

## Research Paper

# The evolving role of community pharmacists during COVID-19 in the UAE; assessing preparedness and knowledge

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## Abstract

**Objectives** To investigate community pharmacists' knowledge about COVID-19 and their preparedness for the pandemic.

**Methods** This cross-sectional online survey was conducted (in community pharmacies in the United Arab Emirates) over 3 weeks (24 May 2020 to 14 June 2020). A proportionate random sample of 491 participants was invited to take part. The SPSS version 26 was used for data management and analysis.

**Key Findings** The majority of participants ( $n = 400$ ) had good knowledge about COVID-19 and high level of preparedness for the pandemic control. Most pharmacists agreed (212, 53.0%) or strongly agreed (91, 22.8%) that they have a major role in the management of the ongoing crisis. Most participants had good awareness about the most common methods of COVID-19 transmission (359, 89.7%) and symptoms encountered (368, 92.0%). However, approximately a quarter of participants (103, 25.7%) incorrectly thought COVID-19 was caused by a DNA virus. Participants who had 5–10 and >10 years of experience were 3.95 ( $P = 0.03$ ) and 1.59 ( $P = 0.01$ ) times, respectively, were more likely to have good knowledge compared to participants with less than 2 years of experience. Those with good knowledge were more likely to have a specific area for customers with suspected COVID-19 symptoms compared to those with poor knowledge ( $P = 0.031$ ).

**Conclusion** This study indicates that years of experience and good knowledge on COVID-19 were significant determinants of pharmacists' preparedness for the pandemic control.

**Keywords:** COVID-19; community pharmacists; UAE; preparedness

## Introduction

The world is witnessing a major pandemic; the highly contagious SARS Cov-2 virus (severe acute respiratory syndrome coronavirus 2) is responsible for the corona virus disease (COVID-19), which was initially identified in Wuhan, China in December 2019 and has now spread to over 200 countries and territories worldwide.<sup>[1]</sup> <sup>2]</sup> The outbreak was declared a public health emergency of international concern on 30 January 2020.<sup>[3]</sup> As of 30 September 2020, SARS Cov-2 virus infected 33,843,974 individuals and accounted for 1,012,657 fatalities worldwide.<sup>[4]</sup> SARS Cov-2 is an RNA virus and is found in both humans and other mammals.<sup>[5]</sup> The incubation period is between 2 and 14 days, and symptoms include at least some of mild-to-severe fever, dry cough, loss of taste or smell, aches and pains, a rash on skin and shortness of breath. Furthermore, serious complications including severe respiratory problems and renal impairment have been reported and linked to COVID-19.<sup>[6-8]</sup> SARS Cov-2 virus can be transmitted by direct contact and through the spread of respiratory droplets from coughing or sneezing. At the time of this study, there were no antiviral medications or vaccines effective against this infection. Therefore, isolation remains the dominant approach to controlling spread of the disease.<sup>[7]</sup>

In the United Arab Emirates (UAE), as in many other countries, community pharmacies are either small independently owned or chain franchised shops located on a street or in shopping malls and they are valued for their accessibility to consumers.<sup>[9]</sup> They can contribute to containing the spread of SARS Cov-2 virus through counselling and educating the public, supplying hygiene products and screening suspected individuals.<sup>[2, 10-12]</sup> During the ongoing pandemic and the lockdown in most countries, community pharmacies in UAE as elsewhere, have remained open reflecting their central role in health care.<sup>[10]</sup>

As of the end of September, 2020, there were 93,090 confirmed cases and 416 deaths in the UAE,<sup>[13]</sup> and health authorities had performed more than 5 million COVID-19 tests for citizens and residents, which were conducted by hospitals, medical centres and drive-through testing centres.<sup>[13]</sup>

Given the seriousness of the ongoing crisis and the urgent need for proper and efficient pharmaceutical care services, it is crucial to understand the perspectives of front-line community pharmacists. This study aimed to assess their knowledge of COVID-19 and their preparedness for the pandemic and its control.

## Method

### Study design and participants

This study was conducted in three areas of the UAE using a cross-sectional online survey during the 3 weeks from 24 May 2020 to 14 June 2020. Eligible participants were licensed pharmacists currently practicing in a community setting. Those practicing for less than 3 months or not willing to participate were excluded.

### Sample size calculation

The minimum recommended sample size was 368 pharmacists, using Raosoft sample size calculator [95% confidence interval (CI), 5% margin of error and 50% response distribution].<sup>[14]</sup> We set a target recruitment of 400 community pharmacist participants.

### Survey development

The survey was a self-administered questionnaire, developed to meet the research aims. Following an extensive review of the

literature,<sup>[15-18]</sup> a first draft of the questionnaire was developed by N.M. This draft was discussed by the wider research team through an online Zoom meeting. Misconceptions were corrected, duplicates were removed and concepts clarified. The survey was designed and delivered in the English language since English is the official language for pharmacy education and the pharmacist licensing exam in the UAE.

Content validity was assessed by a panel of five experts in public health/epidemiology, microbiology, clinical pharmacy and respiratory medicine, who each provided professional opinions according to their area of expertise. Any disagreements were resolved by discussion at an online Zoom meeting. The draft questionnaire with the score sheet was emailed to the group, and members were asked to rate the questions out of 10 (1 = inappropriate to 10 = completely appropriate) for appropriateness, importance and phrasing. Any additional comments were noted. Overall means for appropriateness, importance and phrasing were 8.47 SD  $\pm$  1.23, 8.91 SD  $\pm$  1.47 and 9.2 SD  $\pm$  1.74, respectively. Amendments to the survey included adding extra information to knowledge questions and preparedness questions.

The modified version of the questionnaire consisted of 4 sections and 27 questions; the first part included six questions to collect demographic data (age, gender, educational level, region, years of experience and job status); in the second part, participants were asked to answer 10 (Yes/No) questions about their knowledge of SARS Cov-2 virus. The third section consisted of five questions to evaluate the perception of community pharmacists towards their role in the pandemic control, rated on a 5-point Likert scale (strongly agree, agree, neutral, disagree and strongly disagree). The final section consisted of five close-ended questions to assess community pharmacists' preparedness for the COVID-19 pandemic and one question to probe sources of information about COVID-19. The survey was anonymous. A copy of the questionnaire is given in the Supplementary Material.

Reliability and understandability of the study instrument was checked in a pilot test, in which 25 subjects from each region (see below under data collection) were included. Data were managed and analysed in an SPSS database (Version 26; Statistical Package for Social Sciences, by IBM incorporated). Cronbach's  $\alpha$  was used to test the internal consistency of the study questionnaire based on the data obtained from the piloting test; the resulting  $\alpha$  coefficient of reliability ranges from 0 to 1 in providing this overall assessment of a measure's reliability. If all of the scale items are entirely independent from one another, then  $\alpha = 0$ ; and, if all of the items have high covariances, then  $\alpha$  will approach 1 as the number of items in the scale approaches infinity. In this study,  $\alpha$  coefficient less than 0.5 was considered unacceptable,  $\alpha$  coefficient between 0.5 and 0.7 was considered moderate, and  $\alpha$  coefficient higher than 0.7 was considered good.<sup>[19]</sup> We found that  $\alpha$  for the overall questionnaire is 0.72; for the first section,  $\alpha = 0.68$ ; for the second section,  $\alpha = 0.72$ ; for the third section,  $\alpha = 0.77$  and for the last section,  $\alpha = 0.71$ .

### Data collection

The total number of licensed community pharmacists in the UAE is 8469, of which 43.8% (3709) are working in the Capital region, 28.5% (2414) in the Central region and 27.7% (2346) in the Northern region. Each region includes one or more of the seven Emirates which comprise the UAE, as follows: Capital Region (Abu Dhabi), the Northern Region (Ajman, Fujairah, Ras al Khaimah, Sharjah and Umm al Quwain) and Central Region (Dubai). Each state (Emirate) was stratified geographically into areas based on the study population

density. The Capital and the Central regions were divided into nine and eight areas (districts), respectively. While the Northern region was divided into 12 areas with districts. Areas from each region were listed in decreasing order, coded with numbers and entered into a computer software, at which three areas from each region were selected randomly. Pharmacists from each area were listed alphabetically, and then coded with numbers. A random sample of community pharmacists was invited from each area, proportionate to the relative proportion of pharmacists in the region, that is, 175 (43.8%, 175/400) from the Capital region, 114 (28.5% (114/400) from the Central Region and 111 (27.7% (111/400) from the Northern Region. If a participant refused to complete the survey or was ineligible to participate, the data collector approached randomly the next eligible participant. The authors ensured that the survey was anonymous and confidential.

The final online version of the questionnaire was constructed using the survey administration facility in Google.<sup>[15]</sup> During the data collection period, the research team approached participants by phone to check their willingness and eligibility for participation, and those who were eligible and willing to participate were asked to send a signed informed consent by email. Pharmacists were approached sequentially until the quota for each Emirate had agreed to take part. The link of the questionnaire was emailed to participants for online completion. Participants could withdraw from completing the survey at any time and had the right to refuse answering any question without providing a reason.

### Knowledge and preparedness scaling

Participants who answered  $\geq 7$  out of 10 knowledge questions correctly were deemed to have good knowledge, and those only answered  $\leq 6$  out of 10 questions correctly were considered to have poor knowledge of COVID-19. This threshold was based on the recommendations of the expert group. Candidates who declared commitment to  $\geq 4$  out of 5 statements on preparedness were considered to be well prepared to control the pandemic.

### Data management and analysis

Data were coded and entered into a Statistical Package for Social Science (SPSS) database (version 26; IBM, Chicago, IL, USA) by the main researcher (N.M.). Descriptive results are presented as proportions (%) with 95% CIs, while logistic regression results are shown as odds ratios (ORs) with 95% CI. Statistical significance was considered at  $P$  value  $< 0.05$  (with a confidence limit at 95%). Multivariate logistic regression was used to assess predictors for good knowledge and high level of preparedness for the pandemic. Differences between categorical variables were addressed by conducting Rao–Scott chi-square test.<sup>[16]</sup> To test correlation between independent variables in the regression model, we used the variance inflation factor (VIF), in which number of inflated variances caused by multicollinearity is measured; VIFs  $\leq 3$  refers to low correlation between independent variables, and thus the regression results are more reliable.<sup>[17]</sup> Homoscedasticity describes a situation in which the error term (i.e. the ‘noise’ or random disturbance in the relationship between the independent variables and the dependent variable) is the same across all values of the independent variables. This assumption was considered not violated at  $P \geq 0.05$ .<sup>[18]</sup>

## Results

### Socio-demographic characteristics

To recruit the targeted sample ( $n = 400$ ), we approached 491 pharmacists, of which 81 pharmacists refused completing the questionnaire

and 10 pharmacists were excluded, giving a response rate of 83.2% (400/491) (Table 1). Approximately half of the pharmacists were male (214, 53.5%) and aged less than 30 years (187, 46.7%). A majority of participants practiced as staff pharmacists (328, 82.0%) as they were employed with bachelor degrees (301, 75.3%), but not pharmacy owners or managers. Most pharmacists had 2–5 (114, 28.5%) and 5–10 (208, 52.0%) years of experience.

### Knowledge of community pharmacists about COVID-19

The majority of responding community pharmacists (324, 81.0%) had good knowledge about COVID-19. Pharmacists’ responses to knowledge statements are illustrated in Figure 1. The logistic regression analysis (Table 1) shows that participants with 5–10 (OR 3.95; 95% CI, 1.51 to 8.33;  $P = 0.03$ ) and  $>10$  (OR 1.59; 95% CI, 0.99 to 4.71;  $P = 0.01$ ) years of experience were more likely to have good knowledge compared to those with less than 2 years of practice. No gender, age or educational level differences were significantly related to the level of pharmacists’ knowledge.

### Preparedness of community pharmacists towards COVID-19

Around three-quarters of respondents (298, 74.5%) had a high level of preparedness to control the pandemic. Most pharmacists (331, 82.7%) indicated that hygiene products including alcohol, sanitisers, gloves and face masks are always available for sale in their pharmacies. Defining a specific area for customers with symptoms suggestive of COVID 19 was found more among pharmacists with good knowledge [having good knowledge; (85.2%,  $n = 276/324$ ) vs. having poor knowledge; (21.1%,  $n = 16/76$ ),  $P = 0.031$ ]. Details about pharmacists’ preparedness for COVID-19 and its association with pharmacists’ level of knowledge are given in Table 2.

Our results indicate that participants with 2–5 years of experience were more likely to have high preparedness for the pandemic control compared to those with less than 2 years of practice (OR 4.18; 95% CI, 1.55 to 8.67;  $P = 0.001$ ). Our findings suggest that more than half of pharmacists relied on Ministry of Health and Prevention (185, 46.3%) and the World Health Organisation (65, 16.3%) as sources of information about COVID-19 (Figure 2).

### The pharmacists’ perspective towards their role in the pandemic control

As summarised in Table 3, the majority of respondents agreed (212, 53.0%) or strongly agreed (91, 22.8%) that community pharmacists have a major role in the management of COVID-19 pandemic. Most of the participants agreed (261, 65.3%) or strongly agreed (88, 22.0%) that community pharmacists should maintain personal safety by wearing gloves and masks and avoid close contact with patients.

## Discussion

The findings of this study indicate that the majority of community pharmacists in the UAE have good knowledge about COVID-19; experience was identified as a predictor for good knowledge and high preparedness. An association was found between good knowledge about COVID-19 and high preparedness for the pandemic control among the included pharmacists. The majority of the participants thought pharmacists have a major role in the COVID-19 management.

**Table 1** Socio-demographic characteristics and the relationship with pharmacists' level of knowledge and preparedness

Items	Total (n, %)	Level of knowledge			Level of preparedness		
		Good knowledge (N = 324)	Poor knowledge (N = 76)	Predicting good knowledge OR (95% CI)	High level (N = 298)	Low level (N = 102)	Predicting high level of preparedness OR (95% CI)
Age (years)							
<30 (Ref)	(187, 46.7%)	(154, 47.5%)	(33, 43.4%)	1.00	(113, 37.9%)	(74, 72.6%)	1.00
30–40	(124, 31.0%)	(93, 28.7%)	(31, 40.8%)	0.64 (0.24–0.95)	(116, 38.9%)	(8, 7.8%)	9.44 (5.47–11.89)
>41	(89, 22.3%)	(77, 23.8%)	(12, 15.8%)	1.38 (0.66–2.87)	(69, 23.2%)	(20, 19.6%)	2.25 (1.47–5.77)
Gender							
Male (Ref)	(214, 53.5%)	(172, 53.1%)	(42, 55.3%)	1.00	(161, 54.0%)	(53, 51.9%)	1.00
Female	(186, 46.5%)	(152, 46.9%)	(34, 44.7%)	1.1 (0.49–3.07)	(137, 46.0%)	(49, 48.1%)	0.92 (0.27–1.87)
Education level							
Bachelor of science (Ref)	(301, 75.3%)	(275, 84.9%)	(26, 34.2%)	1.00	(237, 79.5%)	(64, 62.7%)	1.00
Doctor of Pharmacy	(51, 12.7%)	(35, 10.8%)	(16, 21.1%)	0.19 (0.08–0.57)	(41, 13.8%)	(10, 9.8%)	1.33 (0.58–2.27)
Diploma	(45, 11.3%)	(12, 3.7%)	(33, 43.4%)	0.03 (0.005–0.15)	(18, 6.0%)	(27, 26.5%)	0.17 (0.05–0.66)
Doctorate	(3, 0.7%)	(2, 0.9%)	(1, 1.3%)	0.18 (0.04–0.64)	(2, 0.7%)	(1, 1.0%)	0.53 (0.24–0.93)
Job status							
Staff pharmacist (Ref)	(328, 82.0%)	(276, 85.2%)	(52, 68.4%)	1.00	(267, 89.6%)	(61, 59.8%)	1.00
Manager	(49, 12.3%)	(38, 11.7%)	(11, 14.5%)	1.75 (0.79–5.68)	(22, 7.4%)	(27, 26.5%)	0.18 (0.04–0.61)
Owner	(23, 5.7%)	(10, 3.1%)	(13, 17.1%)	0.14 (0.026–0.74)	(9, 3.0%)	(14, 13.7%)	0.13 (0.04–0.39)
Experience (years)							
<2 (Ref)	(36, 9.0%)	(23, 7.1%)	(13, 17.1%)	1.00	(24, 8.1%)	(12, 11.8%)	1.00
2–5	(114, 28.5%)	(88, 27.1%)	(26, 34.2%)	1.9 (0.77–4.98)	(92, 30.9%)	(22, 21.6%)	4.18 (1.55–8.67)*
5–10	(208, 52.0%)	(182, 56.2%)	(26, 34.2%)	3.95 (1.51–8.33)*	(153, 51.3%)	(55, 53.9%)	1.39 (0.48–2.19)
>10	(42, 10.5%)	(31, 9.6%)	(11, 14.5%)	1.59 (0.99–4.71)*	(29, 9.7%)	(13, 12.7%)	1.11 (0.28–2.74)
Region							
Capital region (Ref)	(175, 43.8%)	(159, 49.1%)	(16, 21.1%)	1.00	(115, 38.6%)	(60, 58.8%)	1.00
Centre region	(114, 28.5%)	(101, 31.2%)	(13, 17.1%)	0.78 (0.48–2.07)	(90, 30.2%)	(24, 23.5%)	1.95 (0.87–3.81)
North region	(111, 27.7%)	(64, 19.7%)	(47, 61.8%)	0.13 (0.07–0.89)	(93, 31.2%)	(18, 17.7%)	2.66 (1.62–5.93)

CI, confidence interval; OR, odd ratio from logistic regression; Ref, reference item.

\*P &lt; 0.05.

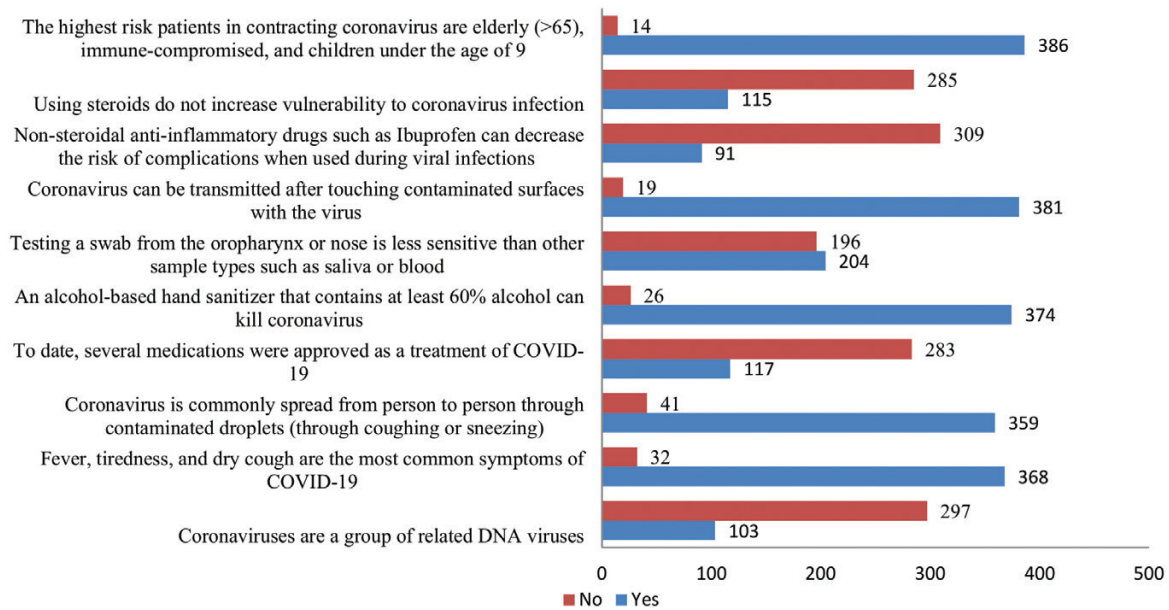


Figure 1 Community pharmacists' knowledge about COVID-19.

Table 2 Preparedness of community pharmacists to control COVID-19 (N = 400)

Items	Total (n, %)	Pharmacists with good knowledge (N = 324)	Pharmacists with poor knowledge (N = 76)	P value*
Alcohol, sensitisers, face masks, disposable gloves, thermometers, antipyretics and ice packs are always available in my pharmacy				0.170
Yes	(331, 82.7%)	(267, 82.4%)	(64, 84.2%)	
No	(69, 17.3%)	(57, 17.6%)	(12, 15.8%)	
Inside the pharmacy, I defined a specific area for customer having suspected symptoms				0.031
Yes	(292, 73.0%)	(276, 85.2%)	(16, 21.1%)	
No	(108, 27.0%)	(48, 14.8%)	(60, 78.9%)	
Inside the pharmacy, contactless payment is always available.				0.067
Yes	(371, 92.7%)	(305, 94.1%)	(66, 86.8%)	
No	(29, 7.3%)	(19, 5.9%)	(10, 13.2%)	
Inside the pharmacy, there are visible signs to keep at least 1.5m distance between costumers.				
Yes	(257, 64.3%)	(206, 63.6%)	(51, 67.1%)	
No	(143, 35.7%)	(118, 36.4%)	(25, 32.9%)	
I have attended online courses or educational workshops on COVID-19?				0.04
Yes	(238, 59.5%)	(223, 68.8%)	(15, 19.7%)	
No	(162, 40.5%)	(101, 31.2%)	(61, 80.3%)	

\*P values from Rao-Scott chi-square test.

Our study was conducted in community pharmacies of the UAE, which is situated in the Southeast of the Arabian Peninsula, bordering Oman and Saudi Arabia. The economy of the UAE is considered the second-largest economy in the region.<sup>[20]</sup> To ensure representative and generalisable findings, we adopted a holistic and valid sampling technique, in which community pharmacists from all regions in the UAE were included. However, several potential limitations of this study need to be addressed. First, the questionnaire was self-reported, which may introduce some bias. Second, the findings presented in our research pertain to experiences and knowledge of a diverse group of pharmacists who were originated from different countries. Therefore, it is quite difficult to track the causes

beyond the responses of participants. However, the potential for misinterpreting statements was minimised by establishing content validity and piloting the questionnaire before distribution. Third, some of the data may reflect pharmacist-specific experiences and not necessarily a pharmacy-wide practice. Finally, the clinical impact of pharmacists' preparedness, patients' satisfaction with these measures and remote pharmacist interventions were beyond the scope of this study. However, these limitations are the basis for future research.

Regarding pharmacists' knowledge about COVID-19, our study was in line with Khayal Muhammad *et al.*'s findings, in which pharmacists from Pakistan were aware about the general aspects of COVID-19.<sup>[21]</sup> On the contrary, Akshaya Bhagavathula

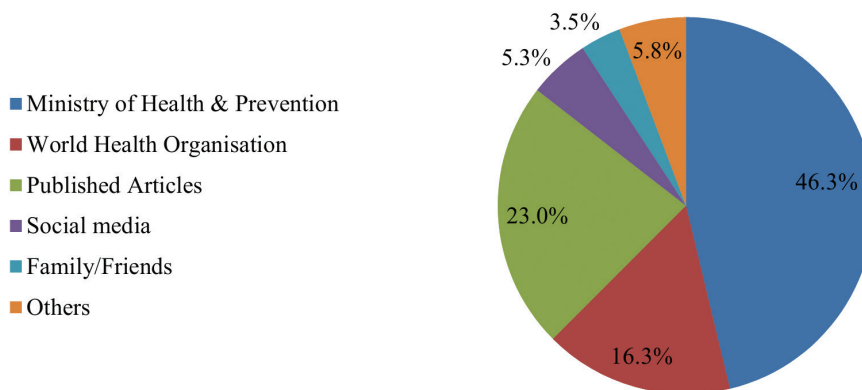


Figure 2 Community pharmacists' source of information about COVID-19.

Table 3 Perspective of pharmacists towards their role in the pandemic control (n = 400)

Items	Strongly agree (a)	Agree (b)	Neutral (c)	Disagree (d)	Strongly disagree (e)	P value <sup>a</sup> (a + b vs. c + d + e)
Community pharmacists have a major role in the management of COVID-19 pandemic.	(91, 22.8%)	(212, 53.0%)	(39, 9.7%)	(36, 9.0%)	(22, 5.5%)	* <0.05
It is your role as community pharmacist to counsel people about coronavirus infection and how to reduce its transmission	(102, 25.5%)	(221, 55.3%)	(18, 4.5%)	(48, 12.0%)	(11, 2.7%)	* <0.05
Pharmacists should maintain personal safety by wearing gloves and masks and avoid close contact with patients.	(88, 22.0%)	(261, 65.3%)	(13, 3.2%)	(30, 7.5%)	(8, 2.0%)	* <0.05
Pharmacists should be allowed to deliver medications to patients home when needed	(79, 19.7%)	(117, 29.3%)	(41, 10.3%)	(97, 24.2%)	(66, 16.5%)	>0.05
I usually dispense hydroxychloroquine without a prescription	(7, 1.7%)	(23, 5.8%)	(81, 20.3%)	(96, 24.0%)	(193, 48.2%)	† <0.05

<sup>a</sup>P values from Rao-Scott chi-square test, \* (a) + (b) significantly greater than (c)+(d)+(e), † (a) + (b) significantly less than (c)+(d)+(e).

*et al.* found that a significant proportion of doctors and medical students had poor knowledge on COVID-19 transmission and symptoms onset.<sup>[22]</sup> Community pharmacists are considered vital members of the healthcare team,<sup>[23–26]</sup> as they can play a major role in responding to the current pandemic by raising the awareness among the public and thus assist minimising the transmission rate of the disease.<sup>[11,27]</sup> Furthermore, pharmacists in community setting have contributed to enhancing public health during the pandemic in a variety of ways including counselling patients on non-COVID-19-related symptoms and minor ailments that people continue to develop, public health promotion through promoting continued medication adherence and disaster management.<sup>[28–31]</sup> Consistent with this, most participants in our study explicitly indicated that they have a crucial role in the management of COVID-19 pandemic through counselling the public on SARS Cov-2 infections and the optimal precautionary measures to reduce its transmission. Similarly, Bsheti *et al.* have found that pharmacists could play an important role during COVID-19 through infection control, by counselling the public regarding hygiene safe practices required to minimise infection spread.<sup>[32]</sup>

The findings of this study emphasise the significance of continuing education for pharmacy professionals in the UAE. These continuing education programmes should not only focus on enhancing pharmacists' knowledge but also help them attain the skills to engage in patient-centred care and emergency response. For instance, improving pharmacists' knowledge and skills in specimen collection

could contribute to reduce the burden of viral outbreaks and health-related emergencies in the UAE healthcare system. The guidelines for pharmacists during COVID-19 released by FIP highlighted that pharmacists have a pivotal role to play not only in ensuring access to medicines and medical devices, but also in public health, namely by informing the public about preventative measures, advising about behavioural precautions and in the risk assessment, early detection and referral of individuals suspected to be at a higher risk of being infected.<sup>[33]</sup> Our results reflected that community pharmacists in UAE have much to offer with respect to services beyond what they have traditionally provided<sup>[34]</sup>; for example, they can manage minor ailments that people will continue to experience during the pandemic taking the pressure off other healthcare providers.<sup>[29]</sup> The literature has shown that a considerable proportion of such cases can be effectively managed in the community pharmacy setting with a high degree of patient satisfaction.<sup>[35]</sup> Second, community pharmacies in the UAE offer a wide range of pharmaceutical products; however, the pharmaceutical market routinely experiences drug shortages,<sup>[34]</sup> which may be exacerbated by COVID-19. The clinical consequences of medication shortages can be substantial and include increased risks to patient safety such as medication errors and adverse patient outcomes.<sup>[36]</sup> Community pharmacists in the UAE are well positioned to reduce these risks by reassuring patients and members of the public of the continued availability of over-the-counter and prescription medications based on rational levels of demand and implementing policies to prevent unnecessary stockpiling.

Our findings suggest that community pharmacists in the UAE have an important role in the management of COVID-19 through many aspects: (1) counselling the public on SARS Cov-2 infections and the optimal precautionary measures to reduce its transmission, (2) public health promotion through promoting continued medication adherence and (3) counselling the public regarding hygiene safe practices required to minimise infection spread. However, our findings suggest that pharmacy practice in the UAE has not yet evolved to be engaged in other areas that could alleviate the healthcare system workload. For that to happen, a whole system-level approach will be required.<sup>[37]</sup>

The findings demonstrate the importance of awareness raising campaigns and educational workshops on pharmacists' general preparedness for the pandemic. Moreover, we found evidence of correlation between pharmacists' knowledge about COVID-19 and their infection control measures. The potential roles and activities highlighted in this study are not exhaustive, but serve to exhibit a range of areas in which community pharmacists could make substantial contributions. It is important that health authorities in the UAE review existing services and make full use of any unrealised potential among community pharmacists and other front-line health service providers.

## Conclusion

This study suggests that years of experience and good knowledge on COVID-19 were significant determinants of pharmacists' preparedness for the pandemic control

## Supplementary Material

Supplementary data are available at *International Journal of Pharmacy Practice* online.

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## Author Contributions

N.M.: Proposal writing, conceptualisation, data acquisition and collection, data analysis, summarisation, interpretation and graphical presentation of results and publishing and manuscript write up. R.M.I.: Proposal writing and polishing, statistical analysis, results interpretation, work design – manuscript write up, reviewing and proof reading. A.Z.M.: Proposal polishing; data analysis manuscript critical appraisal, review analysis and proof reading. D.H.A.-Q.: Conceptualisation, manuscript review, data analysis, data interpretation and critical appraisal. A.S.S.: Data analysis, manuscript drafting and reviewing, critical appraisal and study design. O.M.I.: Literature review, proposal review, manuscript review and polishing and critical appraisal.

## Conflict of Interest

The authors declare that they have no conflict of interest.

## Ethics Approval

This study was approved by The Research Ethics Committee at the University of Al Sharjah.

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