Received: 5 April 2022 | Revised: 26 August 2022 | Accepted: 30 August 2022

DOI: 10.1111/bcp.15529

ORIGINAL ARTICLE

Community pharmacists' participation in adult vaccination: A cross-sectional survey based on the theoretical domains framework

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Funding information
Qatar University Student Grant, Grant/Award Number: QUST-1-CPH-2020-9

Objectives: This study aims to assess Qatar community pharmacists' practices in advocating and promoting adult vaccination and to characterize and quantify potential determinants of participation in adult vaccination as vaccine administrators, based on the theoretical domains framework (TDF).

Methods: A cross-sectional survey of a randomly selected sample of community pharmacists in Qatar was conducted using a self-administered validated questionnaire. Items in the questionnaire on potential determinants of participation in adult vaccination were based on TDF. TDF items were subjected to principal components analysis.

Results: In total, 271 respondents completed the questionnaire (67.7%). Most respondents (83.5%) did not have any previous training in vaccination administration and were not involved in any vaccine-related advocacy activities (78.9%). Principal components analysis of TDF items gave eight components: pharmacists' perceived knowledge and skills (median score of 22, interquartile range [IQR] 17–26, possible range: 7–35); perceived confidence (16; IQR 12–20, possible range: 5–25); perceived external support (9; IQR 7–11, possible range: 3–15); professional role identity (38; IQR 33–42, possible range: 11–55); emotions (10; IQR 9–12, possible range: 3–15); perceived consequences (22; IQR 18–24, possible range: 6–30); perceived usefulness (16; IQR 14–18, possible range: 4–20); and behaviour control (6; IQR 4–8, possible range: 2–10).

Conclusion: Pharmacists' perceived knowledge, skills, confidence and behavioural control are potentially important factors to address to facilitate participation in vaccination administration in Qatar. Along with providing vaccination training to community pharmacists, there is a need to change the current pharmacy practice structure to improve managerial and government support for and to equip pharmacies with resources for this role.

KEYWORDS
immunization, pharmacist, Qatar, vaccination

1 | INTRODUCTION

Infectious diseases are a major public health concern associated with significant societal and economic burden.[1,2] Vaccination is shown to be a very safe and effective intervention for many vaccine-preventable diseases.[3] According to the World Health Organization (WHO) data, vaccination prevents 4–5 million deaths yearly and is 1 of the most cost-effective public health interventions.[4] The coverage of adult vaccination is, however, universally low,[5,6] with pre-COVID data from the USA confirming that 3/4 of adults are missing 1 or more recommended vaccines.[7] This is particularly worrying for those vulnerable patients with chronic medical conditions.[8]

Associated barriers and factors relating to the individual include lack of awareness of vaccination benefits and current recommendations, finance, cultural and religious beliefs, fear of vaccination efficacy and side effects, and lack of trust in healthcare systems and healthcare professionals and others.[9–11] System-related barriers are the lack of a strategic and integrated response from all healthcare professionals and their poor accessibility to vaccination.[9–12] Several corrective strategies have been proposed including vaccine administration by a wider range of healthcare professionals than the traditional vaccination providers of physicians and nurses.[13] Given that community pharmacists are trusted, qualified and geographically accessible, they would as also be appropriate.[14] Several organizations advocate for the pharmacist's role in immunization including the American Society of Health System Pharmacists, the International Pharmaceutical Federation (FIP) and others.[15,16]

The use of pharmacists as vaccine administrators has contributed to higher vaccination rates and accessibility and better clinical outcomes in several countries.[17,18] For instance, Isenor et al. conducted a review on the impact of pharmacists as immunizers *vs*. provision by traditional providers with no pharmacy involvement. Pharmacist involvement in immunization led to increased uptake of immunizations. In addition, there was a positive impact of pharmacists as immunizers irrespective of their role or the type of vaccine given.[17] A systematic review published in 2021 by Murray et al., which included 12 studies on pharmacy-based interventions on influenza vaccination acceptance, demonstrated the pharmacist impact on improving vaccination acceptance of up to 27% compared with standard of care and up to 117% for those who did not obtain influenza vaccination in the previous year.[18]

Several studies have assessed pharmacists' experiences, practices and attitudes towards vaccination around the globe. However, many of these studies had limitations including small sample size and lack of theoretical frameworks to drive the research.[19–26]

There are varying policies and regulations regarding community pharmacists' involvement in vaccination worldwide; however, there is a trend to expand their role as vaccination administrators especially after the COVID-19 (Coronavirus disease) pandemic. FIP published an updated global report in 2020 regarding pharmacists' role in immunization, which involved 99 countries and territories.[27] According to the report, at least 36 countries and territories used pharmacy-based vaccinations; 16 new countries were identified compared with the 2016 report (80% increase).[27] The report also indicated that immunization services at community pharmacies were accessible by 1.8 billion people around the world.[27]

In Qatar, consistent with other countries in the Middle East region, non-COVID-19-related vaccination rate for adults is low. Data from a cross-sectional survey conducted in the Gulf Cooperation Council (GCC) countries highlighted that <25% of residents received the seasonal influenza vaccine. The most common barriers were lack of awareness about the vaccine and relying on body immunity and lifestyle.[28]

As a result, Qatar Ministry of Public Health (MOPH) has emphasized the need for widening vaccination coverage through the National Immunization Program and hosting vaccination promotion and administration campaigns.[29] Despite Qatar community pharmacies being a vital component of the healthcare system and the first point of contact for the public, representing 67.8% of pharmaceutical establishments in the country, they are not considered as part of these initiatives.[30] Community pharmacists in both independent and chain pharmacies are not involved in administering vaccines in Qatar, and no published information is available regarding the role of Qatar community pharmacists in advocating or promoting vaccination for adults and the determinants of their involvement in vaccine administration. Moreover, it is not clear

What is already known about this subject

- Vaccination is one of the most effective interventions for reducing infectious disease-related morbidity and mortality in adults. Despite this, there are a number of barriers that may contribute to vaccine hesitancy and low vaccination rates. Numerous strategies have been proposed to overcome vaccine underutilization and undercoverage, including the involvement of healthcare professionals other than physicians and nurses. The role of pharmacists in vaccination has recently increased, and numerous studies have demonstrated that pharmacists have a positive impact on vaccination rates and accessibility.

What this study adds

- There is a lack of robust studies that have employed theory to research pharmacists' behaviours regarding vaccination. This study is the first to assess the vaccination practices of community pharmacists in Qatar and the Middle East and to provide a detailed and theory-based understanding of the potential determinants of pharmacists' involvement in vaccine administration using the theoretical domains framework. It is anticipated that the study results will serve as the basis for the implementation of pharmacist vaccination services in Qatar community pharmacies in the future.

if community pharmacists in Qatar would be willing to serve as vaccine administrators if they are given the chance to. Moreover, translating studies conducted elsewhere to the Qatari pharmacy practice contact is not possible because it is a unique and a different environment. Therefore, the objectives of this study were to assess Qatar community pharmacists' practices in advocating and promoting adult vaccination, and to characterize and quantify potential determinants of participation in adult vaccination as vaccine administrators.

To achieve the second objective, the theoretical domains framework (TDF) was used.

The TDF is a comprehensive framework that is derived from 33 psychological theories and 128 theoretical constructs to cover a total of 14 domains of the factors that may influence behaviours and desired behavioural changes.[31] It "provides a theoretical lens through which to view the cognitive, affective, social and environmental influences on behavior".[31] TDF is 1 of the most commonly used frameworks in implementation science, especially in the field of health-related psychology and behaviours.[32] Given its comprehensive coverage of potential influences on behaviour, it is appropriate to use in this study to determine the factors that need attention for planning any behaviour change strategies for improving pharmacist vaccination services in Qatar in the future.

2 | METHODS

2.1 | Study design

A cross-sectional survey of a randomly selected sample of community pharmacists was conducted using a self-administered validated questionnaire tool.

2.2 | Participants

Eligible participants were practicing community pharmacists in Qatar. No specific exclusion criteria were applied.

2.3 | Population and sampling

The list of all community pharmacists was obtained from Qatar MOPH (1296 community pharmacists at the time of conducting the study, accounting for more than half of all practicing pharmacists in Qatar). With an assumed error of 5% and a confidence level of 95%, a minimum sample size was estimated as 296 pharmacists. To account for possible attrition rate, the target was 400 pharmacists.

2.4 | Questionnaire development and validation

A draft questionnaire was developed identifying relevant questions from related studies,[19–23] which were then adapted for the Qatar pharmacy practice setting. The questionnaire contained 35 questions and was divided into 3 sections: pharmacist sociodemographic and practice characteristics; pharmacist current vaccination-related advocacy and promotion practices; and pharmacist potential determinants of participation in adult vaccination. Items on potential determinants of participation in adult vaccination were based on the Determinants of Implementation Behavior Questionnaire, which is derived from TDF.[33] The questionnaire was formatted using the online survey software program Surveymonkey.

The draft questionnaire was reviewed for face and content validity by 5 Qatar pharmacy academics with expertise in pharmacy practice research and use of TDF. This was followed by piloting in a sample of 10 community pharmacists who were then excluded from the study.

2.5 | Questionnaire dissemination

Data were collected from April 2020 to December 2020 (pre-COVID-19). Initially, all selected pharmacists were contacted by phone to explain the study objectives and to request their participation. The pharmacists' phone numbers were retrieved from Qatar MOPH database. Following the phone call, pharmacists who agreed to participate received an email with the questionnaire URL through the survey software program (Surveymonkey). No information about the participants' identities was collected during the administration of the questionnaire. At intervals of 2–4 weeks, 3 reminders were sent by email to remind participants to complete the questionnaire. The target sample size of 400 was maintained by randomly selecting other pharmacists from the list to compensate for pharmacists who refused to participate.

2.6 | Ethical approval

The study was ethically approved by the Qatar University Institutional Review Board under the approval number: (QU-IRB 1267-EA/20s).

2.7 | Data analysis

Data were analysed using descriptive and inferential statistics. The items in the TDF were subjected to principal components analysis (PCA) to decrease the number of items to a small and practical number of components.[34] To assess the suitability of using PCA, the following criteria were used: correlation matrix for coefficients (≥.3); Kaiser–Meyer–Olkin measure of sampling adequacy (≥.6); and Bartlett's test of sphericity (≤.05). To determine how many components to extract, components with eigenvalues >1 were considered and the Screeplot was visually examined. To help in interpretation of components, varimax rotation was applied with missing data excluded pairwise.[35] The component with the highest loading was chosen for items that loaded into >1 component. Internal consistency of each component was assessed using Cronbach's α, while considering .7 and

above a sufficient measure to confirm reliability.[36] The total score of each component was calculated by assigning a score of 1 (strongly disagree) to 5 (strongly agree) for each of the Likert responses, with negatively worded items reverse scored. To test for differences in component scores between different sociodemographic and practice characteristics, Mann–Whitney *U* test was used in case of 2 groups and Kruskal–Wallis in case of >2 groups.

3 | RESULTS

In total, 355 questionnaires were received, of which 84 were incomplete and excluded leaving 271 usable responses (67.7% response rate).

3.1 | Sociodemographic and practice characteristics

Table 1 gives respondents' demographic and practice characteristics. The mean age was 34.7 years with an equal split of male and female respondents. The majority were from an Arabic-speaking country (52.5%, $n = 142$) and most (80.4%, $n = 213$) had pharmacist work experience from other countries.

3.2 | Vaccination-related training and experience

The majority of respondents (83.5%, $n = 218$) had no training on vaccination administration. Of those who had received training, for 3/4 (75.6%, $n = 31$), this related to tetanus vaccine administration and 2/3 (63.4%, $n = 26$) to influenza vaccine administration. Most pharmacists did not have experience in vaccine administration (71.7% $n = 170$). Among those who had experience, the most commonly administered vaccines were influenza (47.8%, $n = 32$), tetanus (41.8%, $n = 28$) and hepatitis B (38.8%, $n = 26$).

3.3 | Vaccination-related activities

Table 2 summarizes the different activities of respondents about adult vaccination. Pharmacists reported that they did not participate in any vaccine-related advocacy activities at their community pharmacy (78.9%, $n = 213$). Of those who advocated for adult vaccination, 80.7% ($n = 46$) and 78.9% ($n = 45$) advocated for tetanus and influenza vaccination, respectively.

3.4 | Potential determinants of participation in adult vaccination as vaccine administrators

The Kaiser–Meyer–Olkin measure of sampling adequacy was .879 and Bartlett's test of sphericity significance was <.01. Based on the visualization of the Screeplot that was run to determine the number of potentially eligible factors to retain in the exploratory factor analysis together with the number of components with Eigenvalues above 1.0 suggested, components explaining 67.26% of the variance were retained. The eight components were labelled: pharmacists' perceived knowledge and skills (Cronbach's α .875); perceived confidence (Cronbach's α .917); perceived external support (Cronbach's α .829); professional role identity (Cronbach's α .918); emotions (Cronbach's α .804); perceived consequences (Cronbach's α .845); perceived usefulness (Cronbach's α .904); and behaviour control (Cronbach's α .843).

3.4.1 | Component 1: Pharmacists' perceived knowledge and skills (Table 3)

In general, respondents had low agreement with statements related to their knowledge and skills about adult vaccination. Overall, the median score was 22 (interquartile range [IQR] 17–26), with 35 being the highest positive score. The statement with the least agreement was 'I know how to administer vaccinations' (agree/strongly agree $n = 90$, 37.4%). The component scores of pharmacists working in pharmacies located in gas stations were statistically significantly lower than those working in pharmacies in other sites (Kruskal–Wallis, $P < .05$).

3.4.2 | Component 2: Pharmacists' perceived confidence (Table 4)

Respondents generally gave negative responses with a median score of 16 and an IQR of 12–20. The statements with the lowest levels of agreement were 'I am confident that I can administer vaccinations even if patients are not motivated' (agree/strongly agree $n = 78$, 31.7%) and 'I am confident that I can administer vaccinations even if the time is limited' (agree/strongly agree $n = 94$, 42%). Male pharmacists scored significantly higher on component 2 (Mann–Whitney *U*, $P < .05$). Pharmacists who work in pharmacies in private hospitals scored statistically significantly higher than pharmacists who work in pharmacies in clinics or shopping malls (Kruskal–Wallis, $P < .05$).

3.4.3 | Component 3: Pharmacists' perceived external support (Table 5)

Community pharmacists perceived low levels of external support to administer vaccinations, with a median overall score of 9 and an IQR of 7–11. The statement 'My community pharmacy has the resources needed for me to administer vaccination' (agree/strongly agree $n = 59$, 29.8%) had the lowest percentage of agreement. The pharmacists working in pharmacies located in private hospitals had statistically significantly higher scores than pharmacists working in pharmacies located in gas stations (Kruskal–Wallis, $P < .05$).

TABLE 1 Respondents' demographics and practice characteristics ($N = 271$)

Characteristic		Mean (SD)
Age (y)		34.6 (6.9)
Sex, *n* (%) $N = 270$		
Male	132 (48.9)	
Female	138 (51.1)	
Nationality, *n* (%) $N = 271$		
Qatar	7 (2.6)	
Syria	8 (3.0)	
Jordan	11 (4.1)	
Egypt	99 (36.5)	
Sudan	17 (6.3)	
India	101 (37.3)	
Philippines	18 (6.6)	
Pakistan	5 (1.8)	
Other countries[a]	5 (1.8)	
Highest pharmacy degree, *n* (%) $N = 271$		
BSc	210 (77.5)	
Graduate Diploma	2 (0.7)	
MSc	9 (3.3)	
Pharm D	16 (5.9)	
PhD	2 (0.7)	
Country of pharmacy degree certification, *n* (%) $N = 271$		
Qatar	4 (1.5)	
Syria	6 (2.2)	
Jordan	11 (4.1)	
Egypt	96 (35.4)	
Sudan	15 (5.5)	
India	109 (40.2)	
Philippine's	18 (6.6)	
Pakistan	7 (2.6)	
Other countries[b]	5 (1.8)	
Time in practice in Qatar, *n* (%) $N = 270$		
<5 y	117 (43.4)	
5–10 y	99 (36.7)	
>10 y	54 (20.0)	
Work experience, *n* (%) $N = 265$		
Inside Qatar only	52 (19.6)	
Outside Qatar	213 (80.4)	
Current position in pharmacy, *n* (%) $N = 270$		
Pharmacist in training	3 (1.1)	
Staff pharmacist	160 (59.3)	
Pharmacy manager	78 (28.9)	
Pharmacy supervisor	28 (10.4)	
Other	1 (0.4)	
Pharmacy type, *n* (%) $N = 271$		
Independent pharmacy	72 (26.6)	
Chain pharmacy	199 (73.4)	

(Continues)

TABLE 1 (Continued)

Characteristic	Mean (SD)
Pharmacy location, *n* (%) *N* = 271	
In a shopping mall or a supermarket	93 (34.3)
In a private clinic	65 (24.0)
In a private hospital	26 (9.6)
In a commercial street	47 (17.3)
In a residential area	6 (2.2)
In a gas station	21 (7.7)
Others[c]	13 (4.8)

Abbreviation: SD, standard deviation.
[a]Other countries: Iraq, Lebanon and Nepal.
[b]Other countries: USA, United Arab Emirates, Lebanon, Iraq and England.
[c]Other places: community pharmacies in medical centres.

TABLE 2 Pharmacists' activities in relation to adult vaccination

Statement	Never *n* (%)	Less than twice a week *n* (%)	Twice or more weekly (but not daily) *n* (%)	Once daily *n* (%)	Multiple times daily *n* (%)
Respond to patient inquiries relating to adult vaccination, *N* = 249	105 (42.2)	79 (31.7)	35 (14.1)	10 (4.0)	20 (8.0)
Identify immunization status of adult patients, *N* = 249	123 (49.4)	52 (20.9)	48 (19.3)	8 (3.2)	18 (7.2)
Provide immunization information and advice to adult patients, *N* = 247	83 (33.6)	79 (32.0)	41 (16.6)	14 (5.7)	30 (12.1)
Distribute vaccination related educational materials to adult patients, *N* = 246	161 (65.4)	49 (19.9)	24 (9.8)	8 (3.3)	4 (1.6)
Organize vaccination campaigns, *N* = 246	202 (82.1)	22 (8.9)	14 (5.7)	6 (2.4)	2 (0.8)
Become actively involved in vaccination campaigns, *N* = 244	198 (81.1)	25 (10.2)	12 (4.9)	4 (1.6)	5 (2.0)
Invite other health care professionals to provide education to adult patients in relation to vaccination in the pharmacy, *N* = 243	178 (73.3)	35 (14.4)	17 (7.0)	6 (2.5)	7 (2.9)
Invite other health care professionals to administer vaccination to adult patients in the pharmacy, *N* = 244	192 (78.7)	25 (10.2)	14 (5.7)	10 (4.1)	3 (1.2)
Refer adult patients to healthcare centres in Qatar to receive vaccination, *N* = 245	76 (31.0)	91 (37.1)	42 (17.1)	17 (6.9)	19 (7.8)
Identify and advise high-risk adult patients about their need for vaccination (e.g., advising patients aged ≥65 y, diabetic patients, travel vaccines), *N* = 243	89 (36.6)	79 (32.5)	38 (15.6)	21 (8.6)	16 (6.6)

Pharmacists working in pharmacies located on commercial streets had statistically significantly higher scores than pharmacists working in pharmacies located in gas stations (Kruskal–Wallis, $P < .05$).

3.4.4 | Component 4: Pharmacists' professional role identity (Table 6)

The role of community pharmacists in adult vaccination was generally viewed positively by pharmacists. Overall, the median score was 38, with an IQR of 33–42. It was the statement 'Other work tasks are higher priority for me than administering vaccinations' that received the lowest agreement level (agree/strongly agree *n* = 61, 29.9%).

3.4.5 | Component 5: Pharmacists' emotions (Table 7)

Respondents had positive emotions regarding vaccination with a median score of 10 and an IQR of 9–12. The highest level of

TABLE 3 Pharmacists' perceived knowledge and skills

Statement	Strongly disagree *n* (%)	Disagree *n* (%)	Neither disagree nor agree *n* (%)	Agree *n* (%)	Strongly agree *n* (%)	Median (IQR)
I know how to monitor the patient response to vaccinations in terms of safety and effectiveness ($N = 237$)	15 (6.3)	65 (27.4)	55 (23.2)	90 (38.0)	12 (5.1)	
I know how to assess the patient contraindications for vaccinations as per the guidelines ($N = 237$)	16 (6.8)	64 (27.0)	57 (24.1)	91 (38.4)	9 (3.8)	
I know how to follow up with the patient after vaccination and when to refer him/her to specialist healthcare providers if needed ($N = 236$)	13 (5.5)	64 (27.1)	48 (20.3)	100 (42.4)	11 (4.7)	
I know how to assess the patient needs for vaccinations as per the guidelines ($N = 237$)	17 (7.2)	68 (28.7)	55 (23.2)	88 (37.1)	9 (3.8)	
I have the necessary skills to administer vaccinations following the guidelines ($N = 237$)	20 (8.4)	73 (30.8)	47 (19.8)	84 (35.4)	13 (5.5)	
I know how to administer vaccinations ($N = 241$)	28 (11.6)	76 (31.5)	47 (19.5)	85 (35.3)	5 (2.1)	
For me, administering vaccination is very difficult ($N = 223$)[a]	15 (6.7)	76 (34.1)	68 (30.5)	57 (25.6)	7 (3.1)	
Cronbach's α						.875
Total domain score						22 (17–26)

Component statistics, sum of allocating 1 (strongly disagree) to 5 (strongly agree). Minimum: 7; maximum representing best positive score: 35.
[a]Reverse scored.

TABLE 4 Pharmacists' perceived confidence

Statement	Strongly disagree *n* (%)	Disagree *n* (%)	Neither disagree nor agree *n* (%)	Agree *n* (%)	Strongly agree *n* (%)	Median (IQR)
I am confident that I am able to administer vaccinations even if other community pharmacists do not ($N = 223$)	8 (3.6)	58 (26.0)	50 (22.4)	88 (39.5)	19 (8.5)	
I am confident that I can administer vaccinations as per the guidelines ($N = 225$)	7 (3.1)	46 (20.4)	50 (22.2)	101 (44.9)	21 (9.3)	
I am confident that I can administer vaccinations even if the time is limited ($N = 224$)	12 (5.4)	63 (28.1)	55 (24.6)	80 (35.7)	14 (6.3)	
I am confident that I can administer vaccinations even if patients are not motivated ($N = 221$)	14 (6.3)	78 (35.3)	51 (26.7)	69 (27.6)	9 (4.1)	
As a community pharmacist, I feel that I am competent enough to administer vaccinations ($N = 222$)	8 (3.6)	55 (24.8)	61 (27.5)	76 (34.2)	22 (9.9)	
Cronbach's α						.917
Total domain score						16 (12–20)

Component statistics, sum of allocating 1 (strongly disagree) to 5 (strongly agree). Minimum: 5; maximum representing best positive score: 25.

agreement was for the negatively worded statement 'I'd feel sad if I administer vaccinations' (disagree/strongly disagree $n = 133$, 67.2%). Pharmacists with pharmacy practice experience outside Qatar scored significantly higher on this component (Mann–Whitney U, $P < .05$).

3.4.6 | Component 6: Pharmacists' perceived consequences (Table 8)

In general, respondents were very positive about the consequences of pharmacists administering adult vaccinations. With an IQR of 18–24,

TABLE 5 Pharmacists' perceived external support

Statement	Strongly disagree *n* (%)	Disagree *n* (%)	Neither disagree nor agree *n* (%)	Agree *n* (%)	Strongly agree *n* (%)	Median (IQR)
My manager would listen to my problems if I will administer vaccination ($N = 198$)	16 (8.1)	41 (20.7)	60 (30.3)	72 (36.4)	9 (4.5)	
My manager would be supportive and helpful if I will administer vaccination ($N = 198$)	12 (6.1)	31 (15.7)	61 (30.8)	82 (41.4)	12 (6.1)	
My community pharmacy has the resources needed for me to administer vaccination (e.g., private space, printed material; $N = 198$)	27 (13.6)	70 (35.4)	42 (21.2)	47 (23.7)	12 (6.1)	
Cronbach's α						.829
Total domain score						9 (7–11)

Component statistics, sum of allocating 1 (strongly disagree) to 5 (strongly agree). Minimum: 3; maximum representing best positive score: 15.

TABLE 6 Pharmacists' professional role identity

Statement	Strongly disagree *n* (%)	Disagree *n* (%)	Neither disagree nor agree *n* (%)	Agree *n* (%)	Strongly agree *n* (%)	Median (IQR)
I believe that administering vaccinations is simple for me ($N = 202$)	8 (4.0)	30 (14.9)	57 (28.2)	94 (46.5)	13 (6.4)	
I'd get professional satisfaction if I administer vaccinations for adult patients ($N = 198$)	7 (3.5)	20 (10.1)	41 (20.7)	101 (51.0)	29 (14.6)	
I believe that administering vaccinations is compatible with my daily practice ($N = 202$)	6 (3.0)	36 (17.8)	48 (23.8)	96 (47.5)	16 (7.9)	
I believe that administering vaccinations will not take me much time ($N = 201$)	5 (2.5)	25 (12.4)	54 (26.9)	105 (52.2)	12 (6.0)	
I believe that most people who are important to me think that I should administer vaccination for adults in my community pharmacy ($N = 198$)	7 (3.5)	31 (15.7)	61 (30.8)	87 (43.9)	12 (6.1)	
Other professionals (who are also involved in administering vaccinations) would support me when administering vaccinations for adult patients in my community pharmacy ($N = 199$)	9 (4.5)	30 (15.1)	64 (32.2)	83 (41.7)	13 (6.5)	
I believe that patients would be positive about having their vaccinations in community pharmacies by me ($N = 198$)	10 (5.1)	32 (16.2)	40 (20.2)	95 (48.0)	21 (10.6)	
I'd feel comfortable if I administer vaccinations to adult patients ($N = 198$)	6 (3.0)	30 (15.2)	43 (21.7)	104 (52.5)	15 (7.6)	
Other work tasks are higher priority for me than administering vaccinations[a] ($N = 204$)	11 (5.4)	50 (24.5)	63 (30.9)	72 (35.3)	8 (3.9)	
I'd feel elated if I administer vaccinations to adult patients ($N = 198$)	5 (2.5)	25 (12.6)	66 (33.3)	86 (43.4)	16 (8.1)	
I believe that patients would be feel safe for getting their vaccinations in community pharmacies by me ($N = 198$)	7 (3.5)	42 (21.2)	42 (21.2)	84 (42.4)	23 (11.6)	
Cronbach's α						.918
Total domain score						38 (33–42)

Component statistics, sum of allocating 1 (strongly disagree) to 5 (strongly agree). Minimum allowed: 11; maximum allowed representing best positive score: 55.

[a]Reverse scored.

TABLE 7 Pharmacists' emotions

Statement	Strongly disagree *n* (%)	Disagree *n* (%)	Neither disagree nor agree *n* (%)	Agree *n* (%)	Strongly agree *n* (%)	Median (IQR)
I'd feel overwhelmed if I administer vaccinations ($N = 199$)[a]	24 (12.1)	70 (35.2)	60 (30.2)	43 (21.6)	2 (1.0)	
I'd feel nervous if I administer vaccinations ($N = 199$)[a]	19 (9.5)	84 (42.2)	48 (24.1)	46 (23.1)	2 (1.0)	
I'd feel sad if I administer vaccinations ($N = 198$)[a]	39 (19.7)	94 (47.5)	45 (22.7)	17 (8.6)	3 (1.5)	
Cronbach's α						.804
Total domain score						10 (9–12)

Component statistics, sum of allocating 1 (strongly disagree) to 5 (strongly agree). Minimum: 3; maximum representing best positive score: 15.
[a]Reverse scored.

TABLE 8 Pharmacists' perceived consequences

Statement	Strongly disagree *n* (%)	Disagree *n* (%)	Neither disagree nor agree *n* (%)	Agree *n* (%)	Strongly agree *n* (%)	Median (IQR)
I think that if I administer vaccinations, it will help patients to be healthier ($N = 207$)	9 (4.3)	19 (9.2)	41 (19.8)	98 (47.3)	40 (19.3)	66
I think that if I administer vaccinations, this will strengthen my collaboration with other healthcare professionals with whom I deliver vaccination such as physicians and nurses ($N = 208$)	7 (3.4)	21 (10.1)	38 (18.3)	108 (51.9)	34 (16.3)	
I think that if I administer vaccinations I will get recognition from my work ($N = 205$)	7 (3.4)	27 (13.2)	60 (29.3)	87 (42.4)	24 (11.7)	
I think that if I administer vaccinations I will get recognition from my patients ($N = 206$)	3 (1.5)	20 (9.7)	54 (26.2)	99 (48.1)	30 (14.6)	
I think that if I administer vaccinations, I will get financial reimbursement ($N = 206$)	12 (5.8)	34 (16.5)	81 (39.3)	67 (32.5)	12 (5.8)	3
I think that if I administer vaccinations, the vaccination intake by patients will increase ($N = 206$)	12 (5.8)	46 (22.3)	57 (27.7)	74 (35.9)	17 (8.3)	
Cronbach's α						.845
Total domain score						22 (18–24)

Component statistics, sum of allocating 1 (strongly disagree) to 5 (strongly agree). Minimum: 6; maximum representing best positive score: 30.

the overall median score was 22. The statement 'I think that if I administer vaccinations, I will get financial reimbursement' received the least agreement (agree/strongly agree $n = 79$, 38.3%).

3.4.7 | Component 7: Pharmacists' perceived usefulness (Table 9)

The perceived usefulness of pharmacist administered vaccinations was high with a median of 16 and an IQR of 14–18. Most respondents disagreed with the negatively worded statement 'I think that administering vaccinations is not useful at all for the national economy' (disagree/strongly disagree $n = 166$, 79.8%). Pharmacists with pharmacy practice experience outside Qatar scored significantly higher on component 7 (Mann–Whitney U, $P < .05$).

3.4.8 | Component 8: Pharmacists' behaviour control (Table 10)

Behavioural control of pharmacists regarding adult vaccinations was generally low: a median score of 6 with an IQR of 4–8 with <35% agreeing or strongly agreeing with both statements. Pharmacists from non-Arabic countries and pharmacists who earned their degrees from non-Arabic countries scored higher on component 8 (Mann–Whitney U, $P < .05$).

4 | DISCUSSION

This study is the first in Qatar and in the Middle East to assess community pharmacists' practices in relation to adult vaccination and to

TABLE 9 Pharmacists' perceived usefulness

Statement	Strongly disagree *n* (%)	Disagree *n* (%)	Neither disagree nor agree *n* (%)	Agree *n* (%)	Strongly agree *n* (%)	Median (IQR)
I think that administering vaccinations does not advance pharmacist role ($N = 208$)[a]	45 (21.6)	83 (39.9)	43 (20.7)	34 (16.3)	3 (1.4)	
I think that administering vaccinations is not useful at all for the patient health outcomes ($N = 208$)[a]	60 (28.8)	93 (44.7)	29 (13.9)	33 (11.1)	3 (1.4)	
I think that administering vaccinations is not useful at all for the national economy ($N = 208$)[a]	69 (33.2)	97 (46.6)	27 (13.0)	13 (6.3)	2 (1.0)	
I think that administering vaccination is not useful at all for the society ($N = 208$)[a]	66 (31.7)	94 (45.2)	20 (9.6)	27 (13.0)	1 (0.5)	
Cronbach's α						.90
Total domain score						16 (14–18)

Component statistics, sum of allocating 1 (strongly disagree) to 5 (strongly agree). Minimum: 4; maximum representing best positive score: 20.
[a]Reverse scored.

TABLE 10 Pharmacists' behaviour control

Statement	Strongly disagree *n* (%)	Disagree *n* (%)	Neither disagree nor agree *n* (%)	Agree *n* (%)	Strongly agree *n* (%)	Median (IQR)
If I am authorized by Qatar law, administering vaccinations to adult patients would be something that I would do without having to consciously remember ($N = 196$)	15 (7.7)	58 (29.6)	57 (29.1)	55 (28.1)	11 (5.6)	
If I am authorized by Qatar law, I would administer vaccinations to adult patients by default (i.e., without a need for further motivation/directions/or instructions; $N = 197$)	20 (10.2)	68 (34.5)	40 (20.3)	57 (28.9)	12 (6.1)	
Cronbach's α						.843
Total domain score						6 (4–8)

Component statistics, sum of allocating 1 (strongly disagree) to 5 (strongly agree). Minimum: 2; maximum representing best positive score: 10.

characterize the main determinants of their participation in adult vaccination as vaccine administrators.

The study findings indicated that most surveyed community pharmacists were not involved in advocacy related activities for adult vaccination. These results are dissimilar to studies conducted in other countries. Yemeke et al. conducted a systematic review of published literature describing pharmacists' role in providing vaccination services in low- and middle-income countries.[37] Vaccine advocacy and education was the most commonly reported role of pharmacists in vaccination from 15 countries (Argentina, Bolivia, China, Costa Rica, Democratic Republic of Congo, Ethiopia, Iraq, Jordan, Lebanon, Malaysia, Nigeria, Philippines, Russia, Senegal and South Africa).[38] Moreover, the FIP published a report in 2016 entitled 'An overview of current pharmacy impact on immunization' in order to gain a general understanding of pharmacists' role in immunization around the world.[38] According to this report, pharmacists in 32 countries and territories engage in support and advocacy activities related to immunizations.[38] The high accessibility of Qatar community pharmacists makes them ideal candidates to lead vaccination campaigns, advocate for vaccination and educate the general public about vaccination. As a result, they can identify high-risk patients and provide them with the guidance they need to achieve and meet their vaccination targets.[38] To improve pharmacists' roles in vaccination in Qatar, it is recommended that they follow and implement FIP's advocacy toolkit, 'Supporting and expanding immunization coverage through pharmacists'.[39] FIP proposes a strategic plan for implementing vaccination services by community pharmacies. The plan starts with basic advocacy activities and later moves for more advanced services. There are several tactics included in the plan, including the involvement of pharmacists, schools of pharmacy, health authorities, pharmaceutical companies, medical centres and professional organizations.[39]

PCA of the TDF potential determinants for vaccine administration ended up with 8 components: pharmacists' perceived knowledge and skills; perceived confidence; perceived external support; professional role identity; emotions; perceived consequences; perceived usefulness; and behaviour control.

In general, pharmacists' perceived knowledge, skills, confidence and behavioural control were low. Pharmacists' responses regarding their ability to administer vaccinations and assess their patients' vaccination needs were negative. This was also reflected by the high percentage of pharmacists who never had any training or experience in vaccination administration (83.5% and 71.7%, respectively). In fact, community pharmacists, whether they graduated from Qatar or from another country, are not mandated to receive vaccination training. A lack of knowledge or training has also been reported as a barrier to vaccination administration in multiple studies.[20,40–43] Community pharmacists can be prepared to provide vaccination services through undergraduate pharmacy education or through training programmes tailored to the professional and practice requirements of each state or country.[14] For instance in Canada and the USA, several immunization-training programmes were developed to ensure safe and effective administration of vaccines by pharmacists.[44,45] Moreover, several studies have shown the positive impact of vaccination training programmes. A randomized controlled trial conducted among US pharmacists and pharmacy technicians working in community pharmacies assessed the effect of a structured immunization training on pneumococcal and herpes zoster vaccination services in community pharmacies.[46] For the intervention group, the training programme resulted in a statistically significant increase in pneumococcal vaccine doses (7.50–12.00 doses, $P = .007$) and total vaccine doses (12.50–28.00 doses, $P = .014$) when compared with baseline.[46] The same randomized controlled trial also evaluated the impact of the programme on participants' vaccination-related confidence, perceived barriers and perceived influence on immunization services using a pre- and postintervention survey.[47] The training programme significantly improved the intervention pharmacists' confidence in determining the appropriateness of pneumococcal vaccine ($P = .027$), confidence in patient interactions related to pneumococcal vaccine ($P = .041$) and perceived influence on immunization services ($P < .001$).[47] Another study conducted among US community pharmacists evaluated the effectiveness of an intensive coaching session compared with a self-directed webinar on immunization.[48] Compared with the other group, pharmacists in the coaching group administered more pneumococcal vaccines in the 12-month period after the programme.[48] Caroll et al. evaluated the perceptions of provisionally registered pharmacy graduands regarding a vaccination training course by The University of Sydney School of Pharmacy. The course led to significant increases in the graduands' perceived knowledge of influenza vaccinations (24.4% increase, $P < .001$), skills in managing patients receiving influenza vaccines (27.1% increase, $P < .001$) and confidence level to administer influenza vaccines (80.7% increase, $P < .001$).[49] In addition in Queensland, the process of immunization by community pharmacists has started with a structured training, The Queensland Pharmacist Immunization Pilot. This pilot produced pharmacists who are competent and confident immunizers.[50]

Therefore, evidence-based multifaceted training programmes are needed to improve Qatar community pharmacists' knowledge, skills and confidence about vaccinations, along with evaluating their self-efficacy before and after such programmes. To further improve the pharmacists' behavioural control scores, these training programmes should not only cover the information needed for vaccine administration, such as aseptic techniques, patient screening and managing adverse drug reactions related to vaccines, but also include motivational interviewing techniques and theory-based behavioural strategies in order to motivate pharmacists to prioritize vaccination administration and design action plans for achieving this goal.

Pharmacists perceived external support for vaccination services as low. For instance, they disagreed with the statement about the availability of resources in the pharmacy. Several studies conducted outside Qatar have reached similar conclusions. In a study by Islam et al. on the identification of opportunities and challenges of adolescent and adult vaccination administration within pharmacies in the USA, availability of administration area and vaccine shortage were considered challenges by 43% of surveyed pharmacists.[51]

The community pharmacies in Qatar need a private space, educational materials, electronic tools, vaccines and other resources. Additionally, pharmacists' access to patients' electronic health records can enhance their communication with other healthcare professionals and provide them with clinical alerts to remind them of their patients' immunization needs. A documentation system should also be in place before pharmacist vaccination services can be implemented in the country.

In addition, lack of managerial support for pharmacist involvement in vaccine administration was identified by pharmacists. This could be due to the absence of governmental jurisdictions or policies for pharmacists to administer vaccination in community pharmacies. Managers and leaders should support their staff as they work towards achieving their goals. In light of the high impact Qatar community pharmacists could have on adult vaccination rates, the Ministry of Public Health, health stakeholder groups and owners and managers of large pharmacy chains should collaborate together to expand the scope of practice of community pharmacists to include immunization and potential reimbursements in addition to setting legislations that authorize pharmacists in Qatar to be immunizers and obtaining the resources to set up this advanced service in the pharmacy as currently pharmacists are not recognized as vaccine administrators in the country.

By contrast, community pharmacists in Qatar demonstrated overall positive emotions regarding administration of vaccines as well as high perceived consequences and usefulness of vaccinations. These results are in line with those of other similar studies. Hastings et al. concluded in his study about community pharmacists' attitudes towards human papillomavirus (HPV) vaccine in Alabama, USA, that the majority of pharmacists (47.3%) strongly agree that vaccination against HPV is the best protection against cervical cancer.[52] Koskan et al. assessed community pharmacists' and pharmacy interns' (HPV) vaccine administration behaviours and influences using a cross-sectional survey informed by the theory of planned behaviour.[53] Pharmacists had overall positive attitudes towards HPV and the consequences of vaccination. Moreover, there was a statistically significant correlation between pharmacists' positive attitudes towards vaccination and their intention to vaccinate.[53]

The positive responses of pharmacists in the domains of professional role identity and perceived consequences and usefulness indicate that pharmacists in Qatar are aware of the importance of vaccinations and acknowledge their valuable role as educators and administrators within the community. Moreover, pharmacists' positive emotions found in this study are very encouraging, since negative emotions can dampen pharmacists' enthusiasm and motivation to administer vaccinations.

It is worth noting that the data were collected pre-COVID-19 pandemic. The pandemic could have shifted the pharmacists' perceptions more positively as there has been lots of global attention on the role of pharmacists in COVID-19 vaccine administration.

4.1 | Limitations

The results of this study may be affected by social desirability bias, similar to other cross-sectional studies that use questionnaires. There is the possibility of recall bias. The number of study respondents is lower than the target sample size, yet the sociodemographic characteristics of respondents reflect those of Qatar, which makes the study results generalizable. The number of survey respondents is a bit less than the target sample size yet the sociodemographic characteristics of respondents reflect those of Qatar, which makes the study results generalizable. While survey responses provided information about potential determinants of pharmacist vaccination behaviour, semi-structured interviews conducted as part of a qualitative study design may have provided more information. Despite these limitations, the findings from our study offer a detailed and theory-based understanding of the potential determinants of pharmacist involvement in vaccine administration using TDF. In fact, the PCA applied in this study identified the determinants that would need attention the most when planning theory based behaviour change interventions to improve Qatar pharmacists' role in vaccine administration.

5 | CONCLUSION

Using TDF, this study identified potential determinants to pharmacists' participation in vaccination administration in Qatar. The study results showed that pharmacists' knowledge, skills, confidence and behavioural control are important factors to address before pharmacists administer vaccines. The pharmacy practice structure also needs to be changed to improve managerial support for pharmacists and to equip pharmacies with the resources needed for this advanced role. Future studies should target designing theory multifaceted interventions based on TDF for pharmacists to contribute to vaccination administration in Qatar.

ACKNOWLEDGEMENTS

We would like to thank the pharmacists who filled the questionnaire.

This work was supported by a student grant (grant number QUST-1-CPH-2020-9) from Qatar University Office of Research and Graduate Studies. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of Qatar University.

COMPETING INTERESTS

All authors have no competing interests.

CONTRIBUTORS

All authors contributed to the work and approved the final submitted manuscript. M.H. is the study principal investigator and was responsible for the study concept and design. N.Z. and D.K. participated in data collection. N.Z. and M.H. analysed and interpreted the data. D.S. contributed to the manuscript editing.

DATA AVAILABILITY STATEMENT

Data are available on a reasonable request.

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REFERENCES

1. Shah S, Abbas G, Riaz N, ur Rehman A, Hanif M, Rasool MF. Burden of communicable diseases and cost of illness: Asia pacific region. *Expert Rev Pharmacoecon Outcomes Res*. 2020;20(4):343-354. doi:10.1080/14737167.2020.1782196
2. The top 10 causes of death. World Health Organization. https://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death. Accessed April 4, 2022.
3. Vaccine-preventable diseases and vaccines. World Health Organization. https://www.who.int/ith/chapters/ith2012en_chap6.pdf?ua=1. Accessed April 4, 2022.
4. Immunization. World Health Organization. https://www.who.int/news-room/facts-in-pictures/detail/immunization. Accessed April 4, 2022.
5. de Gomensoro E, Del Giudice G, Doherty TM. Challenges in adult vaccination. *Ann Med*. 2018;50(3):181-192. doi:10.1080/07853890.2017.1417632
6. Strategies for increasing adult vaccination rates. Centers for Disease Control and Prevention. https://www.cdc.gov/vaccines/hcp/adults/for-practice/increasing-vacc-rates.html. Accessed April 4, 2022.
7. Immunization coverage. World Health Organization. https://www.who.int/news-room/fact-sheets/detail/immunization-coverage. Accessed April 4, 2022.
8. Tan L. Adult vaccination: now is the time to realize an unfulfilled potential. *Hum Vaccin Immunother*. 2015;11(9):2158-2166. doi:10.4161/21645515.2014.982998
9. Guzman-Holst A, DeAntonio R, Prado-Cohrs D, Juliao P. Barriers to vaccination in Latin America: a systematic literature review. *Vaccine*. 2020;38(3):470-481. doi:10.1016/j.vaccine.2019.10.088
10. Schmid P, Rauber D, Betsch C, Lidolt G, Denker ML. Barriers of influenza vaccination intention and behavior—a systematic review of influenza vaccine hesitancy, 2005–2016. *PLoS ONE*. 2017;12(1):e0170550. doi:10.1371/journal.pone.0170550
11. Zheng L, Wu J, Zheng M. Barriers to and facilitators of human papillomavirus vaccination among people aged 9 to 26 years: a systematic review. *Sex Transm Dis*. 2021;48(12):e255-e262. doi:10.1097/OLQ.0000000000001407

12. Increase influenza vaccination coverage among your health care personnel. Centers for Disease Control and Prevention. https://www.cdc.gov/flu/toolkit/long-term-care/plan.htm. Accessed April 4, 2022.
13. Bach AT, Kang AY, Lewis J, Xavioer S, Portillo I, Goad JA. Addressing common barriers in adult immunizations: a review of interventions. *Expert Rev Vaccines*. 2019;18(11):1167-1185. doi:10.1080/14760584.2019.1698955
14. Poudel A, Lau ETL, Deldot M, Campbell C, Waite NM, Nissen LM. Pharmacist role in vaccination: evidence and challenges. *Vaccine*. 2019;37(40):5939-5945. doi:10.1016/j.vaccine.2019.08.060
15. American Society of Health System Pharmacists Council on Professional Affairs. ASHP guidelines on the pharmacist's role in immunization. *Am J Health Syst Pharm*. 2003;60(13):1371-1377. doi:10.1093/ajhp/60.13.1371
16. FIP vaccination handbook for pharmacists. International Pharmaceutical Federation. https://www.fip.org/file/5009. Accessed April 4, 2022.
17. Isenor JE, Edwards NT, Alia TA, et al. Impact of pharmacists as immunizers on vaccination rates: a systematic review and meta-analysis. *Vaccine*. 2016;34(47):5708-5723. doi:10.1016/j.vaccine.2016.08.085
18. Murray E, Bieniek K, del Aguila M, et al. Impact of pharmacy intervention on influenza vaccination acceptance: a systematic literature review and meta-analysis. *Int J Clin Pharmacol*. 2021;43(5):1163-1172. doi:10.1007/s11096-021-01250-1
19. Westrick SC, Patterson BJ, Kader MS, Rashid S, Buck PO, Rothholz MC. National survey of pharmacy-based immunization services. *Vaccine*. 2018;36(37):5657-5664. doi:10.1016/j.vaccine.2018.07.027
20. Edwards N, Gorman Corsten E, Kiberd M, et al. Pharmacists as immunizers: a survey of community pharmacists' willingness to administer adult immunizations. *Int J Clin Pharmacol*. 2015;37(2):292-295. doi:10.1007/s11096-015-0073-8
21. Alsabbagh MW, Wenger L, Raman-Wilms L, Schneider E, Church D, Waite N. Pharmacists as immunizers, their pharmacies and immunization services: a survey of Ontario community pharmacists. *Can Pharm J (Ott)*. 2018;151(4):263-273. doi:10.1177/1715163518779095
22. Isenor JE, Slayter KL, Halperin DM, Mcneil SA, Bowles SK. Pharmacists' immunization experiences, beliefs, and attitudes in New Brunswick, Canada. *Pharm Pract (Granada)*. 2018;16(4):1310. doi:10.18549/PharmPract.2018.04.1310
23. Blake EW, Blair MM, Couchenour RL. Perceptions of pharmacists as providers of immunizations for adult patients. *Pharmacotherapy*. 2003;23(2):248-254. doi:10.1592/phco.23.2.248.32083
24. Turcu-Stiolica A, Kamusheva M, Bogdan M, et al. Pharmacist's perspectives on administering a COVID-19 vaccine in community pharmacies in four Balkan countries. *Front Public Health*. 2021;9:766146. doi:10.3389/fpubh.2021.766146
25. Merks P, Religioni U, Bilmin K, et al. Readiness and willingness to provide immunization services after pilot vaccination training: a survey among community pharmacists trained and not trained in immunization during the COVID-19 pandemic in Poland. *Int J Environ Res Public Health*. 2021;18(2):599. doi:10.3390/ijerph18020599
26. 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 Pharmacol*. 2021;43(4):1139-1148. doi:10.1007/s11096-021-01301-7
27. An overview of pharmacy's impact on immunization coverage: a global survey 2020. International Pharmaceutical Federation. https://www.fip.org/file/4751. Accessed April 4, 2022.
28. Alqahtani AS, Bondagji DM, Alshehari AA, et al. Vaccinations against respiratory infections in Arabian Gulf countries: barriers and motivators. *World J Clin Cases*. 2017;5(6):212-221. doi:10.12998/wjcc.v5.i6.212
29. National immunization program. Ministry of Public Health. https://www.moph.gov.qa/health-services/Pages/national-immunization-program.aspx. Accessed April 4, 2022.
30. Pharmacies in Qatar current state. Healthcare Planning and Assessment Department. file:///C:/Users/maguyh/Downloads/Fact%20Sheet%20III%20-%20Pharmacies%20in%20Qatar.pdf. Accessed August 26, 2022.
31. Atkins L, Francis J, Islam R, et al. A guide to using the theoretical domains framework of behaviour change to investigate implementation problems. *Implement Sci*. 2017;12(1):77. doi:10.1186/s13012-017-0605-9
32. Birken SA, Powell BJ, Shea CM, et al. Criteria for selecting implementation science theories and frameworks: results from an international survey. *Implement Sci*. 2017;12(1):124. doi:10.1186/s13012-017-0656-y
33. Huijg JM, Gebhardt WA, Dusseldorp E, et al. Measuring determinants of implementation behavior: psychometric properties of a questionnaire based on the theoretical domains framework. *Implement Sci*. 2014;9(1):33. doi:10.1186/1748-5908-9-33
34. DeVellis RF. *Scale Development: Theory and Applications*. California: Sage Publications; 1991.
35. Pallant J. *SPSS Survival Manual: A Step by Step Guide to Data Analysis Using IBM SPSS*. 7th ed. Open University Press; 2020.
36. Taber KS. The use of Cronbach's alpha when developing and reporting research instruments in science education. *Res Sci Educ*. 2018;48(6):1273-1296. doi:10.1007/s11165-016-9602-2
37. Yemeke TT, McMillan S, Marciniak MW, Ozawa S. A systematic review of the role of pharmacists in vaccination services in low-and middle-income countries. *Res Social Adm Pharm*. 2021;17(2):300-306. doi:10.1016/j.sapharm.2020.03.016
38. An overview of current pharmacy impact on immunization: a global report. International Pharmaceutical Federation. https://www.fip.org/files/fip/publications/FIP_report_on_Immunisation.pdf. Accessed April 4, 2022.
39. FIP global vaccination advocacy toolkit. International Pharmaceutical Federation. https://ipapharma.org/wp-content/uploads/2020/09/FIP-VaccinationToolkit.pdf. Accessed April 4, 2022.
40. Youssef D, Abou-Abbas L, Hassan H. Exploring determinants of community pharmacist-led influenza vaccination in a Middle Eastern country: a national web-based cross-sectional study. *J Pharm Policy Pract*. 2021;14(1):77. doi:10.1186/s40545-021-00367-y
41. Pace AC, Flowers SK, Hastings JK. Arkansas community pharmacists' opinions on providing immunizations. *J Pharm Pract*. 2010;23(5):496-501. doi:10.1177/0897190010362105
42. Valiquette JR, Bédard P. Community pharmacists' knowledge, beliefs and attitudes towards immunization in Quebec. *Can J Public Health*. 2015;106(3):e89-e94. doi:10.17269/cjph.106.4880
43. Balkhi B, Aljadhey H, Mahmoud MA, et al. Readiness and willingness to provide immunization services: a survey of community pharmacists in Riyadh, Saudi Arabia. *Saf Health*. 2018;4(1):1-7. doi:10.1186/s40886-018-0068-y
44. Immunization competencies education program (ICEP). Ottawa (ON): Canadian Society of Hospital Pharmacists. http://www.cshp.ca/programs/onlineeducation/icepCourse_e.asp. Accessed April 4, 2022.
45. Pharmacy-based immunization delivery. American Pharmacists Association. https://www.pharmacist.com/Education/Certificate-Training-Programs/Immunization. Accessed April 4, 2022.
46. Hohmann LA, Hastings TJ, Ha DR, et al. Impact of a multi-component immunization intervention on pneumococcal and herpes zoster vaccinations: a randomized controlled trial of community pharmacies in 2 states. *Res Social Adm Pharm*. 2019;15(12):1453-1463. doi:10.1016/j.sapharm.2019.01.006
47. Hastings TJ, Hohmann LA, Huston SA, Ha D, Westrick SC, Garza KB. Enhancing pharmacy personnel immunization-related confidence,

perceived barriers, and perceived influence: the We Immunize program. *J Am Pharm Assoc*. 2020;60(2):344-351.e2. doi:10.1016/j.japh.2019.10.005

48. Westrick SC, Owen J, Hagel H, Owensby JK, Lertpichitkul T. Impact of the RxVaccinate program for pharmacy-based pneumococcal immunization: a cluster-randomized controlled trial. *J Am Pharm Assoc*. 2016;56(1):29-36.e1. doi:10.1016/j.japh.2015.11.010
49. Carroll PR, Chen Y, Vicheth P, Webber P, Hanrahan JR. Evaluation of a vaccination training program for pharmacy graduands in Australia. *Curr Pharm Teach Learn*. 2020;12(7):850-857. doi:10.1016/j.cptl.2020.02.016
50. Lau ETL, Rochin ME, DelDot M, Glass BD, Nissen LM. "There's no touching in pharmacy": training pharmacists for Australia's first pharmacist immunization pilot. *Can J Hosp Pharm*. 2017;70(4):281-287. doi:10.4212/cjhp.v70i4.1678
51. Islam JY, Gruber JF, Lockhart A, et al. Opportunities and challenges of adolescent and adult vaccination administration within pharmacies in the United States. *Biomed Inform Insights*. 2017;9:1178222617692538. doi:10.1177/1178222617692538
52. Hastings TJ, Hohmann LA, McFarland SJ, Teeter BS, Westrick SC. Pharmacists' attitudes and perceived barriers to human papillomavirus (HPV) vaccination services. *Pharmacy (Basel)*. 2017;5(4):45. doi:10.3390/pharmacy5030045
53. Koskan A, Vizcaino M, Brennhofer SA, Lee CD, Roberto AJ. Human papillomavirus vaccine administration behaviors and influences among Arizona pharmacists and pharmacy interns. *Hum Vaccin Immunother*. 2021;17(9):3090-3095. doi:10.1080/21645515.2021.1905469

How to cite this article: El Hajj MS, Al-Ziftawi N, Stewart D, Al-Khater DMAY. Community pharmacists' participation in adult vaccination: A cross-sectional survey based on the theoretical domains framework. *Br J Clin Pharmacol*. 2022; 1-14. doi:10.1111/bcp.15529