

# Knowledge, Attitude, and Practice of Sudanese Pharmacists toward COVID-19 in Khartoum State, Sudan: An Online-Based Cross-Sectional Study

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## Abstract

**Background:** COVID-19 disease became an outbreak declared by the WHO as a public health emergency that is explicitly threatening the globe. Measures must be taken to control it, and health-care workers' situations need to be assessed. **Objectives:** The study aimed to assess the knowledge, attitude, and practice of Sudanese pharmacists regarding COVID-19. **Materials and Methods:** The study was an online descriptive cross-sectional survey, conducted from April to June 2020, among the registered pharmacists in Khartoum, Sudan. Three hundred fifty registered pharmacists were asked to participate in this study, all of them were responded. An online standardized questionnaire was conducted, and data were collected by a convenience sampling method and analyzed using the Statistical Package for the Social Science. Descriptive and inferential statistics were performed. **Results:** Response rate was 100%, 65.7% of the participants were females. The median age was 27 years, 72.9% of the pharmacists were bachelor degree holders, and 73.1% of participants were community pharmacists. The years of experience were 1–5 years for 54.4% of them. About 69.4% of the participants had sufficient knowledge about COVID-19, 27.1% reported a positive attitude, and 62.6% reported a fair attitude. Moreover, 88.3% of them were wearing facemask, gloves, and frequently use sensitizers. Nearly 47.7% stated that they would not dispense any treatment of COVID-19 without a prescription. Tests revealed that knowledge was statistically significant with gender ( $P = 0.001$ ) and attitude with age and years of experience ( $P = 0.039, 0.01$ ), respectively. **Conclusions:** More than two-third of the participants have sufficient knowledge regarding COVID-19. Only one-tenth of them have a negative attitude, and their practice toward the disease was relatively good.

**Keywords:** Attitude, COVID-19, knowledge, pharmacists, practice

## INTRODUCTION

Coronaviruses are a large group of RNA viruses that can transmit through birds and mammals, with humans being vulnerable to infection and transmission of coronavirus.<sup>[1,2]</sup> Coronaviruses cause respiratory tract infections, which may be mild symptoms, such as common cold, in serious forms, can be lethal such as a novel coronavirus, which is a new strain that has not been previously reported in humans. The first report was in Wuhan, China, on December 31, 2019, then the outbreak was declared as a public health emergency on January 30, 2020; on February 11, 2020, the WHO announced a name for the new coronavirus disease, COVID-19.<sup>[3]</sup> Patients of this disease suffer from several symptoms such as fever, cough with

or without sputum production, shortness of breath, headache, and loss of smell with or without loss of taste. Less common symptoms are sore throat, rhinorrhea, and GIT symptoms.<sup>[4,5]</sup> There are two phenotypes that may occur: hypoxemia with relatively compliant lungs (typical viral pneumonitis), and acute respiratory distress syndrome. In addition,

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nonrespiratory symptoms regarding organ dysfunction may occur, such as renal failure, liver dysfunction, and cardiac dysrhythmia. Symptoms may be due to hyperinflammation syndrome (cytokine storm).<sup>[4]</sup>

Nowadays, there is a preventive vaccine for COVID-19, while there is no specific antiviral against it, regarding that, some studies suggested Remdesivir.<sup>[6]</sup> Regarding CDC recommendations, coronavirus is transmitted mainly from person to another by close contact (within 6 feet) with infected people through respiratory (e.g., coughs or sneezes) or transmitted by touching a surface or object that contaminated by the virus. The best prevention method is to avoid being exposed to the coronavirus by wearing face masks, washing hands with soap and water, and isolating confirmed and suspected cases.<sup>[7]</sup> On March 11, 2020, the WHO has declared that coronavirus disease-2019 (COVID-19) is a global pandemic infection.<sup>[3]</sup> Till June 13, 2020, the total number of confirmed cases in the world reached 7,553,182, and the death rate is 423,349, in Sudan, above 6879 cases were diagnosed, and above 433 cases died.<sup>[8]</sup>

Pharmacists provide essential medical services all over the world. In many communities, pharmacists may be the only health-care providers who accessible to patients in rural and far areas. Their practice sites include hospitals, clinics, physician offices, and community pharmacies that increase the risk of infection as coronavirus can sustain for a long time on various surfaces and stay on them from hour to days.<sup>[9,10]</sup> Some studies showed that health-care workers (HCWs) lack knowledge and attitudes toward severe acute respiratory syndrome (SARS) and the Middle East respiratory syndrome.<sup>[11,12]</sup> To our knowledge, there is no published data regarding the awareness of Sudanese pharmacists toward the COVID-19 outbreak, whereas pharmacists are an essential part of HCWs, therefore, it is necessary to assess their perspectives. Hence, this study aimed to assess the knowledge, attitude, and practice of Sudanese pharmacists regarding COVID-19.

## MATERIALS AND METHODS

### Study setting

This study was an online descriptive cross-sectional survey. It was conducted from April to June 2020 among the registered pharmacists in Khartoum state, Sudan. The pharmacists have been selected according to their registration and geographical distributions; they are distributed in different localities of Khartoum State.

### Inclusion criteria

All registered pharmacists by the Federal Ministry of Health, in Khartoum State, were included in this study.

### Sample size calculation

According to the list provided by the ministry of health, there were 2293 pharmacies in Khartoum state and the sample size was determined using the following equation:

$$n = \frac{N}{(1 + N[e]^2)}$$

$N$  = Target population (number of pharmacies in Khartoum state)

$n$  = size of the sample,  $e$  = margin of error.

$n = 2293/[1 + 2293 (0.0025)^2]$ ,  $n = 343$  pharmacies.

Instead of taking 343 community pharmacists from 343 pharmacies within Khartoum state, we asked 350 community pharmacists from 350 pharmacies within Khartoum state to participate in the study accounting for any nonresponses or any missed data; but all of them were responded.

### Sampling technique

An online link of the questionnaire was distributed to 350 community pharmacists randomly.

### Data collection

The data was collected using an online questionnaire distributed for community pharmacists through "Google for." A preliminary pilot study was conducted on 10 Pharmacists, and then, the questionnaire was reevaluated and standardized according to the respondents' responses. All ten questionnaires' results of the pilot study were excluded.

### Questionnaire structure, variables, and interpretation

The edited questionnaire contains four parts as following nine questions for sociodemographic characteristics, eighteen questions for knowledge, five questions for attitude, and six questions for practice. Due to the lockdown process at the time of data collection, the questioner was entered in a Google Form and distributed to students through a link shared on social media.

Part A contained data about independent variables which include sociodemographic characteristics (age, gender, residence, level of education, the profession, years of experience, source of information regarding COVID-19, and whether they attending workshops or sessions regarding COVID-19).

Part B assessed the respondents' knowledge toward COVID-19 on 18 items, each correct answer for each knowledge's question was given one point, and the false answer and those who selected I do not know were given zero, then a score of knowledge for each participant was calculated, and the score median was taken as a cutoff point, and according to the value of the median of the scores (16 points), the participants were divided into two categories: those who have sufficient knowledge (whose knowledge score was  $\geq 16$ ) and those who have insufficient knowledge (whose knowledge score was  $< 16$ ).<sup>[13]</sup>

Part C assessed the respondents' attitude toward COVID-19 on 5 items. The items were rated on a 3-point Likert scale, that is, disagree – 0, neutral – 1, and agree – 2. The 5 Likert scale items were summed together to give a total score ranging from 0 to 10, in which a higher score reflects

a more positive attitude. Then, the attitude' score was categorized as those having negative attitude (whose scores ranged 0–3), fair attitude (whose scores ranged 4–6), and positive attitude (whose scores ranged 7–10).<sup>[14]</sup>

### Data analysis

Data were analyzed using the computerized program, Statistical Package for the Social Sciences, version 26 (IBM, SPSS, Illinois, Chicago, USA). The results were presented as tables. Chi-square test was used for cross-tabulation at 0.05 margins of error (*P* value). Descriptive statistics (frequency tables, median, histogram, means, and standard deviation [SD]) and inferential statistics (Chi-square test and logistic regression test) were performed.

### Ethical consideration

Ethical approval was obtained from Omdurman Islamic University, faculty of pharmacy 3/2020. Research purpose and objectives were explained to participants in clear, simple words. Participants had the right to withdraw at any time without any deprivation. Privacy and confidentiality were kept.

## RESULTS

### Demographic characteristics of the participant

The participants' median age was 27 years, and 61.7% of them were between 23 and 28 years. Females were 65.7%. About 72.9% of the participants were bachelor degree holders and 73.1% were community pharmacists. The working experience for 54.4% of the participants was from 1 to 5 years. Nearly 41.79% of the participants depended on the Internet as the main source of information and 39.4% of them were depending on the WHO and scientific papers as the main source of information. About 78.6% of the participants reported that they did not attend workshops regarding COVID-19 [Table 1].

### Knowledge regarding COVID-19

The median score of knowledge was 16 (out of 18) and 69.4% of the participants had sufficient knowledge, while 30.6% had insufficient knowledge. Almost 97.1% were well known that HCWs had a higher risk of being infected. About 89.1% knew that COVID-19 was fatal, while 83.7% knew that COVID-19 patients might present with diarrhea and GIT symptoms. On the other hand, 49.4% of the participants agreed that isolated people should not wear personal protective equipment (PPE). Finally, 73.1% of participants knew that antibiotics were not first-line treatment and the most effective treatment for all cases of COVID-19 [Table 2].

### Attitude regarding COVID-19

The average score of attitude was  $6.5 \pm SD (1.8)$ . About 27.1% of the participants reported a positive attitude, 62.6% reported a fair attitude, and only 10.3% reported a negative attitude. Nearly 63.4% of the participants agreed that COVID-19 could be successfully controlled globally and 60.9% of them disagreed that their country could be able to control the pandemic situation soon. Almost 88.5% of the

**Table 1: Sociodemographic characteristics of the studied pharmacists (n=350)**

Sociodemographic characteristics	n, (frequency %)
Age (years)	
23-28	216 (61.7)
29-34	91 (26)
35-40	32 (9.1)
>40	11 (3.1)
Gender	
Female	230 (65.7)
Male	120 (34.3)
Educational level	
Bachelor	255 (72.9)
MSc	90 (25.7)
PhD	5 (1.4)
The profession	
Clinical pharmacy	22 (6.3)
Community pharmacy	256 (73.1)
Hospital pharmacy	39 (11.1)
Academic	7 (2.0)
Medical representative at a company	26 (7.4)
Years of experience (years)	
Less than year	61 (17.4)
>10	40 (11.4)
6-10	60 (17.1)
1-5	189 (54)
Your main source of information regarding COVID-19	
Internet (e.g., social media)	146 (41.7)
Ministry of health	59 (16.9)
WHO and scientific papers	138 (39.4)
Others	7 (2.1)
Attending workshop regarding COVID-19	
Yes	75 (21.4)
No	275 (78.6)

COVID-19: Coronavirus disease-2019, WHO: World Health Organization

participants were agreed that most pharmacists could get the infection and may be a source of infection to their families. Eighty-three percent of them agreed that the prevalence of COVID-19 could be reduced by the active participation of most health-care providers in hospitals on infection control programs and 76.3% of them agreed with the idea of using developed vaccines available [Table 3].

### Practice regarding COVID-19

About 68.3% of the participants reported that they keep 2 m between them others, and 88.3% of them were wearing facemask, gloves, and frequently use sensitizers. Nearly 47.7% of the participants stated that they would not dispense azithromycin without a prescription. Seventy percent of the participant did not visit any crowded place in recent few days. Seventy-one percent of them reported that frequently they wear masks when they left their homes. Forty-eight percent of the participants would give supportive therapy to the patients who complained of headaches, fever, and cough and were in close contact with COVID-19 patients [Table 4].

**Table 2: Knowledge of the studied pharmacists regarding coronavirus disease-2019 (n=350)**

Knowledge questions	Number of responses, n (%)		
	Yes	No	I don't know
1. HCW are at higher risk of infection	340 (97.1)	7 (2)	3 (0.9)
2. COVID-19 could be fatal	312 (89.1)	31 (8.9)	7 (2)
3. COVID-19 could be transmitted by close contact with the infected person or when contacted with contaminated surfaces	343 (98)	4 (1.1)	3 (0.9)
4. Hands shaking with an infected patient doesn't transmit coronavirus	31 (8.9)	312 (89.1)	7 (2)
5. Dead men could transmit coronavirus when they are touched by a healthy one	264 (75.4)	46 (13.1)	40 (11.4)
6. Shortness of breath is one of the symptoms of COVID-19	344 (98.3)	3 (0.9)	3 (0.9)
7. COVID-19 patient could present with diarrhea and GIT symptoms	293 (83.7)	36 (10.3)	21 (6)
8. Some COVID-19 patients might go asymptomatic and known as carriers	338 (96.6)	3 (0.9)	9 (2.6)
9. Persons with COVID-19 cannot transmit the virus to others when fever is not present	13 (3.7)	317 (90.6)	20 (5.7)
10. Elderly (>65 years) are the most vulnerable group that be infected easily by virus	321 (91.7)	20 (5.7)	9 (2.6)
11. Wearing face masks and cleaning and disinfecting our environment are considered preventive measures regarding COVID-19	344 (98.3)	5 (1.4)	1 (0.3)
12. Practicing social distancing and avoiding crowded places (e.g., public transportation) can prevent from getting infected by virus	337 (96.3)	11 (3.1)	2 (0.6)
13. Children and young adults don't need to take measures to prevent infection by COVID-19 virus	20 (5.7)	326 (93.1)	4 (1.1)
14. You should wear a face mask if you are COVID-19 positive or taking care of COVID-19-positive family member	339 (96.9)	8 (2.3)	3 (0.9)
15. When contact with an infected person you should isolate yourself for not <14 days	342 (97.7)	7 (2)	1 (0.3)
16. Isolated patients should wear PPE	155 (44.3)	173 (49.4)	22 (6.3)
17. Antibiotics are first line and the most effective treatment for all cases of COVID-19	75 (21.4)	256 (73.1)	19 (5.4)
18. We can give supportive/symptomatic treatment only for COVID-19 patients	250 (71.4)	85 (24.3)	15 (4.3)

PPE: Personal protective equipment, COVID-19: Coronavirus disease-2019, GIT: Gastrointestinal tract, HCW: Health-care workers

**Table 3: The attitude of the participating pharmacists regarding coronavirus disease-2019 (n=350)**

Attitude questions	Number of responses, n (%)		
	Agree	Disagree	Neutral
1. Do you agree that COVID-19 could be successfully controlled globally	222 (63.4)	78 (22.3)	50 (14.3)
2. Do you agree that your country could be able to control the pandemic situation soon	93 (26.6)	213 (60.9)	44 (12.6)
3. Do you agree that most pharmacists could get the infection and maybe a source of infection to their families	310 (88.6)	20 (5.7)	20 (5.7)
4. Do you agree that the prevalence of COVID-19 could be reduced by the active participation of most healthcare providers in hospitals and infection control program	293 (83.7)	24 (6.9)	33 (9.4)
5. Do you agree with the idea of using developed vaccine if available	267 (76.3)	46 (13.1)	33 (9.4)

COVID-19: Coronavirus disease-2019

**Table 4: The practice of studied pharmacists regarding coronavirus disease-2019 (n=350)**

Variables	Number of responses, n (%)		
	Yes	No	I don't know
1. In your area of working, do you keep a barrier of 2 m between you and the patients	239 (68.3)	38 (10.9)	73 (20.9)
2. To protect yourself, do you wear face mask, gloves and frequently use sensitizers	309 (88.3)	15 (4.3)	26 (7.4)
3. If someone with COVID-19 symptoms came to your pharmacy and asked you to give him treatment (e.g., azithromycin), would you dispense it to him	118 (33.7)	166 (47.7)	66 (18.9)
4. In recent days, have you ever visited any crowded place	85 (24.3)	245 (70)	20 (5.7)
5. In recent days, have you ever worn a mask when you are leaving your home	250 (71.4)	67 (19.1)	33 (9.4)
6. A 35-year-old man, known to be diabetic, came to your pharmacy with complaints of headache, fever, and dry cough. He told you about his close contact with COVID-19 patient before five days, and then he asked you to help him. What would you do with him?			
You would call infection prevention and control directorate immediately and report the patient			70 (20)
You would give him supportive therapy and report him to the infection prevention and control directorate			72 (20.6)
You would give him supportive therapy, advise him to isolate himself at his home, and educate him about COVID-19			169 (48.3)
You would tell him to return home and isolate himself until the symptoms are cleared			12 (3.4)
You would tell him to return home, isolate himself and educate him about COVID-19			15 (4.3)
You would give him medications to relieve his symptoms			5 (1.4)
Others			7 (2.1)

COVID-19: Coronavirus disease-2019



When the Chi-square test was performed, we found that knowledge was statistically significantly associated with gender ( $P = 0.001$ ). On the other hand, attitude was statistically significantly associated with age and years of experience ( $P = 0.039, 0.01$ ), respectively.

When the logistic regression test was performed, we found that gender was statistically significant with knowledge; females were more likely to have sufficient knowledge by two times than males ( $P = 0.002$ , confidence interval [CI] = 1.350–3.646). Interestingly, considering educational level, master holders were less likely to have sufficient knowledge than those with bachelor degree holders ( $P = 0.017$ , odd ratio = 0.467). This may be due to the uneven number of master degree holders compared with bachelor degree participants. Clinical pharmacists were more likely to have sufficient knowledge by two times than those who work in the manufacturing companies (CI = 0.439–10.239). Similarly, those who had work experience for 6–10 years were more likely to have sufficient knowledge by twofolds than those whose work experience was less than a year (CI = 0.734–5.698). On the other hand, those who perform protective measures against the coronavirus were more likely to have sufficient knowledge by 1.6 times than those who do not (CI = 0.515–4.756) [Table 5].

## DISCUSSION

On March 13, the first confirmed case of COVID-19 has been announced in Sudan. Since that time, the health authorities have planned many strategies to control and manage this critical threat. HCWs are the main part of these implementing strategies, and they represent the frontline in this fight against COVID-19. Pharmacists are the most important HCWs, as they play a critical role in the management cycle of coronavirus outbreak.<sup>[15,16]</sup> Besides, after applying the lockdown rule in Sudan, pharmacies one of the few places that are allowed to be open for providing services to the community. Due to that, community pharmacists have become the first accessed point for seeking medical advice.<sup>[16-18]</sup> Furthermore, many published reports have highlighted the role of pharmacists in the prevention of COVID-19 spreading.<sup>[19,20]</sup> Thus, pharmacists should have adequate knowledge and a positive attitude toward all aspects related to COVID-19, particularly to clinical symptoms, prevention strategies, and proposed treatments.

To the best of our knowledge, this is the first study to assess the knowledge, attitudes, and practice of pharmacists toward COVID-19 in Sudan.

In the current cross-sectional study, 350 Sudanese pharmacists were enrolled in this survey. Females were the higher participant (65.7%) because the girls represent the larger proportions in Sudanese pharmacy schools in recent years. As the community pharmacy field in Sudan is the main site for job opportunities, particularly for bachelor degree holders, therefore, 73.1% of the participants were community pharmacists.<sup>[21]</sup> Furthermore, 54.5% of the pharmacists have experience of 1–5 years; this may because most of the fresh-graduated pharmacists start working in community pharmacies before seeking other jobs.<sup>[22,23]</sup> Attending scientific workshops and webinars about COVID-19 helped a lot to increase the knowledge about control and prevention from the disease in a proper manner, as there are many misleading and unverified information found in the social media.<sup>[24]</sup> However, globally, social media is still considered the primary source of information about COVID-19, even for health-care professionals.<sup>[25]</sup> In the current study, the Internet represents the main source of information (to 41.8% of the participant), 39.4% of them were right to depend on WHO and scientific papers as the main source of information; nevertheless, 21.4% of the participants reported that they attend workshops regarding COVID-19. These findings were consistent with previous studies from Pakistan, Turkey, China, Iran, and Uganda.<sup>[25-29]</sup>

In general, knowledge is important to provide positive attitudes and behaviors, appropriate practice toward prevention, and control of any diseases, including COVID-19.<sup>[30]</sup> The knowledge of Sudanese pharmacists about COVID-19 was evaluated in this study and showed that 69.4% of them have sufficient knowledge. This overall knowledge score was in line with the knowledge score of community pharmacists in Pakistan (71.5%).<sup>[31]</sup> However, most of Turkey pharmacists (90%) reported having adequate knowledge about COVID-19.<sup>[27]</sup> This may due to the appearance of the disease in Sudan was late in comparison to other countries. Interestingly, female students were showed to have more knowledge about COVID-19 than males ( $P = 0.001$ ). This might be attributed to higher care and curiosity behaviors for

**Table 5: Predicting of the factors that can affect the studied pharmacists' knowledge by using binary logistic regression test ( $n=350$ )**

Predictors	B	$\chi^2$	P	OR	95% CI for OR	
					Lower	Upper
Age	0.003	0.007	0.934	1.003	0.929	1.084
Gender	0.797	9.877	0.002	2.218	1.350	3.646
Educational level	-0.762	5.743	0.017	0.467	0.250	0.870
The profession	0.752	0.876	0.349	2.121	0.439	10.239
Years of experience	0.715	1.870	0.172	2.044	0.734	5.698
Performs protective measure against the virus	0.448	0.623	0.430	1.565	0.515	4.756

OR: Odds ratio, CI: Confidence interval

females than males. Similar findings were observed in Chinese and Indian reports.<sup>[32,33]</sup> Fascinatingly, many published studies indicated that pharmacists have the highest knowledge about the COVID-19 among other healthcare professionals, such as physicians and nurses.<sup>[25,26]</sup> These observations further support the role of pharmacists in controlling the COVID-19 outbreak.

Based on the results, the majority of pharmacists responded well to the knowledge questions related to the severity of the disease, transmission ways of the virus, and the COVID-19 symptoms. However, around 75% of pharmacists knew about the possibility of transmitting the virus from COVID-19 dead person. The elderly patients are more prone to be infected and additionally more likely to be affected by the COVID-19 complications.<sup>[34]</sup> Here, 91.7% of pharmacists were considered elderly are the most vulnerable group that can be infected easily by the virus. The majority of them agreed with the importance of preventing infection to adults and children. Furthermore, to prevent the transmission of the disease, the WHO and the Ministry of Health recommended the following precautionary measures such as using disinfectants and wearing face masks in public places.<sup>[35,36]</sup> In line with this, we found that the majority of the pharmacists believed that such preventive measures reduce the transmission of the disease. Moreover, isolation of the suspected case is another critical step in controlling the transmission,<sup>[37]</sup> which was acknowledged by most participants. However, around half of them indicated that isolated patients should wear PPE. On the other hand, to prevent the development of antimicrobial resistance, antibiotics should not be used for prevention or treating the COVID-19.<sup>[36,38]</sup> Nonetheless, 27% of pharmacists have deemed that taking antibiotics as a preventive measure against COVID-19. Thus, to improve the knowledge and perception, further training and education on transmission, symptoms, and management about COVID-19 are required in our population.

Increased knowledge about the disease has a higher impact on the gain of positive attitudes toward a health crisis such as the COVID-19 outbreak.<sup>[39]</sup> Due to the comparatively low level of knowledge in the current study, most Sudanese pharmacists (62.2%) showed fair attitudes toward the disease. In contrast, other studies revealed that most health-care professionals have a positive attitude toward COVID-19.<sup>[24,25,39]</sup> Around 63% of the participants agreed that COVID-19 would be successfully controlled globally. Although the Sudanese government has applied many rules to control the spreading of the disease, such as lockdown and prohibiting the gathering and increasing public awareness by disseminating information about COVID-19 and the preventive guides toward the disease, only 26.6% agreed that Sudan would be able to win the battle against the disease. Furthermore, 83% of the pharmacists believed in the involvement of all health-care providers in infection control programs to reduce the prevalence of COVID-19. Today, research institutes and pharmaceutical companies have developed a promising and effective vaccine to counteract

this outbreak.<sup>[40,41]</sup> In this study, 76.3% of the pharmacists thought positively about developing the vaccine in the near future.

Regarding the practice of Sudanese pharmacists, our study indicated that most of the pharmacists had good practice to avoid SARS-CoV-2. Keeping a distance of 2 m will help in reducing the transmission of the disease; interestingly, we found that around 68% of pharmacists are using a barrier in the area of working to keep this distance. Moreover, the highest good practice was observed in wearing face masks and gloves and frequent use of sensitizers at the workplace. These findings were also observed in Pakistanis community pharmacists,<sup>[31]</sup> and contrast to another study that reported only 8.9% of the hospital pharmacists are using facemasks at the workplace.<sup>[27]</sup> Azithromycin was reported to have efficacy against COVID-19; in this study, 47.7% of the participants stated that they would not dispense azithromycin without a prescription, whereas 48% of the participants would give supportive therapy to the patients who were complaining of headache, fever, and cough and were with close contact with COVID-19 patient. Therefore, it is crucial to improve the pharmacists' knowledge and attitude regarding the COVID-19 infection that will ultimately be translated into proper practice.

The current study has some notable limitations. First, the cross-sectional design may not allow for determining the relationship between the outcomes and other factors. In addition, the study was conducted in only Khartoum state, so the findings cannot be generalized to all pharmacists in the country. Second, we used an online-based survey method to prevent infection exposure, and as the users of social platforms are mostly young people, this resulted in a large proportion of young participants. Therefore, the possibility of selection bias should be considered. Thus, further research will still need to potentially include longitudinal tracking of the factors contributing to the COVID-19 morbidity and mortality rather than pharmacists' awareness.

## CONCLUSIONS

More than two-third of the participants have sufficient knowledge regarding COVID-19. Only one-tenth of them have a negative attitude, and their practice toward the disease was relatively good. Chi-square test revealed that knowledge was statistically significantly associated with gender. On the other hand, the attitude was statistically significantly associated with age and years of experience.

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## Conflict of interest statement

The authors report no conflicts of interest.

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## ملخص المقال باللغة العربية

المعرفة والمواقف والممارسات من الصيدالة السودانية نحو كوفيد-19 في ولاية الخرطوم، السودان: دراسة مقطعية

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**الخلفية:** أصبح مرض كوفيد-19 متفشياً إلى الدرجة التي اعتبرته منظمة الصحة العالمية صراحةً حالة طوارئ صحية عامة تهدد العالم ويجب اتخاذ تدابير للسيطرة عليه، كما يجب تقييم معرفة وأوضاع العاملين في مجال الرعاية الصحية.

**الأهداف:** هدفت الدراسة إلى تقييم معرفة وموقف وممارسة الصيدالة السودانية فيما يتعلق بـ كوفيد-19 .

**المواد والطرق:** كانت الدراسة عبارة عن مسح مقطعي وصفي عبر الإنترنت، تم إجراؤه في الفترة من أبريل إلى يونيو 2020، بين الصيدالة المسجلين في الخرطوم، السودان. طُلب من ثلاثمائة وخمسين صيدلياً مسجلاً المشاركة في هذه الدراسة، وتم الرد منهم جميعاً. تم إجراء استبيان موحد عبر الإنترنت، بعد جمع البيانات تم إجراء الإحصاء الوصفي والاستنتاجي للعينات الملائمة وتحليلها باستخدام الحزمة الإحصائية للعلوم الاجتماعية.

**النتائج:** كان معدل الاستجابة 100%، 65.7% من المشاركين من الإناث. كان متوسط العمر 27 عاماً، وكان 72.9% من الصيدالة من حملة درجة البكالوريوس، و73.1% من المشاركين كانوا يعملون كصيدالة المجتمع. تراوحت سنوات الخبرة من 1-5 سنوات لـ 54.4% منهم. حوالي 69.4% من المشاركين لديهم معرفة كافية بـ كوفيد-19، 27.1% أفادوا بموقف إيجابي، و62.6% أفادوا بموقف متوسط. علاوة على ذلك، كان 88.3% منهم يرتدون أقنعة الوجه، والقفازات، ويستخدمون بشكل متكرر المطهرات. صرح ما يقرب من 47.7% أنهم لن يقوموا بأي علاج لـ كوفيد-19 بدون وصفة طبية. أظهرت النتائج أن المعرفة لها علاقة إحصائية مع الجنس، أما السلوك والمواقف فلها علاقة إحصائية مع العمر وسنوات الخبرة.

**الاستنتاجات:** أكثر من ثلثي المشاركين لديهم معرفة كافية بشأن كوفيد-19، فقط عُشر منهم لديه موقف أو سلوك سلبي، وممارساتهم تجاه المرض كانت جيدة نسبياً.

**الكلمات المفتاحية:** الموقف، كوفيد-19، المعرفة، الصيدالة، التجاوب.