

ORIGINAL PAPER
INFECTIOUS DISEASES

Public perceptions about pharmacists' role in prescribing, providing education and delivering medications during COVID-19 pandemic era

Hamza Alhamad¹  | Rana Abu-Farha²  | Fares Albahar¹  | Deema Jaber¹ 

¹Department of Clinical Pharmacy, Faculty of Pharmacy, Zarqa University, Zarqa, Jordan

²Department of Clinical Pharmacy and Therapeutics, Faculty of Pharmacy, Applied Science Private University, Amman, Jordan

Correspondence

Hamza Alhamad, Department of Clinical Pharmacy, Faculty of Pharmacy, Zarqa University, PO Box 2000, Zarqa, 13110, Jordan.

Email: halhamad@zu.edu.jo

Abstract

COVID-19 is a pandemic disease with a significant threat to public health. Public knowledge and perception significance in tackling pandemics have been evidenced in the previous research. This study aimed to explore public perceptions about pharmacists' educational and prescribing role, and the medication delivery service provided during COVID-19 outbreak.

A cross-sectional study was conducted among the general population of Jordan using a convenient sampling technique for 10 days (15-25 May 2020). Data were collected from 578 participants who agreed to fill the questionnaire, which was distributed online. The questionnaire items were piloted using face validity and reliability.

Participants showed a positive perception about the impact of pharmacists and pharmacy services provided during COVID-19 outbreak. More than half of the participants (61.1%) believed that pharmacists could prescribe over-the-counter medications, and only 15.7% believed that pharmacists could prescribe both over-the-counter and prescribed medications. Linear regression was performed to assess the factors that affect the participants' perception of pharmacists' prescribing and educational role and delivering medication during COVID-19. Females have lower perception scores towards medication delivery services compared with males (P value = .008). However, male participants, those aged less than 50 years, those with postgraduate degrees and those from non-medical profession showed a significantly higher perception score towards the impact of pharmacists and pharmacy services provided during COVID-19 outbreak compared with others (P value < .05 for all).

This study indicates that the public positively endorsed the impact of the educational role of the pharmacist, medication delivery services and extending pharmacists' prescribing authority during COVID-19 pandemic. Also, findings from this study provide a platform to examine the perception of the public towards pandemic diseases and inform policy decision-makers to react by updating their regulation to allow extending pharmacy services and prescribing role during COVID-19 pandemic.

1 | INTRODUCTION

Coronavirus is a respiratory virus known for causing illness ranging from the common cold to severe acute respiratory syndrome (SARS),¹ Coronavirus can be transmitted via animal-to-human, and human-to-human interaction through the droplet and direct contact.^{2,3} In 2002, epidemic outbreaks occurred (SARS), with around 800 deaths, and 2012 (Middle East Respiratory Syndrome: MERS - Coronavirus), with 860 deaths.^{3,4} About 8 years after the MERS - Coronavirus epidemic, the current outbreak of novel coronavirus (COVID-19) in Wuhan City, Hubei Province, China, which has an average incubation period of 4-6 days from exposure to symptoms onset (but can extend 14 days),^{5,6} is protruded as a global outbreak and considerable public health problem.⁷ By the end of January 2020, the World Health Organization (WHO) announced COVID-19 a public health emergency of global concern.^{8,9} Rapidly, in the first week of March, a considerably large number of new cases were reported globally, making COVID-19 a pandemic disease.¹⁰ As of 30 October 2020, about 44.5 million confirmed cases across 219 countries, areas or territories, and more than one million deaths had been reported.¹⁰ In Jordan, the first reported case was on 3 March 2020, and the COVID-19 situation was under control supported by the number of confirmed (1869) and death (15) cases by the end of August,¹¹ and as declared by the Jordan Ministry of Health.¹² However, the COVID-19 confirmed and death cases started to increase by the end of September and peaking through October. As of 30 October 2020, the number of confirmed cases was 69 306, 1346 under treatment and 772 deaths.¹³ The current situation of COVID-19 in Jordan requires considerable governmental efforts to control and prevent the spread of COVID-19 through collaboration between the Jordan ministry of health, Jordan Food and Drug Administration (JFDA) and Healthcare Workers (HCWs), policy updates and extending healthcare and pharmacy services.¹⁴

In the absence of an approved antiviral treatment or vaccine by the WHO that has shown to be effective against COVID-19,¹⁵ except for Remdesivir which appears to have a preliminary and promising clinical antiviral effect against COVID-19,^{16,17} the current critical intervention for HCWs is to apply preventive measures to control COVID-19.¹⁵ HCWs are in contact with patients and are an essential source of exposure to infected cases in healthcare settings; thus, HCWs are expected to be at high risk of infection. Recently, the WHO and Centers for Disease Control and Prevention (CDC) have released recommendations for HCWs regarding the prevention and control of COVID-19.^{18,19} Also, the WHO initiated several online training sessions and materials on COVID-19 in various languages to strengthen preventive strategies, including raising awareness and training HCWs in preparedness activities.²⁰

The HCWs—doctors, nurses and pharmacists—are the first-line defence fighting against COVID-19.²¹ Pharmacists have expanded their practices during the COVID-19 pandemic. Also, pharmacists contributed by helping in preventing infection, managing supply chains (ie, essential medicine supply), preventing stockpiling, vaccination services for influenza and health education and provision

What' known

- COVID-19 is an emerging pandemic disease with a considerable threat to public health.
- Jordanian pharmacists believed that they have enough education about the pandemic disease with the majority followed the WHO for latest updates.
- Jordanian pharmacists believed that they have a significant role in providing pharmacy services required for the management of COVID-19 pandemic.

What's new

- This study provides a platform for evaluating the perception of the public towards pandemic diseases.
- This study indicates that the public positively endorsed the pivotal educational role of the pharmacist and medication delivery services provided and highlighting the idea of extending pharmacists' prescribing authority during COVID-19 pandemic and afterwards.
- This study would inform policy decision-makers in Jordan, as well as comparable global countries, to react by updating the regulation that may allow extending pharmacy services and pharmacists' prescribing and educational role during COVID-19 pandemic and afterwards.

of evidence-based medical information.²²⁻²⁴ Pharmacists, mostly working in the community, found themselves without comprehensive guidelines, especially at the beginning of the COVID-19 pandemic. Therefore, the International Pharmaceutical Federation (FIP) responded quickly by publishing recent guidelines describing the needed COVID-19 pandemic information and determining the responsibilities for pharmacists.²⁵ The FIP guidelines ensured the pharmacist's contribution to managing the essential medicine supply, health education, provision of evidence-based COVID-19 pandemic information.^{25,26} Also, pharmacists were expected to help in early detection of COVID-19 pandemic cases by asking about signs and symptoms and appropriately referring COVID-19 cases, promoting a culture of empathy and psychological support to patients, newscasting COVID-19 facts in their communities via different media and other pharmacy services such as counselling and delivering medications to patients.^{26,27}

The preventive measures established by the government, and collaborated with HCWs, the role of the pharmacist and the pharmacy services such as medication delivery provided to the community are essential to prevent the spread of COVID-19. However, public commitments to the preventive measures are potentially influenced by their knowledge and perceptions towards COVID-19.²⁸⁻³⁰ The importance of public knowledge and perceptions in tackling pandemics has been evidenced in the previous researches.²⁸⁻³⁰ In this study, the assessment of public knowledge and perceptions

about the impact of pharmacists and pharmacy services provided, the medication delivery service and the pharmacists' prescribing role can help policy decision-makers gain more insights about the factors that can influence the public to adopt healthy practices, identify gaps and strengthen the government's prevention efforts during COVID-19 outbreak.

2 | AIM OF THE STUDY

This study aimed to investigate the public perceptions about the pharmacists' educational role and medication delivery service provided during COVID-19 outbreak. Also, to examine the public perception about the prescribing role the pharmacist can play during COVID-19 outbreak.

3 | METHODS

3.1 | Compliance with ethical standards

This study was approved by the University Ethics Committee for Scientific Research (ECSR) (Appendix B), following the principles of the protection of human subjects and the ethical principles related to research studies and was given an approval number (2/2/2019-2020). Also, an informed consent form (Appendix C) was obtained from all participants before participation in the study, ensuring that participation is voluntary, and participants can withdraw at any stage, with their answers treated confidentially.

3.2 | Study design and sample

This study was conducted using a convenient sampling technique over 10 days of May 2020 (15-25 May 2020) among the general population of Jordan, during the lockdown period and Eid Holiday Curfew. The cross-sectional study design was used to assess the public perceptions about the pharmacists' educational role, medication delivery service and the prescribing role the pharmacist can play during COVID-19 outbreak.

The sample size was determined by an online Raosoft sample size calculator.³¹ Considering the population in Jordan to be around 10 million,³² the sample size was calculated by determining a margin of error of 5%, a confidence level of 95% and 50% response distribution. A sample size of 385 was found to be minimally required.

3.3 | Questionnaire development and data collection

A self-reported questionnaire was developed by the authors based on relevant COVID-19 guidance reported by the WHO and CDC,^{18,19}

and a comprehensive literature review.³³⁻³⁶ The questionnaire was initially developed in English, then translated into Arabic with the help of a professor in English translation whose native language is Arabic. To ensure the face validity of the questionnaire, both Arabic and English version of the questionnaire was reviewed by a panel of four academic experts in pharmacy practice and reviewed accordingly. The academic experts commented on the wording, the clarity and the comprehensiveness of the questionnaire items, and whether each item of the questionnaire was relevant to the study aims and objectives. The academic experts' feedback and comments were reviewed by the Authors and used to refine the questionnaire. The reliability of the questionnaire (ie, internal consistency) was measured using the responses obtained from the 63 participants during the piloting process of the questionnaire. The internal consistency of the scale items was good, as the Cronbach's alpha value was 0.845 (Appendix A). Data used for piloting were not included in the final analysis.

After completing the piloting process, the final questionnaire version was created using Google forms and distributed online based on the authors' networks via social media platforms: Facebook, WhatsApp and Twitter. Participants willing to participate were also sent the study ethics committee approval (Appendix B), and the consent form (Appendix C) along with the questionnaire, which required of less than 10 minutes to complete. The final questionnaire version (Appendix D) was composed of two main sections. The first section sought to obtain demographic information of the participants. The second section explored the pharmacist educational impact, medication delivery service and the prescribing role the pharmacist can play during COVID-19 outbreak.

3.4 | Statistical analysis

Data entered were analysed using Statistical Package for the Social Sciences (SPSS) version 22 (SPSS Inc., Chicago, IL, USA). The descriptive analysis was done using the median and inter quartile range (IQR) for continuous variables and percentages for categorical variables.

Simple linear regression was carried out to initially screen the independent variables that affect participants' perception scores towards medication delivery services used and the impact of pharmacists and pharmacy services provided during COVID-19 outbreak. Variables that were found to have P -value $< .25$ using univariate linear regression analysis were entered into multiple linear regression analysis. Variables were selected after checking their independence, where tolerance values > 0.1 and Variance Inflation Factor (VIF) values < 5 were

selected to indicate the absence of multicollinearity between the independent variables in regression analysis. In the multiple linear regression analysis, variables that were independently affecting participants' perception were identified. A P value of $< .05$ was considered statistically significant.

4 | RESULTS

During the data collection period, 578 participants agreed to participate in this study. More than half of the participants ($n = 324$, 56.1%) aged between 18 and 35 years. Males represented 52.9% ($n = 306$) of the study sample, and around two-thirds of them were married ($n = 363$, 62.8%). Participants' education ranged as follows: high school or less ($n = 36$, 6.2%), Diploma or Bachelor degree ($n = 411$, 71.1%), while the others had postgraduate degrees (Masters or a PhD) ($n = 131$, 22.7%). Most of the participants lived in Amman ($n = 223$, 38.6%) and Irbid ($n = 197$, 34.1%). Finally, most of the participants are from the non-medical profession ($n = 447$, 77.3%). For more details about participants' demographic characteristics refer to Table 1.

Regarding the medical characteristics of the study participants (Table 2), around half of them ($n = 283$, 49.0%) were suffering from different chronic medical disease including diabetes ($n = 137$, 23.7%), respiratory diseases ($n = 135$, 23.4%) and cardiovascular diseases ($n = 91$, 15.7%). Only one-third of the participants ($n = 201$, 34.8%) reported to take chronic medications for more than 6 months.

Participants' opinions about who is responsible in raising awareness about COVID-19 outbreak showed that the majority believed that the ministry of health is the main responsible party to provide information or to raise awareness about COVID-19 pandemic ($n = 499$, 86.3%) followed by physicians ($n = 358$, 61.9%). In comparison, nurses were considered to have the lowest role in improving awareness as perceived by the participants ($n = 252$, 43.6%) (Figure 1).

Concerning participants' perceptions about the impact of pharmacists and pharmacy services provided during COVID-19 outbreak (Table 3), more than 50% of the participants agreed/strongly agreed that pharmacists advised them about signs and symptoms of COVID-19 ($n = 317$, 54.8%) and advised them about how to reduce the risk of transmission of COVID-19 to them and others ($n = 329$, 56.9%). Also, more than half of the participants ($n = 347$, 60.0%) perceived that pharmacist helped reassure them taking the correct medications at the right time, feel more in control of taking their medications and reduced the potential of medication errors ($n = 329$, 56.9%), and provided pharmacy services that improved their relationship with the pharmacist during the outbreak of COVID-19 ($n = 322$, 55.7%).

Regarding participants' perceptions about medication delivery service during COVID-19 outbreak (Table 4), the majority showed a positive perception towards this delivery service. Participants agreed/strongly agreed that this service helps them take their medications on time ($n = 469$, 81.1%), helped them feel more in control of taking their medications ($n = 450$, 77.9%), allowed them more time to do or buy other things ($n = 441$, 76.3%) and improved their satisfaction with the pharmacy ($n = 474$, 82.0%). However, only 38.8% ($n = 224$) believed that this service generally might contribute to the spread of infection and outbreaks of COVID-19. Also, some participants believed that medication delivery service used during this pandemic might contribute to the spread of counterfeit (ie, fake) medications ($n = 216$, 37.4%), contribute to increased unjustified (ie, wrong) use of the medications ($n = 233$, 40.3%) and contribute to

TABLE 1 Demographic characteristics of the study respondents ($n = 578$)

Variable	n (%)
Gender	
Males	306 (52.9)
Females	271 (47.1)
Age	
18-35	324 (56.1)
36-50	116 (20.1)
51-65	106 (18.3)
More than 65	32 (5.5)
Marital status	
Single	184 (31.8)
Married	363 (62.8)
Widowed or divorced	31 (5.4)
Educational level	
High school or less	36 (6.2)
Diploma or Bachelor	411 (71.1)
Postgraduate studies (MSc. or PhD)	131 (22.7)
Income level	
More than 1500 dinars	84 (14.5)
From 1001 - 1500 dinars	74 (12.8)
From 500 - 1000 dinars	177 (30.6)
Less than 500 dinars	243 (42.0)
Place of residence (city)	
Amman	223 (38.6)
Irbid	197 (34.1)
Zarqa	90 (15.6)
Other areas	68 (11.8)
Insurance type	
Governmental or military insurance	262 (43.6)
Private insurance	171 (29.6)
There is no insurance	155 (26.8)
Profession	
Medical profession	131 (22.7)
Non-medical profession	447 (77.3)

increased unjustified (wrong) use of narcotic medications in particular ($n = 228$, 39.4%).

Regarding participants' perceptions of the pharmacists' prescribing role during COVID-19 outbreak, around 61.1% ($n = 353$) believed the pharmacists could only prescribe over-the-counter medications. In comparison, only 15.7% ($n = 91$) believed that they could prescribe all types of medications (both over-the-counter and prescribed medications) (Figure 2).

Finally, factors that affect the participants' perception of the impact of pharmacist and pharmacy services provided during

COVID-19 outbreak were assessed using linear regression analysis (Tables 5 and 6). Results from the regression analysis showed that females have lower perception scores towards medication delivery services used during COVID-19 outbreak compared with males (P-value = .008). On the other hand, male participants, those aged less than 50 years, those with postgraduate degrees and those from non-medical profession showed a significantly higher perception score towards the impact of pharmacists and pharmacy services provided during COVID-19 outbreak compared with others (P-value < .05 for all).

TABLE 2 Medical and medication information of the study respondents (n = 578)

Variable	n (%)
Do you have any chronic diseases?	
I do not suffer from chronic disease	295 (51.0)
Cardiovascular diseases	91 (15.7)
Diabetes	137 (23.7)
Respiratory diseases and allergies	135 (23.4)
Hypertension	29 (13.8)
Others	85 (14.7)
Are you currently taking medications for a long time (more than 6 months)?	
Yes	201 (34.8)
No	377 (65.2)
How many medications are you currently prescribed?	
I currently do not have prescribed medication	377 (65.2)
Between 1-5	114 (19.7)
Between 6-9	58 (10.0)
Ten and more	29 (5.0)

5 | DISCUSSION

COVID-19 is an emerging pandemic disease with a considerable threat to public health. Understanding the complexity of the COVID-19 situation and the perplexity of the unavailability of COVID-19 vaccine and or treatment raised awareness about the importance of preventive measures and the significant role the healthcare providers (including pharmacist) can play to reduce the infection rates and to control the transmission of COVID-19. On the other hand, the public should adhere to the preventive measures provided by the pharmacists and other healthcare providers under the direction of the Jordan Ministry of Health and JFDA. A study from Jordan that focussed on assessing the pharmacists' readiness to deal with the COVID-19 pandemic and evaluated the pharmacists' awareness and perceptions of their role reported that more than half of the pharmacists believed that they have enough education about the pandemic disease with the majority followed the WHO for latest updates and have a significant role in providing pharmacy services required for the management of COVID-19 pandemic.²¹ This study focussed on exploring the Jordanian public perceptions about the pharmacist educational impact, medication delivery service and the prescribing role the pharmacist can play during COVID-19 outbreak which is important helping the public adhere to COVID-19 preventive measures.

In this study, participants thought that the Jordan ministry of health is the main responsible party to provide information and to raise awareness about COVID-19, followed by physicians, pharmacist and nurses. This was consistent with results from a recent Jordanian study where more than half of the participants agreed that Jordan ministry of health is a considerable source of information.³⁷ The Jordanian Health Minister himself was reporting the number of daily cases of COVID-19 on the TV since the first confirmed COVID-19 case discovered on the 2 March 2020, and also

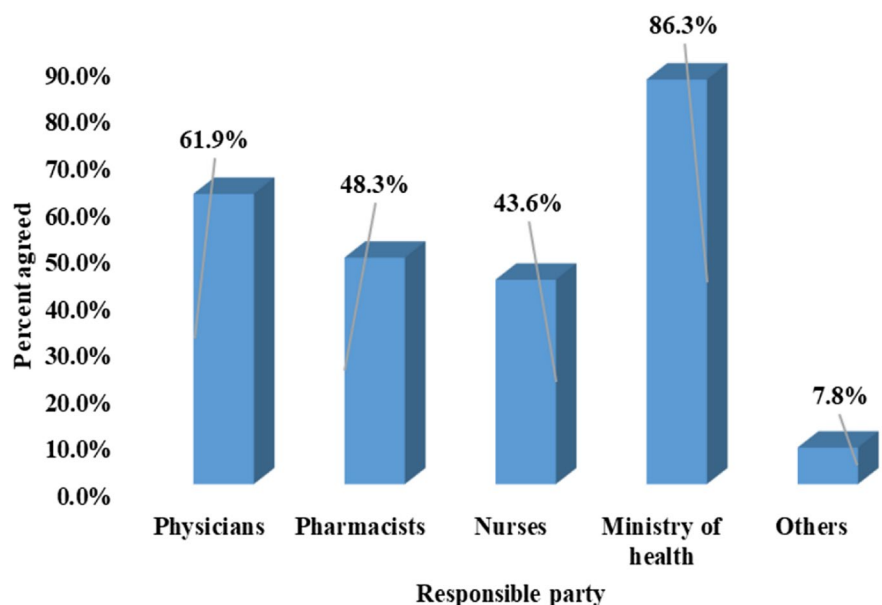


FIGURE 1 Public perceived opinions about who is responsible for raising awareness about COVID-19 outbreak, (n = 578)

TABLE 3 Public perceptions about the impact of pharmacists and pharmacy services provided during COVID-19 outbreak (n = 578)

Statements	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Pharmacist advised me about the signs and symptoms of COVID-19	94 (16.3)	223 (38.6)	155 (26.8)	91 (15.7)	15 (2.6)
Pharmacist advised me about how to reduce the risk of transmission of the COVID-19 to me and to others	98 (17.0)	231 (40.0)	140 (24.2)	94 (16.3)	15 (2.6)
Pharmacist helped reassure that I am taking the correct medications at the right time during the outbreak of COVID-19	99 (17.1)	248 (42.9)	139 (24.0)	78 (13.5)	14 (2.4)
Pharmacists helped me feel more in control of taking my medications and reduced the potential medication error during the outbreak of COVID-19	99 (17.1)	230 (39.8)	158 (27.3)	73 (12.6)	18 (3.1)
Pharmacy services provided during the outbreak of COVID-19 improved my relationship with the pharmacist.	90 (15.6)	232 (40.1)	167 (28.9)	75 (13.0)	14 (2.4)

TABLE 4 Public perceptions towards medication delivery service that was used during COVID-19 outbreak (n = 578)

Statements	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Medication delivery during the outbreak of COVID-19 will help me take my medications on time	174 (30.1)	295 (51.0)	84 (14.5)	20 (3.5)	5 (0.9)
Medication delivery during the outbreak of COVID-19 will help me feel more in control of taking my medications	167 (28.9)	283 (49.0)	98 (17.0)	25 (4.3)	5 (0.9)
Medication delivery during the outbreak of COVID-19 allows me more time to do or buy other things	144 (24.9)	297 (51.4)	104 (18.0)	26 (4.5)	7 (1.2)
Medication delivery during the outbreak of COVID-19 will improve my satisfaction with the pharmacy	172 (29.8)	302 (52.2)	82 (14.2)	18 (3.1)	4 (0.7)
Medication delivery during the outbreak of COVID-19 may generally contribute to the spread of infection and outbreaks of COVID-19	68 (11.8)	156 (27.0)	154 (26.6)	165 (28.5)	35 (6.1)
Medication delivery during the outbreak of COVID-19 may generally contribute to the spread of counterfeit (ie, fake) medications	67 (11.6)	149 (25.8)	171 (29.6)	159 (27.5)	32 (5.5)
Medication delivery during the outbreak of COVID-19 may generally contribute to increased unjustified (ie, wrong) use of the medications	70 (12.1)	163 (28.2)	168 (29.1)	153 (26.5)	24 (4.2)
Medication delivery during the outbreak of the new coronavirus (COVID-19) may contribute to increased unjustified (wrong) use of narcotic medications in particular	72 (12.5)	156 (27.0)	168 (29.1)	156 (27.0)	26 (4.5)

raise the awareness about the significance of social distancing, wearing masks and other preventive measures. This could explain the high trust percentage of Jordan ministry of health perceived by the public in Jordan. Also, the debate about whether public trusting physicians or pharmacists is complex and affected by many factors.³⁸⁻⁴⁰ However, and up to the author's knowledge, this is the first study to report public trust relationships with HCWs (ie, physicians vs pharmacists vs nurses) as a source of information related to COVID-19.

More than half of the participants certain that pharmacists educated them about the signs and symptoms and how to reduce the transmission of the COVID-19, reassured that the participants took their correct medications at the right time and are in control of taking their medications that potentially reduce their risk of medication errors and that pharmacy services provided improved participant relationship with the pharmacist during the COVID-19 outbreak. The contribution of the pharmacist for public health was evaluated during^{21,26,41} and outside⁴²⁻⁴⁴ crises and pandemic diseases

such as COVID-19. The acknowledgement of the importance of pharmacists' role in providing pharmaceutical care was reported in many Jordanian studies.⁴⁵⁻⁴⁸ Also, an improvement in the public-pharmacist relationship was recently reported in two studies from Jordan.^{45,48} The first one reported that the patients in Jordan think highly of the pharmacy profession and would seek advice from the pharmacist, especially for over-the-counter medications.⁴⁵ The second study reported that most parents likely consulted a community pharmacy first for self-treatment of their children instead of going to the hospital, as pharmacists are considered better than hospital physicians.⁴⁸

The JFDA temporally allowed (ie, prohibited under normal circumstances) medication delivery service since the start of COVID-19 pandemic in Jordan to ensure that patients receive and access their medication promptly, and only the pharmacist (once registered in a database was developed for this purpose) can deliver medication to patients.⁴⁹ As this is a new service provided by the pharmacist, this study aimed to evaluate the public perception of the medication

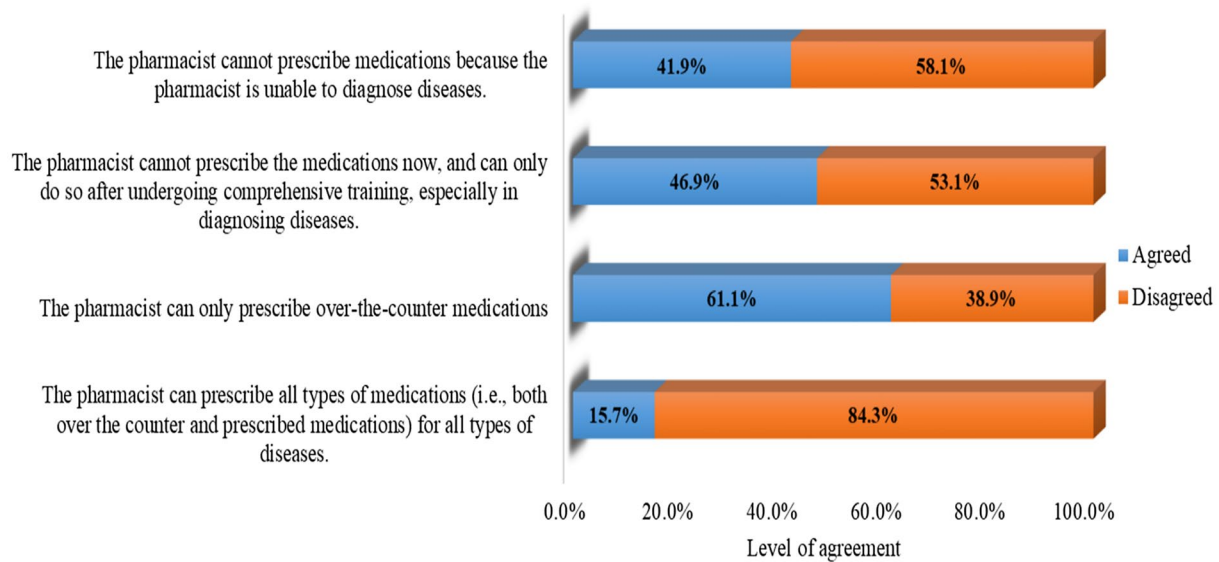


FIGURE 2 Public perception about the prescribing role pharmacist can play during COVID-19 outbreak (n = 578)

delivery service. Most of the participants reported a positive perception of the delivery service, thought that medication delivery service helped them take control of their medication, allowing them more time to do and buy other things and improved their satisfaction with the pharmacy profession. However, about one-third of the participants believed that medication delivery service generally might contribute to the spread of infection, the spread of counterfeit (ie, fake) medications and increased unjustified (ie, wrong) use of the medications (including narcotics) during COVID-19. Despite pharmacist commitment to preventive and infection control measures including wearing masks and social distancing, about one-third of participants believed that the medication delivery service would contribute to the spread of infection during COVID-19, contrasting the purpose of opening the service which is seen as an opportunity to reduce the spread of COVID-19.⁵⁰ However, the reasons behind participants' belief about medication delivery system contribution to the spread of infection, counterfeit medicines and the unjustified use of medications, including narcotics, were not explored; this could be a limitation to this study.

In the light of COVID-19 pandemic, pharmacists' role conceived to be extended as pharmacists are at the front line to fight against COVID-19.^{51,52} In Jordan, pharmacists are not prescribers, and can only prescribe over-the-counter medications. Despite the urgent need to extend the prescribing role during COVID-19 pandemic, the opportunity for the pharmacist to extend their prescribing authority has not emerged as the Jordanian ministry of health have not extended pharmacists' prescribing authority. In this study, the public perception about pharmacists' prescribing role was explored. About more than half of the participants believed that pharmacists could prescribe over-the-counter medications with only 15.7% (n = 91) believed that they could prescribe all types of medications (ie, both over-the-counter and prescribed medications). Around half of the participants believed that pharmacists' ability to diagnose the diseases and the need

for comprehensive training were referred to as reasons pharmacist cannot prescribe all type of medications. This finding can inform policy decision-makers in Jordan to further qualify and provide pharmacists with comprehensive training to extend pharmacists' prescribing authority.

To address the importance of the factors that can affect participants' perceptions about the pharmacist impact and pharmacy services provided during COVID-19 outbreak, linear regression analysis was performed. Gender was a factor that affects participants' perception towards medication delivery with females reported to have lower perception scores towards medication delivery services compared with males. Other factors such as male participants, those aged less than 50 years, those with postgraduate degrees and those from non-medical profession reported having a significantly higher perception score towards the impact of pharmacists and pharmacy services. However, the reasons whereby these factors affect the participant's perceptions were not explored; this could be a limitation to this study.

Up to the authors' knowledge, this is the first Jordanian study that reported the public perceptions of the pharmacist roles on medication education, medication delivery service and the possible extension of the prescribing authority of the pharmacist in the upcoming future using a valid and reliable questionnaire. The balanced number of males and females, with different age bands and from different areas in Jordan, was included, which adds to the generalisability of the findings that can be drawn from this study. However, this study was conducted in a difficult time where COVID-19 pandemic in Jordan was escalated; therefore, it is vital to assure that public perceptions about the pharmacists' role and services could be affected. Moreover, data were collected online based on the authors' networks and through self-reporting; this could be another limitation to this study.

Findings from this study showed that the public firmly endorsed the vital pharmacist educational role and medication delivery

TABLE 5 Assessment of factors affecting participants' perception score towards medication delivery services used during COVID-19 outbreak (n = 578)

Parameter	Perception score towards medication delivery services used during COVID-19 outbreak			
	Beta	P value [#]	Beta	P value ^{\$}
Age				
≤50 years	Reference			
>50 years	-0.074	.076	0.005	.921
Gender				
Male	Reference			
Female	-0.113	0.013	-0.110	.008*
Marital status				
Married	Reference			
Others	0.117	.005	0.083	.066
Educational level				
Undergraduate level	Reference			
Postgraduate level	0.013	.754	-	-
Monthly income				
<500 JD	Reference			.110
≥500 JD	-0.122	.003	-0.075	
Profession				
Medical profession	Reference			
Non-medical profession	-0.023	.580	-	-
Do you have any chronic diseases?				
Yes	Reference			
No	-0.029	.490	-	-
Do you use chronic medications?				
Yes	Reference		-0.059	.281
No	-0.102	.014		

#using simple linear regression.

\$using multiple linear regression.

*significant at 0.05 significance level.

service provided and highlighting the idea of expanding pharmacists' prescribing authority during COVID-19 pandemic. This study provides a scheme to examine the perception of the public towards pandemic diseases. Also, the result of this study would help policy decision-makers gain more insight about the impact of the pharmacist educational and prescribing role, and pharmacy services (such as medication delivery service) that can be provided during COVID-19 pandemic and may be extended afterwards.

TABLE 6 Assessment of factors affecting participants' perception score towards the impact of pharmacists and pharmacy services provided during COVID-19 outbreak (n = 578)

Parameter	Perception score towards the impact of pharmacists and pharmacy services provided during COVID-19 outbreak			
	Beta	P value [#]	Beta	P value ^{\$}
Age				
≤50 years	Reference			
>50 years	-0.072	.085	-0.129	.004*
Gender				
Male	Reference			
Female	-0.119	.004	-0.087	.033*
Marital status				
Married	Reference			
Others	-0.044	.288	-	-
Educational level				
Undergraduate level	Reference			
Postgraduate level	0.198	<.001	0.165	<.001*
Monthly income				
<500 JD	Reference			
≥500 JD	0.064	.126	0.072	.103
Profession				
Medical profession	Reference			
Non-medical profession	0.155	<.001	0.166	<.001*
Do you have any chronic diseases?				
Yes	Reference			
No	-0.042	.314	-	-
Do you use chronic medications?				
Yes	Reference			
No	-0.029	.492	-	

#using simple linear regression.

\$using multiple linear regression.

*significant at 0.05 significance level.

6 | CONCLUSION

Since the start of COVID-19 global pandemic, many studies evaluated the pharmacist role and services provided during COVID-19. However, findings from this study indicate that the public positively endorsed the pivotal pharmacist role and services provided and highlighting the idea of extending pharmacists' prescribing authority during COVID-19 pandemic. Also, this study provides a platform

for evaluating the perception of the public towards pandemic diseases. The results from this study would help policy decision-makers in Jordan, as well as comparable global countries, gain more insight about the public perceptions of the pivotal pharmacists' role and services provided during COVID-19 pandemics; therefore, allowing policy decision-makers to react by updating their regulation to allow extending pharmacy services and prescribing role during COVID-19 pandemic. Future research is required to assess the reasons behind the public beliefs and perceptions and identifying the barriers and facilitators towards extending pharmacists' prescribing and educational role, and medication delivery service during COVID-19.

DISCLOSURE

The authors declare that they have no conflict of interest.

AUTHOR CONTRIBUTIONS

Hamza Alhamad, contributed to the design and conception of the study, acquisition of data, analysis and interpretation of data, drafting the article, critically revising and final approval of the version to be published. Rana Abu-Farha contributed to analysis and interpretation of data, drafting the article, critically revising and final approval of the version to be published. Fares Albahar contributed to acquisition of data, drafting the article, critically revising and final approval of the version to be published. Deema Jaber contributed to the design and conception of the study, and final approval of the version to be published.

ORCID

Hamza Alhamad  <https://orcid.org/0000-0002-9309-4565>

Rana Abu-Farha  <https://orcid.org/0000-0001-8298-4071>

Fares Albahar  <https://orcid.org/0000-0002-4302-6636>

Deema Jaber  <https://orcid.org/0000-0002-4691-0427>

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APPENDIX A

THE RELIABILITY TESTING (INTERNAL CONSISTENCY) OF THE SCALE ITEMS

	Cronbach's Alpha	Cronbach's Alpha based on standardised items	N of items
Questionnaire scale items	0.845	0.815	18
Pharmacist role and impact in the new coronavirus (COVID-19) outbreak	0.961	0.961	6
Medication delivery as a new service developed only as a result of the new coronavirus (COVID-19) outbreak	0.764	0.773	8
Pharmacist prescribing role based on the new medication delivery system provided during the new coronavirus (COVID-19) outbreak	0.753	0.757	4

APPENDIX B
ETHICAL APPROVAL

No.:

Zarqa University

الرقم:

Date:

Ethics Committee for Scientific
Research (ECSR)

التاريخ:

الموافق:

Project title:

"Patient knowledge, medication handling, and pharmacist role in medication education and delivery towards COVID -19"

Dear Dr. Hamza Alhamad

The above-referenced project was reviewed and approved by the Ethics Committee for Scientific Research (ECSR) at Zarqa University in accordance with the requirements of the protection of human subjects and the ethical principles related to research studies. Approval number (2/2/2019-2020).

This approval, based on making the following determinations:

- The subjects will be provided with full information about the study purposes, risk and benefits, as well as their rights before participation.
- It should be clear for all subjects that participation is voluntary, and withdrawal is allowed at any time after the beginning of data collection.
- The subjects will sign the informed consent before the beginning of data collection.
- The use or disclosure of personal information involves no more than minimal risk.
- Granting of using personal information will not adversely affect confidentiality of the individuals whose data will be used.
- An adequate plan to protect identifiers from improper use and disclosure is included in the research plan.
- The project plan includes written assurances that personal information will not be re-used or disclosed for other purposes.

Sincerely,

On behalf of the ECSR,
Prof. Nidal F. Eshah

APPENDIX C

CONSENT FORM

Dr. Hamza Alhamad
halhamad@zu.edu.jo
Mobile: 0799794519
Zarqa University, Faculty of pharmacy.
Tel: +962-53821100, internal 1409
P.O.Box: 13222, Zarqa 13132 Jordan

Participant consent form

Public Perceptions about Pharmacists' Role in Prescribing, Providing Education and Delivering Medications during COVID-19 Pandemic Era

I have read and had explained to me by the researcher the purposes of the study and what will be required of me, and any questions I had, have been answered to my satisfaction.

- 1. I confirm that I have understood the purpose of the above study. I have had the opportunity to ask questions and have had these answered satisfactorily ().
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason ().
3. This study has been subject to ethical review, according to the procedures specified by the Zarqa University Ethics Committee, and has been given a favourable ethical opinion for conduct ().
4. I agree to take part in the above study ().
5. I wish to receive a summary of the results once the study is complete and analysed scientifically. For that to take place (receiving a summary of the results), I give my contact details below ():

.....
.....
.....

APPENDIX D

QUESTIONNAIRE

Introduction

Welcome to the questionnaire about Public Perceptions about Pharmacists' Role in Providing Education and Delivering Medications during COVID-19 Pandemic Era

This questionnaire aims to investigate the public perceptions about the pharmacists' educational role and medication delivery service provided during COVID-19 outbreak. Also, to examine the public perception about the prescribing role; the pharmacist can play during COVID-19 outbreak.

The questionnaire composed of two sections. The first section sought to obtain demographic information of the participants. The second section explored the pharmacist educational impact, medication delivery service, and the prescribing role; the pharmacist can play during COVID-19 outbreak.

Your participation in filling out scientific questionnaires is one that contributes to spreading knowledge, exchanging experiences and helps in solving health and social problems. This participation is voluntary, and you are free to withdraw or stop filling out this questionnaire at any time without giving any reason. All data and information collected will be treated confidentially and securely and will be used for research purposes only.

Thanks for your cooperation,

A. Demographics

1. Choose one option that determines your age range:

- A. Under 50.
- B. 50-64.
- C. 65-74.
- D. 75 and more.

2. Do you live alone?

- A. Yes.
- B. No.

3. Who is responsible for providing you with health care:

- A. Myself, as I live alone.
- B. Myself, as I live with my family.
- C. One of my children.
- D. Husband or wife.
- E. Private nurse.
- F. Others.

4. Place of residence (city):

- A. Amman.
- B. Irbid.
- C. Zarqa.
- D. Other areas.

5. What is your gender?

- A. Male.
- B. Female.

6. What is your marital status?

- A. Single.
- B. Married.
- C. Widowed or divorced.

7. What is your educational level?

- A. High school or less.
- B. Diploma or Bachelor.
- C. Postgraduate studies (MSc. or PhD).

8. What is your profession?

- A. Medical profession (Doctor, pharmacist, nurse, paramedical professions).
- B. Non-medical profession.

9. What is your income level:

- A. More than 1500 dinars.
- B. From 1001-1500 dinars.
- C. From 500-1000 dinars.
- D. Less than 500 dinars.

10. What is your insurance type?

- A. Governmental or military insurance.
- B. Private insurance.
- C. There is no insurance.

11. Do you have any chronic diseases? (Please select all that apply):

- A. I do not suffer from chronic disease
- B. Cardiovascular diseases.
- C. Diabetes.

D. Respiratory diseases and allergies.

E. Hypertension.

F. Others.

12. Are you currently taking medications for a long time (more than 6 months)?

A. Yes.

B. No.

12a. If you answer yes, how many medications are you currently prescribed?

A. I currently do not have prescribed medication.

B. Between 1-5.

C. Between 6-9.

D. 10 and more.

B. Main survey

13. How much do you agree with the following statements about the pharmacist role and impact in the new coronavirus (COVID-19) outbreak?

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
Pharmacist advised me about the signs and symptoms COVID-19					
Pharmacist advised me about how to reduce the risk of transmission of the COVID-19 to me and to others					
Pharmacist helped reassure that I am taking the correct medications at the right time during the outbreak of COVID-19					
Pharmacists helped me feel more in control of taking my medications and reduced the potential medication error during the outbreak of COVID-19					
Pharmacy services provided during the outbreak of COVID-19 improved my relationship with the pharmacist.					

14. How much do you agree with the following statements about medication delivery as a new service developed only as a result of the new coronavirus (COVID-19) outbreak?

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	I don't know
Medication delivery during the outbreak of COVID-19 will help me take my medications on time						
Medication delivery during the outbreak of COVID-19 will help me feel more in control of taking my medications						
Medication delivery during the outbreak of COVID-19 allows me more time to do or buy other things						
Medication delivery during the outbreak of COVID-19 will improve my satisfaction with the pharmacy						
Medication delivery during the outbreak of COVID-19 may generally contribute to the spread of infection and outbreaks of COVID-19						
Medication delivery during the outbreak of COVID-19 may generally contribute to the spread of counterfeit (ie, fake) medications						
Medication delivery during the outbreak of COVID-19 may generally contribute to increased unjustified (ie, wrong) use of the medications						
Medication delivery during the outbreak of the new coronavirus (COVID-19) may contribute to increased unjustified (wrong) use of narcotic medications in particular						

15. Based on the pharmacist role and the new medication delivery system provided during the new coronavirus (COVID-19) outbreak, which of the following statement about pharmacist becoming a prescriber most applies to (Please select all that apply):

- A. The pharmacist can prescribe all types of medications (ie, both over the counter and prescribed medications) for all types of diseases.
- B. The pharmacist cannot prescribe the medications now, and can only do so after undergoing comprehensive training, especially in diagnosing diseases.
- C. The pharmacist cannot prescribe medications because the pharmacist is unable to diagnose diseases.
- D. The pharmacist can only prescribe over-the-counter medications.