Original Research Article

Knowledge, Attitude and Practice Towards the Application of Point-Of-Care Pharmacogenotyping Service Among Community Pharmacists in Malaysia

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ABSTRACT

Point-of-care pharmacogenetic testing (POCT) is a method employed by hospitals and community pharmacies for the detection of a patient's genetic profile related with drug response variability. The pharmacogenetic POCT has contributed significantly to the optimization of individualised medication therapy for patients. This strategy is extensively utilised in community pharmacies throughout developed nations, although Malaysia has yet to adopt it. The purpose of this study was to evaluate the knowledge, attitude, and practice of community pharmacists on the use of pharmacogenetic POCT in clinical practice. A cross-sectional study was conducted using a web survey comprising 36 items, with a response rate of 9.17% from 52 community pharmacists. The majority of respondents, predominantly females aged 31 to 40, exhibited diverse educational backgrounds and years of pharmacy practice. The study revealed a substandard level of knowledge, as indicated by a median score of 1. Despite this, participants displayed a positive attitude and eagerness to implement pharmacogenetic POCT in community settings. Notably, a statistically significant correlation was observed between knowledge and age (p=0.020), highlighting the need for targeted educational programs and training on pharmacogenomic POCT and its clinical application. To facilitate the optimal integration of this service locally, it is imperative to prioritize educational initiatives that enhance the understanding and application of pharmacogenetic POCT among community pharmacists. Addressing this knowledge gap can potentially revolutionize medication therapy, fostering a more personalized and effective approach to patient care.

Keywords: Point-of-care test, community pharmacist, knowledge, attitude, practice

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1.0 Introduction

The rise of molecular technology has aided in the creation of recombinase polymerase amplification as a point-of-care testing (POCT) instrument to detect genetic mutation related with a specific gene. Numerous developing nations utilise pharmacogenetic POCT due to its ease and rapid availability of results. Pharmacogenetic POCT represents a paradigm shift from conventional practices by introducing a personalized and genetically informed approach to medication therapy. It addresses the limitations of trial-and-error methods and population-based guidelines, offering a more tailored and effective healthcare strategy (1). Clinical practices incorporating POCT testing encompass various applications, such as predicting and ensuring the safety of antibiotics, optimizing anti-coagulants and antiplatelets for patients with medical needs, and contributing to research in the field of cancer. In 2018, the Malaysia Ministry of Health strategically delineated a three-phase plan for pharmaco-genomic POCT. This comprehensive plan includes: i) establishing data infrastructure and genomic sequencing, ii) implementing data analytics and integration, and iii) developing personalized health and wellness solutions. As a result of this initiative, numerous emerging healthcare facilities (2) have embraced the adoption of such services, offering patients a multitude of benefits, including improved treatment response, avoidance of adverse effects, prediction of risk assessments, and support for lifestyle modifications (2). According to Bannur *et al*., Malaysian healthcare professionals have a high level of anticipation for the future application of pharmacogenomics in clinical practice (3). In addition, community pharmacists claimed that the use of pharmacogenetic POCT has been demonstrated to save time (4). As a result, quick analysis is possible as opposed to waiting hours or days for test findings. This perfect POCT for genetic testing is also cost-effective and permits a rapid clinical choice for pharmacological therapy (5). In the United States, the use of pharmacogenetic POCT is expanding in the field of mental health. Collaboration between the Goodrich Pharmacy with local independent practitioners, such as Arden Woods Psychological Services and the Minnesota Clinic of Health and Wellness, has made patient referrals more efficient (6). However, the implementation of a clinical decision support systeM is urgently required to assist pharmacists with drug therapy management (7). Although the implementation of POCT is diversifying in other nations, the understanding, attitude, and practices of community pharmacists in Malaysia about POCT pharmacogenotyping services remain questionable. In light of the fact that POCT pharmacogenetic testing is a more efficient, cost-effective, and time-saving method, the outcomes of this study would contribute to the improvement of the Malaysian healthcare system. In Malaysia, it was revealed that pharmacists' knowledge of pharmacogenomics ranged from inadequate to intermediate, but they had a favourable attitude toward the future application of pharmacogenomics in clinical practice (3). Despite the numerous local studies completed on the knowledge, attitude, and practice of pharmacogenomics in Malaysia, no study has been reported on the implementation of the pharmacogenetic POCT, one of the techniques in pharmacogenomics. Hence, the primary aim of this research is to evaluate the knowledge, attitude, and practices of community pharmacists in Malaysia concerning the adoption of POCT pharmacogenotyping services. An evaluation of the knowledge, attitudes, and practices of community pharmacists will shed light on their preparedness to potentially incorporate POCT

approach in future, to enhance optimization of patient drug therapy, as suggested by the findings of this study.

2.0 Materials and methods

2.1 Design of the study

A descriptive, cross-sectional study was conducted among community pharmacist in Malaysia. Stratified random sampling was used as a sampling technique to assess the knowledge, attitude and practice among community pharmacist in Malaysia. The study was conducted over 3 months between April 2020 until June 2020.

2.2 Study population and sample

Based on the local publication published on 22 February 2019, the total population of community pharmacist in Malaysia was approximately 5000 (8). The sample size to make the study valid is 357 samples, calculated by using Krejcie and Morgan Formula (1970). The inclusion criteria comprised of fully registered pharmacists (RPh) currently working in a community pharmacy. Respondents practicing in a hospital setting and those providing incomplete answers in the questionnaire were excluded. Community pharmacists were recruited through an online web survey distributed primarily via email and the Malaysian Pharmaceutical Society. Various social media platforms, including Facebook and Twitter, were utilized to promote the online survey among community pharmacists in Malaysia. Reminders were sent to respondents every three weeks. The consent form, which includes details of the research, was embedded on the first page of the online web survey. Community pharmacists who agreed to participate in the study had to sign the consent form before proceeding to answer the remaining questions in the questionnaire. No personal identifiers were included in the form.

2.3 Measurement Tool

The questionnaire was derived and adapted from prior research, after which it underwent validation to align with contemporary practices. It was comprised of four English-language sections. The final survey comprised a total of 36 inquiries, all of which were mandatory for the participants to answer. The respondents' demographic information, including age, gender, race, years of pharmacy practice, and highest educational attainment, was included in Section 1. Section 2 comprised a set of ten inquiries designed to assess the respondents' comprehension of the POCT pharmaco-genotyping service. The purpose of the ten questions in section 3 was to assess the opinions of respondents regarding the POCT pharmacogenotyping service. Ten questions comprise Section 4 concerning the level of acceptance for the provision of POCT pharmacogenotyping services in Malaysia. The responses were assessed using a Likert scale consisting of five points: strongly disagree, disagree, agree, neutral, and strongly agree. Four lecturers from the Department of Pharmacy Practice, Faculty of Pharmacy, UiTM Puncak Alam, Selangor, Malaysia conducted the validation process for the questionnaire. A pilot study was undertaken involving a sample of 30 community-practicing pharma-cists. In order to meet the criteria of the Cronbach's alpha reliability test score (>0.7), the questions were modified. Each domain (knowledge, attitude, and practice) had a Cronbach's alpha of 0.916, 0.886, and 0.883, respectively. The ultimate survey is divided into four sections: sociodemographic information, knowledge, attitude, and practice regarding the utilisation of the POCT pharmacogenotyping service; and practice.

2.4 Statistical Analysis

The questionnaires that were collected were analysed using version 25 of the Statistical Package for the Social Sciences (SPSS). The descriptive analysis was employed to summarise the nominal sociodemographic data, which included age, gender, race, years of pharmacy practice, and highest education level. The results were presented in the form of frequencies and percentages. The data were assessed for normality using Shapiro-Wilk tests. In order to assess the participants' understanding of pharmacogenetic POCT, each respondent was assigned a total score: one point was deducted for each accurate response, while an incorrect answer received no points. The overall scores for knowledge were classified into three distinct levels: high (9-12), moderate (5-8), and poor (0-4). In order to analyse the relationship between sociodemographic data and the domains of knowledge, attitude, and practice, the Mann-Whitney U test and Kruskal-Wallis test were applied to the non-normal data. A p-value less than 0.05 was deemed to indicate statistical significance.

3.0 Results

A total of 567 community pharmacists throughout Malaysia were engaged to participate in the study. There were 55 participants responded but three of them were discarded from the study due to incomplete answers to the survey which gave the response rate of 9.17% (52 respondents). The demographic data of the respondents are shown in Table 1.

Table 1: Respondents' demographic data (n=52)

Variable		**Frequency (%)**
Gender	Male	25 (48.1)
	Female	27 (51.9)
Age	20-30	8 (15.4)
	31-40	28 (53.8)
	41-50	11 (21.2)
	51-60	4 (7.7)
	>60	1 (1.9)
Race	Malay	38 (73.1)
	Chinese	13 (25.0)
	Indian	1(1.9)
Education Level	Bachelor's Degree	48 (92.3)
	Master's Degree	4 (7.7)
	Doctorate Degree	0 (0)
	Others	0 (0)
Number of years of practice	<1	1 (1.9)
	1-5	17 (32.7)
	6-10	12 (23.1)
	>10	22 (42.3)

3.2 Knowledge towards the application of POCT pharmacogenotyping service

As indicated in Table 2, the majority of participants (90.4 percent) provided an accurate response when asked whether POCT refers to a laboratory test that can be conducted in close proximity to the patient or at their bedside. The majority of participants (86.5 percent) were adequately informed about the purpose of the POCT pharmaco-genotyping service, which is to identify genetic mutations linked to particular drug-metabolizing enzymes (n=45). In addition, while the majority of respondents (n=33, 63.5 percent) were aware that operating the POCT does not necessitate any special abilities or sophisticated equipment, a considerable number of them were unaware (n=19, 36.5 percent). Although a considerable proportion of the respondents (n=15, 28.8 percent) were not acquainted with POCT, a majority (n=37, 71.2 percent) were cognizant of its meaning and appearance. The majority of participants (86.5 percent) expressed satisfaction with the ease of use of POCT instruments, which are portable, handheld, and transportable, in relation to the detection of genetic mutations (n=45). Furthermore, the technical aspects of POCT, including the source of the patient's DNA (n=43, 82.7 percent) (n=9, 17.3%), an appropriate temperature for conducting the procedure (n=38, 73.1 percent) (n=14, 26.9 percent), the reagents utilised and their storage conditions to facilitate the POCT (n=45, 86.5 percent) (n=7, 13.5%), and the approximate turnaround time for receiving the POCT result (n=7, 13.5%), elicited mixed responses for both correct and incorrect answers. Although the majority of respon-dents (n=46, 88.5 percent) acknowledged that the ultimate purpose of POCT is to deliver prompt clinical results for the purpose of individualising patient treatment, 11.5 percent of them refuted this claim. As shown in Table 3, community pharmacists possess a deficient level of understanding concerning the implementation of pharmacogenetic POCT, as evidenced by median knowledge score of 1.

Table 2: Respondents' knowledge towards the application of POCT pharmacogenotyping service

Questions	Number of respondents (%)	
	Yes	No
POCT is a term used to describe a laboratory test that can be performed at the bedside or near the patient	47 (90.4)	5(9.6)
POCT is used in the detection of genetic mutations associated with specific drug-metabolizing enzyme	45 (86.5)	7 (13.5)
Running a POCT testdoes not require specialized skill and complex instrumentation	33 (63.5)	19 (36.5)
POCT resemble the concept and appearance of urine pregnancy test	37 (71.2)	15 (28.8)
POCT is transportable, portable and handheldinstruments for genetic mutation detection	45 (86.5)	7 (13.5)
The source of patient's DNA is obtained from the finger pricking procedure	43 (82.7)	9 (17.3)
POCT pharmacogenetic testing is	38 (73.1)	14 (26.9)

best conducted attemperature of 37˚C		
POCT and its reagents must be kept in its original sealed packaging and stored between 10°C-25°C	45 (86.5)	7 (13.5)
POCT result turnaround time is approximately 10 minutes	40 (76.9)	12 (23.1)
The ultimate goal of POCT is to provide a quick clinical result to allow personalized treatments given to the patient according to their genetic profile	46 (88.5)	6 (11.5)

Table 3: Respondent's total knowledge score (median)

Variables		**Median**	**N**	**SD**	**P value**
Gender	Male	1.00	25	0.277	0.707
	Female	1.00	27	0.320	
Age	20-30	1.00	8	0.354	0.020
	31-40	1.00	28	0.262	
	41-50	1.00	11	0.000	
	51-60	1.00	4	0.500	
	>60	-	1	0.000	
Race	Malay	1.00	38	0.343	0.368
	Chinese	1.00	13	0.298	
	Indian	-	1	0.000	
Numberof yearsof practice	<1	-	1	0.000	0.789
	1-5	1.00	17	0.243	
	6-10	1.00	12	0.389	
	>10	1.00	22	0.294	
Education level	Bachelor'sDegree	1.00	48	0.309	0.501
	Master'sDegree	1.00	4	0.298	

3.3 Attitude towards the application of POCT pharmacogenotyping service

The same number of respondents (n=19, 36.5 percent) expressed agreement or neutrality (median=4, IQR=2) with regard to the notion that the POCT pharmacogenotyping service has the potential to enhance the efficacy of drugs (Table 4). The majority of respondents held a neutral stance on the POCT pharmacogenotyping service, which has the potential to reduce the expenses associated with the development of novel pharmaceuticals. A total of 19 respondents (36.5 percent) expressed agreement, with 18 strongly agreeing (34.6 percent), that they were concerned about unauthorised individuals gaining access to the genetic result of the patient (median=4, IQR=2). In ensuring drug safety throughout medication therapy, the majority of respondents (n=28, 53.8 percent) (median=4, IQR=1) believed that POCT pharmacogenotyping services are crucial. A consensus was reached among the majority of participants that the POCT pharmacogenotyping service would effectively decrease adverse drug reactions (ADRs) in drug therapy (n=25, 48.1 percent) (median=4, IQR=1), patient hospitalizations (n=27, 51.9 percent) (median=4, IQR=1), and patient medication expenditures (n=27, 51.9 percent) (median=4, IQR=1). A neutral stance was expressed by the greatest proportion of respondents with regard to the statement "POCT pharmacogenotyping service should be a priority in patient care."

A significant majority of the participants (n=23, 44.2 percent) and those who strongly agreed (n=13, 25 percent) that pharmacogenetic testing holds value within the vocation of pharmacist.

3.4 Practice towards the application of POCT pharmacogenotyping service

Regarding the counselling of patients concerning the POCT pharmacogenotyping service as an aspect of the community pharmacist's role, 34.6 percent (n=18) of respondents agreed and were neutral, as shown in Table 5. Additionally, the majority of respondents (n=27, 51.9 percent) and strongly agreed (n=14, 26.9 percent) that community pharmacists can increase public awareness regarding this POCT pharmaco-genotyping service (n=25, 48.1 percent) (median 4, IQR=1) and that this service will increase the workload of a community pharmacist (n=22, 42.3 percent) (median 4, IQR=1) were also in agreement with the pharmacist respondents. With regards to the customization of medication, 50% (n=26) concurred that a POCT pharmacogenotyping service could be utilised to entice clients to gain a deeper understanding (median=4, IQR=2). Additionally, participants indicated their concurrence with the notion that investing money in training on how to utilise CPIC guidelines for drug selection based on a patient's genetic profile is advantageous

Table 4: Respondents' attitude towards the application of POCT pharmacogenotyping service

Questions	Number of respondents (%)					
	Strongly disagree	**Disagree**	**Neutral**	**Agree**	**Strongly agree**	**Median (IQR)**
In your opinion, can point-of-care pharmacogenetic testing increase drug effectiveness?	-	1 (1.9)	19 (36.5)	19 (36.5)	13 (25)	4 (2)
In your opinion, how likelyis it that point-of-care pharmacogenetic testing will help to decrease the cost of developing new drugs?	2 (3.8)	5 (9.6)	23 (44.2)	16 (30.8)	6 (11.5)	3 (1)
How concerned are you that point-of-care pharmacogenetic testing may cause in discrimination by employers and/orinsurance companies?	1 (1.9)	5 (9.6)	17 (32.7)	18 (34.6)	11 (21.2)	4 (1)
How concerned are you that unauthorized persons may gain access to the results of a patient's genetic testing?	-	2 (3.8)	13 (25)	19 (36.5)	18 (34.6)	4 (2)
In your opinion, is point- of-care pharmacogenetic testing important to ensure drug safety?	-	-	10 (19.2)	28 (53.8)	14 (26.9)	4 (1)

Table 5: Respondents' practice towards the application of POCT pharmacogenotyping services

Questions	Number of respondents (%)					
	Strongly disagree	**Disagree**	**Neutral**	**Agree**	**Strongly agree**	**Median (IQR)**
A part of community pharmacist's role should include counselling patients regarding pharmacogenetic testing	-	3 (5.8)	18 (34.6)	18 (34.6)	13 (25.0)	4 (2)
Pharmacist must be get familiarized with the usage of CPIC guidelines in selecting drugs according to patient's genetic profile	-	1 (1.9)	10 (19.2)	27 (51.9)	14 (26.9)	4 (1)
Community pharmacist is willing to keep patient's record in personalizing drug against patient	-	2 (3.8)	12 (23.1)	24 (46.2)	14 (26.9)	4 (1)
Pharmacist in charge in community pharmacy find it easy to get the supplier for point-of-care pharmacogenetic testing kit	5 (9.6)	9 (17.3)	20 (38.5)	8 (15.4)	10 (19.2)	3 (2)
Community pharmacist is able to raise awareness to the public regarding point-of-care pharmacogenetic testing	1 (1.9)	3 (5.8)	12 (23.1)	25 (48.1)	11 (21.2)	4 (1)
The application of point-of-care pharmacogenetic testing will increase workload of community pharmacist	-	4 (7.7)	15 (28.8)	22 (42.3)	11 (21.2)	4 (1)
Point-of-care pharmacogenetic testing can be used as a medium to attract customers for their better understanding in personalized medicine	-	-	14 (26.9)	26 (50)	12 (23.1)	4 (2)
It is worthwhile to spend money on point-of-care pharmacogenetic testing to obtain faster result	2 (3.8)	3 (5.7)	18 (34.7)	22 (42.3)	7 (13.5)	4 (1)
Point-of-care pharmacogenetic testing offers more advantages if it is implemented in community setting	-	2 (3.8)	20 (38.5)	21 (40.4)	9 (17.3)	4 (1)
If the cost of performing point-of-care pharmacogenetic testing is less than RM80 per patient, would you agree to implement this service in your community pharmacy?	1 (1.9)	3 (5.8)	19 (36.5)	17 (32.7)	12 (23.1)	4 (2)

(median=4, IQR=1). In regard to their willingness to maintain a patient's genetic profile record at the community pharmacy, the majority of respondents (n=24, 46.2 percent) (median=4, IQR=1) have replied positively. Regarding the simplicity of locating the pharmacogenetic POCT kit provider, 38.5% (n=20) of respondents were neutral (median=3, IQR=1). A greater proportion of POCT pharmacogenotyping services (n=21, 40.4 percent) (median=4, IQR=2) yield quicker results, and a greater number of POCT pharmacogenotyping services (n=21, 40.4 percent) (median=4, IQR=1) supply more benefits for implementation in community settings. Although the cost of the kit is less than RM80 per test, the majority of respondents exhibited a neutral stance regarding the implementation of this service in their community.

3.5 Association of sociodemographic data with the knowledge, attitude and practice

The correlation between sociodemographic variables (e.g., gender, age, race, education level, and number of years of practise) and knowledge, attitude, and practise revealed that, with the exception of knowledge, which is presented in Tables 5, 6, and 7, no significant differences were found between any of the domains and any of the sociodemographic variables. Table 5 presents a statistically significant distinction between the age and knowledge of the respondents, as indicated by a p value of 0.020.

Table 6: Association between sociodemographic data with the level of knowledge towards the application of pharmacogenotyping service

Variables		Mean Rank	P values
Gender*	Male	26.08	0.707
	Female	26.89	
Age‡ (years)	20-30	27.25	0.020†
	31-40	25.86	
	41-50	24.00	
	51-60	30.50	
	>60	50.00	
Race‡	Malay	27.42	0.368
	Chinese	24.00	
	Indian	24.00	
Educationlevel‡	Bachelor's Degree	26.71	0.501
	Master's Degree	24.00	
Number ofyears of practice	<1	24.00	0.789
	1-5	25.53	
	6-10	28.33	
	>10	26.36	

*Mann-Whitney U Test
†P value of <0.05 was considered as significant
‡Kruskal-Wallis Test

Table 7: Association between sociodemographic data with respondents' attitude towards the application of pharmacogenotyping service

Variables		**Mean Rank**	**P values**
Gender*	Male	27.64	0.579
	Female	25.44	
Age‡ (years)	20-30	26.50	0.514
	31-40	29.14	
	41-50	22.82	
	51-60	22.00	
	>60	11.00	
Race‡	Malay	27.95	0.418
	Chinese	22.00	
	Indian	30.00	
Education level‡	Bachelor's Degree	25.60	0.117
	Master's Degree	37.25	
Number of years of practice‡	<1	11.00	0.378

*Mann-Whitney U Test
†P value of <0.05 was considered as significant
‡Kruskal-Wallis Test

Table 8: Association between sociodemographic data with respondents' attitude towards the application of pharmacogenotyping service

Variables		Mean Rank	P values
Gender*	Male	28.24	0.401
	Female	24.89	
Age‡ (years)	20-30	32.13	0.204
	31-40	25.36	
	41-50	22.32	
	51-60	38.25	
	>60	12.50	
Race‡	Malay	28.55	0.187
	Chinese	20.19	
	Indian	30.50	
Education level‡	Bachelor's Degree	25.90	0.294
	Master's Degree	33.75	
Number of years of practice‡	<1	30.50	0.237
	1-5	32.18	
	6-10	22.58	
	>10	24.07	

*Mann-Whitney U Test
†P value of <0.05 was considered as significant
‡Kruskal-Wallis Test

4.0 Discussion

This study aimed to evaluate the knowledge, attitude, and practice of community pharmacists in Malaysia concerning the implementation of pharmacogenotyping services. The obtained knowledge level among community pharmacists was found to be low, aligning with similar research findings (2, 8). In Western Africa, Kudzi *et al*. conducted a study on selected public and commercial hospitals in Ghana (9). In contrast, the majority of surveyed respondents demonstrated a solid understanding of pharmacogenetics, with 90% reporting proficiency in the subject. This suggests that respondents are well-versed in the clinical application of pharmacogenomics within their nation. Nearly all respondents were familiar with the concept of POCT, which are laboratory tests administered near the patient. Many responders highlighted POCT's capability to detect genetic mutations associated with drug-metabolizing enzymes. However, a significant number of respondents were unaware of the concept, appearance, and specialized instruments required for pharmacogenetic POCT, consistent with a systematic review that evaluated the level of pharmacogenetics knowledge among pharmacists from Malaysia to the USA (10). Responses to questions about the technical aspects of POCT procedures indicated a poor to average level of expertise. Nevertheless, nearly all respondents correctly identified the purpose of POCT—to deliver rapid and accurate analytic results with a shortened test turnaround time, facilitating a quicker therapeutic response interval or prompt therapy control (11). This aligns with a study emphasizing the unmistakable value of POCT in providing immediate, actionable data for tailoring drug therapy in infectious illness management (12). Shifting focus to attitudes toward the implementation of pharmacogenotyping services, respondents exhibited varied opinions on the efficacy of pharmacogenetic POCT in ensuring the effectiveness of pharmacological therapy. More than half agreed that pharmacogenetic POCT is crucial for medication safety, while a considerable percentage was unsure about its impact on reducing the cost of developing new drugs, reflecting a lack of awareness of the pharmacogenomics basis for drug therapy management (13-15). Concerns about patient discrimination based on genetic profiles were expressed by 34.6% of respondents, consistent with previous studies (16). Additionally, a significant proportion (71.1%) believed unauthorized parties could access pharmacogenetics test findings, reflecting broader concerns about genetic testing results invading patient privacy (17). Respondents generally supported the notion that pharmacogenetic POCT helps reduce adverse drug reactions (ADRs), with percentages higher than in previous studies (17-18). A notable percentage agreed that pharmacogenetic testing helps reduce patient hospitalization and prescription costs, emphasizing its importance in patient care and the pharmacist profession. In terms of practice, a majority of respondents believed that counselling patients on pharmacogenetic testing should be part of the community pharmacist's role, aligning with findings in the United States and Indonesia (16, 21). Some respondents were indifferent or unfamiliar with pharmacogenetic counselling in community pharmacies, emphasizing the need for additional knowledge in pharmacogenomics. Regarding the accessibility and availability of pharmacogenetic POCT kits, respondents demonstrated varying levels of awareness and difficulty in locating them. A statistically significant relationship was found between respondents' knowledge and their age, emphasizing the need for targeted education initiatives, particularly for older pharmacists. In conclusion, this study

provides valuable insights into the knowledge, attitude, and practice of community pharmacists in Malaysia regarding pharmacogenotyping services, highlighting both strengths and areas for improvement in their understanding and application of this emerging field.

5.0 Conclusion

Our findings provided baseline information on the knowledge, attitude and practice towards the application of POCT pharmacogenotyping service among community pharmacists in Malaysia. The respondents of this survey demonstrated a generally poor level of knowledge on pharmacogenetic POCT. However, participants demonstrated a positive attitude towards pharmacogenetic POCT and seemed interested to adopt this technique in their practice. Therefore, more training and educational programs focusing on pharmacogenomic POCT and its clinical application are needed.

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Conflict of Interest

Authors possess no conflict of interest in the present work

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