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Knowledge, Practices and Information Sources of Egyptian Community Pharmacists Towards the Novel Coronavirus (COVID-19) During the Peak of the Pandemic

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ABSTRACT

Background: Community pharmacists are among the first accessible healthcare providers to patients and play a pivotal role in completing the cycle of COVID-19 pandemic control and prevention. **Objective**: To evaluate knowledge, attitudes and practices of Egyptian community pharmacists towards the novel Coronavirus (COVID-19) during the peak of the pandemic and discover their sources of information. **Methods:** An observational cross-sectional questionnaire-based study in Egypt. Community pharmacists were included between June and July 2020. The questionnaire was validated through face and content validation. **Results:** Four hundred and twenty-two community pharmacists responded to the questionnaire. Approximately two thirds (n=287, 68%) showed good knowledge with a median knowledge score of 8 [IQR= 7-9]. About 63% of the participants showed positive attitudes towards the role of the Egyptian ministry of health in controlling the pandemic. Less than half (n =171, 40.5%) were found to have good practice level. The type of community pharmacy and the academic degree were associated with knowledge levels (p=0.014 and p=0.033, respectively). No correlation was found between knowledge and practice (r_s=0.068, p=0.163). Official health organizations were found to be the primary (n=326, 77.3%) source of information in our sample. **Conclusion**: Many Egyptian community pharmacists had good to fair knowledge, attitude and practice levels towards the novel Coronavirus pandemic. However, Egyptian health organizations should consider more educational and awareness programs as insufficient knowledge, incorrect sources of information with the wrong attitude by some pharmacists could have negative and unwanted consequences on pandemic control and public health.

Keywords: *COVID-19; Community pharmacists; SARS-COV-2; Egypt; KAP*

INTRODUCTION

Global concerns about coronavirus disease 2019 (COVID-19) have risen due to its high transmission capability, morbidity and mortality rate [1]. On March 11th, 2020, COVID-19 was declared a pandemic by the World Health Organization (WHO) when the cases were no longer spreading in China but outbroke globally to

114 countries [2]. Egypt confirmed the first case of COVID-19 on February 14th, 2020 and since then cases numbers continued to rise and the total number of confirmed cases in Egypt exceeded 101,000 cases with at least 5627 deaths by the middle of September 2020 [3].

Common Symptoms of COVID-19 include fever, cough, fatigue, malaise, and losing the ability of smell and tasting [1]. Most infected cases are presented with mild symptoms, however, severe cases have life-threatening pneumonia [4]. To date, no effective treatment or vaccination has been established to combat the Coronavirus (SARS-COV 2) infection. However, strong preventive measures are considered the primary interventions to minimize the infection spread in addition to the use of some symptomatic and supportive treatment [5].

As most countries of the world imposed a lockdown and quarantine, pharmacies were kept open for people to service patients as well as educate, support and provide care to the public [6]. Community pharmacists have always played a crucial role in the provision of healthcare services [7]. While in this time of crisis, community pharmacies are the first accessible points to patients seeking medical advice [8,9]. Community pharmacists are considered among frontline health care providers against the COVID-19 pandemic and they play a pivotal role in completing the management cycle of COVID-19 outbreak control and prevention [6,10]. In addition to providing necessary information to the public, pharmacists have responsibilities and roles in the supply of key medicines and preventative protection products, performing early detection of possible cases [6,11–13]. International Pharmaceutical Federation (FIP) and the Centre for Disease Control and Prevention (CDC) issued prevention and control guidelines for health care providers especially community pharmacists to ensure good practices during a pandemic and protect themselves from the infection [14,15].

Experience gained from other coronaviruses members outbreaks suggested that measuring of knowledge, practice and attitude (KAP) were helpful to identify and evaluate programs and strategies of control infection [16]. It is important to assess the degree of knowledge and perceptions at the beginning, in middle (at peak) and at the end of the pandemic as the recommendation, guidelines and general knowledge about the virus change. Determining the readiness of community pharmacists to combat the virus during the pandemic will decrease the number of infected pharmacists and promote public health as well during the current time or in future infection waves.

Therefore, the current study aimed to evaluate community pharmacists' KAPs about the novel Coronavirus/COVID-19 during the peak of the pandemic between June and July 2020 in Egypt [17,18]. Additionally, the study highlighted the main information sources utilized by the pharmacists.

METHODS

Study design and data collection

An online cross-sectional observational questionnaire-based study was conducted between June and July 2020. The study was based on convenient and snowball sampling which included Egyptian community pharmacists and students in training who were actively working during the coronavirus pandemic across different regions in Egypt. Community pharmacists who were not working during the pandemic, and/or duplicate surveys were excluded. The questionnaire was self-administrated and distributed online through using different social media platforms such as Facebook and WhatsApp. In-person distribution of the questionnaire was avoided to control infection spread through direct contact with the pharmacists and/or pharmacy visitors.

To avoid duplication of responses, the participant's name initials, and their year of birth were collected before filling in the questionnaire and those with similar credentials were considered duplicates and were excluded. Moreover, a question was asked about their current role whether working in community pharmacy during the pandemic or not to exclude those who are not currently working as a community pharmacist.

An informed consent statement and a brief description of the study were provided at the beginning of the questionnaire to all the participants. All participants were asked voluntarily to fill in the questionnaire. The study was approved by the Ethical Committee of Faculty of Pharmacy, Helwan University with approval number 02H2020.

Survey construction

The questionnaire was developed in English after an extensive literature review of similar studies as well as the updates, reports and guidelines published by WHO, Egyptian Ministry of Health (EMOH) and International Pharmaceutical Federation (FIP) [15,19,20]. The survey consisted of 30 closed-ended questions distributed on five domains; the first domain consisted of seven questions for the collection of different demographical data. The second domain contained 10 "True or False" questions assessing the basic knowledge about the novel coronavirus (COVID-19). The knowledge section was assessing the participant's information on the transmission, diagnosis, symptoms and management of COVID-19.

The third section contained six questions capturing community pharmacists' attitudes in form of Likert-scale ranging from "strongly agree" to "strongly

Table 1. Respondents demographics

Demographics	Count (%) (N = 422)
Age groups (years)	
20-30	325 (77)
31-40	67 (15.9)
> 40	30 (7.1)
Gender	
Male	195 (46.2)
Female	227 (53.8)
Community pharmacy experience (years)	
< 5	277(65.6)
5-9	71 (16.8)
> 10	74 (17.5)
Type of community pharmacy	
Private/individual	293 (69.4)
Chain	129 (30.6)
Region	
Urban	290 (68.7)
Rural	132 (31.3)
Average working hours per day	
≤ 8 hours	256 (60.7)
> 8 hours	166 (39.3)
Latest Academic degree	
Student/undergraduate in training	95 (22.5)
Bachelor	278 (65.9)
Post-graduate degree such as Master	49 (11.6)
PhD, Diploma, Pharm D, Board Certified	

disagree". The fourth section was measuring some practices using five Likert-scale questions of four options ranging from "always" to "never". At the end of the survey, two miscellaneous questions were provided to the participant; the first was a multi-choice question asking about their sources of information regarding the novel coronavirus and a question asking about the frequency of dealing with positively infective patients in the community pharmacy.

Pilot and validation

The survey was validated using the guide published by Burns *et al.*[21] and Lynn *et al.* [22]. For the content validation, the survey was distributed among six independent professors and experts in the field of infectious diseases and epidemiology. Each one assessed and scored the questions based on their relevancy to the general idea/question of the study. Questions with low relevancy scores were either amended or changed accordingly. Afterward, face validity was initiated through a pilot study in which the survey was distributed among 20 community pharmacists to assess the language understanding and the cohesion of the questions. Data collected during the pilot study was not included in the results. The final questionnaire contained all the amendments and recommendations from both face and content validation, and it was uploaded online on Google Forms.

Sample size

The sample size was calculated at a margin of error 5%, 95% confidence level, and population response 50% (being most conservative). Since there is no updated official statistics about the number of community pharmacists in Egypt, we estimated the maximum possible number of pharmacists based on the most recent available statistics which is based on a study published in 2016 [23] and a report published by WHO in 2011 [24] in which they reported that there are about 16.8 to 18 pharmacists per 10,000 population in Egypt. Taking into account the number of population growth, we estimated the number of possible community pharmacists for the calculations to be around 180,000. Sample size calculation was done using RoaSoft® website [25]. At these estimates, the sample size required was 384 respondents. The online survey was closed at the end of July with a total number of 529 responses collected. After filtering the duplicates, unusable responses and those who were not currently working in community pharmacies, the number was reduced to 422 valid responses.

Statistical analysis

The demographical data for the respondents and responses to questions are presented as frequency and percentage. Knowledge domain questions were coded as 1 for correct answers and 0 for incorrect answers and

Table 2. Questions and responses of Knowledge section

	Question	Correct answer n (%)	Incorrect answer n (%)
K1	Surgical gloves can be a possible source of COVID-19 transmission. *	411 (97.4)	11 (2.6)
K2	The surface contaminated with COVID-19 patients' droplets can transmit the novel Coronavirus. *	411 (97.4)	11 (2.6)
K3	Decrease and/or loss of smelling and tasting abilities are symptoms of COVID-19. *	407 (96.4)	15 (3.6)
K4	Complete blood count is a useful diagnostic tool for COVID-19. **	122 (28.9)	300 (71.1)
K5	The novel Coronavirus rapid immunodiagnostic tests (point of care testing) are of high accuracy for diagnosis. **	277 (65.6)	145 (34.4)
K6	Vaccines are available for protection from the novel coronavirus. **	399 (94.5)	23 (5.5)
K7	Antibiotics are useful in controlling the novel coronavirus infection. **	240 (56.9)	182 (43.1)
K8	Generally, most patients with COVID-19 will require intensive care. **	334 (79.1)	88 (20.9)
K9	Home isolation and home quarantine is very effective in no symptoms to mild cases of COVID-19. *	409 (96.9)	13 (3.1)
K10	Masks remain their efficacy in preventing the coronavirus transmission when they become wet. **	356 (84.4) ¶	63 (14.9)

** the correct answer is "True"*
*** the correct answer is "False"*
¶ 3 respondents are missing for this question (0.7%)

the knowledge score was calculated accordingly. For the Practice domain questions, they were coded and scored as 1 for Always, 0.5 for occasionally, 0 for rarely and never (questions P4 and P5 were reverse coded), practice score was calculated accordingly. As for the attitude domain, only descriptive statistics were used to represent responses. Score categories were based on Bloom's cut-off for the knowledge and practice scores in which scores of ≥80% were considered of good level, and scores between 60–79% were considered fair while scoring <60% were assigned as poor level [26]. The normality of knowledge and practice scores were tested by using the Shapiro Wilk test. Median and interquartile ranges (IQR) were used to describe cumulative scores.

Chi-square test was used for testing the associations between the demographic variables and the ordinal categories of knowledge and practice levels. Fisher's exact test was used as an alternative to Chi-square test when 20% or more of the cells have expected value less than 5. Additionally, the same tests were used to determine the association of the frequency of encountering positively confirmed patients (Miscellaneous question) and demographics, knowledge and practice levels. Spearman's correlation was used to determine the relationship between knowledge and practice domains. All statistical analyses were done using IBM-SPSS version 25 (Chicago, IL, USA). The statistical level at p-value < 0.05 was considered statistically significant.

RESULTS

A total number of 422 community pharmacists with valid responses participated in the study. Most of them (n=325, 77%) were between 20-30 years of age. Males and females were approximately comparable (54% females, and 46% males). Community pharmacy experience was less than 5 years for about 277 (65%) of the pharmacists in the sample. About 70% of the respondents were working in private/individual pharmacies and working in urban areas. Most of the participants (n=278, 65.9%) were bachelor's degree holders. All demographical data for respondents are presented in **Table 1**.

Regarding the knowledge domain, correct answers were predominant for all questions except for the usefulness of complete blood count (CBC) as a diagnostic tool question, in which 300 pharmacists (71.1 %) answered that using CBC is useful. Answers for the usefulness of antibiotics for the novel coronavirus were comparable in which 240 (57%) gave the correct answer, and 182 (43%) gave an incorrect answer. All questions and results of the knowledge domain are presented in **Table 2**.

The most reported source of information was the official guidelines and policies published by professional health organizations such as WHO, CDC, or EMOH (n = 326, 77.3%). Approximately half of our participants selected other sources such as a medical

Table 3. Questions and responses of Attitude section

Question		Strongly agree n (%)	Agree n (%)	Neutral n (%)	Disagree n (%)	Strongly disagree n (%)
A1	As a healthcare provider, working while wearing a cotton/cloth masks are effective in preventing coronavirus transmission	22 (5.2)	42 (10)	76 (18)	171 (40.5)	111 (26.3)
A2	Home remedies and folk medicine such as honey, garlic and lemons can be used to control COVID-19	36 (8.5)	142 (33.6)	169 (40)	63 (14.9)	12 (2.8)
A3	Patients usually go to community pharmacy when they develop any symptoms of COVID-19	183 (43.4)	152 (36)	42 (10)	31 (7.3)	14 (3.3)
A4	People usually buy and stock any medications reported to be used in COVID-19 that have been published in social media, television and/or news	253 (60)	75 (17.8)	16 (3.8)	46 (10.9)	32 (7.6)
A5	Precautions and safety instructions and their updates provided by Egyptian ministry of health can help in controlling the novel coronavirus transmission	56 (13.3)	210 (49.8)	98 (23.2)	47 (11.1)	11 (2.6)
A6	Community pharmacists fear getting infected during their work under the current COVID-19 situation in Egypt	201 (47.6)	164 (38.9)	36 (8.5)	17 (4)	4 (0.9)

Table 4. Questions and responses of Practice section

Question		Always n (%)	Occasionally n (%)	Rarely/Never n (%)
P1	Does your pharmacy provide measures for social distancing?	201 (47.6)	131 (31)	90 (21.4)
P2	How often do you provide advice and education to your patients about COVID-19?	300 (71.1)	109 (25.8)	13 (3.1)
P3	How often do you follow personal protection procedures during handling medicines for each patient? [protection procedures such as hand sanitizing and changing gloves]	310 (73.5)	96 (22.7)	16 (3.8)
P4	How often do you handle medications and cash wearing the same gloves?	84 (19.9)	134 (31.8)	204 (48.3)
P5	How often do you dispensed -without a prescription- any medication published in the Egyptian guidelines for patients with suspected symptoms of COVID-19?	83 (19.7)	194 (46)	145 (34.4)

website (n = 212, 50.2%) and social media (n = 196, 46.4%) as their source of information. Different sources of information are presented in **Figure 1**.

In the attitude section, two thirds of the respondents (66.8%) disagreed that cotton/cloth masks are effective in preventing coronavirus transmission for healthcare providers. Regarding the use of home remedies and folk medicines for coronavirus, 169 (40%) of the respondents were neutral while 178 (42%) agreed to strongly agree that alternative medicine can be used in controlling COVID-19. Questions from A3 to A6 of the domain were answered mostly in the agree side (strongly agree or agree). Most pharmacists (>75%) agreed that patients tend to visit pharmacies more often whenever they develop any symptoms similar to those of COVID-19 and patients tend as well to buy and stock any medications mentioned in the social media or news related to COVID-19 management. Similarly, the majority (86.5%) stated that they fear being infected from their work in community pharmacy. Finally, about 226 (63%) participants showed a positive attitude towards the role of the EMOH as they agreed to strongly agree that policies and safety instructions issued by EMOH can decrease the pandemic spread and enhance infection control. Attitude questions and responses are presented in **Table 3**.

Almost half of the participants (n=201, 47.6) stated that they apply social distancing measures in their community pharmacies, while only 90 (21.4%) pharmacists reported that no measures were incorporated at all. Most of the pharmacists (71.1%) always educate their patients regarding COVID-19. Additionally, more

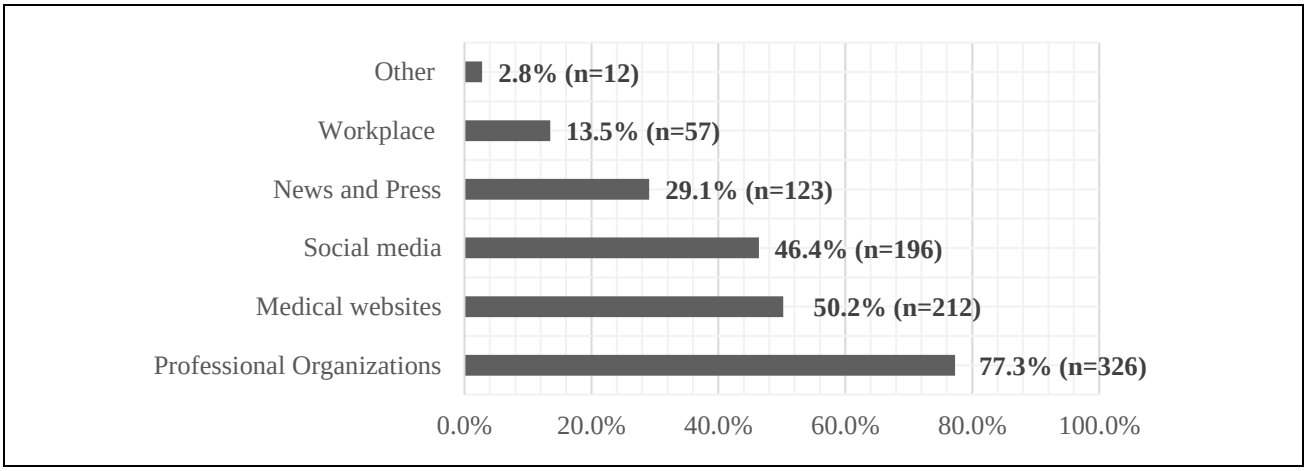

Figure 1. Sources of information on the novel Coronavirus used by community pharmacists

than two thirds (73.5%) reported that they always follow personal protection procedures, while only 16 pharmacists (4%) reported they rarely/never follow them. Interestingly, about 20% of the participant reported that they dispense any medication related to COVID-19 management without any prescription, while the majority (n=194, 46%) stated that they occasionally do the same. **Table 4** represents the practice questions and responses.

The median knowledge score was 8 [7-9] out of a full score of 10, the practice score median was 3.5 [3-4] out of 5. More than half of the respondents with 287 pharmacists (68%) scored more than 80% correct answers in knowledge and regarded to have good knowledge, while only 12 pharmacists (2.8%) showed a poor degree of knowledge with scores less than 60%. The majority of the participating pharmacists (83.9%) were had either good or fair practical while only 68 pharmacists (16.1%) showed poor practice scores of less than 60%. We found that the knowledge scores were not correlated with the practice scores (r_s=0.068, p=0.163). Different knowledge and practice levels are presented in **Figure 2**.

Upon comparing the association between the different demographic variables and the knowledge and practice domain levels (**Table 5**), we found that the type of community pharmacy was significantly associated with knowledge score categories (p=0.014), in which good and fair knowledge levels were more common among pharmacists working in private/individual pharmacies (98.6% out of 293) versus chain pharmacies (93.8% out of 129). Moreover, the academic degree was also associated with the knowledge level (p=0.033). In which, about 70% of bachelor's degree holders and postgraduate degrees holders had good knowledge scores when compared to undergraduates (55.8%) who had good knowledge score. On the other side, practice score categories were not significantly associated with any of the participant demographical variables.

Finally, about a third (n= 130, 30.8%) of the community pharmacists reported that they deal with positively confirmed COVID-19 cases during their work time in the community pharmacy. While about 41.5% (n=175) reported that they occasionally are encountered by positive patients. On the contrary, 117 (27.7%) pharmacists had never dealt with any COVID-19 patients during their working periods. Neither the knowledge level nor practice level was influenced by the frequency of encountering positively confirmed patients in the community pharmacy (p=0.596, p=0.338, respectively). However, the frequency of encountering COVID-19 patients significantly differed according to the area of the pharmacist and the duration of the working shift (p=0.004, p=0.033, respectively). In which, community pharmacists who work in an urban area (35.2%) and who work more than 8 hours per shift (37.3%) reported a higher frequency of encountering COVID-19 positive patients (**Table 6**). None of the other demographics was statistically significantly associated with this question.

DISCUSSION

Understanding community pharmacist's KAPs during the peak of the pandemic is necessary to provide more efficient and updated education programs and to promote COVID-19 pandemic management in the upcoming pandemic waves. Hence, the current study was designed to capture the degree of knowledge, perceptions and attitudes of the community pharmacists towards the COVID-19 during the peak period. In addition to determining the most common source of information used which will help in selecting the best channel to deliver updates, guidelines and policies to the community pharmacists. To the best of our knowledge,

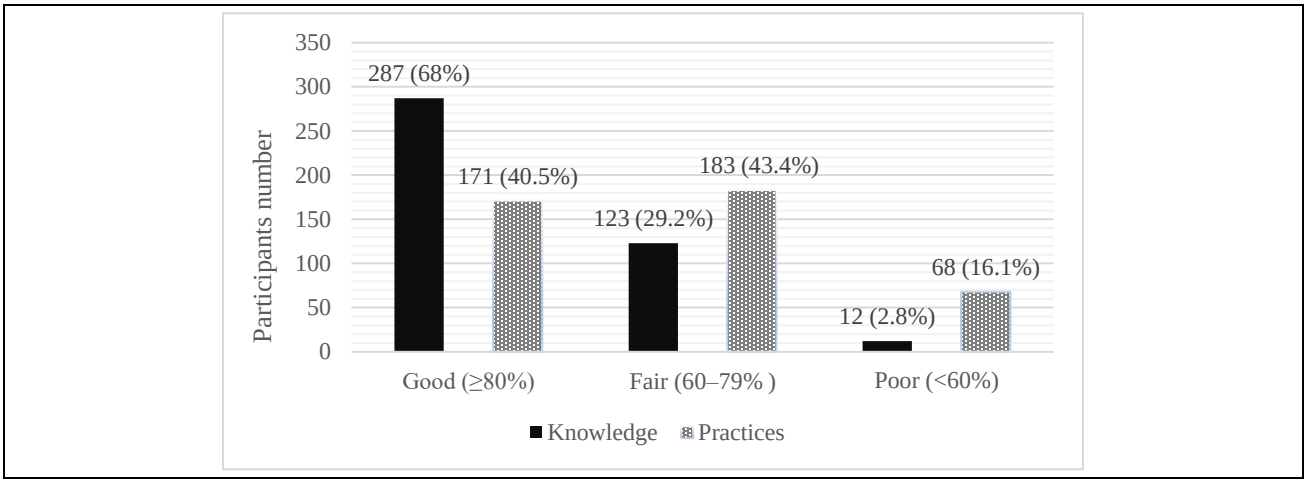

Figure 2. Knowledge and practice scores categories.

the current study was the first to address community pharmacists during the peak of the pandemic.

Most of the participants were found knowledgeable about different aspects of the knowledge questions however, in some questions some participants showed poor knowledge such as when they were asked about some diagnostic approaches for the novel Coronavirus. More two thirds (71.1%) of participants falsely claimed that CBC was a useful diagnostic tool toward COVID-19. Moreover, upon asked about the accuracy of immunodiagnostic testing, 34.4 % of the participants answered these tests have high accuracy for diagnosis. On the contrary, neither CDC nor WHO authorized the use of CBC as a diagnostic parameter for COVID-19 and they only recommended immunodiagnostic testing for research setting and not for public use [27–29]. Up to the time of writing the manuscript no updates from WHO or CDC on recommending the use of immunodiagnostic tests for COVID-19 diagnosis, however, a new study from Italy reported the limited utility of such testing methods in clinical practice [30].

About 43% of the participated pharmacists answered wrongly that antibiotics are useful in controlling the novel Coronavirus infection. Interestingly, Wahed et al [31], reported that approximately 62% of health care providers in Egypt stated that antibiotics are the drug of choice for COVID-19 treatment. According to the National Institutes of Health and WHO, antibiotics should only be prescribed for patients with suspected and/or confirmed secondary bacterial infection [32,33].

In the current study, around 68% of the participated community pharmacists were found to have a good degree of knowledge (scoring ≥80%). Similarly, a study in Egypt conducted on senior pharmacy students found that 73.5% of the students had enough knowledge level [34]. Similar study in Pakistan reported high percentage of good knowledge among community pharmacists in which where 71.5% of the participated pharmacists were found to have good knowledge [35]. However, Tesfaye et al reported a lower percentage (53.2%) of pharmacists having adequate knowledge in Ethiopia [36].

Determining the main source of information utilized by the pharmacists will help in selecting the most appropriate and effective channel to deliver information and updates regarding the pandemic. Official guidelines and policies published by health organizations were found to be the most used source of information as reported by more than two thirds (77.3%) of the participating pharmacists in the current study. In Kosovo and Jordan community pharmacists ,in a similar manner to our finding, were reported to utilize professional organizations websites and releases as their primary source of information [37,38]. However in another study also conducted in Jordan and Ethiopia, the media was found to be the first source of information for the pharmacists [10,36].

Type of pharmacy (either private/individual or chain pharmacy) and superior level of education (70% of bachelor's degree holders and postgraduate degree holders) were found to have a statistically significant association with knowledge level. There is no available evidence to support why pharmacists working in private/individual pharmacies had a higher knowledge level, and it requires more investigation. In accordance, several studies found that healthcare providers who had higher levels of education had higher knowledge levels [31,35,39].

Similarly to our finding regarding the association of age and experience with knowledge level, a study in Pakistan reported that they were not associated

Table 5. Demographics variables association with knowledge and practice categories. [a]

Demographics		Knowledge			P-value	Practice			P-value
		Good n (%)	Fair n (%)	Poor n (%)		Good n (%)	Fair n (%)	Poor n (%)	
Age	20-30	216 (66.5)	98 (30.2)	11 (3.4)	0.806[$]	131 (40.3)	139 (42.8)	55 (16.9)	0.129
	31-40	49 (73.1)	17 (25.4)	1 (1.5)		24 (35.8)	30 (44.8)	13 (19.4)	
	>40	22 (73.3)	8 (26.7)	0		16 (53.3)	14 (46.7)	0	
Gender	Male	137 (70.3)	53 (27.2)	5 (2.6)	0.654	73 (37.4)	89 (45.6)	33 (16.9)	0.489
	Female	150 (66.1)	70 (30.8)	7 (3.1)		98 (43.2)	94 (41.4)	35 (15.4)	
Community pharmacy experience	<5	185 (66.8)	82 (29.6)	10 (3.6)	0.501[$]	108 (39)	120 (43.3)	49 (17.7)	0.659
	5-10	46 (64.8)	24 (33.8)	1 (1.4)		31 (43.7)	29 (40.8)	11 (15.5)	
	>10	56 (75.7)	17 (23)	1 (1.4)		32 (43.2)	3 (45.9)	8 (10.8)	
Type of community pharmacy	Private/ Individual	198 (67.6)	91 (31.1)	4 (1.4)	0.014*	120 (41)	120 (41)	53 (18.1)	0.161
	Chain	89 (69)	32 (24.8)	8 (6.2)		51 (39.5)	63 (48.8)	15 (11.6	
Region	urban	201 (69.3)	82 (28.3)	7 (2.4)	0.584	118 (40.7)	122 (42.1)	50 (17.2)	0.578
	rural	86 (65.2)	41 (31.1)	5 (3.8)		53 (40.2)	61 (46.2)	18 (13.6)	
Average working time per day	≤ 8 hours	185 (72.3)	64 (25)	7 (2.7)	0.061	109 (42.6)	104 (40.6)	43 (16.8)	0.369
	> 8 hours	102 (61.4)	59 (35.5)	5 (3)		62 (37.3)	79 (47.6)	25 (15.1)	
Degree	Undergraduate	53 (55.8)	40 (42.1)	2 (2.1)	0.033*[$]	30 (31.6)	42 (44.2	23 (24.2)	0.114
	Bachelor	200 (71.9)	69 (24.8)	9 (3.2)		120 (43.2)	120 (43.2)	38 (13.7)	
	Postgraduate	34 (69.4)	14 (28.6)	1 (2.0)		21 (42.9)	21 (42.9)	7 (14.3)	

a Chi square test was used
** Statistically significant at p-value <0.05*
[$] Fisher's Exact Test was used

Table 6. Distribution of the significant demographics and the miscellaneous question. [a b]

		During your working time, have you dealt with a positively confirmed COVID-19 cases in your pharmacy?			P-value
		Always n (%)	Occasionally n (%)	Rarely/Never n (%)	
Region	Urban	102 (35.2)	119 (41)	69 (23.8)	0.004
	Rural	28 (21.2)	56 (42.4)	48 (36.4)	
Average working time per day	≤ 8 hours	68 (26.6)	108 (42.2)	80 (31.3)	0.033
	> 8 hours	62 (37.3)	67 (40.4)	37 (22.3)	

[a] *Chi square test was used*
[b] *Statistically significant at p-value <0.05*

with knowledge level in community pharmacists [35]. However and opposite to our findings, gender was associated with the degree of knowledge in that study by which females were found to have a lower degree of knowledge than males and academic degrees were reported to be insignificantly associated with the knowledge [35]. On the contrary to our finding, older age (46–62 years) was associated with the better knowledge level of community pharmacists in Ethiopia, while they reported similar finding regarding gender as it was not associated with knowledge [36]. In the same study, they reported that increasing experience is associated with better knowledge level [36].

Two thirds (66.8%) of our sample disagreed on the effectiveness of virus transmission prevention of cotton/cloth masks. This was following the latest WHO advice published on the use of masks in which they recommended that the use of cloth masks should not be regarded as an alternative to surgical masks for healthcare providers [40].

Despite the good knowledge level of our sample, up to 40% of the participants reported neutral attitude towards the use of folk and herbal medicine in controlling COVID-19, and interestingly, 33.6% agreed that alternative medicine can control COVID-19. This belief contradicts WHO and CDC recommendations which do not approve the use of alternative medicine in controlling and management of COVID-19 [32,33]. The reason behind this belief can be assumed to be driven by the cultural and the traditional aspects of the Egyptians in general, however, this may require more investigations.

Similar to our findings, other studies conducted on either Egyptian healthcare providers or the public reported a positive attitude towards the role of the Egyptian ministry of health in controlling the outbreak[31,41].

The majority (86.5%) of community pharmacists in our sample reported having fears of getting infected with the novel coronavirus. A similar finding was recently reported in an Egyptian study [31], in which 83.1% of the study sample of healthcare providers were afraid of being infected with COVID-19. Abdelhafiz et al [42], reported that 55% of the Egyptians disagreed that wearing a mask is necessary to prevent infection. As pharmacies are always open to public and even with good knowledge of community pharmacists as seen in the current study, this fear can be justified as a natural consequence when the public does not follow safety regulations and do not wear masks.

The highest level of practice observed in our participants was that the majority (96.2%) always to occasionally used personal protection procedures like hand sanitizing, using masks and regular cleaning and disinfecting. These results were in agreement with other findings reported for Egyptians and Italian community pharmacists in which up to 99% of pharmacists follows personal control practices[43,44]. Hoti et al [38], reported a slightly lower percentage (87.9%) of pharmacists in Kosovo who implements preventative measures.

Regardless of the high frequency seen in the current study of the pharmacists who implement personal protection measures, only (78.6%) of pharmacies applied social distance measures. Interestingly at the beginning of the pandemic, Bahlol et al [43], reported that 95.5% of community pharmacists applied a physical safety distance in their pharmacies. This alarming shift in applying safety measure in the early period of the pandemic and during the peak time should be addressed by the officials as any insufficient preventive measures, especially in healthcare sites and during the critical period of the peak, can lead in increasing the spread of the infection and prolong the pandemic.

A paradigm shift that occurred in pharmacy practice after COVID-19 posed community pharmacists in new challenges, like the transition from only dispense medication and indirect clinical focus in patients to a direct patient focus and care oriented duties through

educating the public and patients about all updates on COVID-19 [45]. In the current study, up to approximately (71%) of the participated community pharmacists reported that they provide education and awareness all the time to their patients. While only 3% stated that they rarely or never provide patient education at their pharmacies. Higher percentages of community pharmacists were reported in Pakistan [35] and Kosovo[38] (84.7 % and 91.7%, respectively) who provide education and advice their patients about the COVID-19.

In the current study, around 40.5% of the participated community pharmacists were found to have a good degree of Practice (scoring ≥80%). Similarly, a study in Pakistan conducted on community pharmacists found that 57.3 % of the students had good practice level (scoring≥75%). Other studies reported good practices of community pharmacists during the pandemic, however they were using different assessment tools that cannot be compared to current study [43,46].

Even though the good practice is usually influenced by good knowledge [47], we did not find any correlation between these domains. Hamza et al [34], reported a similar finding in senior pharmacy students in Egypt. However, studies from other countries reported that knowledge of healthcare providers was positively correlated with their practices [35,39,48].

Additionally, we studied the association between the frequency of encountering positive cases and the pharmacists' demographics. Interestingly, community pharmacists in urban areas reported higher frequencies of exposure to positive patients than their counterparts working in rural areas. This might arise from many factors such as the difference in population distribution between urban and rural regions as well as the difference in the healthcare services provided, however, more studies are needed to study the difference between the urban and rural region regarding the services provided by the community pharmacies and the attitudes of people towards these provided services.

Although the exposure to more patients was reported in some studies to drive the healthcare providers to enhance and increase their knowledge, we did not find any association between the knowledge levels and the frequency of exposure to positive patients [31,39].

One limitation of the current study is that the questionnaire was distributed online, and this could result in missing community pharmacists working in remote areas where internet access is limited.

CONCLUSION

Many community pharmacists, who participated in the current study, showed an acceptable level of knowledge and good to fair practices which make them prepared and trustworthy to carry their duties as frontline healthcare providers against the current COVID-19 pandemic. However, the Egyptian government and health officials should provide more educational and awareness programs and updated policies targeting community pharmacists with a middle to low degree of knowledge and practices as any insufficiencies, especially in healthcare providers, will result in increasing pandemic spread and will hold catastrophic consequences on the public health.

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Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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