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## Pharmacists' readiness to deal with the coronavirus pandemic: Assessing awareness and perception of roles

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### ARTICLE INFO

#### Keywords:

Coronavirus  
Pandemics  
Pharmacists  
Faculty of pharmacy  
Pharmaceutical association  
Jordan

### ABSTRACT

**Background:** The 2019 Coronavirus infection (COVID-19) caused by a novel strain of coronavirus was detected in China in December 2019, and declared a public health emergency of international concern on January 30, 2020. Community pharmacists have an important role in supporting the local health emergency preparedness and response arrangements.

**Objectives:** To investigate pharmacists and pharmacy students' awareness and source of their information regard the management of the coronavirus pandemic, and their perspective of their role during this emergent situation. **Methods:** This descriptive cross-sectional online survey study was conducted in Jordan during the COVID-19 outbreak (from 15 to 30 March 2020). A validated online questionnaire addressing participants' current awareness about epidemics/pandemics and COVID-19, source of information and their perspectives of their role. Data were analyzed using statistical package for social science (SPSS).

**Results:** Participants (n = 726) had a mean age of 26.9 (8.0) years with 71.9% females. Pharmacy students made 35.3% of the sample while the rest were pharmacists. Only 54.3% of participants believed that they got enough education about epidemics/pandemics, and 94.6% of them follow on the latest coronavirus updates on treatments, and that is mainly from the media (59.5%) followed by the World Health Organization reports (58.7%) and then the published researches (57%). Awareness score (out of 20) of pharmacists (n = 470) was significantly higher (p < 0.001) than that of students (n = 256). Better Awareness scores were also associated with higher age of participants, graduating from a public versus a private university, and attending more educational workshops. **Conclusion:** The majority of pharmacists and pharmacy students reported that they have a major role in the management of epidemics/pandemics through the community pharmacies but the majority follow on the latest coronavirus updates from the media. This fact rings bells considering the numerous conflicting messages publicized during the pandemic through the media.

### Introduction

According to the Centres for Disease Control and Prevention (CDC, USA), epidemic refers to a rapid increase in cases of a disease over what is the normally expected occurrence in a particular community or geographic area, with significant population proportions affected in that area.<sup>1</sup> Epidemic escalate to a pandemic, when the disease spreads over wider geographical zones, across countries and continents and affects a

higher number of people all over the world.<sup>1</sup> In recent months, the World Health Organization (WHO) and CDC declared the coronavirus infectious disease (coronavirus disease 2019, termed COVID-19)<sup>2,3</sup> as a pandemic caused by a newly discovered coronavirus strain named 'severe acute respiratory syndrome coronavirus 2' or SARS CoV-2, colloquially referred to as COVID-19.<sup>2,3</sup>

Coronavirus (COVID-19) belong to a family of RNA-viruses which take humans and mammals as formal hosts to live and replicate.<sup>4</sup>

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<https://doi.org/10.1016/j.sapharm.2020.04.020>

Received 19 April 2020; Accepted 20 April 2020

Available online 23 April 2020

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COVID-19 has been reported as an extraordinarily contagious virus.<sup>5</sup> People who get infected with this virus experience mild to moderate respiratory distress including fever, dry cough, and shortness of breath.<sup>2,6,7</sup> According to a recent study by Huang et al., COVID-19 manifests as clusters of severe respiratory symptoms similar to severe acute respiratory syndrome outbreaks caused by coronaviruses viruses reported within the last two decades.<sup>6</sup> These viruses were termed severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV); both have resulted in more than 10,000 cumulative cases, with high fatality rates in both cases.<sup>6</sup> At the end of 2019, the novel COVID-19 has disseminated rapidly, starting with China then spreading to many countries around the world in a short space of time, with no clear treatment or vaccine in sight as yet.<sup>6,8,9</sup> As of April 1, 2020, it is reported by the WHO that COVID-19 outbreak has resulted in 823,626 confirmed cases in the world, 40,598 cases of confirmed deaths, and 206 countries have the disease.<sup>2</sup>

Pharmacists are a part of the health care system, and their role is critical in completing the management cycle of coronavirus outbreak.<sup>10</sup> On the March 19, 2020, the International Pharmaceutical Federation (FIP) released a guideline to clarify the required coronavirus information for pharmacists and the pharmacy workforce,<sup>11</sup> in addition this guideline stipulated the responsibility/role of both community and hospital pharmacists in the control of this outbreak.<sup>11</sup>

Pharmacists need to be engaged in the coordinated efforts during pandemics, and be readily adaptive to changes required in pharmacy practice. As FIP advocated, “community pharmacies in outbreak-affected and unaffected countries are often the first point of contact with the health system for those with health-related concerns or simply in need of information and reliable advice”.<sup>11</sup> Hence, it is important to explore how pharmacists around the world are managing their customary and newly emerging roles during the COVID-19 outbreak. From Macau, China, home of the outbreak, it was documented, from the perspective of the authors, that pharmacists had roles in ensuring the stable supply of key medicines, providing information about the coronavirus infection, performing early detection of cases and appropriate referral, and implementing government arrangement such as the *Guaranteed Mask Supply Scheme*.<sup>10</sup> Another study from China acknowledged that community pharmacy management teams shall support different services by providing adequate supply of COVID-19 related medications and preventative products, in addition to providing sufficient staff trainings.<sup>12</sup> From Colombia, community pharmacists were proposed to contribute to the early detection and appropriate referral of possible cases of the virus, then to be reported through designated telephone lines in addition to providing patient education.<sup>13</sup> From the United Arab Emirates (UAE), it was stated that pharmacists can also play a role in promoting an empathy culture to help in preventing the stigmatization of infected individuals based on ethnicity, population or nationality, and by broadcasting facts in their communities via various media.<sup>14</sup> It is expected that pharmacists around the world are finding their ways to contribute to the collaborative forces in combating the spread of the virus. But for pharmacists to assume a role in humanitarian and health emergency settings, the application of real-world data,<sup>10</sup> in addition to the provision of tailored training programs, taking into consideration all aspects, including the psychological impact of such roles, are vital.<sup>15,16</sup> Published research so far provide reference for pharmacists on providing patient care services to improve patient’s outcomes and make a contribution to the control of the pandemic. No previous study has looked into pharmacists’ own perspective of their role in the management of the coronavirus pandemic, their awareness of important facts needed to be able to deliver their roles successfully, and the source of such facts.

The aim of this study was to investigate pharmacists and pharmacy students’ preparedness to take part in the management of epidemics and pandemics. Specifically, we investigate participants’ awareness of important facts regarding the current coronavirus pandemic and the source of their information, as well as their perspective of

pharmaceutical professional roles during this emergent situation.

## Method

### Study design and participants

The study objectives were addressed in a descriptive cross-sectional online survey. This study was conducted in Jordan during the Coronavirus outbreak (from 15 to 30 March 2020). Eligible participants were licensed pharmacists practicing in community and hospital pharmacies in Jordan, academics and pharmacy students. Ethics approval for the study was obtained from the Faculty of Pharmacy, Applied Science Private University. Participation in the study did not pose any risk to participants and was voluntary. Potential participants who completed the survey were considered to have given informed consent for participation in the study.

### Survey development

Following an extensive review of the literature,<sup>9,11,17,18</sup> the leading research team developed the first draft of the questionnaire. The questionnaire was administered in English since English is the official language of education for pharmacists in Jordan. Several sources were used to generate a pool of questions considered to be relevant to the study objectives. The questions were tabled and reviewed by the research team in order to combine concepts and to remove duplicates if any.

To ensure face validity, the first draft of the questionnaire was evaluated by six independent academics who have previous experience in Pharmacy Practice and Education. They informed the research team if any of the items in the questionnaire were not clear or difficult to comprehend. Comments and feedback provided were considered by the research team and then incorporated where appropriate to develop the final version of the questionnaire. Finally, the research team revised the items as necessary to make them concise and to fit for online administration.

The final version of the questionnaire was organized into three main sections addressing different topics of interest. The *first section* included items to collect demographics data. The *second section* included items aimed at assessing potential participants’ current epidemics/pandemics and COVID-19 awareness; here potential participating pharmacists were asked about how much they know about the coronavirus, including a) symptoms, b) modes of transmission, c) how to prevent the transmission and the spread of the virus, and d) awareness about where to access the latest coronavirus updates regarding treatment. For each of these sections, there were several detailed items, e.g. participants when asked, for example, were probed about the modes of coronavirus transmission, such as if the virus can be transmitted from the respiratory droplets from person to person among close contacts and after touching surfaces that were contaminated by the virus.<sup>19</sup> Other questions investigated participants’ awareness regarding the highest risk patients in addition to the symptoms that are associated with coronavirus such as fever, dry cough, shortness of breath, muscle aches and gastrointestinal symptoms.<sup>19</sup> The latest coronavirus updates on treatment were questioned, for example, if hydroxychloroquine alone or in combination with azithromycin have been used as a preventive therapy against coronavirus infection, or if oseltamivir is being used in the management of the coronavirus infection.<sup>19–23</sup> Another question assessed the awareness concerning the use of non-steroidal anti-inflammatory drugs such as ibuprofen when there is an infection.<sup>24,25</sup> Other questions in the treatment section were about whether the use of some drugs (glucocorticoids and autoimmune disease medications) increase the susceptibility to contract coronavirus infection.<sup>26,27</sup> Participants’ awareness of how to prevent the transmission and the spread of the virus was assessed in depth as well, such as if washing hands with soap and water for 20 s would be enough to clean the hands, also the least distance that should be kept while counseling patients (2 m/6 feet).<sup>19,28,29</sup> Two questions were about exercise, the first

one asked if exercise causes antibodies and white blood cells to circulate more rapidly in the body, therefore detecting and combating infections at an early stage, and the second question asked if the brief rise in body temperature during and after exercise prevents bacterial growth, thus increases the body's ability to fight the infection.<sup>17,30</sup> The rest of the questions were about the immune system and ways to boost it, to combat the viral infection.<sup>17,19,31,32</sup> For example, participants were asked if protein-calorie malnutrition increases the opportunistic infection<sup>33,34</sup>; and the role of garlic, mushrooms, vitamin C and D was also questioned. Not smoking and the importance of decreasing stress to boost immunity was also questioned.<sup>35–37</sup> And finally, the effect of sunlight in activating the T-helper cells in order to boost the immunity was questioned.<sup>38</sup> Participants were asked to provide their email to receive the answers for the awareness questions once the study was completed if they wished to receive this information. Potential participants were also given the choice to view the correct answers via a Facebook page designed for this study. All items in this section required a True/False/Not sure response.

The *third section* concentrated on the potential participants' perspective of the role of the pharmacist during epidemics and pandemics, and the new coronavirus pandemic; it included 8 closed-ended questions. The participants' responses to this sections used a Likert scale answer i.e. "Strongly agree", "Agree", "Neutral", "Disagree", or "Strongly disagree".

#### Survey implementation

Study participants were recruited through social media (Facebook and WhatsApp); those willing to consider participation could open a link to initially view ethics committee approved information about the study and then proceeding to the survey. At the end of the data collection phase (7 days), the correct answers for the awareness part in the survey were made available to the participants (as informed in the information section) to improve their awareness about coronavirus prevention, symptoms and proposed treatment).

#### Sample size

Based on the number of licensed pharmacists in Amman (15,045) sample size calculation using a margin of error of 5%, confidence level of 95%, and response distribution of 50%, a minimum sample size of 375 pharmacies is needed.

For pharmacy students, a sample size calculation was performed using the following formula:  $n = P \times (100 - P) \times z^2/d^2$ . Where P is the anticipated prevalence (prevalence of awareness here), d is the desired precision, z is the appropriate value from the normal distribution for the desired confidence. Using 95% confidence level, 5% precision level and 50% anticipated prevalence of inappropriate awareness (This conservative prevalence value results in the highest possible sample size that can be used in this study, as no previous studies in this area were found to indicate other prevalence of inappropriate awareness), a sample size of 385 was considered representative of this sampling frame.

#### Statistical analysis

Data were analyzed using statistical package for social science (SPSS) version 22 (SPSS Inc., Chicago, IL, USA). The descriptive analysis was undertaken using mean and standard deviations for continuous variables and percentage for qualitative variables. Checking for data normality was carried out using the Shapiro-Wilk test (with P-value  $\geq 0.05$  indicating a normally distributed continuous variable). Group differences between students and pharmacists were explored using Chi-squared analysis.

Screening of the factors affecting participants' awareness score about coronavirus pandemic was carried out using linear regression. For multiple linear regression analysis, using entry method, the variable entry criterion was set to 0.25, i.e. any variables found to be significant

**Table 1**

Demographic characteristics of the study sample at baseline (n = 726).

Parameter	Mean (SD)	n (%)
Age (mean $\pm$ SD)	26.9 (8.0)	
Gender, n (%)		522
• Female		(71.9)
• Male		204 (28.1)
Marital status, n (%)		199
• Married		(27.4)
• None-married (single, divorced, widowed)		527 (72.6)
University		393
• Private University		(54.1)
• Public University		333 (45.9)
Educational level		256
• Student		(35.3)
• Diploma		24 (3.3)
• B.Pharm		292
• Pharm.D		(40.2)
• Masters		45 (6.2)
• PhD		81 (11.2)
Employment		28 (3.9)
• Pharmacy owner		33 (4.5)
• Pharmacy employee		91 (12.7)
• Hospital pharmacist		33 (4.5)
• Pharmacy trainee		53 (7.3)
• Academic		68 (9.4)
• Pharmacy student		342
• Others		(47.1)
Living area		105 (14.5)
• Amman		504
• Others		(69.4)
• Missing data		211
Graduation years		(29.1)
• I'm still a student		11 (1.5)
• 1–5 years ago		369
• 6–15 years ago		(50.8)
• 16–25 years ago		204
• More than 25 years ago		(28.1)
Years of experience		102
• 1–5 years		(14.0)
• 6–10 years		31 (4.3)
• 11–15 years		20 (2.8)
• 16–20 years		572
• 21–25 years		(78.8)
• More than 25 years		82 (11.3)
The number of attended educational workshops in the last year		23 (3.2)
• 0		17 (2.3)
• 1		16 (2.2)
• 2		16 (2.2)
• 3		193
• 4		(26.6)
• 5		163
• More than 5		(22.5)
		138
		(19.0)
		83 (11.4)
		53 (7.3)
		32 (4.4)
		64 (8.8)

on the single predictor level ( $P < 0.25$ ) were entered into the multiple linear regression analysis to explore the variables that were significantly and independently associated with participants' awareness score. Variables were selected after checking their independence, where tolerance values  $> 0.1$  and Variance Inflation Factor (VIF) values were  $< 10$  were selected to indicate the absence of multicollinearity between the independent variables in regression analysis. The homoscedasticity assumption for multiple linear regression was checked using Breusch-Pagan test, with a  $P \geq 0.05$  indicating the absence of heteroscedasticity.

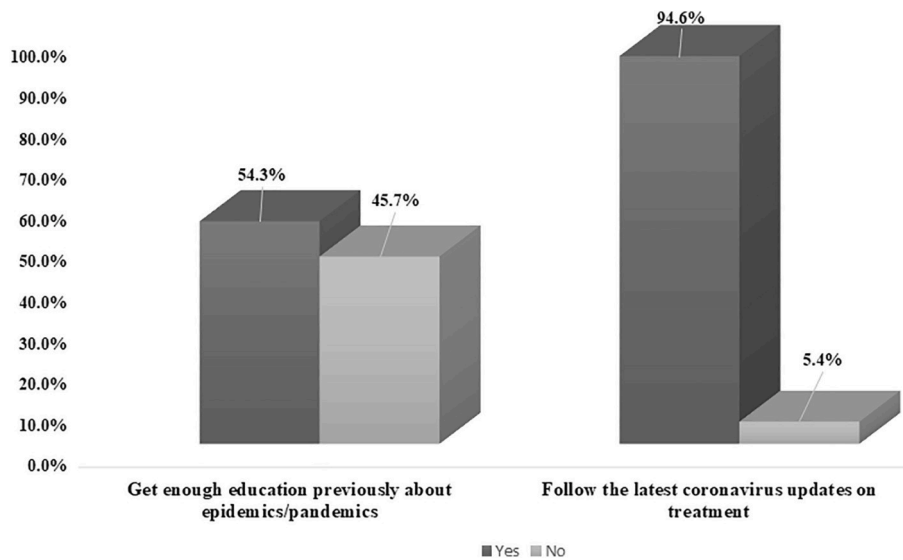


Fig. 1. Study participants awareness about epidemics/pandemics and updates about coronavirus treatment (n = 726).

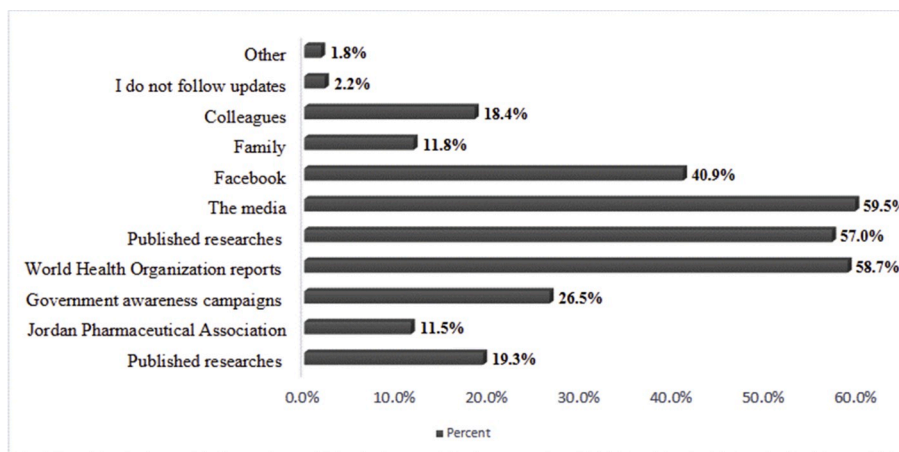


Fig. 2. Sources of information about coronavirus treatment among the study participants (n = 726).

**Results**

The sample size required for the study was reached (n = 726), with a mean age of 26.9 years (Table 1). A majority of participants were females (71.9%), and not married/single (72.6%). Participants came from private (54.1%) and public universities (45.9%) with the majority having a bachelor’s in pharmacy degree (40.2%). Pharmacy students made up 35.3% of the sample while the rest ranged between pharmacy owners, pharmacy employees, hospital pharmacists, pharmacy trainees, academics and others. Most of the participants lived in Amman, the capital of Jordan. If not a student, most of the participants had graduated recently from the university (1–5 years ago, 28.1%), and hence, 1–5 years was the years of experience reported by the majority of participants (78.8%). Many participants did not attend any educational workshop last year (26.6%) while few attended 5 or more workshops (4.4% and 8.8% respectively).

While only 54.3% of the participants believed that they got enough education previously about epidemics/pandemics, most of them (94.6%) reported that they currently followed the latest coronavirus updates on treatments quite closely (Fig. 1).

With regards to the sources of information about coronavirus treatment, study participants reported that they obtain their information mostly from the general media, followed by the WHO reports, published

research papers and Facebook (Fig. 2).

When assessing awareness about coronavirus pandemic, responses demonstrated that more than half of the participants knew the appropriate answers to the items except for two items, the first item: ‘You need to keep a distance of at least 3 m (10 feet) when counseling patients during a pandemic’, where the more appropriate answer in the Jordanian context would be 2 m (6 feet) as sufficient. The second item was ‘The highest population risk category for people contracting coronavirus are: elderly (>65), immune-compromised people or children under the age of 9. Children under the age of 9 are not amongst the highest risk people in contracting the coronavirus (Table 2), yet 81.1% of participants chose this statement as ‘True’.

For the rest of the awareness items, more pharmacist (81.3%) than student participants (69.9%) knew that non-steroidal anti-inflammatory drugs such as ibuprofen may theoretically increase the risk of complications when used during viral infections (p = 0.001) and that muscle aches and GI symptoms (nausea/vomiting/diarrhea) could be associated with coronavirus infections (p < 0.001). The case was the same for the items stating that ‘steroids may increase the susceptibility to coronavirus infection in some cases’, ‘hydroxychloroquine has not been trialed as a preventative therapy against coronavirus infection’, ‘azithromycin has been trialed along with hydroxychloroquine in the treatment of the coronavirus infection’ and that ‘Oseltamivir can be used in the



**Table 2**  
Assessment of study participants (pharmacists and students) awareness about coronavirus pandemic (n = 726).

Statements	Correct answer, n (%)			P-value#
	Total n = 726	Students n = 256	Pharmacists n = 470	
One way of transmission of coronavirus is respiratory droplets from person to person among close contacts.	637 (87.7)	222 (86.7)	415 (88.3)	0.535
Coronavirus can be transmitted after touching surfaces that were contaminated with the virus.	698 (96.1)	245 (95.7)	453 (96.4)	0.649
Non-steroidal anti-inflammatory drugs such as Ibuprofen can decrease the risk of complications when used during viral infections.	560 (77.1)	179 (69.9)	381 (81.1)	<b>0.001*</b>
Fever/dry cough/shortness of breath are associated with coronavirus.	714 (98.3)	249 (97.3)	465 (98.9)	0.092
Muscle aches and gastrointestinal symptoms (nausea/vomiting/diarrhea) are not associated with coronavirus.	470 (64.7)	142 (55.5)	328 (69.8)	< <b>0.001*</b>
Hand washing with soap and water for 20 s is enough to clean the hands and protect from spreading the infection.	620 (85.4)	217 (84.8)	404 (85.7)	0.721
Using steroids do not increase vulnerability to coronavirus infection.	347 (47.8)	97 (37.9)	250 (53.2)	< <b>0.001*</b>
Generally, the use of autoimmune disease treatments increase the susceptibility to contract coronavirus infection.	461 (63.5)	151 (59.0)	310 (66.0)	0.062
Hydroxychloroquine has not been used as a preventative therapy against coronavirus infection.	427 (58.8)	125 (48.8)	302 (64.3)	< <b>0.001*</b>
Azithromycin has been used along with hydroxychloroquine in the treatment of the coronavirus infection cases.	521 (71.8)	154 (60.2)	367 (78.1)	< <b>0.001*</b>
Oseltamivir has not been used in the management of coronavirus infection cases.	205 (28.2)	51 (19.9)	154 (32.8)	< <b>0.001*</b>
Protein calorie malnutrition impairs host immunity (particularly the T-cell system) resulting in increased opportunistic infections.	375 (51.7)	133 (52.0)	242 (51.5)	0.905
Patients should eat food that contains Vitamin C and D to boost their immunity.	692 (95.3)	244 (95.3)	488 (95.3)	0.997
Eating food like mushrooms and garlic is beneficial for the immune system.	548 (75.5)	197 (77.0)	351 (74.7)	0.497
Exercise causes antibodies and white blood cells to circulate in the body more rapidly detecting infections at an early stage.	509 (70.1)	174 (68.0)	335 (71.3)	0.352
The brief rise in body temperature during and right after exercise increases bacterial growth,	460 (63.4)	156 (60.9)	304 (64.7)	0.317

**Table 2 (continued)**

Statements	Correct answer, n (%)			P-value#
	Total n = 726	Students n = 256	Pharmacists n = 470	
which will lower the body's ability to fight the infection.	706 (97.2)	248 (96.9)	458 (97.4)	0.635
Not smoking and decreasing stress help support the immune system.	436 (60.1)	145 (56.6)	291 (61.9)	0.166
Sunlight activates T-helper cells hence boosts immunity.	191 (26.3)	48 (18.8)	143 (30.4)	<b>0.001*</b>
You need to keep a distance of at least 3 m (10 feet) when counseling patients during a pandemic.	147 (18.9)	41 (16.0)	96 (20.4)	0.147
The highest risk patients in contracting coronavirus are elderly (>65), immune-compromised and children under the age of 9.				

Using Chi-square test, \* significant at 0.05 significance level.

management of coronavirus infection' (p < 0.001 for all).

Hence overall, the awareness score (out of 20, the higher the score the higher the awareness) of pharmacists was significantly higher (p < 0.001) than that of students (Fig. 3).

Multiple linear regression analysis of factors affecting awareness cores among study participants highlighted that older age, study group (being a pharmacist versus a student), graduating from a public university versus a private university, attending educational workshops on a yearly basis significantly affected the awareness level of participants (Table 3).

More than 70% strongly agreed/agreed (expressed as believed after here) that they have a major role in the management of pandemics/epidemics through their pharmacies, and that it is their role to ensure the availability of key medications (Fig. 4). More than 90% believed that it was their role to counsel people about coronavirus infection and how to reduce the transmission and the spread of disease, and that they should ensure their personal safety by avoiding close contact with all patients. More than 80% said that if they suspected someone may have coronavirus, they knew how to seek immediate medical attention and that pharmacies should be allowed to send medications to their patients' home during the coronavirus pandemic when needed. Only 22% reported that they would provide hydroxychloroquine to patients who need it even if they don't have a prescription. About 50% believed that they should be allowed to sell medications for coronavirus management via the drive-through service available in some chain pharmacies.

Although 87.2% of the participants provided their email addresses, the majority of participants (65.7%) chose to view the correct answers for the 20 awareness questions once the study was completed via the study Facebook page, and the rest (34.3%) chose to receive the answers via an email sent to their email address from the research team.

## Discussion

Pharmacists play an important role as active members of the healthcare team.<sup>39</sup> Internationally pharmacists are integrated into pandemic planning and response.<sup>40</sup> Not only do they have an effective role in clinical settings,<sup>41</sup> but in community settings they can play an important role in the community by making pharmaceutical products available and by enhancing health awareness among the public.<sup>14,42</sup> Along those lines, participants in the present study believed that they could play an effective role during the COVID-19 pandemic. This was through infection control, by counseling individuals regarding hygiene practices needed to reduce infection spread. More than 80% of participants knew how to act in seeking immediate medical attention if they

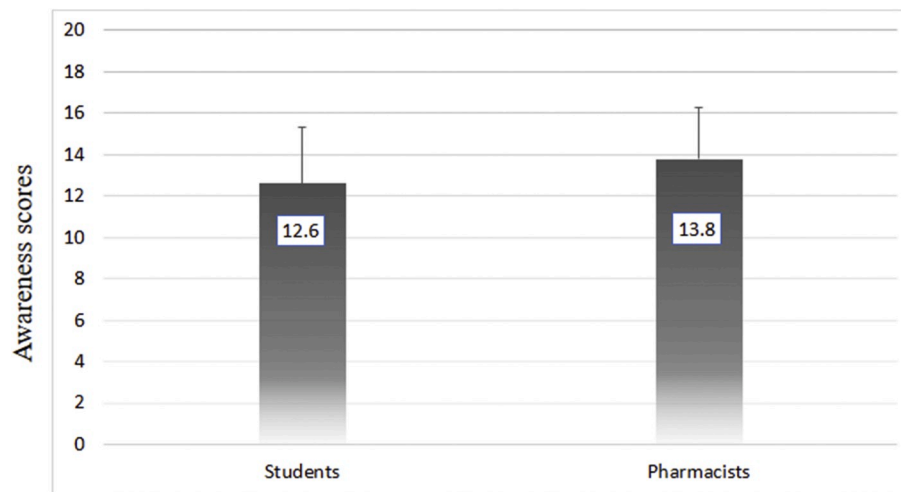


Fig. 3. Comparison of the awareness scores (out of 20) between students (n = 256) and pharmacists (n = 470), (P-value <0.001 using independent sample t-test).

Table 3

Assessment of factors affecting awareness scores among study participants (n = 726).

Parameter	awareness score			
	Beta	P-value#	Beta	P-value\$
Age	0.230	< 0.001	0.145	0.010*
Gender	Reference	0.418	—	—
• Female	-0.026			
• Male				
Marital status	Reference	< 0.001	-0.041	0.345
• Married	-0.176			
• Non-married (single, divorced, widowed)				
Study group		< 0.001	0.131	0.001*
• Students	Reference			
• Pharmacists	0.227			
University of study	Reference	< 0.001	0.170	<
• Private University	0.173			0.001*
• Public University				
Years after graduation	Reference	< 0.001	-0.031	0.554
• ≤ 5 years	0.178			
• > 5 years				
Attend educational workshops yearly	Reference	< 0.001	0.144	<
• No	0.172			0.001*
• Yes				
Living area		0.606	—	—
• Amman	Reference			
• Others	-0.019			

# using simple linear regression, \$ using multiple linear regression, \* significant at 0.05 significance level.

suspected someone may have the coronavirus infection. This study supports the notion that pharmacists are willing to and do play an important role in infection control and public safety,<sup>43</sup> and in assuring public health and wellbeing.

The majority of participants indicated that they will be able to act if they suspected that a patient has COVID-19. One of the important aspects of pharmacy practice in the context of pharmaceutical care is being able to triage patients to appropriate health care.<sup>44</sup> Furthermore, the majority of participants were willing to deliver medicines to patients' homes. This is not required by the Jordanian Drug and Pharmacy laws and in fact pharmacists are not allowed to adopt a courier home delivery service.<sup>45</sup> Hence, during the COVID-19 pandemic only registered pharmacists were allowed to deliver medications. This would be an effective service especially for elderly patients were the risk of infection and its

complication are increased, although of course the delivery personnel should probably be pharmacy staff/trainee pharmacists to 'free-up' pharmacy capacity in a pandemic situation.<sup>19</sup>

Some participants indicated that they were willing to dispense hydroxychloroquine directly to patients. This is quite surprising as hydroxychloroquine has been regulated by the Jordan Food and Drug Administration and is not allowed to be sold in the community pharmacy without a valid prescription. Furthermore, the efficacy of hydroxychloroquine has not been thoroughly established for COVID-19 and the medication has a risk: benefit profile that requires clinical supervision when used. Participants' willingness to dispense without prescription may be influenced by the media which has been proposing hydroxychloroquine as the treatment of COVID-19. About 95% of participants in this study reported that they currently follow the latest coronavirus updates on treatments obtaining their information mostly (60% of them) from the media. Highlighting more reliable sources such as the FIP released guideline in March of this year could benefit in providing accurate information to pharmacists globally, by clarifying required coronavirus information for pharmacists and the pharmacy workforce, and presenting evidence-based information.<sup>11</sup>

Many pharmacists were not sure about the role of hydroxychloroquine (12%) and 29% of them thought it has been used as a preventative therapy against the coronavirus infection. It may be posed that Jordanian pharmacists need to be made aware about current preliminary recommendations for the symptomatic management of mild COVID-19 cases, i.e. fluids, antipyretics and rest. Specialist hospital unit physicians of course have trialed and may be using treatments such as chloroquine or hydroxychloroquine, as well as of course ventilatory support for patients with severe respiratory distress symptoms.<sup>46</sup> Most participants (72%) knew that azithromycin has been trialed along with hydroxychloroquine in the treatment of the coronavirus infection, while only 28% knew that antivirals, such as oseltamivir, have been used in the management in critical cases of the infection and 46% were not sure.<sup>46</sup>

Ibuprofen the non-steroidal anti-inflammatory medicine, or NSAID, is sold under a number of brand names, including Advil® and Nurofen®. In addition to treating pain, it's often used to manage fever associated with various viral or bacterial infections. At the time of designing this study, it was said that NSAIDs such as ibuprofen can increase the risk of complications when used during viral infections (including the coronavirus infection). However, the WHO declared on March 18, 2020 under a post titled 'Anti-inflammatory drug has been subject of conflicting reports' that 'there's no evidence to suggest that using ibuprofen to manage symptoms of COVID-19 will worsen the condition'. Earlier reports said a spokesperson had cautioned against using ibuprofen to

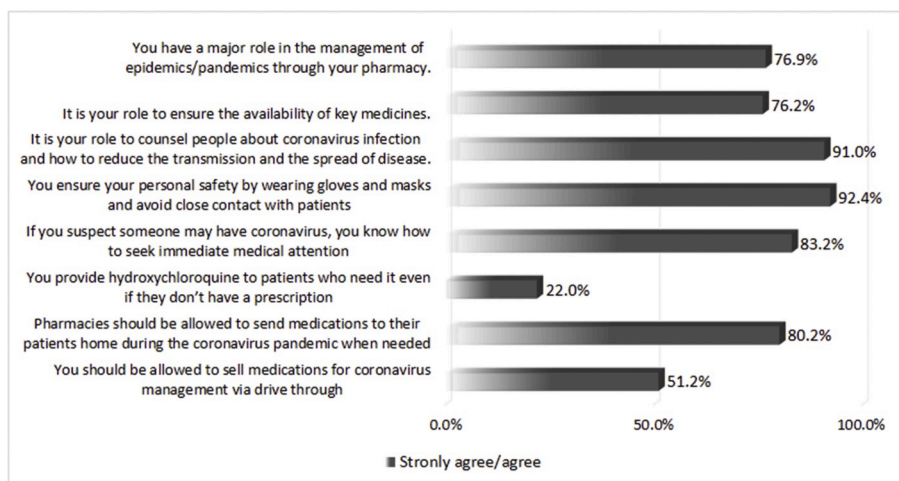


Fig. 4. Study participants perceptions about their role to deal with epidemics/pandemics and coronavirus specifically (n = 726).

manage symptoms of the illness caused by the coronavirus until WHO experts could investigate'. This case provides a good example on the confusing information provided to healthcare professionals, including pharmacists, via the media regarding COVID-19 pandemic.<sup>47</sup>

The use of corticosteroids by COVID-19 patients has also been a confusing issue to many pharmacists. Corticosteroids were widely used during previous outbreaks of similar types of infection such as the Middle East respiratory syndrome (MERS)-CoV.<sup>48</sup> However, although there appeared to be some evidence that corticosteroids may be beneficial if used in the early acute phase of infections, conflicting evidence from the WHO surrounding corticosteroid use in certain viral infections means this evidence is not conclusive.<sup>49</sup> Current reports indicate no unique reason exists to expect that patients with COVID-19 infection will benefit from corticosteroids, and they might be more likely to be harmed with such treatment.<sup>50</sup> Hence, considering the current availability of literature, caution should be exercised until further evidence emerges surrounding the use of corticosteroids in COVID-19 patients.<sup>51</sup>

Pharmacists and pharmacy students showed acceptable awareness about the COVID-19 pandemic as more than half of them knew the correct answers to the awareness related items except for the items probing the appropriate distance they need to maintain between them and the patients; the majority (67%) believed that at least 3 m (10 feet) were the needed distance when counseling patients during a pandemic while the appropriate answer as per Jordanian guidelines is 2 m (6 feet) and 7% were not sure. It was important to raise awareness about this fact (as participants received the correct answers upon completion of the study), because anecdotal comments from pharmacists indicated that some did not allow customers to come anywhere near them which negatively affected the counseling process. The majority (76%) of them were not aware of the highest risk population group in terms of contracting the coronavirus infection and they believed that children under the age of 9 were at highest risk along with and to the same extent as the elderly (>65) and immune-compromised patients, while 5% were not sure. It was interesting to note that generally significantly more pharmacists answered the awareness items on the survey correctly than pharmacy student. This may indicate the experience boosts clinical awareness and reasoning skills of pharmacists. Study results indicated that not only being a practicing pharmacist versus a pharmacy student was associated with better awareness, but that older age, being a public university alumnus versus a private university alumnus, attending more educational workshops on a yearly basis were also significantly associated with a better level of awareness. None of these are of course surprising except of course the difference in graduating from a different type of educational institution (public vs. private). It is noteworthy to recognize that this finding could be due to the fact that about half of the

graduates from the private educational institutions in Jordan are international students, who travel back to their countries once they graduate; international students who remain in Jordan are not able to practice as pharmacists.

Representing a front-line professional component of essential health care and being the most accessible healthcare providers, pharmacists' role has been expanding along with the advancement of different configurations of pharmacy services provided to customers. The drive-through pharmacy service is one example of the numerous newly emerging community pharmacy services in Jordan. This model initiated in the nineties in the United States of America (USA) with pharmacy chains being initial adopters, though now it is a well espoused model across the USA.<sup>52</sup> In Jordan, drive-through pharmacy services have recently been introduced representing a new trend in community pharmacy services with positive customer awareness and perceptions towards the service.<sup>53</sup> Although of course the model limits the 'sit-down' counseling deemed as a higher order role of pharmacists, in Jordan, this service appeared well received particularly in a certain subset of customers, but concerns regarding proper counseling represented the main disadvantage of the service.<sup>43</sup> About 50% of the participants in this study believed that they should be allowed to sell medications for coronavirus management via the drive-through service available in some chain pharmacies in Jordan. Although benefits may be found in this approach of dispensing in the COVID-19 era, suboptimal counseling raises a concern. This discussion falls unto policymakers to make a clear announcement about whether to allow, encourage, or prohibit pharmacists from dispensing coronavirus patients' medications via the drive-through service. In public health emergencies, clinical pharmacists enact their professional expertise by analyzing the current situation rationally and working in a professionally cohesive and efficient manner to provide innovative pharmacy services around medication safety and rational use of medicines.<sup>43</sup> We acknowledge that the scope of community pharmacy practice varies considerably across countries, hence, it is important to examine ways in which the profession can assist with the public health response to COVID-19. This can be done not only by maintaining the continuity of healthcare services but by achieving optimal use of possible services.<sup>54</sup>

A limitation of this study is that it was conducted via an online questionnaire, but due to the pandemic that the world is going through, and the public quarantine currently imposed in Jordan, other research methods were possible. There are of course, issues of representativeness in the profile about participants. A majority of the participants were from Amman, the capital, where the availability of CPD workshops can be higher than in other areas of the country. We did not ask the pharmacy students about their study year, which could have played a role in



the results obtained; fourth and fifth year students for example are expected to have a wider awareness in the clinical field as compared to students in the earlier years of their study. The survey itself, is also of course not validated, although, items were put together in real-time, based on the literature and reviewed by a team of clinical pharmacy experts.

## Conclusion

More than half of the pharmacists and pharmacy students believed that they got enough education previously about epidemics/pandemics, and the majority follow on the latest coronavirus updates on treatments mostly from the media followed by the WHO reports. The majority believed they have a major role in the management of epidemics/pandemics through their pharmacies. Certain gaps in the awareness about COVID-19 were identified highlighting areas of improvement, and generally, pharmacists showed significantly higher awareness score than students, which is, in a way, a satisfactory and expected finding. Higher age of participants, graduating from a public university versus a private university, and attending educational workshops on a yearly basis also significantly affected the awareness level.

## Funding

This study was funded by the Deanship of Academic Research at Applied Science Private University, Amman, Jordan.

## Specific contributions of each contributor to the paper

All authors were involved in all parts of study and manuscript preparation including literature search, study design, analysis of data, manuscript preparation, and review of manuscript.

## Declaration of competing interest

None.

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