



Community pharmacist's knowledge towards the vaccination and their willingness to implement the community-based vaccination service in Malaysia

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ABSTRACT

To investigate the knowledge toward vaccination and community pharmacists' (CPs) willingness to implement vaccination services in Malaysia among them, a cross-sectional study was conducted using a validated questionnaire among CPs practicing in Selangor, Malaysia. A total of 218 CPs participated in this study, and half of them had moderate knowledge (50%) toward vaccination. The majority of them believed that implementation of such service could help to improve the coverage rate (88.6%), accessibility (84.4%), and they should be permitted to expand their practice (62.8%). Nearly 7 out of 10 (69.3%) expressed their willingness to provide vaccination services. Moreover, inadequate education and lack of support are identified as the most common barriers to providing the vaccination service. A significant difference was observed between the highest pharmacy education with knowledge level ($p = 0.01$) and attitude level ($p = 0.037$). Furthermore, a weak but significant positive correlation ($r = 0.209$; $p = 0.02$) was observed between knowledge and attitude scores. Malaysian CPs are willing to expand their scope of practice to include immunization services to the public. Policymakers may start to include pharmacists as vaccinators. However, implementation requires professional development and overcoming the perceived barriers to ensure service is effective for public benefits.

INTRODUCTION

Globally, immunization rates among adults dropping below the desired targets remain a significant public health concern. The rising threat of vaccine-preventable diseases and the underutilization of the immunization service in Malaysia remain a concern. According to the National Health and Morbidity Survey 2016, there were an increasing number of parents who chose not to vaccinate their children, with 637 cases in 2013 and 1,603 cases in 2016 (Panting, 2018) and with only 86.4% of children in Malaysia completing immunization coverage (Musa *et al.*, 2019), which was below the recommended coverage rate of 92%–95% (Tannous *et al.*, 2014). In addition, it was reported by the Ministry of Health

(MoH) that the number of measles cases in Malaysia had risen from 195 cases in 2013 to 1,934 cases in 2018 and this showed about a 900% increase over 5 years (WHO, 2019). Various factors contributed to underutilized vaccination services in Malaysia, such as low awareness about vaccination and its benefits, concern about its side effects, and preference for alternative medicine (Wan Taib *et al.*, 2017).

In 2019, the Malaysian Pharmaceutical Society (MPS) had proposed to include pharmacists to provide vaccination service in response to the failure to attain the target of the Measles Elimination Program in 2018. MPS believed that this action might help in expanding the public's accessibility to get their vaccine shot (Soon, 2019) and combating vaccine hesitancy which had been listed by the World Health Organization (WHO) as one of the top 10 threats worldwide in 2019 (WHO, 2019). However, the request from MPS was disregarded by the Malaysian Medical Association (MMA), emphasizing that there had been more than

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enough highly trained and experienced personnel to provide the vaccination service and pharmacists were not as well trained to give injections which would otherwise increase patients' risk of getting infections (Annuar, 2019).

In Malaysia, community pharmacists (CPs) are not certified healthcare providers in delivering vaccination services. However, they played an important role in educating the public on the importance of vaccination and might also get involved in reviewing patients' history and screening for patients who required vaccination (Allela, 2018). Vaccination services in Malaysia are mainly delivered by doctors through government and private hospitals and primary health clinics.

Vaccination provided by CPs was not new; it has been practiced in many countries such as Australia, Canada, New Zealand, the Philippines, the United Kingdom, and the United States (Rosado *et al.*, 2016). The literature showed that allowing CPs to become vaccinators contributed to various benefits such as improving the public's accessibility to vaccination service (Gerges *et al.*, 2018; Goad *et al.*, 2013b; Papastergiou *et al.*, 2014), improving vaccination coverage rate (Drozd *et al.*, 2017; Hattingh *et al.*, 2016; Isenor *et al.*, 2018b; Loughlin *et al.*, 2007; Scherzmann *et al.*, 2017; Usami *et al.*, 2009; Wang *et al.*, 2013), increasing the cost-effectiveness of vaccines (Prosser *et al.*, 2008; Singhal and Zhang, 2014), raising the awareness toward the importance of vaccination and dispelling the myths about vaccination (Goad, 2013a; Papastergiou *et al.*, 2014), providing patients with reminders to ensure they get the subsequent doses of vaccines (Warner *et al.*, 2013), and establishing collaboration with physicians (Blake *et al.*, 2003; Hurley *et al.*, 2011; Hurley *et al.*, 2014; Welch *et al.*, 2005). From the perspective of the public, there is a high level of satisfaction toward such service provided by community pharmacies due to factors such as long operating hours, strategic location, less waiting time, and availability of appointment booking provided by community pharmacies, which enhances their accessibility and convenience (Goad *et al.*, 2013b; Pilisuk *et al.*, 2010; Poulouse *et al.*, 2015; Warner *et al.*, 2013).

Community pharmacy-based vaccination services provided by CPs show numerous benefits including immunization education and provide a convenient and accessible option for the general public for receiving the immunization. There are many examples of CPs serving in these vaccinator roles with successful outcomes (Table 1).

It was unknown when such service would be implemented in Malaysia as authorizing CPs to become vaccinators was a controversial issue. Furthermore, CPs' willingness to expand their practice had not been discovered in Malaysia.

This study aimed to investigate the CPs' knowledge toward vaccination and their willingness to implement the community pharmacy-based vaccination service in Malaysia.

METHODOLOGY

Study design and setting

A cross-sectional study was conducted among CPs using a validated, self-administered questionnaire in the state of Selangor, Malaysia, from February to May 2020.

Participants and sample size calculation

A list of the total number of community pharmacies in the state of Selangor was retrieved from the website of the Pharmaceutical Service Division, MoH, Malaysia. There were 1,394 registered community pharmacies identified in the state of Selangor. We used Google Earth to locate pharmacies in 15 subdistricts and selected the community pharmacies based on ease of access to obtain a minimum of two community pharmacies from each subdistrict. Accordingly, there were a total of 427 community pharmacies spread across 15 subdistricts. According to an analysis report published by the MPS, the number of CPs who were practicing in Selangor and owned Type A licenses as of December 2018 was 910 (Tan, 2019). In this study, the sampling unit was CPs. Consequently, we invited only one pharmacist from pharmacies with more than one pharmacist. With a 5% margin of error, 95% confidence level, and 50% response distribution, the recommended sample size was 203 community pharmacies as calculated by the Raosoft calculator (Raosoft, 2004).

Inclusion and exclusion criteria

Only those pharmacists who met the inclusion criteria (Malaysian CP with Type A license practicing in Selangor, Malaysia, either as part-time, full-time or locum, and fully registered with the Malaysian Pharmacy Board) were enrolled. Both genders were included. Pharmacists who did not meet the inclusion criteria were excluded from this study.

Questionnaire development

The questionnaire was adopted from Edwards *et al.* (2015) and modified to suit the Malaysian population. The questionnaire consisted of 51 questions and was divided into 6 sections. In section A, pharmacists' sociodemographics (gender, age, area of practice, highest pharmacy qualification, job title, years of practice, and pharmacy setting) were recorded. Section B was about the knowledge toward the vaccination. CPs were asked to select one option from "true," "false," and "don't know" for each statement. Correct responses were scored as one (1) while incorrect and "don't know" responses were scored as zero (0). The scores for each respondent were summed up. A score of 50% or less (scores of 6 or less) was categorized as having a low knowledge level toward vaccination, those who scored 51%–74% (scores of 7–10) were categorized as "moderate level," and those who scored 75% and above (scores of 11 and above) were categorized as having a good knowledge level toward vaccination. Section C assessed CPs' awareness toward community pharmacy-based vaccination programs in other countries. In section D, the attitude of CPs toward the implementation of a community pharmacy-based vaccination program in Malaysia was evaluated by using a 5-point Likert scale of "strongly agree" to "strongly disagree." For positive statements, "strongly disagree," "disagree," "neutral," "agree," and "strongly agree" responses were given one (1), two (2), three (3), four (4), and five (5) marks, respectively. Reverse scoring was carried out to negative statements. A higher score indicated a better attitude toward the implementation of immunization services. Meanwhile, the last section, section E, also

used a 5-point Likert scale to address the key perceived barriers according to the percentage of CPs agreeing on statements.

Reliability and validity of the questionnaire

A pilot study was conducted with 35 CPs before data collection. Cronbach's alpha value obtained in the pilot test was 0.692, which was considered acceptable as it was very close to the recommended cutoff value of 0.7 (Taber, 2018).

The questionnaire used in this study was validated by nine CPs. The means of the item-content validity index (I-CVI) and scale-content validity index (S-CVI) were both found to be 0.91, and this result ensured the content validity of the questionnaire (Rodrigues *et al.*, 2017).

Data collection

Community pharmacies were approached by the principal investigator who invited the pharmacists to participate in the study. Before filling out the questionnaire, respondents were provided with an information sheet and consent form. Self-administered paper-based questionnaires were distributed to CPs by using the drop-off and pick-up method and collected back after 2 weeks. Upon completion, the questionnaire was checked for any missed response. In the case where a missed response

was detected, the participants were requested to fill in the missing response. Participation in this study was voluntary.

Data analysis

All data were analyzed descriptively and inferentially by using IBM Statistical Package for the Social Sciences (SPSS®) statistics for Windows, version 22.0. Independent *t*-test and one-way analysis of variance (ANOVA) test were used to analyze the differences between mean knowledge and attitude scores across various sociodemographics. Pearson's correlation coefficient analysis was conducted to measure the relationship between knowledge and attitude score, and these correlations were categorized into weak ($r = 0.10-0.29$), moderate ($r = 0.30-0.49$), and strong ($r = 0.5-1$) correlations as suggested by Cohen *et al* (2002). A *p*-value of <0.05 was considered statistically significant.

Ethical approval

The study received ethical approval from the Research Management Centre, MAHSA University (RMC/EC22/2020). Written consent was taken from each respondent before participation in the study. Confidentiality and anonymity of all respondents were maintained as no names were mentioned in the questionnaires.

Table 1. Benefits of community pharmacy-based vaccination: pharmacist as a vaccinator.

Author and year	Study design	Country	Findings
Drozd <i>et al.</i> , 2017	Retrospective	USA	There was an increase in vaccination rate within 10 years as a result of the implementation of pharmacist-administered influenza vaccine service with 32.2% in 2003 and this increased to 40.3% in 2013.
Loughlin <i>et al.</i> , 2007	Retrospective	USA	Vaccination rates increased significantly from 39% to 76% ($p < 0.0001$) after program implementation of pharmacist-managed influenza vaccination in high-risk populations.
Pilisuk <i>et al.</i> , 2010	Telephonic survey	USA	Feasible for the general public to walk in or to get a vaccination appointment and a convenient option for them to get their shots due to community pharmacy's strategic location and long operating hours.
Goat <i>et al.</i> , 2013b	Retrospective review	USA	Pharmacists administered 6,250,402 vaccinations, out of which 30.5% of the vaccine doses were provided during off clinic hours.
Papastergiou <i>et al.</i> , 2014	Cross-sectional study	Canada	Improved patients' accessibility and convenience to vaccination service and the majority reported being very satisfied (92%) and being very comfortable (86%) with being vaccinated in community pharmacies.
Hattingh <i>et al.</i> , 2016	Mixed-method	Australia	96.5% of pharmacies agreed that pharmacist-vaccination service helped to increase vaccination coverage rate, promote the professional image of the pharmacy, and expand the role of pharmacists. Furthermore, it was reported that 11.9% of influenza vaccinations were provided to patients who were eligible for influenza vaccination under the NIP but chose to have it from pharmacies due to convenience.
Warner <i>et al.</i> , 2013	Pharmacy-based survey and vaccination service	UK	The involvement of community pharmacies in the seasonal influenza vaccination program helped to increase vaccination rates and is associated with high levels of patient acceptability.
Atkins <i>et al.</i> , 2016	Retrospective study	UK	Administration of flu vaccines through pharmacies shows potential for improving convenience and cost-effectiveness for vaccine recipients. Moreover, general public support with CPs' role as vaccinators when compared to general practitioners.
Usami <i>et al.</i> , 2009	Cluster randomized trial	Japan	There were increases in the vaccination rate and decreases in the number of influenza patients where the vaccination rate in the intervention pharmacy group (81.6%) was significantly higher than that in the control pharmacy group (64.9%).

RESULTS

Sociodemographic data of the respondents

A total of 270 community pharmacies were approached. Only 218 pharmacists gave consent to participate in the study with a response rate of 80.7% (218/270). The majority of the respondents were female ($n = 130$; 59.6%) and Chinese ($n = 151$; 69.3%) with age between 20 and 29 years ($n = 119$; 54.6%). Most of them have bachelor's degrees ($n = 185$; 84.9%) as the highest pharmacy qualification with a duration of experience of 1–5 years ($n = 108$; 49.5%). Most of the community pharmacies were chain pharmacies ($n = 132$; 60.6%), followed by independent retail pharmacies ($n = 86$; 39.4%). The summary of the sociodemographic data is presented in Table 2.

Awareness toward a community pharmacy-based vaccination program

More than half of the pharmacists (58.3%) were aware of MPS both proposing to involve pharmacists in delivering vaccination services and that CPs in some other countries were allowed and certified to administer vaccinations. When CPs were asked on which countries had their CPs certified in delivering vaccination that they were aware of, the United Kingdom had the highest responses (36.7%), followed by Australia (33.9%), the United States (33.5%), New Zealand (17.4%), Canada (14.7%), the Philippines (5.5%), and Japan (2.3%) (Table 3).

Attitude toward the implementation of a community pharmacy-based vaccination program

The majority of the CPs agreed that the proportion of the population receiving immunizations would increase if CPs were permitted and trained to provide vaccination (88.6%) and the accessibility of the public to immunization service would be improved (84.4%). However, it was found that more than half of the CPs (55.5%) disagreed that CPs have received an adequate amount of training and learning on vaccination topics during their pharmacy studies. There was a greater number of CPs (62.8%) who believed that CPs should be permitted to expand their practice (62.8%) and there should be formal certification (87.1%). In addition, 36.7% of the CPs had a neutral attitude regarding the administration of vaccines as an easily learned technical skill. Moreover, it was demonstrated that a majority of CPs (87.2%) believed that they required additional learning and training before they could administer vaccines safely. A favorable attitude was also shown as there was only a minority of CPs (6%) who disagreed that the public would feel comfortable if CPs were vaccinators. However, a majority of CPs (78.5%) were not confident that they would be comfortable in providing vaccination even if they did not receive additional training and education. There were almost equal numbers of CPs who either agreed (36.7%) or were neutral (35.8%) regarding the improvement of the relationship between CPs and other vaccine providers, such as physicians. In addition, more than half of the CPs expressed their willingness to provide vaccination to the public (69.3%) and believed that the benefits outweighed the drawbacks if CPs were permitted to provide vaccination (66.5%). Table 4 summarizes the responses

Table 2. Sociodemographic data of the respondents ($n = 218$).

Sociodemographic data	<i>n</i> (%)
Gender	
Male	88 (40.4)
Female	130 (59.6)
Age (years)	
20–29	119 (54.6)
30–39	55 (25.2)
40–49	24 (11.0)
50 and above	20 (9.2)
Ethnicity	
Malay	46 (21.1)
Chinese	151 (69.3)
Indian	21 (9.6)
Highest pharmacy qualification	
Bachelor's	185 (84.9)
Master's	33 (15.1)
Job title in pharmacy	
Pharmacy owner	38 (17.4)
Pharmacy manager	43 (19.7)
Staff pharmacist	130 (59.6)
Locum	7 (3.2)
Years of practice	
Less than 1 year	32 (14.7)
1–5 years	108 (49.5)
6–10 years	30 (13.8)
11–20 years	30 (13.8)
21–30 years	13 (6.0)
More than 30 years	5 (2.3)
Practice site	
Independent pharmacy	86 (39.4)
Chain pharmacy	132 (60.6)

on the attitude toward the implementation of a community pharmacy-based vaccination program.

Perception toward the implementation of a community pharmacy-based vaccination program

Eight key perceived barriers were identified. The major perceived barrier was the inadequate level of training by CPs to administer vaccines (89.9%). Lack of support from the authorities (79.4%), resources cost (77.1%), the level of knowledge toward vaccination (76.6%), vaccination record practice (74.3%), the amount of time and effort for vaccination training and development (73.4%), concern for public's safety (70.2%), and lack of support from other vaccine providers (69.3%) were also found to be the main perceived barriers. Table 5 summarizes the responses on the perceived barriers toward the implementation of a community pharmacy-based vaccination program.

Table 3. Responses to the awareness toward a community pharmacy-based vaccination program.

	Statements	Yes	No
		<i>n</i> (%)	<i>n</i> (%)
1	Are you aware that in early 2019, the MPS voiced out on involving pharmacists in delivering vaccination?	127 (58.3)	91 (41.7)
2	Are you aware that CPs in other countries are certified to delivery vaccination service to the public?	127 (58.3)	91 (41.7)
	Please indicate the countries that you know where CPs are practicing vaccination delivery service (you may tick more than one):		
	United States	73 (33.5)	145 (66.5)
	United Kingdom	80 (36.7)	138 (63.3)
	Canada	32 (14.7)	186 (85.3)
3	New Zealand	38 (17.4)	180 (82.6)
	Australia	74 (33.9)	144 (66.1)
	Japan	5 (2.3)	213 (97.7)
	Philippines	12 (5.5)	206 (94.5)
	Othera	2 (0.9)	216 (99.1)

^aThe Netherlands, Denmark, Pakistan, South Africa, Argentina, Portugal, Ireland, and Switzerland.

Table 4. Responses to the attitude toward the implementation of a community pharmacy-based vaccination program.

Statements	Strongly agree <i>n</i> (%)	Agree <i>n</i> (%)	Neutral <i>n</i> (%)	Disagree <i>n</i> (%)	Strongly disagree <i>n</i> (%)
1 If CP were permitted to administer vaccines, the proportion of population who receive recommended immunizations would increase.	78 (35.8)	115 (52.8)	21 (9.6)	3 (1.4)	1 (0.5)
2 Patient access to vaccination services would be improved by permitting CPs to administer vaccines.	82 (37.6)	102 (46.8)	31 (14.2)	1 (0.5)	2 (0.9)
3 I received adequate teaching/training about vaccine during my pharmacy studies and training for me to deliver vaccination.	9 (4.1)	24 (11.0)	64 (29.4)	86 (39.4)	35 (16.1)
4 CP should be permitted to expand their practice to include administration of vaccines.	43 (19.7)	94 (43.1)	67 (30.7)	12 (5.5)	2 (0.9)
5 Formal certification in vaccine administration should be required for CPs.	91 (41.7)	99 (45.4)	24 (11.0)	2 (0.9)	2 (0.9)
6 Administration of vaccines is an easily learned technical skill.	29 (13.3)	67 (30.7)	80 (36.7)	36 (16.5)	6 (2.8)
7 CP requires additional training/education to be able to administer vaccines safely.	107 (49.1)	83 (38.1)	23 (10.6)	2 (0.9)	3 (1.4)
8 If CP were permitted to deliver vaccine, most of the population would feel comfortable receiving their recommended vaccinations from a CP.	43 (19.7)	102 (46.8)	60 (27.5)	10 (4.6)	3 (1.4)
9 With no additional training or education, I would feel comfortable administering vaccinations.	4 (1.8)	14 (6.4)	29 (13.3)	78 (35.8)	93 (42.7)
10 The relationship between CPs and other vaccine provider (e.g., physician) would improve if CP certified to administer vaccines.	37 (17.0)	80 (36.7)	78 (35.8)	14 (6.4)	9 (4.1)
11 I am willing to deliver vaccination to the public if I am permitted to.	52 (23.9)	99 (45.4)	52 (23.9)	10 (4.6)	5 (2.3)
12 The benefits outweigh the drawbacks if I am permitted to provide vaccination.	44 (20.2)	101 (46.3)	67 (30.7)	4 (1.8)	2 (0.9)

Knowledge toward vaccination and their attitude toward the implementation of a community pharmacy-based vaccination program

The findings from the current study show that half of the participating CPs (50%) in this study had a moderate level of knowledge toward vaccination. Furthermore, almost all the CPs (95.5%) had a good attitude toward the implementation of a community pharmacy-based vaccination program in Malaysia (Table 6).

Difference between sociodemographics with knowledge and attitude level

Based on Table 6, there was a significant difference in the knowledge score based on the highest pharmacy education ($p = 0.01$) where CPs with master's degrees had a significantly higher knowledge level when compared to CPs with bachelor's degrees. In addition to that, there was a significant difference in the attitude score based on the highest pharmacy education ($p = 0.037$) where CPs with master's degrees had a significantly better attitude when compared to CPs with bachelor's degrees.

Correlation between knowledge and attitude level

The attitude of CPs toward the implementation of a community pharmacy-based vaccination program was found to be weak but significantly positively correlated with their knowledge toward vaccination ($r = 0.209$, $n = 218$, $p = 0.002$) (Table 7).

DISCUSSION

Knowledge toward vaccination

This study assesses the CPs' knowledge toward the vaccination and their attitude and perception in the implementation of vaccination service in community pharmacy. It has been reported that a low level of knowledge regarding immunization led to a reluctance to receive vaccination (Abdullah *et al.*, 2016; Azhar *et al.*, 2012; Panting, 2018). CPs' knowledge on immunization was crucial as CPs had the task to educate the public regarding immunization, and a higher level of knowledge could help in facilitating this role and improving the immunization coverage of the nation (Della Polla *et al.*, 2020). Studies have proved that educational intervention helped to improve public knowledge and change their perception toward vaccines (Awadh *et al.*, 2014; Tony *et al.*, 2014). This was supported by two studies, which revealed a positive correlation between knowledge level and intention to provide pharmacy-based vaccination service (Luthin *et al.*, 2011; Ongpoy, 2017).

Attitude toward the implementation of a community pharmacy-based vaccination program

In our study, the majority of CPs (>80%) agreed that CPs could help in improving vaccination coverage and the public's accessibility to get their vaccination. The literature had abundant data that proved that as vaccine providers CPs improved the vaccination coverage rate and the expanded accessibility toward vaccination, and this contributed to the increase in vaccination rate (Drozd *et al.*, 2017; Isenor *et al.*, 2018a; Loughlin *et al.*, 2007; Schwerzmann *et al.*, 2017; Usami *et al.*, 2009; Wang *et al.*, 2013). With the overloaded MoH's public clinic, the public might seek places which were more convenient and accessible. Accessibility was the key determinant factor for patients to choose a community pharmacy as the site of

vaccination, and this factor of convenience was reported in other studies (Gerges *et al.*, 2018; Papastergiou *et al.*, 2014).

The findings from the current study also revealed that more than half of the CPs disagreed that they had an adequate amount of education and training (55.5%) and they were well prepared for the provision of vaccination service (78.5%) which was in line with Edwards *et al.*'s (2015) study where 59% of their CPs responded the same way. Hence, to implement such service in Malaysia, CPs would need to be trained to become proficient in administering vaccination. Various immunization training programs had been implemented in Canada showing positive results as 97% of the participating pharmacists expressed more preparedness to provide such vaccination service (Edwards *et al.*, 2015).

Moreover, this study showed a greater number of CPs (62.8%) believed that they should be permitted to expand their practice. This result was almost similar to Edwards *et al.* (2015) where 68% of their CPs responded the same way. The reason CPs looked for expanding their roles could be due to their existence in the community, the trust placed in them by the community, their communication skills, their experience in handling different types of patients, and their knowledge of preventive care (Alsabbagh *et al.*, 2018). In addition, the majority of the CPs in our study was shown to be more neutral toward the idea that vaccination administration could be easily learned. The literature shows that CPs are capable of learning and providing safe vaccines administration. During a 2-month period of time, newly trained CPs had administered a total of 343 doses of vaccines, and no adverse events were reported (Ernst *et al.*, 1997). From the perspective of patients, two studies had revealed that patients were satisfied with CPs' injection technique (Papastergiou *et al.*, 2014; Poulouse *et al.*, 2015).

There were almost equal numbers of CPs who either agreed (36.7%) or were neutral (35.8%) regarding the improvement of the relationship between CPs and other vaccine providers. One study had shown that most physicians agreed that it was helpful to have pharmacists share the role of vaccinators (Hurley *et al.*, 2014). However, it was also found that GPs were less supportive with pharmacists taking on the role of vaccinators due to the concern of reduced healthcare quality, the safety of vaccine recipients, pharmacists' financial losses (Atkins *et al.*, 2016), and ineffective documentation (Orenstein and Schaffner, 2008).

In terms of willingness, 69.3% of the CPs in our study expressed their willingness to provide vaccination service if they were permitted to. This result was similar to a study conducted in Saudi Arabia where 55% of the CPs expressed their willingness to provide vaccination service and the remaining 45% of CPs expressed their concern about patients' safety and their inadequate amount of training in vaccination practice (Balkhi *et al.*, 2018). A study had found that CPs who participated in immunization-related educational programs expressed a greater willingness to provide immunization-related activities (Madhavan *et al.*, 2001). As this study found a greater percentage of CPs with the willingness to provide vaccination (69.3%), it could be due to the current coronavirus disease 2019 (COVID-19) pandemic that, as the frontliners, CPs might feel that they had greater responsibility in contributing to public health.

The current study also found that the highest pharmacy education degree had a significant difference with the attitude

Table 5. Perceived barriers toward implementation of a community pharmacy-based vaccination program.

Statements	Strongly agree <i>n</i> (%)	Agree <i>n</i> (%)	Neutral <i>n</i> (%)	Disagree <i>n</i> (%)	Strongly disagree <i>n</i> (%)
1 Lack of support from authorities (e.g., Malaysian National Immunization Program).	49 (22.5)	124 (56.9)	38 (17.4)	6 (2.8)	1 (0.5)
2 The level of knowledge by CPs toward vaccination.	40 (18.3)	127 (58.3)	39 (17.9)	10 (4.6)	2 (0.9)
3 Recourses cost (e.g., pharmacists' and staff time, vaccine and supplies).	39 (17.9)	129 (59.2)	31 (14.2)	18 (8.3)	1 (0.5)
4 Inadequate level of training to administer vaccine.	66 (30.3)	130 (59.6)	14 (6.4)	5 (2.3)	3 (1.4)
5 Lack of interest of the public toward community pharmacy-based vaccination service.	31 (14.2)	91 (41.7)	60 (27.5)	30 (13.8)	6 (2.8)
6 Criticism and lack of support from other vaccine providers (e.g., physician).	54 (24.8)	97 (44.5)	56 (25.7)	8 (3.7)	3 (1.4)
7 Cost and time associated with professional development and training.	42 (19.3)	118 (54.1)	35 (16.1)	19 (8.7)	4 (1.8)
8 The amount of pharmacy space to administer and store vaccines.	41 (18.8)	93 (42.7)	43 (19.7)	33 (15.1)	8 (3.7)
9 Uncomfortable in dealing with needles and blood.	21 (9.6)	68 (31.2)	70 (32.1)	46 (21.1)	13 (6.0)
10 Concern on the safety of vaccine recipients.	38 (17.4)	115 (52.8)	46 (21.1)	12 (5.5)	7 (3.2)
11 CPs have high level of interest to expand their scope of practice to include vaccination.	31 (14.2)	98 (45.0)	75 (34.4)	10 (4.6)	4 (1.8)
12 Insufficient among of staffs and resources to implement.	31 (14.2)	114 (52.3)	44 (20.2)	21 (9.6)	8 (3.7)
13 The level of trust toward CPs as vaccinator by the public.	36 (16.5)	111 (50.9)	46 (21.1)	17 (7.8)	8 (3.7)
14 It requires standard record keeping practice.	60 (27.5)	102 (46.8)	40 (18.3)	9 (4.1)	7 (3.2)

Table 6. Level of knowledge toward vaccination and their attitude toward the implementation of a community pharmacy-based vaccination program in Malaysia.

Variables	Total score	<i>n</i> (%)	Mean (SD)
Knowledge			7.52 (±2.57)
Poor	0–6	81 (37.2)	
Moderate	7–10	109 (50.0)	
Good	11–14	28 (12.8)	
Attitude			46.76 (±6.17)
Poor	12–36	10 (4.6)	
Good	37–60	208 (95.5)	

of the CPs. Moreover, CPs' knowledge toward vaccination had a significant positive correlation with their attitude in the implementation of community-based vaccination service. These results were in line with a previous study where a significant positive correlation with the level of preparedness to provide vaccination service and pharmacy education was found where those who completed the master's or Ph.D. program expressed greater preparedness (Ongpoy, 2017). In addition, a similar positive correlation was also found between pharmacy students' intention to provide pharmacy-based immunization service and their knowledge score (Luthin *et al.*, 2011).

Perceived barriers toward implementation of community pharmacy-based vaccination program

Among the perceived barriers, the four most common barriers toward the vaccination services perceived by CPs

were “inadequate level of training,” “lack of support from the authorities,” “resources cost,” and “lack of knowledge on vaccination topic.”

An inadequate level of training was perceived as an important barrier. The literature shows that CPs who did not undergo training were more likely to report a lack of training as a barrier (Kummer and Foushee, 2008) and there should be continuous training and education for implementing a community pharmacy-based vaccination program (Balkhi *et al.*, 2018; Valiquette and Bédard, 2015).

Lack of support from the authorities was the second top perceived barrier (79.4%). MPS's proposal to include pharmacists for the provision of vaccination service was not approved by MoH (Pearl, 2019). In 2016, FIP published a global report and pointed out that there were 13 countries that already had authorized CPs as vaccinators which included Argentina, Australia, Canada, Costa Rica, Denmark, Ireland, New Zealand, the Philippines, Portugal, South Africa, Switzerland, the UK, and the USA (Rosado *et al.*, 2016). These countries had acknowledged the potential benefit of allowing pharmacists to provide vaccine service to the community.

Resources cost was the top third perceived barrier (77.1%). Several studies had identified lack of reimbursement as a barrier (Edwards *et al.*, 2015; Hastings *et al.*, 2017; Kamal *et al.*, 2003; Kummer and Foushee, 2008; Westrick *et al.*, 2018). This barrier can be addressed by adequate reimbursement. In the United States, pharmacists obtained reimbursement from Medicare under the current fee schedule (Hartzell, 2017), whereas, in Ontario, an amount of \$7.50 would be reimbursed by the government for the administration cost of each vaccine injection (Ministry of Health, 2015).

Table 7. Differences between mean knowledge and attitude score across various sociodemographics and correlation with knowledge and attitude score ($n = 218$).

Sociodemographics	Knowledge score		Attitude score	
	Mean (SD)/Pearson correlation, r	p value	Mean (SD)	p value
Attitude score	0.209	0.002**^s		
Gender				
Male	7.54 (\pm 2.80)	0.916 ^s	47.57 (\pm 5.51)	0.112 ^s
Female	7.51 (\pm 2.41)		46.22 (\pm 6.54)	
Age (years)				
20–29	7.34 (\pm 2.75)	0.263 [‡]	46.25 (\pm 6.51)	0.306 [‡]
30–39	8.03 (\pm 2.37)		47.98 (\pm 5.69)	
40–49	7.00 (\pm 2.17)		47.29 (\pm 6.50)	
50 and above	7.80 (\pm 2.31)		45.80 (\pm 4.60)	
Ethnicity				
Malay	6.78 (\pm 2.48)	0.058 [‡]	47.48 (\pm 5.65)	0.630 [‡]
Chinese	7.79 (\pm 2.60)		46.50 (\pm 6.50)	
Indian	7.24 (\pm 2.28)		47.05 (\pm 4.70)	
Area of practice				
Subang	7.21 (\pm 2.52)	0.875 [‡]	47.08 (\pm 5.01)	0.135 [‡]
Cyberjaya	7.50 (\pm 2.38)		46.50 (\pm 5.97)	
Cheras	7.68 (\pm 2.68)		45.63 (\pm 7.35)	
Kajang	6.84 (\pm 2.79)		48.11 (\pm 4.97)	
Petaling Jaya	7.79 (\pm 2.10)		47.33 (\pm 6.29)	
Serdang	8.40 (\pm 2.61)		44.20 (\pm 7.33)	
Bangi	7.50 (\pm 3.63)		47.20 (\pm 5.83)	
Jenjarom	9.20 (\pm 3.03)		52.40 (\pm 4.98)	
Puchong	7.61 (\pm 2.48)		46.39 (\pm 4.98)	
Shah Alam	7.07 (\pm 2.40)		45.75 (\pm 5.94)	
Klang	7.67 (\pm 3.50)		50.17 (\pm 6.27)	
Sepang	7.50 (\pm 2.08)		48.50 (\pm 6.03)	
Banting	7.00 (\pm 0.00)		45.50 (\pm 6.36)	
Gombak	9.50 (\pm 4.95)		49.50 (\pm 9.19)	
Sungai Buloh	9.50 (\pm 3.54)		34.00 (\pm 15.56)	
Highest pharmacy qualification				
Bachelor's	7.34 (\pm 2.55)	0.010**^s	46.39 (\pm 5.96)	0.037**^s
Master's	8.56 (\pm 2.46)		48.81 (\pm 6.97)	
Job title in pharmacy				
Pharmacy owner	7.34 (\pm 2.00)	0.666 [‡]	47.26 (\pm 5.62)	0.832 [‡]
Pharmacy manager	7.93 (\pm 2.59)		47.28 (\pm 8.37)	
Staff pharmacist	7.42 (\pm 2.72)		46.46 (\pm 5.46)	
Locum	7.86 (\pm 2.41)		46.43 (\pm 6.75)	

Continued

Sociodemographics	Knowledge score		Attitude score	
	Mean (SD)/Pearson correlation, <i>r</i>	<i>p</i> value	Mean (SD)	<i>p</i> value
Years of practice				
Less than 1 year	6.81 (±2.66)	0.466 [‡]	46.25 (±5.10)	0.912 [‡]
1–5 years	7.64 (±2.81)		46.74 (±6.72)	
6–10 years	8.00 (±1.89)		47.57 (±6.18)	
11–20 years	7.20 (±2.38)		47.13 (±5.96)	
21–30 years	8.00 (±2.20)		46.31 (±5.66)	
More than 30 years	7.40 (±1.52)		44.60 (±3.21)	
Practice site				
Independent pharmacy	7.27 (±2.27)	0.219 [§]	46.86 (±5.09)	0.849 [§]
Chain pharmacy	7.69 (±2.75)		46.70 (±6.80)	

***p*-value < 0.05 denotes statistical significance.

[§]Independent *t*-test.

[‡]One-way ANOVA.

[§]Pearson's correlation.

Lack of knowledge on vaccination topics was another perceived barrier (76.6%). The literature shows a positive correlation between knowledge level and CPs' intention to provide vaccination service (Luthin *et al.*, 2011; Ongpoy, 2017). Thus, this suggests knowledge level needs to be improved before implementing such service in Malaysia. Pharmacists in Saudi Arabia had not been granted the authority to administer vaccination; the majority of them (95.2%) reported that continuous professional education is an important factor for the implementation of CPs administered vaccination service (Balkhi *et al.*, 2018).

Record practices associated with vaccination were perceived as barriers (74.3%). Documentation was an important component in the process of immunization. It was reported that a minority of pharmacists document the information following the vaccination process into the regional immunization registry (Westrick *et al.*, 2018) and GPs were concerned with the probability of incomplete documentation of patient data by pharmacists (Atkins *et al.*, 2016; MacDougall *et al.*, 2016; Orenstein and Schaffner, 2008). The amount of time and effort associated with vaccination training was perceived as a barrier (73.4%). This perceived barrier was a concern to CPs as they were concerned about the lack of time for patient care after incorporating immunization practice, especially for chain pharmacies where there are a huge number of dispensing activities per day and the profitability depends on the prescription volume (Madhavan *et al.*, 2001).

Concern for public safety was another main perceived barrier (70.2%). An association was found between the level of comfort in providing vaccination and the level of training (Akala and Powers, 2005); thus, training should be provided before CPs provide vaccination. The literature shows that CPs who were trained were capable of providing safe vaccine administration with only 3 cases of adverse events reported from 100,000 doses of vaccine administered (Capurso and Powers, 2006). Lack of support from other vaccine providers was perceived as a barrier (69.3%). In Malaysia, the proposal to include pharmacists as vaccinators was refused by MMA stating that pharmacists were not well trained

(Anuar, 2019). A similar case was shown in Australia (Haggan, 2018) and Canada (MacDougall *et al.*, 2016). The reduction of income sources was the reason for GPs' opposition in the UK (Francis and Hinchliffe, 2010).

Study limitation

This study has some limitations. First, the study location was one of the limitations as this study was only conducted in 15 areas in Selangor; hence, the study design was a cross-sectional survey. Thus, the findings might be difficult to be generalized to all of Selangor's CPs. Second, the COVID-19 pandemic had limited the data collection process, hence yielding a smaller number of respondents. Third, our study was conducted at a specified time. Last, bias from the respondents when answering the questionnaires was also possible due to their busy workload in the community pharmacy during the COVID-19 pandemic. Although the findings from this study did not represent the data of the whole country, it could serve as a baseline study for future larger studies to investigate CPs' willingness and acceptability for the provision of community-based vaccination service before implementing such service in Malaysia.

CONCLUSION

The majority of the CPs had a moderate knowledge toward vaccination. Most of them had a positive attitude in the implementation of community-based immunization service which could help to improve the coverage rate of the nation, improving the public's accessibility and resilience to the public health system. CPs can also provide additional services such as vaccination information, vaccination reminders, and identification of the high-risk group. Seven out of 10 CPs expressed their willingness to provide vaccination service. Government and policymakers may consider reforming the national immunization program (NIP) to include pharmacists as vaccination providers. The perceived barriers should be addressed before the expansion of CPs' roles as vaccinators for successful vaccination services in Malaysia.

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CONFLICT OF INTEREST

The authors declared no potential conflicts of interest.

AUTHOR CONTRIBUTIONS

All authors made substantial contributions to the conception and design, acquisition of data, or analysis and interpretation of data; took part in drafting the article or revising it critically for important intellectual content; agreed to submit to the current journal; gave final approval of the version to be published; and agreed to be accountable for all aspects of the work. All the authors are eligible to be authors as per the International Committee of Medical Journal Editors (ICMJE) requirements/guidelines.

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