ORIGINAL RESEARCH

Attitude and Willingness to Get COVID-19 Vaccines by a Community Pharmacist in Saudi Arabia: A Cross-Sectional Study

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Introduction: Community pharmacists play a key role as vaccinators for COVID-19. They can reduce the burden of the disease worldwide.

Objective: This study used a cross-sectional questionnaire to determine whether the Saudi Arabian public was willing to obtain the COVID-19 vaccine via community pharmacists.

Results: The questionnaire focused on the satisfaction, concerns, and opinions towards providing vaccination by community pharmacists. The study featured 415 individuals aged 18 and older (eligible for the COVID-19 vaccine). Of the participants in this study, 58.1% were aged 18–25, with 55.4% female. Most participants (72.8%) have not been exposed to COVID-19 and are not aware of the approval of COVID-19 vaccination by community pharmacists. Of the 415 complete questionnaires, 45% believed that community pharmacists are not experienced in administering vaccines. However, 63% of participants are satisfied with getting the COVID-19 vaccination by a community pharmacist if no other option is available. More than 68% of the respondents agree that community pharmacies should expand their health care services to include vaccinations, prescriptions, checkups, and other forms of preventative medicine.

Discussion: The availability of community pharmacist-administered vaccination in Saudi Arabia could be a significant factor in the success of the country's vaccination program. This study may serve as a model to expand the role of pharmacists in other countries' vaccination programs.

Keywords: SARS-CoV-2, community pharmacy, immunization, perspective, adherence, patient satisfaction

Introduction

Coronavirus-19 (COVID-19) is a newly identified respiratory illness that causes an infectious disease. COVID-19 was first identified in Wuhan City, China, in December 2019. COVID-19 is thought to be acquired from a zoonotic origin and spreads by droplet and contact transmission.[1] More than 300 million people have been affected by the COVID-19 pandemic, which is thought to be caused by the severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2), and 5.4 million people have died by December 2021.[2,3] To protect the community from COVID-19, vaccinations are the key public health intervention and the most successful technique.[4] Despite the production of vaccines, the spread of SARS-CoV-2 infections is likely to persist for some time. SARS-CoV-2 variants B.1.1.7 (alpha), variant B.1.351 (beta), and variant B.1.617.2 (delta) have evolved as the pandemic progresses and are spreading very rapidly.[5,6] Recently, another new variant B.1.1.529 (Omicron) emerged in November 2021 and rapidly spread worldwide.[7]

Professionally, pharmacists in the community played significant roles in controlling and responding to this COVID-19 outbreak by hand to hand with many doctors and nurses. Although they were responsible for ensuring that essential

medicines were always available, community pharmacists have also been tasked with ensuring that COVID-19 patients received prompt diagnosis and treatment.[8,9] As part of their role, they are also tasked with monitoring the well-being of their household's patients and members who are kept in self-isolation.[10] Pharmacist involvement in COVID-19 testing helped close various testing accessibility gaps in the United States and demonstrated pharmacists' value in addressing basic healthcare needs.[11] In Vietnam and Macao, the pharmacist helped the government to implement the COVID-19 policy, whereas around 82,000 community pharmacists are employed by 61,000 pharmacies in Vietnam.[8,12] Pharmacists are recognized for their involvement in preventing infections. In response to Covid-19 in Saudi Arabia, they have come to the forefront of public safety by serving as primary contact points.[13]

Digitalization of healthcare in Saudi Arabia during the COVID-19 pandemic has been unheard of. The Saudi government established digital applications to track COVID-19 cases, arrange screening tests, and alert individuals if they are in the region of a confirmed case.[14] The Saudi Food and Drug Authority (SFDA) analyzed the results provided by vaccine manufacturers and found that early findings show vaccinations are safe and effective enough to be approved for use in Saudi Arabia.[15] The SFDA has approved the COVID-19 vaccine developed by Pfizer-BioNTech for the Saudi public on a phase-by-phase basis.[16] So far, Saudi Arabia has provided at least 53 million doses of COVID vaccination, equivalent to 67.4% of the country's total population. A successful immunization program relies on a significant number of people receiving the vaccine while delaying receiving the vaccination leads to vaccine hesitancy.[17] The success of immunization programs depends on healthcare personnel's knowledge and attitudes towards vaccines. Public resistance and hesitation to vaccines have been linked in numerous studies. Vaccine resistance is used to describe someone who refuses to get vaccinated, while vaccine hesitancy is used to describe someone who is cautious about getting vaccinated.[18] A negative attitude or hesitance to vaccination is also noted among healthcare staff, who rarely recommend vaccination to their patients.[16,19,20]

Community pharmacists are among the most approachable healthcare professionals to the public; thus, they significantly impact how the Covid-19 pandemic is handled. In Saudi Arabia, community pharmacists performed a key role in ensuring that patients received the proper medication and that this drug was not misused. It has improved patient outcomes, life quality, and understanding of diseases and drugs, as well as reduced the need for medical services because of their involvement.[21,22] However, different studies found that healthcare providers' attitude toward vaccinations is low. Possibly, this is because of the misinformation about vaccines on social media, which eventually also affect the attitudes of the public.[16] People may be hesitant to get vaccinated because of misinformation, which could put public health at risk when responding to an emergency. The vaccinations are given in the community by healthcare providers such as physicians and nurses. To reach the maximum vaccination coverage and release stress on the hospitals and healthcare centers, the Saudi Arabia's Ministry of Health (MOH) has allowed the community pharmacist to provide vaccination in the community pharmacies to reduce the spread of the COVID-19 pandemic.[23] Receiving training in the vaccination of COVID-19 is mandatory for any community pharmacist before being a certified vaccinator. The purpose of this study is to determine whether the Saudi public attitude and willingness to receive the COVID-19 vaccine through pharmacists in the community pharmacy.

Methods
Study Design
In this study, an analytical cross-sectional online survey was carried out among the general population over 18 (who were eligible to get the COVID-19 vaccine). The data were collected systematically from January 6 to March 15, 2021. The Google layout was used to construct an online questionnaire following a thorough assessment of the literature and contact with professionals in the field. Finally, the barcode method was used to distribute and make the survey more easily accessible. Participants received it via a variety of social media networks. Participants were provided with online consent forms before beginning the online study survey. Once accepted, the participant was provided with the online questionnaire. The respondents who are below the age of 18, and those who did not sign the consent form were excluded from this study. An analysis of demographic factors and participants' perceptions of receiving the COVID-19 vaccine in community pharmacies (26 items) was conducted to construct the findings. There was a total of 415 participants who

volunteered to do the survey. The survey was completed in an average of 5 minutes. A similar methodology was employed in other countries to gather qualitative data (via a large sample size).[24] For the survey validity and reliability, a panel of four researchers checked the questions scientifically, then Cronbach alpha was calculated, where a pilot study was performed on 10 participants. The internal consistency of the questionnaire was 0.73 (good reliability).

The Research Ethics Committee at King Khalid University (HAPO-06-B-001) has reviewed and agreed on this project: Approval No. ECM#2021-5410; Approval date 02-05-2021. All Authors confirm adherence to the terms of the Helsinki Agreement.

Measures

A self-administered, systematic, and closed-ended questionnaire was constructed based on prior studies to obtain information about receiving COVID-19 vaccination by community pharmacists. The demographics, general questions about vaccines, and receiving the COVID-19 vaccine from a pharmacist were then addressed in the questionnaire. A linguistics specialist also checked the survey's terminology. The survey was split into four sections and translated into Arabic to simplify data collection. The study's objective, goals, and future benefits and outcomes are summarized in the first section, which closes with a consent form declaration to proceed. In the second section, the demographics of the participants have been collected. In the third section, general COVID-19 vaccination questions have been asked. They were also questioned about their personal history of being affected by COVID-19 and their opinions toward receiving the COVID-19 vaccines by pharmacists. After that, a question about their interest in seeing the initial report of this study has been asked, and our gratitude to them has been expressed.

Data Analysis

After completing the questionnaires, they were checked for accuracy and completeness before getting into SPSS version 20. (IBM Corp., Armonk, NY, USA). The findings were derived by using both descriptive and inferential statistical methods. For categorical data, the chi-square test was performed. If the p-value is less than 0.05, it is considered significant. Univariate and multivariate logistic regression was conducted to examine the factors affecting some of the questionnaire questions. After conducting the univariate regression, a particular variable was included in the multivariate if it resulted in a p-value equal to or less than 0.20. Odds ratio (OR) and 95% confidence interval were calculated. Questions that have results varied from strongly disagree to strongly agree. Strongly agree and agree were considered as a "positive attitude". While neutral, disagree, and strongly disagree were considered as a "negative or reluctant attitude" (Supplementary Table 1).

Results

Demographic Representation

There were 415 filled questionnaires at the end of the data collection period. Table 1 provides the demographic information of the respondents. Almost 58.1% of the participants are 18–25 years. Sex was reported to be women in 55.4% and men in 44.6% of respondents. Self-reported highest acquired level of education was mainly diploma or bachelor's (79.5%). In addition, around 56% of the population is unemployed, and among the employed respondents, most of them earn less than 5000 Saudi Riyal (SR) monthly, which is close to the national minimum wage in Saudi Arabia. Surprisingly, around 56% of respondents are from health sector-related jobs.

Involvement of Community Pharmacists in COVID-19 Vaccination

Most respondents were concerned about getting a vaccination for COVID-19 (Table 2), and many (around 45%) believed that community pharmacists are not experienced in administering vaccines. Although the respondents might be concerned about taking the vaccine in a community pharmacy, most of their plans to be vaccinated are not affected by the approval of COVID-19 vaccination by the community pharmacists in the pharmacy. This might be because official institutes such as MOH are responsible for the guidance for vaccine administration, and 42.4% of the respondents also think that community

Table 1 Socio-Demographic Characteristics of the Participants (N = 415)

Characteristic	N (%)
Sex	
Female	230 (55.4)
Male	185 (44.6)
Age group	
18–25 years	241 (58.1)
26–35 years	125 (30.1)
36–45 years	28 (6.7)
46–55 years	12 (2.9)
More than 55 years	9 (2.2)
Educational level	
Pre-high school	11 (2.7)
High school	53 (12.8)
Diploma or bachelors	330 (79.5)
Postgraduate degree	21 (5.1)
Employment status	
Unemployed	233 (56.1)
Employed	182 (43.9)
Monthly income	
Less than 5000 Saud Riyal (SR)	227 (54.7)
5000–10,000 SR	116 (28)
More than 10,000 SR	72 (17.3)
Job location	
Health sector	232 (55.9)
Non-health score	183 (44.1)
Social status	
Single	276 (66.5)
Married	139 (33.5)

pharmacists should compulsorily give vaccination. Importantly, most of the respondents (72.8%) have not been affected by COVID-19, and they are also unaware of the approval of COVID-19 vaccination by community pharmacists.

Community Pharmacy as a Place for COVID-19 Vaccination

In the current study, the role of the pharmacist as a COVID-19 vaccinator in the community pharmacy has been analyzed. Hence, the questionnaire includes the capability of the community pharmacist regarding the proper vaccination against

Table 2 Participants' Concerns Regarding Providing Vaccination in the Community Pharmacy (N=415)

Responses	N (%)
How concerned are you about getting vaccinations in general?	
Not at all concerned	41 (9.9)
Somewhat concerned	181 (43.6)
Extremely concerned	193 (46.5)
What would be your main concern about COVID-19 vaccination by community pharmacists in community pharmacies?	
The place is not safe	35 (8.4)
The place is not suitable	104 (25.1)
They are not experienced	187 (45.1)
The place is not private	89 (21.4)
Did the MOH approval of the COVID-19 vaccination by community pharmacists affect your plan to get vaccinated?	
To some extent	72 (17.35)
No	291 (70.12)
Yes	52 (12.53)
If you are willing to get the COVID-19 vaccine in community pharmacies, which source of information will you mostly trust and will affect your decision most to get vaccinated or not?	
Friends and relatives	15 (3.6)
Official institutes like MOH	351 (84.6)
I will not take the vaccines	21 (5.1)
International media platforms	11 (2.7)
Social media	17 (4.1)
Regarding COVID-19 vaccination by community pharmacists for the public, what is your opinion on vaccination in general?	
No need for vaccination; other preventive measures are enough.	25 (6)
Should be compulsory	176 (42.4)
Should be optional	214 (51.6)
Did you have a history of catching COVID-19 infection?	
No	302 (72.8)
Yes	113 (27.2)
Did you have a history of contacting infected persons with COVID-19?	
No	179 (43.1)
Yes	236 (56.9)
Did you hear about the approval of COVID-19 vaccinations by community pharmacists?	
No	251 (60.5)
Yes	164 (39.5)

COVID-19. From the answers from the respondents, most of the respondents showed a positive attitude towards the vaccination strategy by community pharmacists (Table 3). However, most of the respondents negatively expressed their concern regarding community pharmacy as an accessible or better place for vaccination. Moreover, most of the participants showed a neutral response after issuing a COVID-19 vaccine by a community pharmacist. This might be due to the inexperienced vaccination strategy by the community pharmacists. However, around 63% of the participants are fine with COVID-19 vaccination by a community pharmacist if there is no alternative vaccination. Apart from this, the rate of vaccination by community pharmacists was on a surge. It was approximately 60% when the community pharmacists showed concern for taking preventive measures during vaccination; furthermore, their attitude toward vaccination increased if the pharmacists issued a certificate showing the proof of vaccination provider. Moreover, most of the participants trust community pharmacists when it comes to COVID-19 vaccination. Most of them, around 68%, believe that community pharmacies should expand their health care services on vaccination and other services such as prescribing medications, checkups etc.

Factors Affecting Attitude Toward Providing COVID-19 Vaccination by Community Pharmacists

Previously, our analysis revealed that community pharmacists' positive attitude toward the COVID-19 vaccination was on the rise. Hence, a univariate logistic regression analysis was performed to determine the factors affecting the attitude

Table 3 Participants' Opinion Regarding Providing Vaccination in the Community Pharmacy (N=415)

	N (%)	N (%)	N (%)	N (%)	N (%)
Question	**Strongly disagree**	**Disagree**	**Neutral**	**Agree**	**Strongly agree**
I believe that community pharmacists are capable vaccinators regarding COVID-19 vaccination.	0 (0)	35 (8.4)	85 (20.5)	**155 (37.3)**	140 (33.7)
Community pharmacies are accessible and better places to provide COVID-19 vaccination	12 (2.9)	67 (16.1)	**135 (32.5)**	120 (28.9)	81 (19.5)
The decision to get COVID-19 vaccination by community pharmacists if there is no vaccination still fine with you.	7 (1.7)	31 (7.5)	117 (28.2)	**158 (38.1)**	102 (24.6)
After issuing the COVID-19 vaccine by community pharmacists, has your decision to get the vaccine changed?	61 (14.7)	85 (20.5)	**112 (27)**	88 (21.2)	69 (16.6)
Your decision to get the COVID-19 vaccination can be affected by the presence of preventive measures taken by community pharmacies.	18 (4.3)	41 (9.9)	112 (27)	**137 (33)**	107 (25.8)
Your decision to get the COVID-19 vaccination in community pharmacies can be affected by the belief that community pharmacies are being commercially oriented than health care providing sites.	23 (5.5)	39 (9.4)	115 (27.7)	**138 (33.3)**	100 (24.1)
Community pharmacists should show "a vaccination provider certificate" before providing the service.	8 (1.9)	18 (4.3)	81 (19.5)	118 (28.4)	**190 (45.8)**
Are community pharmacies efficient and effective places for providing vaccination services?	19 (4.6)	40 (9.6)	122 (29.4)	**134 (32.3)**	100 (24.1)
Community Pharmacists are trustees when it comes to COVID-19 vaccination.	12 (2.9)	35 (8.4)	**130 (31.3)**	121 (29.2)	117 (28.2)
Community pharmacies should be expanding the provision of health care services in the near future, not only vaccination but also other healthcare services (prescribing medications, checkups, etc.)	8 (1.9)	24 (5.8)	98 (23.6)	103 (24.8)	**182 (43.9)**

Note: The bolded number indicated the most common answers.

towards community pharmacists in the case of COVID-19 vaccination. Initially, in the case of age, the age interval between 18–25 years was considered as a reference. A significant difference was found in the decision to get a COVID-19 vaccination by community pharmacists if the respondents do not require vaccination in the case of the age interval between 26–35 years (OR = 0.678, p-value = 0.086) (Table 4). In addition, the analysis is more significant in the case of expanding the service of community pharmacists beyond health care, and it showed in the age intervals for both 26–35 and 36–45 years respondents (Table 4). However, no significant findings were observed regarding the role of community pharmacists as capable vaccinators of COVID-19 and the placing of the community pharmacy as a vaccination place.

In addition, considering education level at pre-high school as a reference, the univariate logistic regression analysis revealed that all respondents from high school and with higher degrees, including bachelor's and post-graduate degrees, were more likely to respond that community pharmacies are well recognized for COVID-19 vaccination. However, in reference to the respondents that are from pre-high school, there is a significant change only for respondents from high schools who decided that COVID-19 vaccination by community pharmacists, if there is no vaccination, is fine with them (p-value = 0.086) (Table 4). Moreover, in reference to the respondents whose monthly incomes are less than 500 SR, respondents who earn more than 10,000 SR monthly significantly positively responded about the efficiency of COVID-19 vaccination in community pharmacies (OR = 1.46, p-value = 0.172). They also believe in community pharmacists as vaccinators (OR = 1.444, p-value = 0.189). Apart from this, the respondents who were employed responded that community pharmacists are capable of COVID-19 vaccination (OR = 0.673, p-value = 0.068). The respondents from the non-health sector also believe in the capability of the pharmacists as vaccinators in reference to the respondents who belonged to the health sector (OR = 0.651, p-value = 0.048). In addition, the non-health sector employees' response also agreed on the role of community pharmacies as effective and efficient places for vaccination and the role of community pharmacists in providing vaccination as well as other healthcare services.

Furthermore, multiple regression analysis was conducted with the previously mentioned variable that showed a p-value ≤ 2 in the univariate regression model. The results followed a similar trend in the case of the age factor, where community pharmacists are trusted during COVID-19 vaccination (OR = 0.631, p-value = 0.045) (Table 5). Respondents that were from high school responded that community pharmacies are accessible and better places for the COVID-19 vaccination (OR = 0.164, p-value = 0.018).

Discussion

Here, in this study, the involvement of community pharmacists in the vaccination of COVID-19 was shown. Moreover, several key features about the role of community pharmacies in providing effective and efficient vaccination services were provided.

A recent review study depicted the role of community pharmacists amidst the COVID-19 pandemic.[25] Community pharmacists are considered the other channel to provide pharmacy service to patients. They are mostly associated with providing medications and preventive products, evidence-based practice, and routing clinical services to patients. Most of the time, community pharmacies are open 24 h daily during the current pandemic. They are now recognized as first-line health workers due to their dedication to providing medications and healthcare services. Community pharmacists have already provided crucial health services during the current pandemic, including point-of-care testing and emergency medications.[26,27] In addition, Hoti et al reported that approximately 90% of the community pharmacists have good knowledge about implementing preventive measures during the COVID-19 pandemic.[28]

Community pharmacists in several countries have been traditionally involved in administering and supplying numerous vaccines, including influenza, pneumococcal, and human papillomavirus. Specifically, in the USA, community pharmacies are utilized as the second most used sites for the vaccination of adult influenza virus.[29] A previous systematic review documented the role of pharmacists in vaccination and reported that the pharmacist-led vaccination strategy is well accepted by the patients. Moreover, this strategy helped to improve the overall vaccination rate.[30] However, several factors, such as organizational barriers, political obstructions, and socio-economic status, impede the establishment of community pharmacies as effective places for vaccination.

Table 4 Univariate Logistic Regression Model Examining Factors Affecting the Attitude Toward Community Pharmacists as Covid 19 Vaccine Providers

Dependent Factors / Independent Factors	I Believe That Community Pharmacists are Capable Vaccinators Regarding COVID-19 Vaccination.	Community Pharmacies are Accessible and Better Places to Provide COVID-19 Vaccination	The Decision to Get COVID-19 Vaccination by Community Pharmacists if There is No Vaccination is Still Fine with You.	Community Pharmacies are Efficient and Effective Places for Providing Vaccination Services.	Community Pharmacists are Trustees When it Comes to COVID-19 Vaccination.	Community Pharmacies Should be Expanding the Provision of Health Care in the Near Future, Not Only Vaccination but also Other Health care Services (Prescribing Medications, Checkups, etc.)
	OR (95% CI) P-value	OR (95% CI), P-value	OR (95% CI) P-value	OR (95% CI) P-value	OR (95% CI) P-value	OR (95% CI) P-value
Sex (Ref. = female)	0.976 (0.637–1.496) p=0.912	**1.445 (0.979–2.131) p=0.064**	0.963 (0.646–1.437) p=0.854	1.113 (0.753–1.644) p=0.593	0.996 (0.674–1.473) p=0.985	**0.607 (0.4–0.921) p=0.019**
Age						
18–25	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
26–35 years	0.741 (0.463–1.186) p=0.211	1.187 (0.77–1.829) p=0.437	**0.678 (0.435–1.056) p=0.086**	0.951 (0.616–1.469) p=0.822	**0.65 (0.42–1.005) p=0.053**	**0.648 (0.409–1.027) p=0.065**
36–45 years	0.763 (0.329–1.774) p=0.53	0.822 (0.373–1.811) p=0.626	0.797 (0.357–1.781) p=0.58	0.891 (0.406–1.953) p=0.773	0.738 (0.336–1.62) p=0.449	**0.583 (0.259–1.31) p=0.191**
46–55 years	0.723 (0.211–2.484) p=0.607	0.783 (0.242–2.535) p=0.683	0.516 (0.161–1.649) p=0.264	1.081 (0.334–3.502) p=0.897	0.639 (0.2–2.041) p=0.45	**0.528 (0.162–1.722) p=0.29**
More than 55 years	1.266 (0.256–6.251) p=0.773	0.877 (0.23–3.344) p=0.847	1.805 (0.367–8.886) p=0.468	2.702 (0.55–13.277) p=0.221	2.238 (0.455–11.004) p=0.321	1.32 (0.267–6.517) p=0.733
Education level						
Pre-high school	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
High school	1.758 (0.443–6.979) p=0.422	**0.177 (0.042–0.753) p=0.019**	**3.692 (0.965–14.125) p=0.056**	1.491 (0.401–5.543) p=0.551	1.21 (0.311–4.701) p=0.783	1.952 (0.488–7.813) p=0.344
Diploma or bachelors	1.373 (0.393–4.796) p=0.62	**0.384 (0.1–1.474) p=0.163**	1.894 (0.566–6.334) p=0.3	1.05 (0.314–3.51) p=0.937	0.729 (0.209–2.538) p=0.62	1.259 (0.361–4.397) p=0.718
Postgraduate degree	1.429 (0.303–6.737) p=0.652	**0.281 (0.058–1.37) p=0.116**	1.95 (0.445–8.548) p=0.376	0.758 (0.175–3.274) p=0.71	0.519 (0.116–2.322) p=0.391	0.519 (0.116–2.322) p=0.391
Monthly income						
Less than 5000 Saud Riyal (SR)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.

5000–10,000 SR	0.775 (0.479–1.255) p=0.3	1.101 (0.704–1.722) p=0.674	0.818 (0.519–1.291) p=0.389	1.241 (0.79–1.951) p=0.349	1.116 (0.71–1.753) p=0.635	0.766 (0.476–1.233) p=0.272
More than 10,000 SR	1.27 (0.686–2.352) p=0.446	0.851 (0.499–1.45) p=0.553	1.454 (0.818–2.583) p=0.202	**1.46 (0.848–2.515) p=0.172**	**1.444 (0.835–2.496) p=0.189**	0.952 (0.535–1.694) p=0.866
Employment status						
Unemployed	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Employed	**0.673 (0.439–1.03) p=0.068**	1.075 (0.729–1.585) p=0.714	0.811 (0.543–1.21) p=0.304	1.144 (0.773–1.693) p=0.5	1.025 (0.693–1.518) p=0.901	1.025 (0.693–1.518) p=0.901
Job location						
Health sector	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Non-health sector	**0.651 (0.425–0.997) p=0.048**	1.014 (0.688–1.495) p=0.942	0.79 (0.53–1.179) p=0.248	**1.312 (0.886–1.943) p=0.175**	0.889 (0.601–1.315) p=0.556	**0.739 (0.487–1.121) p=0.155**
Social status						
Single	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Married	1.01 (0.644–1.584) p=0.965	**0.76 (0.504–1.144) p=0.189**	0.792 (0.521–1.203) p=0.275	0.941 (0.624–1.419) p=0.773	0.812 (0.539–1.225) p=0.322	**0.692 (0.449–1.066) p=0.095**
Did you have a history of catching COVID-19 infection? (Ref. = no)	**1.512 (0.916–2.496) p=0.106**	**1.653 (1.068–2.557) p=0.024**	1.248 (0.793–1.965) p=0.338	**1.775 (1.131–2.786) p=0.013**	**1.597 (1.019–2.502) p=0.041**	0.967 (0.607–1.538) p=0.886
Did you have a history of contacting infected persons of COVID-19? (Ref. = no)	**1.479 (0.965–2.266) p=0.072**	**1.302 (0.882–1.923) p=0.184**	1.141 (0.764–1.704) p=0.519	**1.747 (1.178–2.59) p=0.006**	**1.534 (1.035–2.274) p=0.033**	0.952 (0.626–1.448) p=0.819

Note: Bolded number indicated significant p-value (less than or equal 0.20).

Table 5 Multivariate Logistic Regression Model Examining Factors Affecting the Attitude Toward Community Pharmacists as Covid 19 Vaccine Providers (Only Variables with a p-value Equal to or Less Than 0.2 in the Univariate Model)

Dependent Factors / Independent Factors	I Believe That Community Pharmacists are Capable Vaccinators Regarding COVID-19 Vaccination.	Community Pharmacies are Accessible and Better Places to Provide COVID-19 Vaccination	The Decision to Get COVID-19 Vaccination by Community Pharmacists if There is No Vaccination is Still Fine with You.	Community Pharmacies are Efficient and Effective Places for Providing Vaccination Services.	Community Pharmacists are Trustees When it Comes to COVID-19 Vaccination.	Community Pharmacies Should be Expanding the Provision of Health Care in the Near Future, Not Only Vaccination but also Other Health Care Services (Prescribing Medications, Checkups, etc.)
	OR (95% CI) P-value	OR (95% CI), P-value	OR (95% CI) P-value	OR (95% CI) P-value	OR (95% CI) P-value	OR (95% CI) P-value
Sex (Ref. = female)	NA	1.555 (1.031–2.345) p=0.035	NA	NA	NA	**0.641 (0.415–0.992) p=0.046**
Age						
18–25	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
26–35 years	NA	NA	0.704 (0.449–1.106) p=0.128	NA	**0.631 (0.402–0.99) p=0.045**	0.766 (0.448–1.311) p=0.331
36–45 years	NA	NA	0.764 (0.328–1.777) p=0.532	NA	0.712 (0.309–1.64) p=0.424	0.825 (0.332–2.052) p=0.679
46–55 years	NA	NA	0.623 (0.183–2.127) p=0.45	NA	0.566 (0.166–1.932) p=0.363	0.87 (0.237–3.194) p=0.834
More than 55 years	NA	NA	2.083 (0.355–12.207) p=0.416	NA	1.758 (0.329–9.387) p=0.509	1.756 (0.325–9.484) p=0.513
Education level						
Pre-high school	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
High school	NA	**0.164 (0.037–0.73) p=0.018**	3.731 (0.855–16.283) p=0.08	NA	1.09 (0.251–4.723) p=0.909	NA
Diploma or bachelors	NA	0.401 (0.099–1.628) p=0.201	2.062 (0.521–8.152) p=0.302	NA	0.751 (0.188–2.999) p=0.685	NA
Postgraduate degree	NA	0.279 (0.055–1.405) p=0.122	2.467 (0.489–12.439) p=0.274	NA	0.634 (0.126–3.192) p=0.58	NA
Monthly income						
Less than 5000 Saud Riyal (SR)	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.

5000–10,000 SR	NA	NA	NA	1.106 (0.694–1.762) p=0.671	NA	NA
More than 10,000 SR	NA	NA	NA	1.467 (0.845–2.546) p=0.173	NA	NA
Employment status						
Unemployed	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Employed	**0.596 (0.384–0.925) p=0.021**	NA	NA	NA	NA	NA
Job location						
Health sector	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Non-health sector	**0.6 (0.387–0.931) p=0.023**	NA	NA	1.337 (0.896–1.995) p=0.155	NA	0.749 (0.485–1.157) p=0.193
Social status						
Single	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Married	NA	**0.657 (0.423–1.019) p=0.061**	NA	NA	NA	0.82 (0.474–1.419) p=0.479
Did you have a history of catching COVID-19 infection? (Ref. = no)	1.428 (0.818–2.495) p=0.21	**1.68 (1.017–2.773) p=0.043**	NA	1.434 (0.865–2.377) p=0.162	1.406 (0.848–2.332) p=0.186	NA
Did you have a history of contacting infected persons of COVID-19? (Ref. = no)	1.325 (0.823–2.133) p=0.247	1.141 (0.733–1.778) p=0.559	NA	1.535 (0.991–2.375) p=0.055	1.394 (0.897–2.166) p=0.139	NA

Note: The bolded number indicated a significant p-value (≤0.05).

Additionally, vaccine hesitancy is considered a broad-spectrum phenomenon, including reluctance to vaccine adminis-tration, skepticism to rely on vaccine products, refusal or rejection of vaccination, and fear of vaccine administration.[31–33] As previously mentioned about the organizational and political barriers, many other factors, including geographical distribution, and religious beliefs, are also responsible for vaccine hesitancy. This phenomenon is becoming a challenging issue that can severely jeopardize global health and related affairs.

Although in several developed countries, community pharmacists work only as advice providers for the benefits of vaccination practices, some community pharmacists are directly involved in the administration of vaccines. Initially, the first thing about proper vaccination is better communication and proper conveying of the appropriate information. A review from Ciliberti et al reported that a lack of scientific and reliable information could severely jeopardize the impact.[34] However, different associations are working their best to identify the limitations and gaps for providing better information. For example, the National Federation of Pharmacy Holders in Italy has provided not only organizational but also implemented an effective vaccination program to accelerate the role of community pharmacies. In this study, the participants showed a positive attitude towards the vaccination by community pharmacists if they are provided with government-issued verification and authentication, which might align with the claim mentioned in the previous statement.

In the present study, the role of community pharmacists as COVID-19 vaccinators was evaluated by the active participation of both male and female respondents, regardless of their age, educational background, monthly income, marital status, etc. Our study revealed that the association of government agencies regarding vaccination campaigns by community pharmacists increased the response in favor of vaccination. The result is supported by a previous study conducted in Western Australia, where legislation procedures were introduced to allow community pharmacists to administer vaccines, and around 98% of subjects received vaccination.[35] In addition, most of the respondents are willing to take vaccination by the community pharmacists. Apart from this, most of the participants associated with higher studies considered community pharmacies a COVID-19 vaccination place. This is probably because educated people more easily understand the importance of community pharmacies, which is supported by a previous study.[30] Surprisingly, in addition with occupants from the health sector, the non-health sector employees were aware of the role of community pharmacists in providing vaccination. Even they are keener to include the community pharmacist to cross the boundary of healthcare service and broaden their service to more aspects. However, the use of the convenience sampling method is a limitation of this study. Another limitation is the high percentage of healthcare sector participants. Consequently, these participants could have higher clinical experience and trust in the pharmacist.

Conclusion

The current experiment may facilitate the role of community pharmacists in the vaccination of COVID-19. The study provides a consolidated base that the inclusion of community pharmacists for implementing vaccination strategy and vaccine administration will be beneficial. However, government agencies and other healthcare service associations should be aware of the proper role of the community pharmacist in establishing community pharmacies as an effective place for vaccine administration. With a better relationship and by providing proper scientific and detailed information, community pharmacists might be able to change the shape of the current vaccination strategy and make key changes about proper vaccination.

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References

1. Umakanthan S, Sahu P, Ranade AV, et al. Origin, transmission, diagnosis and management of coronavirus disease 2019 (COVID-19). *Postgrad Med J*. 2020;96(1142):753–758. doi:10.1136/postgradmedj-2020-138234

2. Zhu N, Zhang D, Wang W, et al. A novel Coronavirus from patients with pneumonia in China, 2019. *N Engl J Med*. 2020;382(8):727–733. doi:10.1056/NEJMoa2001017

3. van Breemen RB, Muchiri RN, Bates TA, et al. Cannabinoids block cellular entry of SARS-CoV-2 and the emerging variants. *J Nat Prod*. 2022;2022. doi:10.1021/acs.jnatprod.1c00946

4. Chan EY, Cheng CK, Tam GC, Huang Z, Lee PY. Willingness of future A/H7N9 influenza vaccine uptake: a cross-sectional study of Hong Kong community. *Vaccine*. 2015;33(38):4737–4740. doi:10.1016/j.vaccine.2015.07.046

5. Centers for Disease Control and Prevention. Available from: https://www.cdc.gov/coronavirus/2019-ncov/science/science-briefs/scientific-brief-emerging-variants.html. Accessed December 15, 2021.

6. Tareq AM, Emran TB, Dhama K, Dhawan M, Tallei TE. Impact of SARS-CoV-2 delta variant (B.1.617.2) in surging second wave of COVID-19 and efficacy of vaccines in tackling the ongoing pandemic. *Hum Vaccin Immunother*. 2021;17(11):4126–4127. doi:10.1080/21645515.2021.1963601

7. Sohan M, Hossain MJ, Islam MR. The SARS-CoV-2 Omicron (B.1.1.529) variant and effectiveness of existing vaccines: what we know so far. *J Med Virol*. 2022. doi:10.1002/jmv.27574

8. Ung COL. Community pharmacist in public health emergencies: quick to action against the coronavirus 2019-nCoV outbreak. *Res Social Adm Pharm*. 2020;16(4):583–586. doi:10.1016/j.sapharm.2020.02.003

9. Khan Z, Muhammad K, Ahmed A, Rahman H. Coronavirus outbreaks: prevention and management recommendations. *Drugs Ther Perspect*. 2020;1–3. doi:10.1007/s40267-020-00717-x

10. Erku DA, Belachew SA, Abrha S, et al. When fear and misinformation go viral: pharmacists' role in deterring medication misinformation during the 'infodemic' surrounding COVID-19. *Res Soc Admin Pharm*. 2021;17(1):1954–1963. doi:10.1016/j.sapharm.2020.04.032

11. Goode JR, Page A, Burns A, Bernard S, Wheawill S, Gatewood SBS. The pharmacist's role in SARS-CoV-2 diagnostic testing. *J Am Pharm Assoc*. 2020;60(6):e19–e32. doi:10.1016/j.japh.2020.08.017

12. Nguyen HTT, Dinh DX, Nguyen VM. Knowledge, attitude and practices of community pharmacists regarding COVID-19: a paper-based survey in Vietnam. *PLoS One*. 2021;16(7):e0255420. doi:10.1371/journal.pone.0255420

13. Ahmad A, Alkharfy KM, Alrabiah Z, Alhossan A. Saudi Arabia, pharmacists and COVID-19 pandemic. *J Pharm Policy Pract*. 2020;13(1):41. doi:10.1186/s40545-020-00243-1

14. Hassounah M, Raheel H, Alhefzi M. Digital response during the COVID-19 pandemic in Saudi Arabia. *J Med Internet Res*. 2020;22(9):e19338–e19338. doi:10.2196/19338

15. Albogami Y, Alkofide H, Alrwisan A. Covid-19 vaccine surveillance in Saudi Arabia: opportunities for real-time assessment. *Saudi Pharm J*. 2021;29(8):914–916. doi:10.1016/j.jsps.2021.07.005

16. Qattan AMN, Alshareef N, Alsharqi O, Al Rahahleh N, Chirwa GC, Al-Hanawi MK. Acceptability of a COVID-19 vaccine among healthcare workers in the Kingdom of Saudi Arabia. *Front Med*. 2021;8. doi:10.3389/fmed.2021.644300.

17. Rhodes A, Hoq M, Measey M-A, Danchin M. Intention to vaccinate against COVID-19 in Australia. *Lancet Infect Dis*. 2021;21(5):e110. doi:10.1016/S1473-3099(20)30724-6

18. Umakanthan S, Patil S, Subramaniam N, Sharma R. COVID-19 vaccine hesitancy and resistance in India explored through a population-based longitudinal survey. *Vaccines*. 2021;9:10. doi:10.3390/vaccines9101064

19. Nzaji MK, Ngombe LK, Mwamba GN, et al. Acceptability of vaccination against COVID-19 among healthcare workers in the Democratic Republic of the Congo. *Pragmat Obs Res*. 2020;11:103. doi:10.2147/POR.S271096

20. Dubé E, Laberge C, Guay M, Bramadat P, Roy R, Bettinger JA. Vaccine hesitancy: an overview. *Hum Vaccin Immunother*. 2013;9(8):1763–1773. doi:10.4161/hv.24657

21. Alaqeel S, Abanmy NO. Counselling practices in community pharmacies in Riyadh, Saudi Arabia: a cross-sectional study. *BMC Health Serv Res*. 2015;15(1):557. doi:10.1186/s12913-015-1220-6

22. Hedima EW, Adeyemi MS, Ikunaiye NY. Community Pharmacists: on the frontline of health service against COVID-19 in LMICs. *Res Social Adm Pharm*. 2021;17(1):1964–1966. doi:10.1016/j.sapharm.2020.04.013

23. Saudi health minister: COVID-19 vaccines will be available at pharmacies for free. Arab News. Available from: https://www.arabnews.com/node/1819076/saudi-arabia. Accessed October 5, 2022.

24. Stämpfli D, Martinez-De la Torre A, Simi E, Du Pasquier S, Berger J, Burden AM. Community pharmacist-administered COVID-19 vaccinations: a pilot customer survey on satisfaction and motivation to get vaccinated. *Vaccines*. 2021;9(11):1320. doi:10.3390/vaccines9111320

25. Sami SA, Marma KKS, Chakraborty A, et al. A comprehensive review on global contributions and recognition of pharmacy professionals amidst COVID-19 pandemic: moving from present to future. *Future J Pharmaceut Sci*. 2021;7(1):1–16. doi:10.1186/s43094-021-00273-9

26. Strand MA, Bratberg J, Eukel H, Hardy M, Williams C. Community pharmacists' contributions to disease management during the COVID-19 pandemic. *Prev Chronic Dis*. 2020;17:E69–E69. doi:10.5888/pcd17.200317

27. Kristina A, Herliana N, Hanifah S. The perception of role and responsibilities during covid-19 pandemic: a survey from Indonesian pharmacists. *Int J Pharmaceut Res*. 2020;12(11):3034–3039.

28. Hoti K, Jakupi A, Hetemi D, Raka D, Hughes J, Desselle S. Provision of community pharmacy services during COVID-19 pandemic: a cross sectional study of community pharmacists' experiences with preventative measures and sources of information. *Int J Clin Pharm*. 2020;42(4):1197–1206. doi:10.1007/s11096-020-01078-1

29. Burson RC, Buttenheim AM, Armstrong A, Feemster KA. Community pharmacies as sites of adult vaccination: a systematic review. *Hum Vaccin Immunother*. 2016;12(12):3146–3159. doi:10.1080/21645515.2016.1215393

30. Paudyal V, Fialová D, Henman MC, et al. Pharmacists' involvement in COVID-19 vaccination across Europe: a situational analysis of current practice and policy. *Int J Clin Pharm*. 2021;43(4):1139–1148. doi:10.1007/s11096-021-01301-7

31. Eggertson L. Lancet retracts 12-year-old article linking autism to MMR vaccines. *Can Med Assoc J*. 2010;182(4):E199.

32. Rosselli R, Martini M, Bragazzi NL. The old and the new: vaccine hesitancy in the era of the Web 2.0. Challenges and opportunities. *J Prev Med Hyg*. 2016;57(1):E47.

33. Signorelli C, Odone A, Ricciardi W, Lorenzin B. The social responsibility of public health: italy's lesson on vaccine hesitancy. *Eur J Public Health*. 2019;29(6):1003–1004. doi:10.1093/eurpub/ckz135

34. Ciliberti R, Bragazzi NL, Bonsignore A. The implementation of the professional role of the community pharmacist in the immunization practices in Italy to counteract vaccine hesitancy. *Pharmacy*. 2020;8(3):155. doi:10.3390/pharmacy8030155

35. Burt S, Hattingh L, Czarniak P. Evaluation of patient satisfaction and experience towards pharmacist-administered vaccination services in Western Australia. *Int J Clin Pharm*. 2018;40(6):1519–1527. doi:10.1007/s11096-018-0738-1