ORIGINAL ARTICLE

DOI: 10.4274/gulhane.galenos.2025.26234
Gulhane Med J

Knowledge, attitude and practice of long-acting reversible contraception among healthcare workers in Kelantan, Malaysia

Nur Nabila Jusoh, Tengku Alina Tengku Ismail, Suhaily Mohd Hairon

Department of Community Medicine, School of Medical Sciences, Universiti Sains Malaysia Health Campus, Kelantan, Malaysia

Cite this article as: Jusoh NN, Tengku Ismail TA, Mohd Hairon S. Knowledge, attitude and practice of long-acting reversible contraception among healthcare workers in Kelantan, Malaysia. Gulhane Med J. [Epub Ahead of Print]

Date submitted:
25.11.2024
Date accepted:
27.03.2025
Epub:
30.06.2025

Corresponding Author:
Tengku Alina Tengku Ismail, M.D., Department of Community Medicine, School of Medical Sciences, Universiti Sains Malaysia Health Campus, Kelantan, Malaysia
dralina@usm.my

ORCID:
orcid.org/0000-0001-6689-4527

Keywords: Knowledge, attitude, long-acting reversible contraception, healthcare worker

ABSTRACT

Aims: Long-acting reversible contraception (LARC) offers numerous advantages in preventing unintended pregnancies; however, its usage in Malaysia remains low. This study aimed to determine the knowledge, attitude, and practice (KAP) levels regarding LARC provision among primary healthcare workers (HCWs) and identify their associated factors.

Methods: A cross-sectional study involving doctors and nurses with at least one year of experience in maternal and child health (MCH) services at health clinics in Kelantan, Malaysia, was conducted between July and September 2023. The level of KAPs towards LARC provision was assessed using a self-administered questionnaire, which was developed and validated by the research team.

Results: A total of 190 doctors and nurses were involved in the study [mean (standard deviation) age: 38.36 (7.05) years; female: 86.3%]. The mean percentage scores for KAP were 69.1%, 48.1%, and 64.1%. Knowledge of LARC provision was associated with being a doctor [adjusted b=8.40; 95% confidence interval (CI): 3.76, 13.05; p<0.001], having formal LARC training (adjusted b=7.47; 95% CI: 2.81, 12.12; p=0.002), and awareness of LARC insertion services in their healthcare facility (adjusted b=8.92; 95% CI: 0.82, 17.02; p=0.031). Additionally, HCWs with more years of experience in MCH service exhibited more favorable attitudes (adjusted b=0.36; 95% CI: 0.23, 0.50; p<0.001) and practices (adjusted b=0.74; 95% CI: 0.43, 1.04; p<0.001) towards LARC provision.

Conclusions: HCWs demonstrated relatively high knowledge and practice levels but a less favorable attitude towards LARC provision, with these levels being associated with the categories of HCWs, formal training, awareness of LARC services, and years of experience in MCH.

Introduction

The unmet need for family planning, where fecund women wish to delay or cease childbearing but do not use contraception, is a significant public health concern issue. Malaysia faces a notably high unmet need at 26.7%, surpassing other Asian countries (1). This statistic correlates with the alarming prevalence of unplanned pregnancies among Malaysian women, reported at 33.0% (1). Unplanned pregnancies not only pose significant risks to maternal and child health (MCH), but also have detrimental societal repercussions, including poorer educational achievement, reduced labor force participation and economic instability (2,3).

Long-acting reversible contraceptive (LARC) methods, including the intrauterine contraceptive device (IUCD) and implant, are effective, safe, and long-lasting contraceptive methods. They can be recommended as first-line contraception

from adolescence to perimenopause, to prevent unintended pregnancies (4). Nonetheless, the utilization of LARC in Malaysia remains low. Out of 42.8% of women who use contraception, merely 6.5% opted for IUCD, and 5.5% for implant, respectively (1).

Healthcare workers (HCWs) serve as clients' first point of contact and main source of information when seeking family planning services. However, their outdated knowledge regarding LARC leads to the dissemination of inaccurate information to clients, which can prevent clients from making informed decisions about contraception (5,6). Moreover, HCWs may sometimes impose additional barriers and restrictions on providing LARC to specific clients based on factors such as the patient's medical condition, parity, or marital status. However, these restrictions often do not align with established clinical guidelines. For instance, a study in the United States revealed that over one-fifth of HCWs deemed IUCD inappropriate for nulliparous women or those with a history of pelvic inflammatory disease (PID) or ectopic pregnancies (7). This contradicts the medical eligibility criteria for contraceptive use established by the World Health Organization (WHO) in 2015 (8). HCWs can also act as barriers by not offering LARC methods to clients, consequently restricting clients' choices. A study revealed that one-third of HCWs in the United States of America (USA) never discuss implants with their clients (5).

Evaluating HCWs' knowledge, attitudes, and practice (KAP) can provide insights into the extent of misconceptions and challenges in LARC provision. Furthermore, understanding the factors influencing HCWs KAP helps tailor interventions to specific HCWs' characteristics. Although numerous global studies have examined HCWs' KAP regarding LARC, limited information is available on the validity and reliability of the questionnaires used. Additionally, while extensive research has focused on IUCD, studies assessing implants remain scarce. A bibliometric analysis supports this, showing that research on HCWs and IUCDs outnumbers research on implants by a three-to-one ratio (9). A study in Malaysia assessed KAP with regard to IUCD provision among doctors (10). However, the questionnaire used in that study only underwent content validity and reliability testing and did not assess KAP on implants. Furthermore, the study focused exclusively on doctors, even though nurses play a significant role in providing contraceptive services.

Therefore, this study aimed to determine the level of KAP towards LARC (IUCD and implant) provision among doctors and nurses, and their associated factors at government-based health facilities in Kelantan, Malaysia. The study was conducted using a questionnaire that was developed and validated by the research team.

Methods

Study design and settings

This cross-sectional study was conducted between July and September 2023 and included doctors and nurses from 16 government-based health clinics in Kelantan, Malaysia. The study was conducted in accordance with the Declaration of Helsinki and the good clinical practice guidelines. Ethical approval was obtained from the Medical Research and Ethics Committee, Ministry of Health Malaysia [ID-22-01463-WYY (IIR)], and the Research Ethics Committee (Human), University Sains Malaysia (JEPeM Code: USM/JEPeM/22060427, date: 08.08.2022). Additionally, permission to conduct research in government health clinics was obtained from the Director of the Kelantan State Health Department.

Inclusion and exclusion criteria

Inclusion criteria required participants to have at least one year of experience in MCH services at their current healthcare facility and be able to understand the Malay language. Individuals who were unavailable during the study period or declined participation were excluded.

Participants selection

Four districts-Bachok, Jeli, Pasir Puteh, and Tanah Merah-were randomly selected from the ten districts in Kelantan. These districts were chosen based on their similar socioeconomic background. Only four districts were chosen to make data collection feasible without compromising the study's outcomes. From each district, four health clinics were randomly selected, resulting in a total of 16 clinics. The required number of HCWs at each clinic was determined using a stratified proportionate sampling method. Participants from each clinic were then selected through simple random sampling, based on a list of eligible HCWs provided by the clinic's person in charge. All random sampling procedures were carried out using the simple random sampling generator in Excel, developed by Najib (11).

The minimum required sample size of 135 participants was determined using a single mean formula, considering a 95% confidence level, a 10% non-response rate, and a precision of 0.5, based on a standard deviation (SD) of 2.8 from a previous study (10). For multiple linear regression analysis, G*Power version 3.1.9.7 software calculated a sample size of 190 participants, considering an effect size of 0.15, a margin of error of 0.05, 15 expected factors at 90% power and a 10% non-response rate. The final sample size for the study was set at 190 participants, based on the largest sample size calculation.

Assessment tool: development, validity, reliability, and scoring

This study utilized the KAPP-LARC questionnaire, which was developed and validated by the research team. The questionnaire was written in Malay and consisted of 39 items categorized into three sections: 15 items on knowledge, 13 on attitude, and 11 on practice. The knowledge section covered the general knowledge and side effects of LARC. The attitude section comprised factors named as "client-related", "method-related resources" and "method-related limitations" on LARC provision. The practice section emphasized counselling, clinical evaluation, and insertion of LARC.

The development process included a comprehensive literature review, field discussions with HCWs, and expert consultations. For validity assessment, the item content validation index and item face validation index, values were reported as greater than 0.83 (12). The knowledge section underwent item response theory analysis, where the difficulty and discrimination values were within or close to the acceptable range (13). In the exploratory factor analysis of the attitude and practice sections, all items loaded above 0.32, with acceptable Cronbach's alpha values ranging from 0.666 to 0.840, indicating good internal consistency (14). The confirmatory factor analysis fit indices were acceptable for both the attitude and practice sections, with satisfactory Raykov's rho values ranging from 0.642 to 0.825 (15).

In the knowledge section, response options were "true", "false", and "don't know". Correct responses were scored as one, whereas incorrect or "don't know" responses were scored as zero. A five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree) was used in the attitude section. Similarly, a five-point scale from 1 (never) to 5 (always) was used in the practice section. Reverse-worded items were reverse-coded before analysis.

Definitions and study terms

LARC specifically refers to Implanon and the copper IUCD. These two methods were chosen because they are available options in the government health clinics in Kelantan. The MCH services encompass a range of healthcare offerings, including family planning, child health, antenatal, and postnatal services. The term "formal LARC training" is defined as training about LARC received within the last five years through continuous medical education, presentations, workshops, conferences, or courses. The term "average number of clients" refers to the estimated average number of MCH clients seen daily.

Data collection

The study was conducted face-to-face, in which the researchers approached and distributed the self-administered questionnaires to participants who met the study criteria. Detailed explanations were provided before the study commenced, and any questions raised were clarified. Written informed consent was obtained from all participants. The approximate time for completion was 20 minutes.

Outcomes

The primary outcome was the level of KAP regarding LARC provision among primary HCWs. The secondary outcomes were the factors associated with the KAP levels.

Statistical Analysis

The data were analyzed using SPSS Statistics for Windows, version 26.0 (IBM Corp., Armonk, NY, USA). Numerical data were presented as mean (SD) while categorical data were presented as number (n) and percentage (%). The scores for the knowledge section were transformed into percentage scores by dividing the participant scores by the maximum score of 15 marks and multiplying by 100. The Likert scale ratings employed in the attitude and practice sections generate ordinal scores. Therefore, the scores for each factor and the total score for each section were converted to percentage scores using the recommended formula by Hasson and Arnetz (16) as depicted below. The higher the percentage score, the more favorable the attitude and practice of LARC provision among HCWs.

$$Percentage\ score = \frac{(obtained\ score - minimum\ score)}{(maximum\ score - minimum\ score)} \times 100$$

Linear regression analysis was performed to determine the associated factors influencing each KAP score. The independent variables were age, sex, ethnicity, marital status, education, monthly income, category of HCW (doctors or nurses), years working as an HCW, years working in MCH, formal LARC training (yes or no), number of clients, personal or partner's use of LARC (yes or no), number of children, clinic with or without family medicine specialist (FMS), and awareness of the availability of LARC insertion service in the clinic (yes or no). The dependent variables were the KAP percentage scores.

Only variables demonstrating a p-value of less than 0.25 in the simple regression were incorporated into the multiple linear regression analysis. Stepwise, backward, and forward variable selection methods were used to assess all independent variables, and variables with a p-value <0.05 were retained in the model. Subsequently, interaction and multicollinearity were examined. Model assumptions of normality, linearity, and homoscedasticity were checked. The final model was presented with crude and adjusted regression coefficients, 95% confidence intervals (CI), and p-values.

Results

Characteristics of the study participants

A total of 190 participants were involved in the study [mean (SD) age: 38.36 (7.05) years; female: 86.3%). Table 1 presents the detailed characteristics of the participants, highlighting that the majority were Malay (99.5%) and nurses (54.7%). Notably, 24.7% of HCWs or their partners have utilized LARC, making it the most popular modern contraceptive method, followed by pills (11.6%), depot medroxyprogesterone acetate injections (9.5%), and condoms (7.4%).

Table 1. Characteristics of the study participants (n=190)

Variables	Value
Age (years), mean (SD)	38.36 (7.05)
Sex, n (%)	
Male	26 (13.7)
Female	164 (86.3)
Ethnicity, n (%)	
Malay	189 (99.5)
Non-Malay	1 (0.5)
Marital status, n (%)	
Married	171 (90.0)
Non-married	13 (10.0)
Education, n (%)	
Certificate	48 (25.3)
Diploma	54 (28.4)
Degree and higher	88 (46.3)
Category of HCW, n (%)	
Nurse	104 (54.7)
Doctor	86 (45.3)
Monthly income (RM), mean (SD)	4545.26 (1679.08)
Years working as HCW, mean (SD)	13.34 (7.59)
Years working in MCH, mean (SD)	9.71 (7.58)
Average number of clients, mean (SD)	12.78 (5.57)
Formal LARC training, n (%)	
No	113 (59.5)
Yes	77 (40.5)
Personal/partner's use of LARC, n (%)	
No	143 (75.3)
Yes	47 (24.7)
Number of children, mean (SD)	2.49 (1.64)
Clinic with FMS, n (%)	
No	78 (41.1)
Yes	112 (58.9)
Awareness of LARC insertion service, n (%)	
No	17 (8.9)
Yes	173 (91.1)

SD: Standard deviation, HCW: Healthcare workers, MCH: Maternal and child health, LARC: Long-acting reversible contraception, FMS: Family medicine specialist, RM: Ringgit Malaysia

Knowledge, attitude and practice on long-acting reversible contraception provision among healthcare workers

Table 2, Table 3, and Table 4 display the descriptive analysis of the KAP sections of the KAPP-LARC questionnaire. The respective mean percentage scores for the KAP sections were 69.1%, 48.1%, and 64.1%. In the knowledge section, the mean (SD) of the raw score was 10.37 (2.53) and the mean (SD) of the percentage score was 69.1 (16.9). Most participants provided correct responses to the majority of questions. However, most participants answered incorrectly regarding whether the IUCD can be inserted even when a client is not menstruating (item K9), whether it causes cramping pain during the early stages of insertion (item K14), and whether it can be inserted 24 hours after delivery (item K10). Besides, half of the participants answered incorrectly regarding the length of efficacy of Implanon (item K2). It is crucial to recognize that Implanon is effective in preventing pregnancy for up to three years, not five years (17).

In the attitude section, among the three factors, the "client-related" factor had the lowest mean percentage score of 33.1% (Table 3). More than 70% of participants exhibited a misunderstanding, as they disagreed or strongly disagreed with the statement that LARC is suitable for nulliparous women, unmarried women, or women with a history of PID or ectopic pregnancy (items A2 to A5). Furthermore, around one-third of the participants disagreed or strongly disagreed that many doctors have the necessary skills to insert LARC (items A6 and A7). In the practice section, the study revealed that HCWs provided more frequent counselling and recommendations for IUCD, compared to Implanon (Table 4). Additionally, nearly one-third of doctors never perform IUCD insertion and Implanon insertion (items P10 and P11).

Factors associated with knowledge, attitude and practice of long-acting reversible contraception provision among healthcare workers

The simple linear regression was carried out for each section. The multiple linear regression analysis of KAP sections is shown in Table 5. In the univariable analysis in the knowledge section, the p-value of <0.25 was observed for ten independent variables, which include age, education, monthly income, category of HCW, years working as HCW, years working in MCH, number of clients, formal LARC training, clinic with or without FMS, and awareness of LARC insertion service. These variables were incorporated into the multiple linear regression. The multiple linear regression analysis showed the category of HCW, formal LARC training, and awareness of LARC insertion service had a significant linear relationship with the percentage score for the knowledge section, after controlling for other confounders.

Table 2. Descriptive statistics of items in the knowledge section (n=190)

No	Item	Answer response, n (%)			Response, n (%)	
		True	False	Don't know	Correct	Incorrect
K1	Implanon makes cervical mucus thicker	137 (72.1)	35 (18.4)	18 (9.5)	137 (72.1)	53 (27.9)
K2	Implanon is effective in preventing pregnancy for up to 5 years*	109 (57.4)	79 (41.5)	2 (1.1)	81 (42.6)	109 (57.4)
K3	Implanon releases a low dose of the hormone progestin	139 (73.2)	34 (17.9)	17 (8.9)	139 (73.2)	51 (26.8)
K4	Implanon can be inserted regardless of the menstrual cycle time, provided that the client is not pregnant	176 (92.6)	11 (5.8)	3 (1.6)	176 (92.6)	14 (7.4)
K5	Fertility returns immediately after the removal of Implanon	137 (72.1)	38 (20.0)	15 (7.9)	137 (72.1)	53 (27.9)
K6	Implanon can cause the clients to have no period (amenorrhea)	148 (77.9)	35 (18.4)	7 (3.7)	148 (77.9)	42 (22.1)
K7	Implanon can cause irregular menstrual cycles	159 (83.7)	24 (12.6)	7 (3.7)	159 (83.7)	31 (16.3)
K8	Implanon is safe for use by clients who are breastfeeding	185 (97.4)	3 (1.6)	2 (1.1)	185 (97.4)	5 (2.6)
K9	IUCD can be inserted when the client is not menstruating	93 (48.9)	94 (49.5)	3 (1.6)	93 (48.9)	97 (51.1)
K10	IUCD can be inserted within 24 hours after delivery	43 (22.6)	127 (66.8)	20 (10.5)	43 (22.6)	147 (77.4)
K11	Fertility returns immediately after the removal of IUCD	163 (85.8)	13 (6.8)	14 (7.4)	163 (85.8)	27 (14.2)
K12	IUCD can cause heavier menstrual bleeding	123 (64.7)	61 (32.1)	6 (3.2)	123 (64.7)	67 (35.3)
K13	IUCD can cause prolonged menstrual bleeding	117 (61.6)	64 (33.7)	9 (4.7)	117 (61.6)	73 (38.4)
K14	IUCD can cause cramping pain during the early phase of insertion	94 (49.5)	76 (40.0)	20 (10.5)	94 (49.5)	96 (50.5)
K15	The effectiveness of LARC in preventing pregnancy is over 99%	177 (93.2)	7 (3.7)	6 (3.2)	177 (93.2)	13 (6.8)

*Negative statement. IUCD: Intrauterine contraceptive device, LARC: Long-acting reversible contraception

Table 3. Descriptive statistics of items in the attitude section (n=190)

No	Item	Answer response, n (%)					Mean (SD)[a]	Mean % (SD)[b]
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree		
	Client-related						**11.62 (2.18)**	**33.1 (10.9)**
A1	I think IUCD is suitable for clients who are having sexually transmitted diseases*	95 (50.0)	71 (37.4)	9 (4.7)	8 (4.2)	7 (3.7)	1.74 (0.99)	
A2	I think IUCD is suitable for clients with a history of pelvic inflammatory disease	87 (45.8)	74 (38.9)	12 (6.3)	12 (6.3)	5 (2.6)	1.81 (0.99)	
A3	I think IUCD is suitable for clients with a history of ectopic pregnancy	67 (35.3)	73 (38.4)	16 (8.4)	29 (15.3)	5 (2.6)	2.12 (1.13)	
A4	I think LARC is suitable for clients who have never been pregnant (nulliparous)	78 (41.1)	86 (45.3)	16 (8.4)	8 (4.2)	2 (1.1)	1.79 (0.85)	
A5	I think LARC is suitable for unmarried clients	101 (53.2)	63 (33.2)	20 (10.5)	4 (2.1)	2 (1.1)	1.65 (0.83)	

Table 3. Continued

No	Item	Answer response, n (%)					Mean (SD)[a]	Mean % (SD)[b]
		Strongly disagree	Disagree	Neutral	Agree	Strongly agree		
	Method-related resources						**12.24 (3.00)**	**51.5 (18.7)**
A6	I think many doctors have the skill to insert Implanon	2 (1.1)	50 (26.3)	52 (27.4)	69 (36.3)	17 (8.9)	3.26 (0.98)	
A7	I think many doctors have the skill to insert IUCD	2 (1.1)	58 (30.5)	54 (28.4)	59 (31.1)	17 (8.9)	3.16 (1.00)	
A8	I think the LARC training is sufficient	11 (5.8)	87 (45.8)	42 (22.1)	42 (22.1)	8 (4.2)	2.73 (1.01)	
A9	I think the LARC insertion procedure is easy	7 (3.7)	49 (25.8)	63 (33.2)	62 (32.6)	9 (4.7)	3.09 (0.96)	
	Method-related limitations						**13.98 (2.12)**	**62.4 (13.3)**
A10	I think LARC counselling takes a long time*	4 (2.1)	86 (45.3)	59 (31.1)	36 (18.9)	5 (2.6)	2.75 (0.88)	
A11	I think LARC can cause severe side effects*	24 (12.6)	119 (62.6)	31 (16.3)	15 (7.9)	1 (0.5)	2.21 (0.78)	
A12	I feel worried about being blamed if a complication occurs after LARC insertion*	7 (3.7)	74 (38.9)	56 (29.5)	49 (25.8)	4 (2.1)	2.84 (0.93)	
A13	I will not recommend LARC to clients because it is expensive*	33 (17.4)	105 (55.3)	30 (15.8)	21 (11.1)	1 (0.5)	2.22 (0.88)	
	Total score						**38.00 (3.99)**	**48.1 (7.7)**

*Negative statement. [a]Mean of raw score, [b]Mean of percentage score, SD: Standard deviation, IUCD: Intrauterine contraceptive device, LARC: Long-acting reversible contraception

Table 4. Descriptive statistics of items in the practice section (n=190)

No	Item	Answer response, n (%)					Mean (SD)[a]	Mean % (SD)[b]
		Never	Rarely	Sometimes	Often	Always		
	Counselling						**23.97 (5.24)**	**60.6 (18.7)**
P1	I provide counselling regarding IUCD to clients	3 (1.6)	22 (11.6)	45 (23.7)	77 (40.5)	43 (22.6)	3.71 (1.00)	
P2	I provide counselling regarding Implanon to clients	4 (2.1)	28 (14.7)	62 (32.6)	67 (35.3)	29 (15.3)	3.47 (0.99)	
P3	I explain the advantages of LARC during counselling	8 (4.2)	20 (10.5)	38 (20.0)	81 (42.6)	43 (22.6)	3.69 (1.07)	
P4	I use visual aids (for example, flipcharts and pictures) while providing counselling regarding LARC	27 (14.2)	32 (16.8)	53 (27.9)	52 (27.4)	26 (13.7)	3.09 (1.25)	
P5	I explain LARC to clients who are planning to use other contraception	11 (5.8)	27 (14.2)	58 (30.5)	68 (35.8)	26 (13.7)	3.37 (1.07)	
P6	I recommend IUCD to clients	4 (2.1)	28 (14.7)	63 (33.2)	69 (36.3)	26 (13.7)	3.45 (0.97)	
P7	I recommend Implanon to clients	4 (2.1)	38 (20.0)	83 (43.7)	49 (25.8)	16 (8.4)	3.18 (0.92)	
	Clinical evaluation						**8.13 (1.80)**	**76.6 (22.5)**
P8	I assess sexually transmitted disease risk before IUCD insertion	12 (6.3)	14 (7.4)	35 (18.4)	64 (33.7)	65 (34.2)	3.82 (1.17)	
P9	I check blood pressure readings before Implanon insertion	7 (3.7)	3 (1.6)	14 (7.4)	66 (34.7)	100 (52.6)	4.31 (0.95)	

Table 4. Continued

No	Item	Answer response, n (%)					Mean (SD)[a]	Mean % (SD)[b]
		Never	Rarely	Sometimes	Often	Always		
	Total score						**32.07 (6.10)**	**64.1 (17.0)**
	Insertion (for doctors only, n=86)							
P10	I perform IUCD insertion	28 (32.6)	22 (25.6)	23 (26.7)	6 (7.0)	6 (7.0)	2.29 (1.20)	
P11	I perform Implanon insertion	25 (29.1)	13 (15.1)	26 (30.2)	12 (14.0)	9 (10.5)	2.62 (1.32)	

[a]Mean of raw score, [b]Mean of percentage score, SD: Standard deviation, IUCD: Intrauterine contraceptive device, LARC: Long-acting reversible contraception

Table 5. Factors associated with knowledge, attitude and practice of LARC provision (n=190)

Variables	Multiple linear regression					
	Knowledge		Attitude		Practice	
	Adjusted b[a] (95% CI)	p-value	Adjusted b[a] (95% CI)	p-value	Adjusted b[a] (95% CI)	p-value
Provider type Nurse Doctor	Ref. 8.40 (3.76, 13.05)	**<0.001**	-	-	-	-
Formal LARC training No Yes	Ref. 7.47 (2.81, 12.12)	**0.002**	-	-	-	-
Awareness of LARC insertion service No Yes	Ref. 8.92 (0.82, 17.02)	**0.031**	-	-	-	-
Years working as HCW	-	-	0.36 (0.23, 0.50)	**<0.001**	0.74 (0.43, 1.04)	**<0.001**

[a]Adjusted regression coefficient. Forward, backward and stepwise methods were applied. No interaction between independent variables and no multicollinearity problem.
Only significant variables in multiple linear regression were included in the table.
LARC: Long-acting reversible contraception, HCW: Healthcare worker, CI: Confidence interval

Doctors demonstrated a higher knowledge score of 8.40 (95% CI: 3.76, 13.05; p<0.001) compared to nurses when adjusted for other variables. HCWs with formal LARC training had knowledge scores 7.47 higher (95% CI: 2.81, 12.12; p=0.002) than those without such training when adjusted for other variables. Additionally, those who were aware of LARC insertion services at their healthcare facilities had higher knowledge scores by 8.92 (95% CI: 0.82, 17.02; p=0.031) than those who were not, when adjusted for other variables.

In the attitude section, eight variables demonstrated a p-value of <0.25 in univariable analysis (age, marital status, education, category of HCW, years working as HCW, years working in MCH, number of clients, and clinic with or without FMS). These variables were included in the multivariate analysis. Multiple linear regression showed that only years of experience in MCH had a significant association with attitude percentage scores towards LARC provision. With each additional year of experience in MCH, attitude scores increased by 0.36 percentage points (95% CI: 0.23, 0.50; p<0.001).

In the practice section, eleven variables exhibited a p-value of <0.25 in univariable analysis, namely age, sex, marital status, education, category of HCWs, years working as HCWs, years working in MCH, number of clients, formal LARC training, number of children, and clinic with or without FMS. These eleven variables were subsequently included in the multivariate analysis. Similar to the attitude section, the sole significant factor associated with the percentage score in the practice section was the number of years of experience in MCH. An extra year of MCH experience increased practice percentage scores by 0.74 (95% CI: 0.43, 1.04; p<0.001).

Discussion

This study evaluated the KAP of LARC provision among HCWs in Kelantan, Malaysia, and explored their associated factors using a locally validated questionnaire. The findings revealed that while HCWs demonstrated relatively high knowledge and practice levels regarding LARC provision, their attitudes toward it were less favorable. Higher knowledge levels were observed among doctors, those with formal LARC training, and those aware of LARC insertion services at their healthcare facilities. Additionally, longer experience in MCH services was associated with more positive attitudes and better practices towards LARC provision.

The majority of the participants were female, which can be attributed that all nurses were female, and most doctors in the MCH Unit were also women. This female dominance is consistent with a similar study conducted among HCWs in MCH in Selangor, Malaysia (18). Additionally, in this study, LARC was the most favored contraceptive method among HCWs, in contrast to the general population, who preferred short-acting methods such as pills, injections, and condoms (19). This preference among HCWs for LARC may be due to their being more up-to-date with the evidence supporting LARC, making them more comfortable using the method themselves (20).

The overall knowledge score in this study was similar to that found in other research on IUCD knowledge in Malaysia and Nepal, with scores of 68% and 61.4%, respectively (10,21). In contrast, the average baseline knowledge score among Canadian HCWs regarding IUCD was 82.8% (22). However, a direct comparison of the scores between these settings is challenging because the survey questions and target participants were different.

The present study revealed participants' confusion regarding Implanon's efficacy duration, possibly due to confusion with IUCD, which is effective for up to five years. This misinformation might lead HCWs to provide clients with inaccurate information, influencing their contraceptive decisions (23). Furthermore, a significant portion of the participants lacked awareness regarding the potential cramping pain during the early stages of LARC insertion. Awareness of such side effects is essential, enabling HCWs to implement preventive measures that alleviate clients' discomfort and prevent this issue from discouraging others from choosing this method. Additionally, providing clients with accurate and detailed information about side effects when initiating a method has been shown to increase continuation rates (24).

In this study, only half of the participants were aware that an IUCD can be inserted at any phase of the menstrual cycle, which is not consistent with the WHO's recommendation (17). Research has also shown that there is no significant difference in pain scores or ease of IUCD insertion whether it is performed during or outside of menstruation (25). Furthermore, awareness of immediate post-partum IUCD insertion was low in this study, in contrast to higher levels of awareness reported in France (26) and Nepal (21).This misunderstanding may hamper timely LARC insertion, particularly for clients experiencing barriers to accessing contraception, such as those who reside in rural areas (27).

The overall attitude score was low, largely influenced by a particularly poor performance in the "client-related" factor. This score was lower than a study conducted among pediatricians and nurses in New York City, where the score was 63.3% (28). In the present study, the majority of HCWs perceived the LARC as unsuitable for specific groups of women, such as those who are nulliparous, unmarried, or have a history of PID or ectopic pregnancy. These findings are consistent with previous studies, which demonstrated the common misconception about LARC eligibility for certain clients (29,30). This attitude contradicts the guidelines outlined by the WHO in the "Medical eligibility criteria for contraceptive use" and "Family planning: a global handbook for providers", which report that LARC is safe and suitable for these groups of women (8,17). Such attitudes can limit women's access to a wide range of contraceptive choices, restricting their ability to make well-informed decisions. To address this, HCWs are encouraged to use the Medical Eligibility Criteria mobile application, developed by the WHO, for contraceptive use (31). This tool provides easy access to updated information on the medical eligibility of LARC, which can help reduce misconceptions, ensure adherence to guidelines, and ultimately foster confidence in providing evidence-based care.

Furthermore, a smaller proportion of the respondents in this study agreed that LARC counselling is time-consuming, than in another study, which found that two-thirds of HCWs believed they needed more time to counsel about LARC compared to other contraceptive options (28). Therefore, the HCWs in our study demonstrated a more favorable attitude towards LARC provision, suggesting that they did not perceive time as a significant barrier. Despite the government covering the expense of LARC through subsidy, a minority of HCWs remained hesitant to recommend LARC, citing concerns about its perceived high cost. It is noteworthy that while LARC methods have a higher upfront cost, they become cost-saving within the initial two years of use (32).

Overall, the high total percentage for the practice section suggested a favorable attitude towards the provision of LARC provision. Notably, counselling and recommendations for IUCD were more frequent than for Implanon. This trend is in line with the higher prevalence of IUCD usage in Malaysia compared to that of Implanon (1) implying that HCWs might be more accustomed to IUCD.

Almost one-third of doctors never perform IUCD insertion or Implanon insertion. This aligns with a similar proportion of participants who thought that many doctors lacked competence in LARC insertion, and who found the procedure difficult. These observations resonate with the fact that more than half of HCWs have not undergone formal LARC training in the past five years. The issue of incompetency in LARC insertion could limit LARC insertion services and prevent timely insertions.

This study revealed that doctors have exhibited higher knowledge scores regarding LARC than nurses. This aligns with findings from an Australian study, which reported that general practitioners had greater knowledge about implants compared to practical nurses (33). A Malaysian study also highlighted that doctors had better contraceptive knowledge scores compared to nurses (34). This disparity can be attributed to the more

advanced and extensive medical training among doctors compared to nurses. The present study also demonstrated that HCWs who were aware of the LARC insertion service in their healthcare facilities had higher knowledge scores compared to those who were not. This may be due to their direct exposure and familiarity with the LARC procedure.

The present study found that HCWs who received formal LARC training demonstrated higher knowledge scores compared to those without such training. Similarly, a case-control study in China showed that HCWs who underwent LARC training via mobile videos had higher knowledge scores compared to the control group (30). Furthermore, a study in Nepal indicated that more recent training was associated with higher overall knowledge scores on IUCD (21). While previous studies suggested that training could enhance attitude and practice scores (30,35), this present study found no significant association between formal LARC training and attitude or practice scores. A study in Nepal showed that even though a three-day training improved the HCWs' attitude towards client selection, biases persisted towards certain groups of clients at 6 and 24 months after the intervention (27). It suggests that ongoing training would be more effective in reducing biases among HCWs, as opposed to one-time training sessions.

This study discovered that HCWs with more years of experience in MCH exhibited more favorable attitudes and practices towards LARC provision. This corresponds with another study conducted in Selangor, Malaysia, indicating a significant association between the duration of working in MCH and the confidence of providing contraceptive counselling (34). Another study found that HCWs with greater experience, measured by the number of IUCDs inserted, demonstrated better attitudes towards LARC eligibility (36).

This finding was also consistent with the Dreyfus Model of Skill Acquisition, which describes the progression from novice to expert in any skill domain (37). The experience provides exposure to a diverse range of cases and scenarios, enabling HCWs to make well-informed decisions. Experienced HCWs can apply their knowledge to real-world clinical settings, even in complex situations (37). Therefore, intervention should focus on skill enhancement for less experienced HCWs, especially those who are new to MCH services. Mentorship programs can be adopted where experienced HCWs act as role models by sharing their experiences with the new ones to improve the attitudes and practices of HCWs (5).

Rather than blaming HCWs for their misconceptions, biases, or incompetence, the focus should be on supporting them through a comprehensive intervention aimed at improving LARC provision (38). It should incorporate both theoretical and practical training, complemented by a mentorship program to improve KAP of HCWs. An outstanding example is the maternal and child survival program, which implemented a modular LARC training encompassing theoretical knowledge, client eligibility assessment, counselling techniques, and insertion procedures (39). Certified experienced HCWs specializing in LARC provision mentored a group of mentees, providing continuous support. Once mentees were confident in providing LARC services, they could then be assessed and certified. In Kenya and Zambia, the mentorship program had successfully expanded choices of methods.

The strength of this study lies in employing a valid, reliable, and culturally appropriate questionnaire in the Malay language to assess KAP on LARC provision among local HCWs. Unlike other studies, which used inadequately validated questionnaires, our instrument ensures effective measurement of KAP, enhancing the likelihood of deriving meaningful conclusions. Additionally, the study established a baseline for KAP of implant among Malaysian HCWs and represents the first study on the KAP of LARC provision among nurses. This distinguishes our study from the previous local study, which focused solely on the KAP of IUCD among doctors.

However, the study, which was carried out in the northeastern region of Malaysia, may not capture unique cultural aspects distinct from other regions, posing a limitation in generalizing the findings to the entire country. Despite this, it is noteworthy that HCWs frequently relocate between states throughout their careers, exposing them to various cultures in Malaysia. In addition, this study specifically focused on primary HCWs within the public sector, omitting those in private primary healthcare sectors and family planning providers in hospital settings. However, the majority of clients in Malaysia received family planning services from the public primary healthcare facilities.

Conclusion

The current study explored the KAP of LARC provision among HCWs using the locally validated KAPP-LARC questionnaire. While the overall knowledge level among HCWs was relatively high, the study revealed some misinformation regarding fundamental LARC knowledge. A significant association was identified between LARC knowledge and both formal LARC training and the HCW category. Thus, it is recommended to develop targeted training programs with a particular focus on nurses, covering both fundamental and updated knowledge of LARC. The study also revealed a markedly low attitude score. Although practice scores were relatively high, there was a lack of counselling and recommendations for Implanon, compared to IUCD. Additionally, the study demonstrated that HCWs with more years of experience in MCH tended to have more favorable attitudes and practices in LARC provision. An ongoing mentorship program could enhance HCWs' attitudes and practices by facilitating the transfer of values and skills from more experienced HCWs to those newer to the field.

Ethics

Ethics Committee Approval: The study was conducted in accordance with the Declaration of Helsinki and the good clinical practice guidelines. Ethical approval was obtained from the Medical Research and Ethics Committee, Ministry of Health Malaysia [ID-22-01463-WYY (IIR)], and the Research Ethics Committee (Human), University Sains Malaysia (JEPeM Code: USM/JEPeM/22060427, date: 08.08.2022).

Informed Consent: Written informed consent was obtained from all participants.

Acknowledgements

The author would like to express gratitude to the Kelantan State Health Department for their support in facilitating the data collection process. Appreciation is also extended to the HCWs in Kelantan who generously participated in the study, taking time out of their busy schedules. Special recognition is given to the experts who carefully reviewed the questionnaire and offered invaluable feedback during its development.

Footnotes

Authorship Contributions

Concept: N.N.J., T.A.T.I., Design: N.N.J., T.A.T.I., Data Collection or Processing: N.N.J., Analysis or Interpretation: N.N.J., T.A.T.I., S.M.H., Literature Search: N.N.J., Writing: N.N.J., T.A.T.I., S.M.H.

Conflict of Interest: The authors declared no conflict of interest.

Financial Disclosure: The authors declared that this study received no financial support.

References

1. Ministry of Health Malaysia. National Health and Morbidity Survey 2022: Maternal and Child Health Malaysia. Selangor, Malaysia: Institute of Public Health Malaysia; 2022: 120-128.
2. Sonfield A, Hasstedt K, Kavanaugh ML, Anderson R. The social and economic benefits of women's ability to determine whether and when to have children. New York: Guttmacher Institute; 2013:7-16.
3. Hall JA, Benton L, Copas A, Stephenson J. Pregnancy intention and pregnancy outcome: systematic review and meta-analysis. *Matern Child Health J.* 2017;21:670-704.
4. Pearson S, Boerma CJ, McNamee K, Bateson D. Long-acting reversible contraceptives: new evidence to support clinical practice. *Aust J Gen Pract.* 2022;51(4):246-252.
5. Solo J, Festin M. Provider bias in family planning services: a review of its meaning and manifestations. *Glob Health Sci Pract.* 2019;7(3):371-385.
6. Rouncivell L, Takuva S, Ledibane N, Musekiwa A, Leong TD. Knowledge, attitudes, and perceptions of long-acting reversible contraceptive methods among healthcare workers in sub-Saharan Africa. *Trop Med Int Health.* 2021;26(8):840-861.
7. Biggs MA, Harper CC, Malvin J, Brindis CD. Factors influencing the provision of long-acting reversible contraception in California. *Obstet Gynecol.* 2014;123(3):593-602.
8. World Health Organization. Medical eligibility criteria for contraceptive use. 5th ed. *World Health Organization*. 2015:57-211.
9. Jusoh NN, Ismail TAT. Bibliometric analysis of global research on long-acting reversible contraception and healthcare workers. *IIUM Med J Malays*. 2023;22:41-48.
10. Chew KT, Salim N, Abu MA, Abdul Karim AK. Knowledge, attitudes and practice regarding copper intrauterine contraceptive devices among doctors in Malaysia. *BMJ Sex Reprod Health*. 2018;44:200-206.
11. Najib MY. Simple random sampling generator using microsoft excel version 4.0. Kubang Kerian Kelantan Malaysia: unit of biostatistics and research methodology, school of medical sciences, USM; 2015.
12. Polit DF, Beck CT, Owen SV. Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. *Res Nurs Health.* 2007;30(4):459-467.
13. Baker FB. The basics of item response theory. 2nd ed. The United States of America: ERIC; 2001.
14. Nunnally JC, Bernstein IH. Psychometric Theory. 3rd ed. New York: McGraw-Hill; 1994.
15. Diamantopoulos A, Siguaw J. Introducing LISREL: a guide for the uninitiated. London: Sage; 2000.
16. Hasson D, Arnetz BB. Validation and findings comparing VAS vs. Likert scales for psychosocial measurements. *Int Electron J Health Educ.* 2005;8:178-192.
17. World Health Organization. Family planning: a global handbook for providers. 4th ed. Geneva Switzerland: *World Health Organization*; 2022.
18. Abu Saad H, Low PK, Jamaluddin R, Chee HP. Level of physical activity and its associated factors among primary healthcare workers in Perak, Malaysia. *Int J Environ Res Public Health.* 2020;17(16):5947.
19. Ibrahim H, Tengku Ismail TA, Hairon S, Sulaiman Z. Factors associated with postpartum family planning in a cohort of Kelantanese women with previous caesarean delivery in Malaysia. *IIUM Med J Malays*. 2020;19(1): 85-97.
20. Zigler RE, Peipert JF, Zhao Q, Maddipati R, McNicholas C. Long-acting reversible contraception use among residents in obstetrics/gynecology training programs. *Open Access J Contracept.* 2017;8:1-7.
21. Chakraborty NM, Murphy C, Paudel M, Sharma S. Knowledge and perceptions of the intrauterine device among family planning providers in Nepal: a cross-sectional analysis by cadre and sector. *BMC Health Serv Res.* 2015;15:39.
22. Cook J, Waddington A, Black D, Costescu D, Desjardins D, Duchesne E, et al. Intrauterine contraception: knowledge and prescribing practices of Canadian health care providers. *J Obstet Gynaecol Can.* 2019;41:1084-1092.

23. Dehlendorf C, Levy K, Ruskin R, Steinauer J. Health care providers' knowledge about contraceptive evidence: a barrier to quality family planning care? *Contraception.* 2010;81(4):292-298.

24. Cavallaro FL, Benova L, Owolabi OO, Ali M. A systematic review of the effectiveness of counselling strategies for modern contraceptive methods: what works and what doesn't? *BMJ Sex Reprod Health.* 2020;46(4):254-269.

25. Hocaoglu M, Gunay T, Demircivi Bor E, Nur AG, Turgut A, Karateke A, et al. Comparison of intrauterine device insertion-related pain and ease of procedure at different times during menstruation. *Medeniyet Med J.* 2021;36(3):225-232.

26. Bléas C, Llouquet F, Neveu ME, Gaudu S, Fernandez H, Vigoureux S. Study on the use practices and knowledge of French practitioners about the use of intra-uterine devices in early post-partum contraception in France. *J Gynecol Obstet Hum Reprod*. 2022;51(1):102240.

27. Stone L, Puri MC, Guo M, Shah IH. Assessing knowledge, attitudes, and practice of health providers towards the provision of postpartum intrauterine devices in Nepal: a two-year follow-up. *Reprod Health.* 2021;18(1):43.

28. Kohn JE, Hacker JG, Rousselle MA, Gold M. Knowledge and likelihood to recommend intrauterine devices for adolescents among school-based health center providers. *J Adolesc Health.* 2012;51:319-324.

29. Aziz M, Ahmed S, Ahmed B. Attitudes of physicians providing family planning services in Egypt about recommending intrauterine device for family planning clients. *Sex Reprod Healthc.* 2017;14:64-68.

30. Xiong W, Li C, Liu X, Gui T, Peng P. The effect of mobile video training for healthcare providers on long-acting reversible contraceptive (LARC) use among adolescents and young women. *J Pediatr Adolesc Gynecol.* 2021;34:686-692.

31. World Health Organization. New app for WHO's Medical eligibility criteria for contraceptive use. 2019. Last Access Date 11.11.2024. Available from: https://www.who.int/news/item/29-08-2019-new-app-for-who-s-medical-eligibility-criteria-for-contraceptive-use.

32. Trussell J, Hassan F, Lowin J, Law A, Filonenko A. Achieving cost-neutrality with long-acting reversible contraceptive methods. *Contraception.* 2015;91:49-56.

33. Garrett CC, Williams H, Keogh L, Ullah QW, Kong F, Hocking JS, et al. Is there a role for practice nurses in increasing the uptake of the contraceptive implant in primary care? Survey of general practitioners and practice nurses. *Sex Health.* 2016;13(3):241-247.

34. Othman NF, Latip HAA, Yusoff F, Hassan H, Supian ZA. A study on knowledge, attitude and practice of family planning among doctors and nurses in petaling district. *Malays J Med Health Sci*. 2019;15(Suppl 4):82.

35. Bratlie M, Aarvold T, Skårn ES, Lundekvam JA, Nesheim BI, Askevold ET. Long-acting reversible contraception for adolescents and young adults-a cross-sectional study of women and general practitioners in Oslo, Norway. *Eur J Contracept Reprod Health Care.* 2014;19(3):194-202

36. Agha S, Fareed A, Keating J. Clinical training alone is not sufficient for reducing barriers to IUD provision among private providers in Pakistan. *Reprod Health.* 2011;8:40.

37. Benner P. Using the Dreyfus model of skill acquisition to describe and interpret skill acquisition and clinical judgment in nursing practice and education. *Bull Sci Technol Soc*. 2004;24(3):188-199.

38. Hancock H, Carlson O, Hempstone H, Arnold B, Hoffmann K, Gul X, et al. Six recommendations for provider behavior change in family planning. *Glob Health Sci Pract.* 2023;11:2200495.

39. Sitrin D, Pfitzer A, Ndirangu G, Kamanga A, Onguti B, Ontiri S, et al. Expanding contraceptive method choice with a hormonal intrauterine system: results from mixed methods studies in Kenya and Zambia. *Glob Health Sci Pract.* 2021;9(1):89-106.