, more than half million cases with approximately 1,610 fatalities were identified in the country. From that moment, the UAE government worked intensively to increase its preparedness at all levels to face this outbreak. It represents a unique model in response to the novel Coronavirus pandemic; as it has been implementing a set of strategies and programs against this condition.[3] One of the strategies adopted was developing the mobile pharmacy service (Dawa'ee), where medicine is delivered to patients' homes to protect patients with chronic diseases and elderly from going to hospitals and being infected in addition to reducing the pressure on medical centers. Furthermore, awareness sessions across community pharmacists were conducted to educate them about most appropriate manner to deal with such pandemics.[2,4] However, majority of patients may experience certain medical conditions that cannot be recognized by themselves or they are unable to seek medical care at hospitals due to the increased burden on the medical staff. Therefore, pharmacists have essential contribution in alleviating the enormous strain of this COVID-19 pandemic among all healthcare providers.

Community pharmacists amid COVID

The community population is at higher risk for COVID-19 infection; therefore, pharmaceutical care (PC) services are among the fundamental medical services to be

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improved during pandemics at its all levels, especially the community pharmacies, which have opened their doors to patients even during the lockdown when other resources were limited. The main responsibilities of the community pharmacist include detecting early cases that need appropriate referral, offering over-the-counter remedies for mild symptoms and medical protective equipment as sanitizers, gloves, and face masks for proper hygiene, ensuring early and safe supply of "key medicines" beside patient's education about COVID-19, and proper counseling on minor ailments. In COVID-19, patients' symptoms are typically presented in the community pharmacy, whereby pharmacist is one of the frontline soldiers and the first point of contact, who can actively contribute to preventing the spread of COVID-19 outbreak and overall emergency management.[5-7]

Hospital pharmacists amid COVID

Nonetheless, it is important to highlight the pivotal role of hospital pharmacists as well, since they have effectively contributed to managing COVID-19 protocols, participating in hospital rounds alongside nurses and physicians, providing sufficient medications' supply for inpatients and ICU beds, and managing medications' shortage in collaboration with the medical team. In addition, hospital pharmacists have been involved in the antimicrobial management stewardship program; therefore, planning and participating during pathogens outbreaks as COVID-19.[8] For instance, hospital pharmacists are capable of developing protocols and recommending certain medications targeting viral and/or bacterial infections, as well as monitoring the use of antibacterial agents in case of co-infections with COVID-19.[9] As in the current situation, several empirical therapies as hydroxychloroquine, favipiravir, azithromycin, and prednisolone are used to manage COVID-19; however, none of them has been approved as an optimal treatment for COVID-19 patients. Thereby, hospital pharmacists can help researchers in assessing the efficacy and safety of the abovementioned medications' use and asking infected patients to participate in several studies and clinical research trials.[10]

Being very accessible healthcare professionals, community and hospital pharmacists' role should be expanded in future pandemics as their practice is crucial in terms of reducing the load on other healthcare facilities, including the emergency department in hospitals, by clarifying misconceptions about the disease and its related medications' problems, the needed equipment for public or in ICU beds, offering tele-medicine services, and COVID-19 medication management.[11]

AIM

The aims of this study are to evaluate the UAE pharmacists' knowledge about COVID-19 pandemic and to assess the pharmacists' and pharmacy work force contribution during the novel COVID-19 pandemic in the UAE.

METHODS

Study design, setting and participants

This is a quantitative cross-sectional study that was conducted during a period from August 2020 to January 2021. A well-designed questionnaire was distributed to licensed community and hospital pharmacists throughout the UAE. The questionnaire was uploaded to Google Drive and distributed online for safety and convenience. The entire survey took about 10 minutes to be completed. Trainees/intern pharmacy students or pharmacists with pharmacy practice experience of less than 3 months were excluded from the study, since their contribution in the crisis is limited compared to experienced pharmacists.

Study outcomes

The main outcomes to be measured in this study were: current knowledge and contribution (current and anticipated future practice) of the pharmacists working in either community or hospital pharmacy toward the COVID-19 crisis. In addition, the need for a mental health training program for ameliorating the stress of the pharmacists caused by this crisis.

Sample size estimation

The sample size was calculated using an online sample size calculator (Raosoft) at a 95.0% confidence level and a 5.0% margin of error.[12] Based on the Federal Competitiveness and Statistics Authority (FCSA), number of pharmacists working the health sector has reached 8,469 pharmacists in 2018.[13] Therefore, the minimum required sample size for this study was 368 pharmacists. Accordingly, a convenient sample composed of 400 pharmacists was targeted to receive the survey, assuming the response rate would be ~90.0%.

Ethical consideration

The research was approved by Emirates Institutional Review Board for COVID-19 Research. Participation in the study was voluntary without any consequent risk upon refusal. An online consent form attached with the questionnaire was provided to explain the purpose of the study, and all provided pharmacists' information were kept confidential and used for research purposes only. Participants were able to answer the questionnaire once they put their approval on the consent form.

Questionnaire development and validity assessment

A well-designed standardized English-based questionnaire was produced by the authors based on current literature and employed for this study. The final version of the

questionnaire highlighted the main points that illustrates pharmacists' contributions to the public health crisis of COVID-19 in the UAE. The questionnaire consists of 6 parts with a total number of 44 questions. Each question aims to evaluate pharmacists' understanding regarding a specific aspect of COVID-19. The first part of the questionnaire collects personal information required to determine the type of pharmacists answering the questionnaire (community, hospital, trainee, or academic) and the location of their workplace in the UAE. The second part includes questions that evaluate the understanding of pharmacists regarding updated information of the current pandemic, the level of their awareness and professionalism in collecting essential data concerning COVID-19 from trusted resources. Parts three and four contain questions that directly test their current knowledge about COVID-19 including: proper patients' education, ways to protect themselves and their household, COVID-19 testing, and whether there have been any discovery of treatment or vaccine. The fifth part investigates pharmacists' role and activities they can perform to combat such emergency crisis. Followed by that, the last part of the questionnaire is to assess the attitudes of pharmacists in the UAE toward introducing a healthcare care program supporting their mental health during this crisis.

The face and content validity of the amended questionnaire was assessed through peer review by two relevant experts (PhD holders) with substantial experience in survey design and development. All the comments from the experts were considered when developing the final version of the questionnaire.

Determining the level of knowledge and practice

Twenty-four questions were related to knowledge about COVID-19, correct answer for each question was given 1 point and the total score of knowledge out of 23 points was calculated by summing all correct answers. Pharmacists answered correctly at least ≥60.0% of the questions were considered at a good level of knowledge. Similarly, pharmacists working at community or hospital pharmacies who declared practicing ≥60.0% of the 14 and 8 activities; respectively, deemed to have a good practice toward the COVID-19 pandemic.

Statistical analysis

Statistical analysis was carried out using the Statistical Package of Social Sciences (SPSS, version 26.0). Continues variables were reported as mean ± standard deviation (SD), while frequencies (percentages) were calculated for the categorical variables. Univariate analysis was used to compare between different groups in the mean scores of knowledge scale. P- value at <0.05 was considered significant.

RESULTS

Demographic data

A total of 376 pharmacists were included in this study (mean age:33.9 ± 9.0, 50.0% males). The highest percentage of respondents were community pharmacists (37.2%, n= 140). Majority had a bachelor's degree (71.3%, n= 268), while only 22.3% (n= 84) had higher education. Although most of the pharmacists did not take online courses about COVID-19 pandemic (77.7%, n= 292), the great majority regularly check or recommend MOHAP awareness materials (81.9%, n= 308) (Table 1).

Table 1. Demographic characteristics of the participated pharmacists

Characteristics	**Total (N)= 376**
Age, (mean ± SD)	33.9 ± 9.0
Gender, n (%)	
Male	188 (50.0)
Female	188 (50.0)
Education, n (%)	
Diploma	24 (6.4)
Bachelor	268 (71.3)
Higher education	84 (22.3)
Employment, n (%)	
Community pharmacists	140 (37.2)
Hospital pharmacists	92 (24.5)
Others	118 (31.4)
Years of experience, (mean ± SD)	10.5 ± 8.6
Place of work, n (%)	
AlAin	224 (59.6)
AbuDhabi	72 (19.1)
Dubai	36 (9.6)
Sharjah	36 (9.6)
RAK	4 (1.1)
Fujaira	4 (1.1)
Taking online courses about COVID-19	
Yes	84 (22.3)
No	292 (77.7)
Checking or recommending MOHAP awareness materials	308 (81.9)
Yes	68 (18.1)
No	

Figure 1 shows that 45.7% (n= 172) of the participated pharmacists expected to have a good level of knowledge.

KNOWLEDGE ABOUT COVID-19

Transmission and symptoms

Table 2 represents general knowledge of pharmacists about COVID-19 transmission and symptoms. More than 80.0% of the respondents had good knowledge in the ways of COVID-19 transmission (88.3%, n= 332), distance of virus spread (92.5%, n= 348), duration of virus incubation (89.4%, n= 336). Pharmacists have also good knowledge in the main symptoms of COVID-19 (96.8%,

Table 2. Knowledge about COVID-19 transmission and symptoms

Statement	Total (N)= 376
1. COVID-19 transmits from one person to another mainly through	332 (88.3)
• Respiratory droplets	8 (2.1)
• Air	36 (9.6)
• Food	
2. COVID-19 spreads among individuals in close contact of	348 (92.5)
• 1-2 meters	12 (3.2)
• 3 meters	16 (4.3)
• 4-5 meters	
3. The main symptoms of COVID-19 infection are:	
• Fever, dry cough, shortness of breath	364 (96.8)
• Aches and pains, nasal congestion, runny nose,	4 (1.1)
• Sore throat or diarrhea	8 (2.1)
4. Gastrointestinal symptoms including diarrhea and nausea have been reported in some cases of COVID-19	324 (86.2)
• Yes	32 (8.5)
• No, I haven't heard about this before	20 (5.3)
• I do not know	0 (0.0)
5. The duration of incubation period is	
• 1-4 days	32 (8.5)
• 2-14 days	336 (89.4)
• I do not know	8 (2.1)
6. Which of the following are at higher risk of developing more severe symptoms to COVID-19? (multiple)	
• Elderly (65 years and older)	296 (78.7)
• Patients with chronic conditions (ex. Asthma, heart diseases, etc)	332 (88.3)
• Children	48 (12.8)
• Correct answer	216 (57.4)
7. COVID-19 can be spread from asymptomatic person during the incubation period?	340 (90.4)
• True	16 (4.3)
• False	20 (5.3)
• I do not know	
8. Can you get infected from touching your nose/ear/mouth after being in contact with a surface contaminated with the virus?	360 (95.7)
• True	12 (3.2)
• False	4 (1.1)
• I do not know	

n= 364) and other minor symptoms associated with the disease (86.2%, n= 324). On the other hand, the vast majority reported that only elderly at age of 65 years old and above were more likely to be at higher risk of developing more severe symptoms to COVID-19 (78.7%, n= 296), while only 57.4 (n= 216) answered correctly that elderly and patients with chronic conditions (ex. Asthma, heart diseases, etc) were at higher risk of having severe illness.

Treatment, prevention and screening

Table 3 illustrates the main information about COVID-19 treatment, prevention and screening. Results shows that few pharmacists are aware about the benefit of NSAIDs in alleviating the fever resulted from COVID-19 (36.2%, n= 136). Two thirds of the pharmacists knew the importance of using corticosteroids in COVID-19 cases that require ventilator support (67.0%, n= 252). Less than half of the pharmacists recognized that the antimalarial hydroxychloquine is not a key preventive agent against COVID-19 (44.7%, n= 168) and it can be used for COVID-19 cases with caution (40.4%, n= 152). However, 73.4% (n= 276) knew that combination of hydroxychloroquine and azithromycin potentially treats COVID -19.

The vast majority of pharmacists believed that vitamins C and D are essential for improving patients' immunity system (94.7%, n= 356) and that regular exercising fights the disease by improving white blood cells circulation in the body (81.9%, n= 308). More than 70.0% of the pharmacists are familiar with the proper methods for protection from COVID-19 infection, but very few realized that all measures should be accounted for full protection from the infection (22.3%, n= 84). In addition, majority of the pharmacists were aware about the eligibility for COVI-19 test, while less than half answered correctly with all cases eligible for the test (42.6%, n= 160).

ATTITUDE OF PHARMACISTS TOWARD COVID-19 PANDEMIC

Attitude toward community pharmacists' role in COVID-19 pandemic

The majority of the respondents agreed that community pharmacists should provide the public with the right preventive methods (e.g. Face mask) from COVID-19 (88.3%, n= 332) and counsel patients about COVID-19 and ways of reducing its spread and transmission (86.2%, n= 324). In addition, 84.0% (n= 316) declared that community pharmacists should seek immediate medical attention when they suspect any COVID-19 case as well as ensure the availability of key medications. Around 45.0% of the respondents disapproved that community pharmacists are unable to educate patients regarding COVID-19 due to perceived lack of time as well as that community disagreed that community pharmacists can provide medication treatment to COVID-19 patients even without a prescription (Table 4).

Attitude toward hospital pharmacists' role in COVID-19 pandemic

More than 85.0% of the respondents have positive attitude toward hospital pharmacists including assurance of sufficient medication supply to support ICU beds, developing local treatment protocols, participating in antimicrobial stewardship programs related to COVID-19, and monitoring the use of antibiotics in cases of bacterial co-infections in COVID-19 patients (Table 5).

Table 3. Knowledge about COVID-19 treatment, prevention and screening	
1. The use of nonsteroidal anti-inflammatory drugs (NSAIDS) may worsen COVID-19	
• True	196 (52.1)
• False, it can relieve its main symptoms including fever	136 (36.2)
• I do not know	44 (11.7)
2. Corticosteroids should be avoided unless indicated for other reasons (e.g. COPD exacerbation)	
• True, corticosteroids have the potential for prolonging viral replication	
• False, corticosteroids (Dexamethasone) can be used in those who require respiratory support	124 (33.0) 252 (67.0)
3. The anti-malarial, anti-inflammatory hydroxychloroquinone is the key preventative drug against COVID-19	
• True	
• False	148 (39.4)
• I do not know	168 (44.7) 60 (16.0)
4. Hydroxychloroquine can be used for treating Coronavirus infected persons with heart problems	
• Yes	
• No	36 (9.6)
• With caution	188 (50.0) 152 (40.4)
5. It has been reported in some studies that the antibiotic Azithromycin might be used in combination with Hydroxychloroquinolone to potentially treat COVID-19 infected persons	
• Yes	276 (73.4)
• No	24 (6.4)
• It is not possible to use antibiotics for viral infections	76 (20.2)
6. Vitamin C and Vitamin D rich-food are very effective in improving immune function	
• True, I advise my patients to take them	356 (94.7)
• False	8 (2.1)
• I do not know	12 (3.2)
7. Regular exercises can boost one's own immunity to fight diseases due to changes in White Blood Cells (WBC) circulation	
• True	308 (81.9)
• False	16 (4.3)
• I do not know	52 (13.8)
8. If a patient presents with fever, cough, and troubles breathing with a history of travel within the last 14 days, you should:	
• Refer them to the hospital	348 (92.6)
• Give them OTC medications to help alleviate the symptoms ONLY	24 (6.4)
• I do not know	4 (1.1)
9. Individuals working in the medical field/ or in contact with infected patients should protect themselves by wearing a surgical face mask?	
• Yes	348 (92.6)
• No	20 (5.3)
• I do not know	8 (2.1)
10. It is essential to counsel patients asking for face masks about their proper use and frequency of changing them. How often do you recommend your patients to change their face mask?	
• Every 6 hours	288 (76.6)
• When it becomes moist	60 (16.0)
• I do not know	28 (7.4)
11. How can you protect yourself and others from COVID-19? (Multiple)	
• Regularly wash hands with soap and water at least 20 seconds especially after you have been in a public place, or after blowing your nose, coughing, or sneezing	360 (95.7)
• Maintain social distancing	268 (71.3)
• Follow respiratory hygiene when sneezing (like covering your nose with bent elbow when sneezing)	276 (73.4)
• Clean hands with alcohol-based hand rub of at least 45% when soap is not available	188 (0.5)
• Correct answer	84 (22.3)
12. To protect your household, you need to clean and disinfect frequently touched surfaces DAILY (ex: tables, doorknobs, light switches, phones, faucets, and sinks) using:	
• Approved bleaches (ex. Clorox) or 70% alcohol solution	216 (57.4)
• Approved bleaches and HOT water	16 (4.3)
• All of the above	120 (31.9)
• I do not know	24 (6.4)

13.	Negative test results for Coronavirus infection rule out getting sick later in the near future.	
•	True	100 (26.6)
•	False	220 (58.5)
•	I do not know	56 (14.9)
14.	COVID-19 tests should be considered for anyone who has the main symptoms of the disease.	
•	True	256 (68.1)
•	False	116 (30.9)
•	I do not know	4 (1.1)
15.	Which of the following are eligible for COVID-19 test?	
•	Hospitalized patients	280 (74.5)
•	Healthcare facility workers with symptoms	328 (87.2)
•	Patients 65 years of age and older with symptoms	312 (83.0)
•	A healthy 65 year-old individual without symptoms	100 (26.6)
•	Correct answer	160 (42.6)

Table 4. Attitude and practice of community pharmacists toward the COVID-19 crisis

Statement	Attitude (n= 376), n(%)			Practicing the activity (n= 140), n(%)
	Disagree	Neutral	Agree	
1. Community pharmacists cannot educate patients regarding COVID-19 Pandemic due to their shortage of time.	169 (44.9)	63 (16.8)	144 (38.3)	36 (25.7)
2. Community pharmacists should have the responsibility to counsel the public about the current available therapeutic options for COVID-19.	16 (4.3)	60 (16.0)	300 (79.8)	24 (17.1)
3. One of the community pharmacists' roles is to counsel the public about COVID-19 and how to reduce its spread and transmission.	8 (2.1)	44 (11.7)	324 (86.2)	20 (14.3)
4. Community pharmacists can reinforce the UAE's efforts in reducing and controlling the spread of COVID-19.	8 (2.1)	48 (12.8)	320 (85.1)	16 (11.4)
5. Community pharmacists should provide the public with the right preventive methods (e.g. Face mask) from COVID-19.	12 (3.2)	32 (8.5)	332 (88.3)	16 (11.4)
6. Community pharmacist's only role is to provide the public with the right preventive methods (e.g. Face mask) from COVID-19.	140 (37.2)	84 (22.3)	152 (40.4)	12 (8.6)
7. If community pharmacists suspect someone may have COVID-19, they should make sure that he seeks immediate medical attention.	16 (4.3)	44 (11.7)	316 (84.0)	16 (11.4)
8. Community pharmacists should provide medication treatment to COVID 19 patients even if they don't have a prescription.	172 (45.7)	96 (25.5)	108 (28.7)	8 (5.7)
9. Community pharmacies should provide home delivery service during the pandemic to minimize contacts.	12 (3.2)	52 (13.8)	312 (83.0)	20 (14.3)
10. Community pharmacists have an important role in the management of COVID 19 through their pharmacy.	20 (5.3)	56 (14.9)	300 (79.8)	16 (11.4)
11. Community pharmacists should offer tele pharmacy services.	28 (7.4)	56 (14.9)	292 (77.7)	16 (11.4)
12. Community pharmacists should contribute to COVID-19 screening.	24 (6.4)	88 (23.4)	264 (70.2)	12 (8.6)
13. Community pharmacists should contribute to COVID-19 diagnosis and treatment of minor cases.	52 (13.8)	100 (26.6)	224 (59.6)	12 (8.6)
14. Community pharmacists should ensure the availability of key medications.	16 (4.3)	44 (11.7)	316 (84.0)	16 (11.4)

PRACTICE OF PHARMACISTS TOWARD COVID-19 PANDEMIC

Practice of community pharmacists

Among the community pharmacists participated in this study, 25.7% (n= 36) educated their patients about COVID-19. Furthermore, around 17.0% (n= 24) counseled the public about the current available therapeutic options for managing COVID-19 symptoms. Additionally, 14.3% (n= 20) provided information to the public about ways of reducing COVID-19 transmission as well as offered home delivery service during the pandemic to minimize contacts. On the other hand, the least practiced activity was providing medications for treating COVID-19 even without a prescription (5.7%, n=8) as shown in Table 4.

Practice of hospital pharmacists

Results of this study indicates that one of the most

Table 5. Attitude and practice of hospital pharmacists toward the COVID-19 crisis

Statement	Attitude (n= 376), n(%)			Practicing the activity (n= 92), n(%)
	Disagree	Neutral	Agree	
1. Hospital pharmacists should contribute to COVID-19 management protocols by participating in inpatient rounds.	4 (1.1)	64 (17.0)	308 (81.9)	8 (8.7)
2. Hospital pharmacist should ensure sufficient medication supply to support ICU beds.	4 (1.1)	40 (10.6)	332 (88.3)	12 (13.0)
3. Hospital pharmacists should participate in antimicrobial stewardship programs related to COVID.	8 (2.1)	48 (12.8)	320 (85.1)	12 (13.0)
4. Hospital pharmacists should be involved in developing local treatment protocols.	-	48 (12.8)	328 (87.2)	12 (13.0)
5. Hospital pharmacists can monitor the use of antibiotics in cases of bacterial co-infections in COVID-19 patients.	4 (1.1)	52 (13.8)	320 (85.1)	12 (13.0)
6. Hospital pharmacists can help interpret test results for COVID-19.	28 (7.4)	64 (17.0)	284 (75.5)	8 (8.7)
7. Hospital pharmacists can explore new drug therapies or uses.	16 (4.3)	84 (22.3)	276 (73.4)	16 (17.4)
8. Hospital pharmacists should provide medication management recommendations.	20 (5.3)	44 (11.7)	312 (83.0)	12 (13.0)

Table 6. General mental health and future role of pharmacists toward the COVID-19 pandemic (n= 376)

Statement	n(%)		
	No	Sometimes	Yes
1. Distant learning/working from home have been followed in the UAE to reduce the spread of COVID-19. Being a part of the healthcare system, you are still required to attend your workplace. Does this increase your concerns about COVID-19 infection?	44 (11.7)	100 (26.6)	232 (61.7)
	Disagree	Neutral	Agree
2. Do you recommend online mental healthcare training programs for pharmacists in the UAE on how to mentally support others/themselves in such emergencies (ex: COVID-19 pandemic)?	-	56 (14.9)	320 (85.1)
3. When the vaccine against COVID-19 is available, pharmacists should be considered one of the frontline healthcare workers that should be permitted to give immunizations.	28 (7.4)	40 (10.6)	308 (81.9)
4. Pharmacists should be able to screen and test patients for COVID-19.	68 (18.1)	120 (31.9)	188 (50.0)

practiced activities hospital pharmacists was exploring new drug therapies or uses 17.4% (n= 16). In addition, few hospital pharmacists participated in the antimicrobial stewardship programs and monitored antibiotic uses for COVID-19 cases and co-infections (13.0%, n= 12). However, minority of them (8.7%, n= 8) contributed to COVID-19 management protocols through inpatient rounds and assisted in interpreting COVID-19 test results (Table 5).

General mental health and future role of pharmacists toward COVID-19 pandemic

More than half of the pharmacists were concerned about the COVID-19 infection as they are part of the healthcare system and required to attend their workplace (61.7%, n= 232). Additionally, majority of the pharmacists recommended online mental healthcare training programs to support them in such emergencies (85.1%, n= 320).

Regarding pharmacists' anticipated role in the COVID-19 pandemic, most of the respondents admitted that pharmacist should be considered one of the frontline healthcare workers and contributed to the vaccination (81.9%, n= 308). Moreover, exactly half of the respondents consented on engaging the pharmacists COVID-19 screening and testing (50.0%, n= 188) (Table 6).

Table 7 represents the influence of demographic characteristics on the level of pharmacists' knowledge about COVID-19. Pharmacists at age ≥40 years old and have an experience of ≥10 years in the pharmacy field were more knowledgeable about COVID-19 with higher scores (17.0±2.1, p <0.001 and 16.8±2.0, p= 0.001; respectively) compared to young-aged pharmacists or those having less than 10 years of experience. In addition, pharmacists holding higher degrees were more likely

Table 7. Univariate analysis to compare between different groups in the mean scores of knowledge scale

Factors	Mean Knowledge Score ± SD	P- Value
Age		
< 40 years old	15.9 (3.0)	<0.001
≥ 40 years old	17.0 (2.1)	
Gender		
Male	16.2 (2.8)	0.610
Female	16.1 (2.9)	
Education		
Diploma	14.2 (3.7)	<0.001
Bachelor	16.0 (2.8)	
Higher education	17.0 (2.1)	
Employment		
Community pharmacists	16.4 (2.9)	0.011
Hospital pharmacists	16.5 (2.0)	
Others	15.5 (3.3)	
Years of experience		
< 10 years	15.8 (3.2)	0.001
≥ 10 years	16.8 (2.0)	

to have better knowledge about COVID-19 (p <0.001). Community and hospital pharmacists showed almost similar score of knowledge about COVID-19 compared to pharmacists working in other fields (p= 0.011).

DISCUSSION

Summary

Internationally, pharmacists have shown a pivotal role in alleviating the unprecedented spread of the COVID-19 infection and have been integrated in planning and responding to this global crisis as they are the first touchpoint to patients. Their contribution was not limited in the clinical settings, but also extended in the community to making all pharmaceutical products available, raising public awareness about COVID-19, and educating patients about effective strategies to prohibit further acquisition of the infection (such as optimal hygiene, social distancing, avoiding close contact and staying at home if having respiratory symptoms.[14-16] Up to our knowledge, the present study is the first to assess knowledge, attitude, and real practice of pharmacists across the UAE communities and hospitals during COVID-19 pandemic.

Knowledge

Knowledge of the pharmacists is important as they serve a vital role in the COVID-19 infection control, manage drug therapies for patients and providing information related to the prescribed medications.[6,17] Although few pharmacists (<25.0%) have taken online courses on COVID-19, the majority (>80.0%) regularly check and recommend the governmental documents related to health and prevention (MOHAP). Interestingly, majority of the pharmacists in this study were aware about general aspects of COVID-19, duration of virus incubation (average of 7; days 2-14 days), methods of infection transmission and its related symptoms. Also, most of them knew that elderly above 65 years old are at higher risk of developing COVID-19 severe illness, while some of them reported that in addition to age, patients with chronic diseases as asthma were at high risk as well. These results are consistent with previous studies conducted in Lebanon and Turkey, which reported adequate knowledge of pharmacists about general aspects of COVID-19 related symptoms, methods of transmission as well as the most vulnerable groups to develop higher risk of critical illness from COVID-19.[18,19]

Although pharmacists had an adequate knowledge about COVID-19 general information, their knowledge was moderately good concerning specific facts related to COVID-19 prevention and treatment, as the majority answered nearly 70.0% of the questions correctly. This can be related to misinformation and uncertainty of some facts related to COVID-19. Pharmacists' knowledge about preventive measures and treatment showed that few pharmacists recommended the use of NSAIDs as antipyretic agents to relieve fever which appears in 99.0% of COVID-19 cases. However, many patients with COVID-19 in reality use over the counter medications as acetaminophen or ibuprofen for alleviating their high body temperature.[20] The studies regarding this concern are conflict, some of them declared that NSAIDs may interfere with the benefit of fever in the natural body mechanism for fighting viral infections and maybe associated with increased risk of morbidity and mortality[21] while others believed that it is important to control elevated body temperature especially among children.[22] According to the the WHO, European Union's Medicines Agency and British Pharmacological Society reports, there is no consistent evidence that using NSAIDs making COVID-19 severity worse, but should be used with caution based on the consultants' recommendations.[23]

Regarding corticosteroids use in COVID-19, majority of the pharmacists knew the importance of using corticosteroids in COVID-19 cases that require ventilatory support. This comes in line with previous study that showed lower mortality rates and shorter duration of staying in the hospital among hospitalized COVID-19 cases with lung dysfunctions who received low doses of corticosteroids.[24]

In the current study, less than half of the pharmacists recognized that hydroxychloroquine is not a key preventive agent against COVID-19 and should be used with caution to treat certain cases. Results from previous RCT (PATCH trial) did not report any preventive benefit of hydroxychloroquine among healthcare providers that are frequently exposed to the infection.[25] In addition,

majority of pharmacists believed that combination of hydroxychloroquine and azithromycin potentially treats COVID -19.This claim can be supported by previous study that reported benefit of using hydroxychloroquine in viral elimination especially when it is combined with azithromycin,[26] on the other hand, recent reports by the American College of Cardiology, American Heart Association, and the Heart Rhythm Society suggested QT assessment and monitoring when both medications are used as some researchers reported risk of QT prolongation when these drugs are co-administered.[25,27]

In this study, most of the pharmacists believed that vitamins C and D are essential for improving patients' immunity system and regular exercising also enhances the ability of white blood cells to fight the infection. According to the available data, vitamin C or vitamin D deficiency compromises the immunity function making the body more vulnerable to get infected, thereby, adequate supplementation of these vitamins is a promising therapeutic approach to fight COVID-19.[28] Furthermore, countless studies proved that sedentary life-style contributes to chronic metabolic problems, however, regular physical exercising elicits a cascade of mechanisms in the body that ultimately boosts the immunity system.[29] Moreover, most of the pharmacists in this study recognized the groups of patients eligible for COVID-19 testing as reported by the WHO guidance on COVID-19 including hospitalized patients, elderly above 65 years old with symptoms and healthcare facility workers with symptoms.[30]

Consistent with previous study, the current study revealed that age (≥40 years old), higher education, working at the hospital pharmacy, and having experience of ≥10 years were the main contributing factors of better knowledge about COVID-19.[19]

Attitude

Concerning the attitude of pharmacists, majority of them had positive attitudes toward struggling the COVID-19 crisis most probably due to devoted efforts and regulations of the UAE healthcare system against this crisis. Majority of pharmacists stated that it is the community pharmacist's responsibility to provide public with right preventive methods (as Face mask and proper hygiene) from COVID-19 as well as counseling about ways of minimizing the spread and transmission of the virus. This finding agrees with several previous studies, which indicated the crucial role of community pharmacists in counseling patients about COVID-19 and raising public awareness about the precautionary and preventive measures as safe hygiene practice to minimize transmission rate of the infection.[31,32] In addition, respondents agreed that community pharmacist should seek medical attention of COVID-19 suspected cases and ensure availability of key medications to treat mild cases confidently. Similarly, a previous study in Jordan supported this attitude as community pharmacists can triage their patients to appropriate healthcare management.[33] Despite that, only 45.0% of the pharmacists disapproved the claim that community pharmacists are unable to educate patients regarding COVID-19 due to perceived lack of time and disagreed that community pharmacists can provide medication treatment to COVID-19 patients even without a prescription. This urges the need of improving pharmacists' knowledge and expanding their responsibilities to acquire more clinical services the benefit the patients in this pandemic. Besides, AlMazrouei et al. (2020) emphasizes the importance of continues education programs and training for the community pharmacists in the UAE to be engaged in COVID-19 screening, prevention and emergency patient-centered care.[31]

On the other hand, pharmacists in general showed more trust in hospital pharmacists during COVID-19 pandemic. More than 85.0% of the participated pharmacists in this study believed that hospital pharmacists can be more involved in the clinical responsibilities during this pandemic including assurance of sufficient medication supply to support ICU beds, developing local treatment protocols, participating in antimicrobial stewardship programs related to COVID-19, and monitoring the use of antibiotics in cases of bacterial co-infections in COVID-19 patients. This positive attitude toward major clinical services conducted by the hospital pharmacists is attributed to the direct involvement of hospital pharmacists in planning and responding to the pathogens, developing potential treatment approaches for diseases, and assisting in conducting research on infected patients.[8]

Practice

Community pharmacies in the UAE are well- equipped with variety of pharmaceutical products, which assist pharmacists in selecting between several alternatives depending on availability and patients' preferences. However, the pharmaceutical market is susceptible to shortage, which leads to risk of medications errors or patients' dissatisfaction. Based on documented data in the literature, community pharmacists in the UAE are well- positioned to educate patients and assure them of continues availability of over the counter and prescription medications to be used in certain minor ailments based on rational levels of demands.[31,34] Regarding pharmacists' practice against COVID-19 pandemic, 25.7% of the community pharmacists in the present study educated their patients and 17.1% counseled them about the currently available therapeutic options for alleviating COVID-19symptoms.While other community pharmacists' activities were practiced to even less extent (around 11.0%) such as counselling about ways of disease's transmission, offering home delivery services to minimize contact, screening, diagnosis, or treatment of minor COVID-19 cases. On the other hand, previous

studies conducted in the UAE reported that UAE community pharmacists are well-prepared to encounter the spread of the infection and raise awareness. However, that study is limited to general assessment of knowledge and preparedness rather than real practice.[31]

Hospital pharmacists' practice was also assessed in this study, and the results indicated that the most practiced clinical activity toward the COVID-19 was exploring new drug therapies or uses for reducing the severity and complications of the disease. Also, some hospital pharmacists participated in the antimicrobial stewardship programs and monitored antibiotic uses for COVID-19 cases and co-infections (13.0%). While the least practiced activity was contribution to the protocol management of COVID-19.Along the same line, the American Society of Hospital Pharmacists (ASHP) stated that hospital pharmacists are responsible for encouraging immunization and screening for certain infectious diseases as well as collaborating with other healthcare providers in establishing guidelines for risk assessment, therapy management, and monitoring patients' health outcomes in case of transmissible infectious diseases.[35] In addition, the WHO has issued a checklist material for assessing the readiness and ability of healthcare workers to enhance their response to COVID-19.[36] However, our findings revealed that pharmacists in the UAE working at either community or hospitals has not yet evolved to be incorporated in in multidisciplinary areas to alleviate the burden on the healthcare system. Thereby, it is crucial to protrude pharmacists' responsibilities and train them to confront the COVID-19 pandemic effectively.

Future Role

Several studies were parallel with our findings that pharmacists were frustrated and harassed during COVID-19 pandemic as they were required to attend their work place to assist public in managing their minor ailments, making medications for chronic diseases available, and raise public awareness regarding basic hygiene tips to protect themselves from the infection.[37,38] For that reason, majority of the surveyed pharmacists suggested online mental healthcare training programs to support them in such emergencies.

In the present study, most of the pharmacists admitted the value of pharmacists' contribution in COVID-19 as frontline healthcare workers. Moreover, they promoted combining pharmacists' traditional responsibilities with COVID-19 vaccination and screening services to be part of their job. And on the same approach, the ASHP has issued an executive summary recommending authorization of proper immunization (vaccination), specimen collection, and test results interpretation by pharmacists.[39]

CONCLUSION

In conclusion, the proposed study revealed an appropriate average knowledge and practice toward COVID-19 among pharmacists in the UAE. In addition, the study demonstrated that years of experience and higher level of education were significant determinants of better knowledge about the COVID-19 pandemic control. Hospital and community pharmacists' knowledge about COVID-19 were almost similar regardless the differences in work place.

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Declarations of interest

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Competing interests

The authors declare no competing interests.

AUTHOR'S CONTRIBUTIONS

All authors have contributed significantly to the publication. Their contributions meet the criteria for authorship. S. A. & M. A.: Contributed to data collection and analysis, preparing research idea and design, writing and reviewing the main manuscript. S.Z.: Participated in writing and reviewing the main manuscript. M. A. & S. S.: Contributed to data collection and analysis.

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