

Knowledge, Attitudes, and Practice of Women in Lebanon Surrounding Uterine Adenomyosis: A Cross-Sectional Study

Abdullah Kadhim

ajk015@student.bau.edu.lb

Beirut Arab University

Aya Shaaban

Beirut Arab University

Mohammad Ziad Bakkar

Beirut Arab University

Mariam Mghames

Beirut Arab University

Ali Kerdieh

Beirut Arab University

Yolla Abou Salha

Beirut Arab University

Adam Zaiour

Beirut Arab University

Dana Salloum

Beirut Arab University

Abdelhadi Moursel

Beirut Arab University

Salim Chahine

New Mazloum Hospital

Salah Malas

Beirut Arab University

Research Article

Keywords: Adenomyosis, Health Knowledge, Attitudes, Practice, Women Health, Lebanon, Survey study

Posted Date: October 23rd, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-11153706/v1>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.
[Read Full License](#)

Additional Declarations: No competing interests reported.

Abstract

Background

Adenomyosis is a common gynaecological disorder associated with dysmenorrhea, abnormal uterine bleeding, pelvic pain, and reproductive complications. Despite the clinical burden presented by it, awareness remains limited. This study aimed to assess knowledge, attitudes, and practice (KAP) regarding adenomyosis in reproductive-aged women in Lebanon.

Methods

A cross-sectional online survey was conducted among women aged 18–49 in Lebanon using snowball and convenience sampling. A modified standardized questionnaire adapted from a previous study was used to assess KAP. Differences in KAP scores were tested using the non-parametric Mann Whitney and Kruskal Wallis tests. Multivariable models were fitted for each KAP domain, as well as a multinomial logit model for “I don’t know” responses and a structural equation model.

Results

Among 418 participants, 79.4% had poor knowledge and only 2.4% had good knowledge. Almost 50% of the responses for each knowledge item were “I don’t know”. 50.0% had good attitudes while only 7.4% had good practice. Healthcare worker/ student status and greater self-reported gynaecological knowledge were associated with higher knowledge scores, while healthcare worker/ student status was also associated with higher practice scores. Knowledge was positively associated with attitude and practice and there was no evidence of an indirect association between knowledge and practice through attitude.

Conclusion

Our findings suggest that substantial gaps in adenomyosis-related knowledge and practice exist in reproductive-aged women in Lebanon, despite favourable attitudes. Disease-specific educational initiatives emphasizing symptom recognition and appropriate healthcare seeking behaviours may help bridge these gaps.

Background

Menstruation – a physiological bodily process of adult females in reproductive years - is not uncommonly accompanied by menstrual irregularities and symptoms ranging from mild discomfort to severe pain and bleeding (2). Dysmenorrhea, defined as painful menstruation, is one of the most common gynaecological complaints among women of reproductive age with a recent 71% global

prevalence estimate (3). Dysmenorrhea is classified as either primary or secondary. Primary dysmenorrhea refers to painful menstruation occurring in the absence of an identifiable pathology (4) while secondary dysmenorrhea is a consequence of an underlying pelvic pathology such as endometriosis, uterine leiomyomas, pelvic inflammatory disease, and adenomyosis (4, 5). Although mild menstrual discomfort may be a normal part of menstruation; severe, persistent, or a progressively worsening menses pain should raise suspicion and warrant further evaluation (4, 5). Dysmenorrhea is frequently undertreated and some women tend to normalize its symptoms or consider menstrual pain something they are expected to tolerate (4). This further contributes to delayed gynaecological-seeking and diagnosis of any underlying pathologies.

Among causes of secondary dysmenorrhea, uterine adenomyosis is an increasingly recognized condition. It is defined as a chronic benign gynaecological disorder characterized by the presence of endometrial glands and stroma within the myometrium (6). The exact pathogenesis is incompletely understood, with suggested mechanisms including invagination of the endometrium into the underlying myometrium and metaplastic development of endometrial tissue from embryonic remnants or stem cells (6, 7). Historically, adenomyosis was considered predominantly a disease of middle-aged women, largely due to diagnosis being restricted to histopathological examination of hysterectomy specimens (6, 8). However, advances in non-invasive imaging, – namely transvaginal ultrasonography and magnetic resonance imaging – have facilitated the diagnosis of adenomyosis and its recognition among younger reproductive-aged women (6, 8, 9).

Women with adenomyosis may experience severe or progressively worsening dysmenorrhea, heavy menstrual or abnormal uterine bleeding, chronic pelvic pain, and dyspareunia (5, 6, 8). The condition may also have consequences beyond menstrual symptoms such as impaired fertility and adverse pregnancy outcomes (10). Furthermore, adenomyosis-related pain and abnormal bleeding can negatively affect quality of life and sexual well-being (5, 11). Nonetheless, adenomyosis remains a challenge to recognize and diagnose. Its symptoms are heterogeneous and may overlap with those of other common gynaecological disorders, particularly endometriosis and uterine leiomyomas, that may also coexist with adenomyosis (6, 8). Moreover, the epidemiological burden of adenomyosis remains difficult to establish, with reported prevalence varying substantially according to the population studied, diagnostic modality, and diagnostic criteria used (6, 8). These factors, combined with the possibility that women may normalize severe menstrual pain or heavy bleeding, underscore the importance of increasing awareness to adenomyosis among women of reproductive age.

In this context, assessing women's knowledge, attitudes, and practices (KAP) regarding adenomyosis provides an important insight into how the condition is understood and approached by the population. Knowledge can reflect women's understanding of adenomyosis, its symptoms, risk factors, diagnosis, and treatment, while attitudes reflect perceptions of the seriousness of the disease and the importance of seeking medical care. Practices can provide information regarding symptom recognition, healthcare-seeking behaviour, and management of symptoms. However, such studies in this context are scarce. A

recent cross-sectional study among 520 Chinese reproductive-aged women found inadequate knowledge, unfavourable attitudes, and poor practices regarding uterine adenomyosis (12).

To our knowledge, women's KAP regarding uterine adenomyosis have not previously been investigated in the Lebanese population. Given the substantial burden of dysmenorrhea among Lebanese women (13) and the potential for severe menstrual pain to reflect an underlying gynaecological pathology, investigating KAP surrounding adenomyosis in this population is warranted. Investigating the current level of KAP helps identify specific areas of deficiency and provides a foundation for future educational initiatives and awareness campaigns. Therefore, we sought to assess the KAP of Lebanese women regarding uterine adenomyosis and the sociodemographic, reproductive, and clinical factors associated with different levels of KAP.

Methods

Study Design and Procedures

The cross-sectional online survey study was conducted using Google Forms. Surveys were sent via text messages and social media, and participants were encouraged to share the form with women they know. Reproductive aged women aging between 18 and 49 were included. Males, post-menopausal females, and those with limited literacy were excluded from our study, as well as participants deemed to have a logical conflict as per the knowledge questionnaire.

Sample Size

Using the sample size formula for estimating population proportions ($\alpha = 5\%$, 95% confidence level, $n = 20000$, response distribution = 50% to yield the maximum required sample size), 385 participants were required. We sought to collect at least 424 responses ($n = 385 + 0.10 \times 385$) to account for non-response and possible exclusions.

Questionnaire

The study questionnaire was first constructed in English by referring to previous studies (12, 14) then translated into Arabic by two bilingual translators using forward-backward translation. Participants could see both the Arabic and English text to ensure comprehension. Also, the questionnaire was reviewed by a physician specialized in obstetrics and gynaecology as well as 10 people of the target population to evaluate comprehension, and comments were addressed.

The KAP instrument was adapted from Ren et al (12) and underwent some wording modifications to better suite the Lebanese population. Each KAP domain score was rescaled to range from 0-100 and represent the percentage of total possible score for comparability across KAP domains (15). The modified Bloom's cutoffs were used to categorize KAP domains for descriptive purposes as follows:

poor ($\leq 59\%$), moderate (60–79%), and good (80–100%) (16). Each of the three KAP domains showed good to excellent internal consistency in our sample (Cronbach alpha = 0.914, 0.942, and 0.822 for knowledge, attitudes, and practice respectively). The final version of the questionnaire comprised 54 questions distributed across 5 sections:

1. *Sociodemographics*: information about participants age, height, weight, nationality, governorate, educational level, average monthly income, marital status and healthcare worker/ student status.
2. *Gynaecological, reproductive, and medical characteristics*: information about participants gynaecological history (menarche, average menses duration, average cycle duration), gravidity, parity, adenomyosis or other gynaecological disease diagnoses, gynaecological symptoms, and other information.
3. *Knowledge*: the knowledge section comprised 12 true or false questions (K1-K12). An additional “I don’t know” (IDK) option was added to the original instrument since we anticipated lack of knowledge in our sample and wanted to mitigate random guessing (15). Participants were instructed to “Please try to answer with “I don’t know” only when you truly have no knowledge of the mentioned statement and would practically be making a random guess” to ensure accuracy. Knowledge items K3 and K9 were designed to be diametrically opposite trap questions with the same meaning but opposite answers. Participants who had contradictory answers for both items were ruled to have a logical conflict and excluded. Knowledge items were scored 1 for correct answers and 0 for incorrect answers or IDK then summed into a total score 0–10.
4. *Attitudes*: the attitude section consisted of 7 questions (A1-A6.1). The first five questions were scored on a five-point Likert scale ranging from “very negative” (1 point) to “very positive” (5 points) which were summed to give the raw score (5–25). Questions A6 and A6.1 were purely descriptive questions regarding the use of hysterectomy as a treatment for adenomyosis and alternative therapies and thus were not scored.
5. *Practice*: the practice section involved 8 questions (P1-P8) about women’s practices surrounding adenomyosis. One question was added to the original study’s questionnaire: P4 – “You regularly attend gynaecological checkups as recommended”. P1 to P8 were scored on a five-point Likert scale ranging from “extremely non-compliant” (1 point) to “completely compliant” (5 points) for P1-P7 while P8 ranged from “never” (1 point) to “always” (5 points). Items were summed to give a total score 8–40.

Ethical Considerations

This study was conducted in accordance with the ethical principles laid by the declaration of Helsinki (1). Institutional Review Board (IRB) approval was obtained from Beirut Arab University and potential respondents provided informed consent before beginning the survey.

Statistical Analysis

Statistical analysis was conducted using Stata 19 BE. Normality of variables was evaluated using the Shapiro Wilk test, histograms, and kernel density plots. Due to non-normal distributions, non-parametric methods were used for the analysis. Descriptive statistics were reported as both mean with standard deviation and median with interquartile range for continuous variables and frequencies with percentages for factor variables. The non-parametric Mann-Whitney U and Kruskal Wallis H tests were used to determine bivariate associations of KAP domains with factor variables of 2 or more categories respectively. Spearman correlation was used to determine the associations between KAP and continuous variables.

Multivariable linear regression was used to determine independent predictors of each KAP domain. The assumptions of linearity, absence of multicollinearity, normality of residuals, and homoskedasticity were evaluated thoroughly and adjustments were made to satisfy them and improve model fit. Correspondingly, heteroskedasticity robust standard errors were used in the knowledge and practice models and polynomial terms were added in the attitude model. Adjusted R^2 values were reported for each model as well as raw coefficients, standard errors, t statistics, p values, and 95% confidence intervals for each predictor. A multinomial logistic regression was also used to determine predictors of answering correctly or incorrectly with confidence compared to answering IDK with association reported as adjusted odds ratios (aOR). Furthermore, structural equational modelling (SEM) with bootstrapping (2000 repetitions) was done to evaluate the hypothesized effects of knowledge on attitude, knowledge on practice, attitude on practice, and any possible mediation. Standardized direct and indirect effect coefficients are reported.

The variables height, menarche, menses, and cycle had missing values in part due to erroneous entries as well as participants being allowed to skip menstrual history questions in case they were pregnant at the time of completing the survey. Pairwise deletion was used to exclude missing values on an analysis-by-analysis basis. Statistical significance was set at a two-sided p value less than 0.05.

Results

Initially, 565 responses were collected. 63 participants did not belong to our target population (reproductive age adult females) and so were excluded. Also, 84 participants had conflicting answers on the diametrically opposite knowledge questions (k3 and k9) leading to their exclusion. The final sample consisted of 418 participants who were relatively young (median age = 25, IQR: 15), predominantly of Lebanese nationality (n = 391, 93.5%), single (n = 257, 61.5%), and of good socio-economic and educational status. Detailed sociodemographic and reproductive characteristics of participants are shown in Tables 1 and 2.

The distributions of knowledge, attitude, and practice scores are shown in Fig. 1. Our study sample had overall insufficient knowledge regarding uterine adenomyosis (mean $\pm$ SD = 29.74 ± 28.74 ; median (IQR) = 25 (58.33)) where 79.43% (n = 332) had poor knowledge, 18.18% (n = 76) had moderate knowledge, and only 2.39% (n = 10) had good knowledge. Notably, almost all knowledge questions were answered with

IDK by 50% or more of participants (Fig. 2), underscoring the lack of knowledge in this study sample. The top three most correct-answered knowledge questions were K11 (51%) “A healthy diet, regular exercise, and consistent follow-up can improve the condition of patients with adenomyosis”, K1 (41%) “Typical clinical manifestations of adenomyosis encompass heavy/ increased menstrual flow and painful menstrual cramps”, and K4 (39%) “Diagnostic approaches for adenomyosis include ultrasonography and magnetic resonance imaging (MRI)”. On the other hand, the most incorrectly answered were K5 (14.83%) “Therapeutic interventions for adenomyosis may involve pharmacological treatments or surgical options. Post-remission, symptoms will never recur “, K2 (12.68%) “Women of reproductive age are not the primary demographic impacted by adenomyosis “, and K12 (12.68%) “Adenomyosis does not possess cancerous transformation potential “. As for attitudes (mean $\pm$ SD = 74.55 $\pm$ 23.77, median (IQR) = 77.5 (20)), 18.18% (n = 76), 31.82% (n = 133), and 50.00% (n = 209) had poor, moderate, and good attitudes respectively. Additionally, practice scores (mean $\pm$ SD = 52.08 $\pm$ 20.68, median (IQR) = 53.13 (31.25)) were also predominantly poor (n = 268, 64.11%) and moderate (n = 119, 28.47%) with only 7.42% (n = 31) scoring good practice. Item-level descriptives for KAP domains are shown in Tables 3–4 and Fig. 2.

Table 1
– Sociodemographic Characteristics of the Study Sample

N	Mean (SD) Median (IQR) Frequency (Percentage)
	418
Age	
Mean (SD)	28.38 (9.03)
Median (IQR)	25.00 (15.00)
Body mass index (kg/m2)	
Mean (SD)	24.840 (4.735)
Median (IQR)	23.733 (6.188)
Lebanese citizen	
No	27 (6.5%)
Yes	391 (93.5%)
Governorate	
Akkar	6 (1.4%)
Beirut	125 (29.9%)
Beqaa	17 (4.1%)
I do not currently live in Lebanon	12 (2.9%)
Mount Lebanon	122 (29.2%)
Nabatiyeh	28 (6.7%)
North Lebanon	33 (7.9%)
South Lebanon	75 (17.9%)
Married	
No	257 (61.5%)
Yes	161 (38.5%)
Average monthly income	
Less than 100\$	16 (3.8%)
Between 100\$ – 299\$	33 (7.9%)
Between 300\$ – 599\$	74 (17.7%)

N	Mean (SD) Median (IQR) Frequency (Percentage)
	418
Between 600\$ – 899\$	89 (21.3%)
Greater than 900\$	206 (49.3%)
Educational level	
Primary education (elementary)	1 (0.2%)
Secondary education (middle/high school)	74 (17.7%)
Higher vocational school (non-university degree)	36 (8.6%)
Bachelors or Master's degree	281 (67.2%)
Post-graduate education	26 (6.2%)
Healthcare Worker/ Student	
No	292 (69.9%)
Yes	126 (30.1%)

Table 2
– Reproductive Characteristics of the Study Sample

Age at Menarche	Mean (SD) Median (IQR) Frequency (Percentage)
Mean (SD)	12.425 (1.531)
Median (IQR)	12.000 1.000
Average Menses Length (days)	
Mean (SD)	5.737 (2.163)
Median (IQR)	6.000 2.000
Average Cycle Length (days)	
Mean (SD)	27.752 (4.458)
Median (IQR)	28.000 4.000
Average menstrual pain severity	
Mean (SD)	6.323 (2.447)
Median (IQR)	7.000 3.000
Gravidity	
Mean (SD)	1.010 (1.624)
Median (IQR)	0.000 2.000
Parity	
Mean (SD)	0.785 (1.247)
Median (IQR)	0.000 2.000
Had an abortion	
No	350 (83.7%)
Yes	68 (16.3%)
Regular cycle	
No	81 (19.4%)
SD: standard deviation; IQR: interquartile range; ¹ defined as “pelvic pain occurring before or after your period, unrelieved by painkillers” or “period pain that is different from typical cramps (sharp or burning)”; ² defined as “failure to conceive after one year of frequent unprotected coitus”; ³ participants were shown an illustration to help standardize responses (Supp Fig. 1)	

Age at Menarche	Mean (SD) Median (IQR) Frequency (Percentage)
Yes	337 (80.6%)
Diagnosed with adenomyosis	
No	405 (96.9%)
Yes	13 (3.1%)
Do you know anyone diagnosed with uterine adenomyosis?	
No one I know	375 (89.7%)
Immediate family	12 (2.9%)
Extended family	8 (1.9%)
Friends	25 (6.0%)
Diagnosed gynaecological diseases	
None	286 (68.4%)
Polycystic ovarian syndrome	99 (23.7%)
Endometriosis	12 (2.9%)
Leiomyomas (uterine fibroids)	11 (2.6%)
Malignant cancers (uterine, ovarian, endometrial, cervical, other...)	2 (0.5%)
Ever used oral contraceptive pills	
No	284 (67.9%)
Yes	134 (32.1%)
Gynaecological symptoms	
Dysmenorrhea ¹	153 (36.6%)
Dyspareunia	25 (6.0%)
Dyschezia	49 (11.7%)
SD: standard deviation; IQR: interquartile range; ¹ defined as “pelvic pain occurring before or after your period, unrelieved by painkillers” or “period pain that is different from typical cramps (sharp or burning)”; ² defined as “failure to conceive after one year of frequent unprotected coitus”; ³ participants were shown an illustration to help standardize responses (Supp Fig. 1)	

Age at Menarche	Mean (SD) Median (IQR)
	Frequency (Percentage)
Pelvic heaviness	71 (17.0%)
Intermenstrual bleeding	22 (5.3%)
Uterine tenderness	31 (7.4%)
Infertility ²	4 (1.0%)
Lightest menstrual flow ³	
Spotting	100 (23.9%)
Light	194 (46.4%)
Moderate	112 (26.8%)
Heavy	12 (2.9%)
Heaviest menstrual flow ³	
Spotting	0 (0.0%)
Light	16 (3.8%)
Moderate	218 (52.2%)
Heavy	184 (44.0%)
Subjective knowledge of gynaecological topics	
Almost no knowledge	48 (11.5%)
Very little knowledge	173 (41.4%)
Basic knowledge	137 (32.8%)
Well-versed in gynaecological topics	60 (14.4%)
SD: standard deviation; IQR: interquartile range; ¹ defined as “pelvic pain occurring before or after your period, unrelieved by painkillers” or “period pain that is different from typical cramps (sharp or burning)”; ² defined as “failure to conceive after one year of frequent unprotected coitus”; ³ participants were shown an illustration to help standardize responses (Supp Fig. 1)	

The dashed lines divide the graph into the three categories poor, moderate, and good according to Bloom’s cutoffs; boxes represent the interquartile range and the white dot represents the median; wider distributions at a given value correspond to higher frequency.

Dashed lines at the 50th percentile represent the median in each graph. Knowledge items K3 & K9 are diametrically opposite and were only used for screening. Attitude item A6 and A6.1 as well as practice item P8 were not plotted since their response categories differ.

Table 3
– Correctness of Individual Knowledge Items

Item	Correctness
K1: Typical clinical manifestations of adenomyosis encompass heavy/ increased menstrual flow and painful menstrual cramps.	172 (41.15%)
K2: Women of reproductive age are not the primary demographic impacted by adenomyosis.	127 (30.38%)
K4: Diagnostic approaches for adenomyosis include ultrasonography and magnetic resonance imaging (MRI).	165 (39.47%)
K5: Therapeutic interventions for adenomyosis may involve pharmacological treatments or surgical options. Post-remission, symptoms will never recur.	109 (26.08%)
K6: Pharmacological management of adenomyosis often entails the use of painkillers, oral contraceptives, and progestogens.	164 (39.23%)
K7: For patients with symptomatic adenomyosis seeking definitive resolution, removal of the uterus may be considered.	134 (23.06%)
K8: Adenomyosis can potentially contribute to infertility.	162 (38.76%)
K10: Adenomyosis is a chronic condition necessitating long-term management strategies.	152 (36.36%)
K11: A healthy diet, regular exercise, and consistent follow-up can improve the condition of patients with adenomyosis.	213 (50.96%)
K12: Adenomyosis does not possess cancerous transformation potential.	94 (22.49%)

Table 4
– Responses to Individual Attitude and Practice Items

Attitude Items					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
A1: You agree that women of childbearing age should have a basic understanding of uterine adenomyosis.	23 (5.50%)	9 (2.15%)	45 (10.77%)	156 (37.32%)	185 (44.26%)
A2: You believe that uterine adenomyosis can potentially lead to serious adverse outcomes and should be taken seriously in terms of prevention and management, regardless of the diagnosis.	21 (5.02%)	11 (2.63%)	85 (20.33%)	159 (38.04%)	142 (33.97%)
A3: You acknowledge that adopting a healthy lifestyle, including maintaining good sleep patterns, regular exercise, and a positive mindset, can contribute to the prevention and treatment of uterine adenomyosis.	21 (5.02%)	14 (3.35%)	69 (16.51%)	160 (38.28%)	154 (36.84%)
A4: You agree that controlling body weight and reducing the number of abortions can help prevent the occurrence and development of uterine adenomyosis.	21 (5.02%)	18 (4.31%)	107 (25.60%)	169 (40.43%)	103 (24.64%)
A5: It is crucial for the prevention and management of uterine adenomyosis to follow the doctor's treatment plan, adhere to medication schedules, and attend regular check-ups as advised.	22 (5.26%)	11 (2.63%)	57 (13.64%)	137 (32.78%)	191 (45.69%)

Attitude Items					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	Yes		No		
A6: You think that a total removal of the uterus is an acceptable option for curing uterine adenomyosis.	137 (32.78%)		281 (67.22%)		
	Conservative surgery (preserving the uterus)		Interventional treatment (uterine artery embolization, ablation, etc..)	Not sure about the choice, prefer to follow the doctor’s recommendation	
A6.1: If you chose “no”, in cases where medication treatment is ineffective, you prefer what alternative treatment	78 (28.26%)		20 (7.25%)	178 (64.49%)	
Practice Items					
	Extremely non-compliant	Non-compliant	Uncertain	Compliant	Completely compliant
P1: In your daily life, you seek information and knowledge about the mechanisms, symptoms, and management of adenomyosis.	77 (18.42%)	139 (33.25%)	85 (20.33%)	91 (21.77%)	26 (6.22%)
P2: You consciously strive to understand the treatment options for uterine adenomyosis.	75 (17.94%)	110 (26.32%)	93 (22.25%)	104 (24.88%)	36 (8.61%)
P3: You engage in discussions with other women of childbearing age to share insights on adenomyosis.	74 (17.70%)	127 (30.38%)	101 (24.16%)	90 (21.53%)	26 (6.22%)
P4: You regularly attend gynecological checkups as recommended.	71 (16.99%)	102 (24.40%)	69 (16.51%)	123 (29.43%)	53 (12.68%)

Attitude Items					
	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
P5: You are sensitive to detecting unusual physical symptoms in daily life, such as abnormal bleeding or pain.	35 (8.37%)	44 (10.53%)	68 (16.27%)	161 (38.52%)	110 (26.32%)
P6: When experiencing unusual symptoms like menstrual pain, prolonged periods, or infertility, you take them seriously.	48 (11.48%)	61 (14.59%)	59 (14.11%)	158 (37.80%)	92 (22.01%)
P7: You confide in family and friends or consult with a healthcare professional for support.	56 (13.40%)	50 (11.96%)	67 (16.03%)	158 (37.80%)	87 (20.81%)
	Never	Occasionally	Sometimes	Often	Always
P8: You maintain a regular exercise routine in your daily life.	42 (10.05%)	83 (19.86%)	151 (36.12%)	79 (18.90%)	63 (15.07%)

Knowledge Associations:

Multiple linear regression of knowledge scores (Table 5) had good fit ($aR^2 = 0.257$, $p < 0.001$) and showed that being a healthcare worker / student ($B = 10.786$, $p = 0.005$, 95% CI: 3.285, 18.286) and self-reported "having basic gynaecological knowledge" ($B = 20.335$, $p < 0.001$, 95% CI: 11.325, 29.345) or "being well-versed in gynaecological topics" ($B = 27.915$, $p < 0.001$, 95% CI: 16.335, 39.494) were all associated with higher knowledge scores. Conversely, not personally knowing anyone diagnosed with uterine adenomyosis was associated with lower knowledge scores ($B = -12.373$, $p = 0.008$, 95% CI: -21.456, -3.290). Furthermore, the bivariate analysis (supplementary tables 1–2) indicated higher knowledge associations for health care worker / student status, higher incomes and educational attainment, higher menstrual pain severity, dysmenorrhea, bleeding between periods, and knowing friends or immediate family with adenomyosis. Additionally, higher age, gravidity, and parity correlated negatively with knowledge. Similarly, having had an abortion and not personally knowing anyone with adenomyosis showed negative knowledge associations.

The multinomial logistic model of knowledge answers (supplementary table 3) evaluated the probability that a participant would confidently choose a correct or incorrect answer rather than choosing IDK (reference category) and had a pseudo $R^2 = 0.116$ ($p < 0.001$). Being a healthcare worker/student had greater odds of answering confidently, whether correctly (aOR = 1.926, $p = 0.003$, 95% CI = 1.247, 2.976) or incorrectly (aOR = 1.803, $p = 0.013$, 95% CI: 1.133, 2.869). The negligible difference between the reported aORs highlights the net decrease in IDK scores in healthcare workers / students with slight evidence of a knowledge advantage. Furthermore, not personally knowing people with adenomyosis was associated with significantly lower odds of answering correctly (aOR = 0.436, $p = 0.004$, 95% CI: 0.249, 0.763) or incorrectly (aOR = 0.384, $p = 0.003$, 95% CI: 0.204, 0.724) as opposed to admitting not having sufficient knowledge. Moreover, higher perceived knowledge on gynaecological topics was consistently associated with higher odds of choosing an answer rather than IDK. The odds of answering incorrectly rather than IDK is 2.75, 5.88, and 10.50 times greater for those who reported "very little knowledge", "basic knowledge", and "well versed in gynaecological topics" respectively compared to "almost no knowledge" (all $p < 0.05$). As for the odds of answering correctly rather than IDK, they were 1.58, 3.92, and 7.71 times greater in those who reported "very little knowledge", "basic knowledge", and "well versed in gynaecological topics" compared to "almost no knowledge", though the first failed to reach statistical significance. This underscores a general misinformation or information-confidence mismatch where participants who self-report higher knowledge are more confident in answering in general but the relative odds that this answer is incorrect is greater than the relative odds of it being correct. Significant results from this model are represented in Fig. 3.

Table 5
– Linear Regression Model for Knowledge

Age	Coefficient	Standard Error	t statistic	p-value	95% CI
	0.012	0.285	0.042	0.967	-0.548, 0.572
Body mass index (kg/m2)	-0.020	0.280	-0.071	0.944	-0.570, 0.530
Lebanese citizen	4.229	4.381	0.965	0.335	-4.384, 12.843
Married	-6.407	4.238	-1.512	0.131	-14.738, 1.924
Average monthly income					
Less than 100\$	0.000	0.000			
Between 100\$ – 299\$	0.409	8.219	0.050	0.960	-15.750, 16.567
Between 300\$ – 599\$	-0.737	7.780	-0.095	0.925	-16.032, 14.558
Between 600\$ – 899\$	7.253	7.614	0.953	0.341	-7.717, 22.223
Greater than 900\$	7.643	7.473	1.023	0.307	-7.049, 22.334
Educational level					
High school or lower	0.000	0.000			
Higher vocational school (non-university degree)	-8.184	5.009	-1.634	0.103	-18.033, 1.664
Bachelor's or Master's degree	-3.842	3.847	-0.999	0.319	-11.404, 3.721
Post-graduate education	-6.077	6.846	-0.888	0.375	-19.536, 7.382
Healthcare worker	10.786**	3.815	2.827	0.005	3.285, 18.286
Average menstrual pain severity	0.486	0.567	0.857	0.392	-0.628, 1.599
Diagnosed with adenomyosis	3.311	7.729	0.428	0.669	-11.884, 18.506
*** p < .001; ** p < .01, * p < 0.05					

Age	Coefficient	Standard Error	t statistic	p-value	95% CI
	0.012	0.285	0.042	0.967	-0.548, 0.572
No one I personally know has been diagnosed with uterine adenomyosis	-12.373**	4.620	-2.678	0.008	-21.456, -3.290
Gravidity	-0.285	1.641	-0.174	0.862	-3.512, 2.941
Had an abortion	-0.778	4.502	-0.173	0.863	-9.629, 8.074
Used oral contraceptive pills	3.499	3.033	1.154	0.249	-2.464, 9.462
Pelvic heaviness	-0.815	3.983	-0.205	0.838	-8.646, 7.015
Bleeding between periods	1.808	5.577	0.324	0.746	-9.157, 12.773
Subjective knowledge					
Almost no knowledge	0.000	0.000			
Very little knowledge	5.550	4.074	1.362	0.174	-2.460, 13.560
Basic knowledge	20.335***	4.583	4.437	0.000	11.325, 29.345
Well versed	27.915***	5.890	4.740	0.000	16.335, 39.494
Dysmenorrhea	1.136	3.015	0.377	0.707	-4.791, 7.063
Intercept	17.498	12.467	1.404	0.161	-7.013, 42.009
*** p < .001; ** p < .01, * p < 0.05					

Only predictors with statistically significant results are shown

Attitude:

Multiple linear regression of attitude scores (Table 6) significantly predicted the outcome better than a null model ($p = 0.012$) but failed to explain much of its variance ($aR^2 = 0.0226$). Consequently, being a health care worker / student was the only significant predictor of higher attitude ($B = 7.669$, $p = 0.009$, 95% CI: 1.893, 13.445). Additionally, bivariate analysis only showed positive attitude associations for

healthcare worker / student status, participants with immediate family members with adenomyosis, history of malignant gynaecological cancers, and longer average cycle length. Furthermore, history of abortion was associated with lower attitude scores (supplementary tables 1–2).

Table 6
– Multiple Linear Regression of Predictors Associated with Attitude

Age (mean centered)	Coefficient	Standard Error	t statistic	p-value	95% CI
	-0.570	0.377	-1.511	0.132	-1.312, 0.172
Age quadratic term	-0.006	0.036	-0.157	0.875	-0.076, 0.064
Age cubic term	0.003	0.002	1.142	0.254	-0.002, 0.007
Married	6.400	4.081	1.568	0.118	-1.623, 14.422
Average monthly income					
Less than 100\$	0.000	0.000			
Between 100\$ – 299\$	-1.445	7.134	-0.203	0.840	-15.470, 12.580
Between 300\$ – 599\$	2.189	6.708	0.326	0.744	-10.999, 15.376
Between 600\$ – 899\$	-1.863	6.744	-0.276	0.783	-15.122, 11.396
Greater than 900\$	2.349	6.482	0.362	0.717	-10.395, 15.093
Educational level					
High school or lower	0.000	0.000			
Higher vocational school (non-university degree)	-0.500	5.261	-0.095	0.924	-10.843, 9.843
Bachelor's or Master's degree	5.725	3.461	1.654	0.099	-1.079, 12.529
Post-graduate education	1.399	7.003	0.200	0.842	-12.368, 15.167
Healthcare worker / student	7.669**	2.938	2.610	0.009	1.893, 13.445
Average menstrual pain severity (mean centered)	-0.798	0.634	-1.260	0.209	-2.044, 0.448
Average menstrual pain quadratic term	-0.461*	0.210	-2.200	0.028	-0.873, -0.049
*** p < .001; ** p < .01, * p < 0.05					

Age (mean centered)	Coefficient	Standard Error	t statistic	p-value	95% CI
	-0.570	0.377	-1.511	0.132	-1.312, 0.172
Diagnosed with adenomyosis	9.771	6.076	1.608	0.109	-2.175, 21.717
No one I personally know has been diagnosed with uterine adenomyosis	-0.573	4.567	-0.125	0.900	-9.551, 8.405
I have not been diagnosed with any other gynaecological diseases	-1.408	2.541	-0.554	0.580	-6.403, 3.588
Gravidity	0.081	1.398	0.058	0.954	-2.668, 2.830
Had an abortion	-4.079	4.193	-0.973	0.331	-12.322, 4.164
Pelvic heaviness	1.554	3.513	0.442	0.658	-5.352, 8.461
Uterine tenderness	4.696	4.721	0.995	0.320	-4.585, 13.977
Intercept	67.792***	8.697	7.795	0.000	50.694, 84.890
*** p < .001; ** p < .01, * p < 0.05					

Practice Associations:

Multiple linear regression of practice scores (Table 7) – $p < 0.001$ $aR^2 = 0.0914$ – showed that being a Lebanese national ($B = 11.820$, $p = 0.004$, 95% CI: 3.780, 19.859) and having attained post-graduate education ($B = 10.359$, $p = 0.035$, 95% CI: 0.708, 20.010) were significantly associated with higher levels of practice. Furthermore, those with "heavy" lightest menstrual blood flow also had higher practice scores ($B = 17.185$, $p = 0.009$, 95% CI: 4.249, 30.121) unlike participants whose heaviest menstrual flow was "moderate" ($B = -10.689$, $p = 0.041$, 95% CI: -20.945, -0.433) or "heavy" ($B = -11.835$, $p = 0.028$, 95% CI: -22.383, -1.286). Also, intermenstrual bleeding was associated with better practice ($B = 11.828$, $p = 0.017$, 95% CI: 2.146, 21.510). These findings relating to menstrual flow prompted an exploratory rerun of the model with a composite "flow difference" variable = heaviest flow – lightest flow; assuming that the positive association of heavy lightest flow paired with the negative associations of heaviest flow indicate an underlying relationship of the difference in flow between the lightest and heaviest. As the difference between heaviest flow and lightest flow increases, practice scores decrease ($B = -2.55$, $p = 0.041$, 95% CI: -4.992, -0.104), suggesting that women who have heavier baseline (lightest) flow intensity have better practice. As for the bivariate analysis, there were no statistically significant negative predictors of practice. However, being a healthcare worker or Lebanese citizen, having higher educational attainment,

having been personally diagnosed with adenomyosis or personally knowing someone who has been, and other comorbidities, symptoms, and menstrual characteristics were associated with better practice (supplementary tables 1–2).

Table 7
– Multiple Linear Regression of Predictors Associated with Practice

Age	Coefficient	Standard Error	t statistic	p-value	95% CI
	-0.026	0.174	-0.147	0.883	-0.369, 0.317
Lebanese citizen	11.820**	4.089	2.890	0.004	3.780, 19.859
Married	-1.880	3.089	-0.609	0.543	-7.954, 4.193
Average monthly income					
Less than 100\$	0.000	0.000			
Between 100\$ – 299\$	-0.019	6.129	-0.003	0.998	-12.069, 12.032
Between 300\$ – 599\$	-4.029	5.557	-0.725	0.469	-14.955, 6.897
Between 600\$ – 899\$	-0.710	5.474	-0.130	0.897	-11.473, 10.053
Greater than 900\$	-3.624	5.252	-0.690	0.491	-13.950, 6.702
Educational level					
High school or lower	0.000	0.000			
Higher vocational school (non-university degree)	3.205	4.194	0.764	0.445	-5.040, 11.450
Bachelor's or Master's degree	1.165	2.714	0.429	0.668	-4.170, 6.500
Post-graduate education	10.359*	4.909	2.110	0.035	0.708, 20.010
Healthcare worker / student	6.428**	2.384	2.696	0.007	1.741, 11.116
Age at menarche	0.954	0.657	1.451	0.148	-0.339, 2.246
Lightest menstrual flow					
Spotting	0.000	0.000			
Light	1.806	2.540	0.711	0.477	-3.187, 6.800
*** p < .001; ** p < .01, * p < 0.05					

Age	Coefficient	Standard Error	t statistic	p-value	95% CI
	-0.026	0.174	-0.147	0.883	-0.369, 0.317
Moderate	2.645	2.923	0.905	0.366	-3.101, 8.392
Heavy	17.185**	6.580	2.612	0.009	4.249, 30.121
Heaviest menstrual flow					
Light	0.000	0.000			
Moderate	-10.689*	5.217	-2.049	0.041	-20.945, -0.433
Heavy	-11.835*	5.365	-2.206	0.028	-22.383, -1.286
Diagnosed with adenomyosis	5.863	6.728	0.871	0.384	-7.364, 19.090
No one I personally know has been diagnosed with uterine adenomyosis	-4.127	3.624	-1.139	0.255	-11.253, 2.998
I have not been diagnosed with any other gynaecological diseases	-0.339	2.388	-0.142	0.887	-5.033, 4.356
Used oral contraceptive pills	1.953	2.323	0.841	0.401	-2.614, 6.521
Dyspareunia	3.036	4.317	0.703	0.482	-5.451, 11.523
Dyschezia	2.445	3.283	0.745	0.457	-4.009, 8.899
Pelvic heaviness	1.223	2.830	0.432	0.666	-4.341, 6.787
Bleeding between periods	11.828*	4.924	2.402	0.017	2.146, 21.510
Dysmenorrhea	-0.350	2.249	-0.156	0.876	-4.771, 4.072
Intercept	40.375**	13.018	3.101	0.002	14.780, 65.970
*** p < .001; ** p < .01, * p < 0.05					

Knowledge, Attitude, and Practice:

Structural equational modelling results of knowledge, attitude, and practice adjusting for age, marital status, income, educational level, and healthcare worker status are shown in Fig. 4.

standardized coefficients are shown

The SEM model showed good fit: Root Mean Squared Error of Approximation (RMSEA) = 0.078 (< 0.08), Tucker-Lewis Index (TLI) = 0.877 (> 0.8), Comparative Fit Index (CFI) = 0.890 (> 0.8). Knowledge had a direct effect on attitudes (Beta = 0.170, $p = 0.001$) and practice (Beta = 0.292, $p < 0.001$). Attitude had a direct negative effect on practice (Beta = -0.143, $p = 0.019$). Furthermore, the indirect effect of knowledge on practice through attitude failed to reach statistical significance (Beta = -0.024, $p = 0.063$), suggesting absence of mediation.

Discussion

This study assessed reproductive-aged women's KAP towards uterine adenomyosis in Lebanon. There was a large disconnect between knowledge, attitudes and practice. Nearly four-fifths of participants lacked adenomyosis-related knowledge (79.4%), and almost two-thirds had poor practice scores (64.1%), despite comparatively more favourable attitudes, with 50% of the participants falling into the good attitude category.

The knowledge deficits we found in our sample are similar to those reported in other research on adenomyosis and other gynaecological conditions. Ren et al reported insufficient knowledge of adenomyosis among Chinese reproductive-age women, with a mean score of 3.54/10, and no knowledge item exceeding 50% correctness (12). Although the scoring approaches differ between the mentioned study and ours, they both highlight that the poor knowledge regarding adenomyosis is not limited to either population. Limited gynaecological awareness has also been found locally. A KAP study on endometriosis among Lebanese women reported gaps in knowledge of the condition (14). While uterine adenomyosis and endometriosis are distinct diseases, the similarity of awareness deficit may reflect a broader gap in public knowledge of chronic gynaecological conditions in Lebanon. Part of the high percentage of participants with poor knowledge in our sample may also be due to the addition of an IDK response option to the questionnaire. While adding this option allows participants to admit the absence of knowledge/ uncertainty rather than guessing an answer they don't truly endorse, it may decrease engagement of participants where they can choose IDK without thinking about the question at hand. However, we tried to mitigate this possibility by instructing the participants to select IDK only when picking an actual answer would be making a random guess and by implementing a logical conflict screening exclusion.

Subjective knowledge – how knowledgeable participants believed themselves to be about gynaecological topics – was positively associated with their actual adenomyosis knowledge scores. As self-perceived knowledge increased, the odds of answering correctly and incorrectly increased compared to selecting IDK. However, the increase in odds relative to IDK was numerically larger for incorrect responses. This may reflect a confidence-accuracy miscalibration, where a greater confidence

in knowledge was not always matched with higher accuracy. It's important to consider the clinical aspect of this mismatch. Those who are confident in inaccurate health knowledge may be less likely to question their understanding and recognize that they need more information, which could reduce their tendencies to seek clarification and additional health information (17).

Beyond self-perceived knowledge, a healthcare-related background was also associated with better knowledge about adenomyosis. Healthcare worker/ student status had a 10.8-point higher knowledge score in our sample after multivariable adjustment. However, the odds of choosing the correct answer rather than IDK were very similar to those of choosing the incorrect answer rather than IDK (1.93 vs 1.80), suggesting that a healthcare-related background may increase familiarity with the condition without consistently translating into a more superiorly accurate adenomyosis knowledge. This may indicate that knowledge gaps about uterine adenomyosis persist even among healthcare workers/ students. Similarly, previous literature findings showed persistent adenomyosis knowledge and awareness gaps among healthcare professionals (18, 19). In addition, knowing someone with uterine adenomyosis was associated with a greater disease knowledge score, particularly among those who have an immediate family member diagnosed with this condition. Lindenmeyer et al. reported that health information is shared between family members through everyday "health talk", which helps build an understanding of the diseases from shared experiences and medical information (20).

Although the attitude scores were more favourable compared to knowledge and practice, the factors examined in this study offered little explanation for why attitude scores differed between participants (final model adjusted $R^2 = 0.0226$). Hence, the variation in attitudes may be driven by factors outside of what we measured. Some of these may be societal beliefs, culture, stigma, symptom normalization, and previous healthcare experiences, as an adenomyosis scoping review highlighted their role in shaping overall women's perceptions and experiences of the condition (19). The generally favourable attitude findings in our sample were similarly reported in the Ren et al. study, though their population exhibited higher levels of agreement on the first 5 attitude statements (12). Interestingly, the attitudes towards hysterectomy in this context were similar between the two studies, with approximately two-thirds of participants not considering total hysterectomy an acceptable option for curing uterine adenomyosis. According to Ren et al., this finding may indicate gaps in participants' awareness of available treatment options.

Adenomyosis-related practice was generally poor in our study, with 64.1% of participants showing poor practice and only 7.4% demonstrating good practice, despite approximately half of participants reporting good attitudes. This discrepancy suggests that favourable perceptions alone may not necessarily translate into appropriate health-related practices, highlighting the potential influence of broader factors that shape how women perceive, interpret, and respond to adenomyosis and its symptoms (19).

In the multivariable analysis, Lebanese nationality, postgraduate education, and healthcare worker/ student status were independently associated with higher practice scores. The association with Lebanese nationality may reflect the accessibility and potentially the familiarity with the local healthcare

system and the available healthcare services and information (21). Similarly, the positive relationship between postgraduate education and practice may be related with higher health literacy, as higher educational attainment may facilitate the acquisition, interpretation, and application of health information (22). The association between healthcare worker/student status and higher practice scores may reflect the practical advantage of the greater exposure to medical information and environment which could facilitate the application of knowledge and strengthen relevant clinical competencies (23). However, the presence of adenomyosis-specific knowledge gaps in this population suggests that general exposure to healthcare knowledge and clinical settings may support appropriate health practices without necessarily ensuring condition-specific knowledge. This highlights the potential value of incorporating adenomyosis-specific content into the education and training of healthcare professionals and students (18).

Menstrual flow characteristics were also significantly associated with practice. The lightest menstrual flow being “heavy” was associated with higher practice scores whereas reporting “moderate” or “heavy” flow as the heaviest flow were both associated with lower practice scores. An exploratory analysis of flow difference (heaviest flow – lightest flow) showed that a greater flow difference was associated with lower practice scores ($B=-2.55$, $P = 0.041$), suggesting that greater menstrual symptom burden at severity baseline may increase attention to menstrual health and encourage care seeking (24), whereas greater variability may reflect less predictable menstrual patterns and potentially hinder consistent monitoring.

The SEM findings provide further insight into the relations between knowledge, attitude and practice surrounding adenomyosis. Although knowledge showed positive direct association with both attitude and practice, there was no evidence that attitude mediated the relationship between knowledge and practice, as the indirect effect was statistically insignificant. This finding may suggest that increasing factual understanding of adenomyosis may be associated with more appropriate practices without necessarily operating through the measured attitudes, and that knowledge may influence practice through pathways independent of attitude or through other unmeasured factors. However, given the cross-sectional design, these associations could not be interpreted causally, and the model was saturated, so it merely reflected the observations in our sample.

Notably, attitude exhibited a significant negative direct association with practice ($B= -0.143$) which is counterintuitive. A potential explanation is that more positive attitudes may not necessarily reflect greater perceived urgency to engage in practical or health protective behaviours. Alternatively, the measured attitudes may have captured the general positivity and acceptance toward adenomyosis rather than specific health protective beliefs that induce action. Thus, participants may express favourable views toward the condition while lacking the knowledge, perceived risk, or personal relevance needed to adopt corresponding practices. Despite these mechanisms being speculative, they suggest that favourable attitude alone may not be sufficient to promote appropriate health practices, emphasizing the potential importance of disease-specific knowledge and perceived relevance in shaping behaviour.

The observed gap between favourable attitudes and limited practice suggests that improving adenomyosis-related outcomes may require interventions extending beyond attitude enhancement and general awareness toward improving disease and symptoms recognition and promoting appropriate health-seeking behaviours. Healthcare workers and students demonstrated comparatively better knowledge and practice in our study, however their greater likelihood to provide confident responses including incorrect answers may reflect persisting knowledge gaps, suggesting that they may represent a potential prioritized and primary target to enhance their adenomyosis-specific knowledge through strengthening disease recognition and improving awareness and knowledge on information limitations. Moreover, given that almost half or more of the participants selected IDK for most knowledge items, with almost 90% having no personal connections with anyone diagnosed with adenomyosis, underscores the need for educational opportunities regarding disease specific knowledge provided for the general population. Such education could be incorporated into gynaecological consultations, primary care and women's health visits, menstrual health campaigns, accessible public health and social media initiatives (18). These approaches may help women recognize potentially concerning symptoms, understand abnormal or heavy bleeding and changes in menstrual patterns, and encourage appropriate and timely care seeking. A multifaceted approach combining healthcare-professional education with public awareness and interventions promoting calibrated health knowledge and confidence that focus on encouraging health action and practices may therefore be more appropriate than information provision alone.

This study has several strengths. The questionnaire underwent forward-backward translation with some wording modifications to better suit the Lebanese population and demonstrated good to excellent internal consistency across all KAP domains. Furthermore, the explicit inclusion of an IDK option allowed uncertainty or lack of knowledge to be captured and minimized the bias of simply guessing correctly. Logical-conflict screening further strengthened data quality despite introducing selection bias, while the multinomial analysis distinguished confident correct and incorrect responses from IDK answers, yielding additional insight into the relationship between certainty and accuracy.

Nonetheless, several limitations should be considered. The cross-sectional design precludes establishing causal relationships. Additionally, convenience and snowball sampling through messages/social media and participant sharing may have introduced selection bias and limits generalizability. Although the composite knowledge score treated IDK responses as equivalent to incorrect responses, potentially obscuring the distinction between uncertainty and misinformation, the multinomial analysis partially mitigated this limitation by examining correct, incorrect, and I don't know responses independently. Finally, the modest explanatory power – particularly for attitude – indicates that substantial variability in KAP remains unexplained, suggesting additional determinants not captured in this study may have contributed to adenomyosis related KAP.

Conclusion

This study identified gaps in both adenomyosis-related knowledge and practice in light of relatively favourable attitudes. Most participants demonstrated poor knowledge and nearly two-thirds had poor adenomyosis-related practice. Healthcare worker/ student status and greater self-reported gynaecological knowledge were associated with higher knowledge, while a healthcare background was associated with more favourable practice scores. These findings support the need for accessible, disease-specific educational initiatives and interventions regarding adenomyosis, its diagnosis, symptoms, and available management options while encouraging healthcare seeking for symptomatic women.

Abbreviations

KAP
Knowledge
attitude
practice

Declarations

Ethics approval and consent to participate

This study was conducted in accordance with the ethical principles laid by the declaration of Helsinki. Ethics approval was obtained for Beirut Arab University’s Institutional Review Board. Informed consent was acquired from all respondents before filling the survey.

Consent for publication

Not applicable

Competing interests

The authors have no competing interests to declare.

IDK

I don't know

IRB
Institutional Review Board

aOR
adjusted Odds Ratio

SEM

structural equational modelling

IQR

interquartile range

SD

standard deviation

aR²

adjusted R squared

CI

confidence interval

Funding

This work did not receive any funding.

Author Contribution

A.Ka. was responsible for the conceptualization of the study, visualizations, and formal analysis. A.Ka. and A.S handled the study methods. A.Ka. and S.M. handled project administration and supervision. A.Ka., A.S., M.M., M.B., A.Ke., Y.A.S, A.Z., D.S., A.H., and S.C. participated in investigation, writing the original draft, and reviewing and editing the final draft. All authors read and approved the final version of the manuscript.

Data Availability

Data analyzed in the present study is available from the corresponding author upon reasonable request.

References

1. World Medical Association. World Medical Association Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Participants. JAMA. 2025;333(1):71–4.
10.1001/jama.2024.21972 . PubMed PMID: 39425955.

2. McKenna KA, Fogleman CD, Dysmenorrhea. *Am Fam Physician*. 2021;104(2):164–70. PubMed PMID: 34383437.
3. de Arruda GT, Barbosa-Silva J, Driusso P, Pathmanathan C, Armijo-Olivo S, Avila MA. Worldwide prevalence of dysmenorrhea: a systematic review and meta-analysis across 70 countries. *Pain*. 2026;167(1):41–55. 10.1097/j.pain.0000000000003768 . PubMed PMID: 41031966.
4. Osayande AS, Mehulic S. Diagnosis and initial management of dysmenorrhea. *Am Fam Physician*. 2014;89(5):341–6. PubMed PMID: 24695505.
5. Dason ES, Maxim M, Sanders A, Papillon-Smith J, Ng D, Chan C, et al. Guideline 437: Diagnosis and Management of Adenomyosis. *J Obstet Gynaecol Can*. 2023;45(6):417–e4291. 10.1016/j.jogc.2023.04.008 . PubMed PMID: 37244746.
6. Moawad G, Fruscalzo A, Youssef Y, Kheil M, Tawil T, Nehme J, et al. Adenomyosis: An Updated Review on Diagnosis and Classification. *J Clin Med*. 2023;12(14):4828. 10.3390/jcm12144828 . PubMed PMID: 37510943; PubMed Central PMCID: PMC10381628.
7. Ferenczy A. Pathophysiology of adenomyosis. *Hum Reprod Update*. 1998;4(4):312–22. 10.1093/humupd/4.4. .312 PubMed PMID: 9825847.
8. Selntigia A, Molinaro P, Tartaglia S, Pellicer A, Galliano D, Cozzolino M. Adenomyosis: An Update Concerning Diagnosis, Treatment, and Fertility. *J Clin Med*. 2024;13(17):5224. 10.3390/jcm13175224.
9. Graziano A, Lo Monte G, Piva I, Caserta D, Karner M, Engl B, et al. Diagnostic findings in adenomyosis: a pictorial review on the major concerns. *Eur Rev Med Pharmacol Sci*. 2015;19(7):1146–54. PubMed PMID: 25912572.
10. Nirgianakis K, Kalaitzopoulos DR, Schwartz ASK, Spaanderman M, Kramer BW, Mueller MD, et al. Fertility, pregnancy and neonatal outcomes of patients with adenomyosis: a systematic review and meta-analysis. *Reprod Biomed Online*. 2021;42(1):185–206. 10.1016/j.rbmo.2020.09.023 . PubMed PMID: 33191131.
11. Alcalde AM, Martínez-Zamora MÁ, Gracia M, Ros C, Rius M, Carmona F. Assessment of quality of sexual life in women with adenomyosis. *Women Health*. 2021;61(6):520–6. 2021.1920557 PubMed PMID: 34006207.
12. Ren R, Li H, Zhang J, Li X, Yuan L, Li D, et al. Knowledge, attitudes, and practices among Chinese reproductive-age women toward uterine adenomyosis. *Front Med (Lausanne)*. 2024;11:1361671. 10.3389/fmed.2024.1361671 . PubMed PMID: 38651069; PubMed Central PMCID: PMC11033394.
13. Karout S, Soubra L, Rahme D, Karout L, Khojah HMJ, Itani R. Prevalence, risk factors, and management practices of primary dysmenorrhea among young females. *BMC Womens Health*. 2021;21(1):392. 10.1186/s12905-021-01532-w . PubMed PMID: 34749716; PubMed Central PMCID: PMC8576974.
14. Kazan Z, Mroueh F, Hazime Z, Joumaa S, Hamze K, Husseini A, et al. Knowledge and concern towards endometriosis among Lebanese women: a cross-sectional study. *BMC Womens Health*.

- 2024;24:609. 10.1186/s12905-024-03443-y . PubMed PMID: 39548443; PubMed Central PMCID: PMC11566171.
15. Andrade C, Menon V, Ameen S, Kumar Praharaj S. Designing and Conducting Knowledge, Attitude, and Practice Surveys in Psychiatry: Practical Guidance. *Indian J Psychol Med*. 2020;42(5):478–81. doi:10.1177/0253717620946111 PubMed PMID: 33414597; PubMed Central PMCID: PMC7750837.
 16. Wang L, Abualfoul M, Oduor H, Acharya P, Cui M, Murray A, et al. A cross-sectional study of knowledge, attitude, and practice toward COVID-19 in solid organ transplant recipients at a transplant center in the United States. *Front Public Health*. 2022;10. 10.3389/fpubh.2022.880774.
 17. Canady BE, Larzo M. Overconfidence in Managing Health Concerns: The Dunning–Kruger Effect and Health Literacy. *J Clin Psychol Med Settings*. 2023;30(2):460–8. 10.1007/s10880-022-09895-4.
 18. Kolovos G, Dedes I, Imboden S, Mueller M. Adenomyosis—A Call for Awareness, Early Detection, and Effective Treatment Strategies: A Narrative Review. *Healthc (Basel)*. 2024;12(16):1641. 10.3390/healthcare12161641 . PubMed PMID: 39201199; PubMed Central PMCID: PMC11354114.
 19. Taylor MA, Croudace TJ, Muir FE, McBride M. Women’s experiences of living with adenomyosis and perceptions of the diagnostic journey: a scoping review. *BMJ Open*. 2025;15(1):e087122. 10.1136/bmjopen-2024-087122.
 20. Lindenmeyer A, Griffiths F, Hodson J. The family is part of the treatment really’: A qualitative exploration of collective health narratives in families. *Health (London)*. 2011;15(4):401–15. 10.1177/1363459310384493.
 21. Bou-Orm I, deVos P, Diaconu K. Experiences of communities with Lebanon’s model of care for non-communicable diseases: a cross-sectional household survey from Greater Beirut. *BMJ Open*. 2023;13(9):e070580. 10.1136/bmjopen-2022-070580 . PubMed PMID: 37666549; PubMed Central PMCID: PMC10481840.
 22. Bouclaous CH, Salem S, Ghanem A, Saade N, El Haddad J, Bou Malham M, et al. Health Literacy Levels and Predictors Among Lebanese Adults Visiting Outpatient Clinics in Beirut. *HLRP: Health Lit Res Pract*. 2021;5(4). 10.3928/24748307-20211012-02.
 23. Shaban EE, Elmelliti H, Shaban A, Shaban A, Zaki HA. Impact of early clinical exposure on medical students’ competency development: a systematic review of evidence from Asian and African countries. *BMC Med Educ*. 2025;25(1):1723. 10.1186/s12909-025-08103-9 . PubMed PMID: 41462235; PubMed Central PMCID: PMC12750808.
 24. Da Silva Filho AL, Caetano C, Lahav A, Grandi G, Lamaita RM. The difficult journey to treatment for women suffering from heavy menstrual bleeding: a multi-national survey. *Eur J Contracept Reproductive Health Care*. 2021;26(5):390–8. 10.1080/13625187.2021.1925881.

Figures

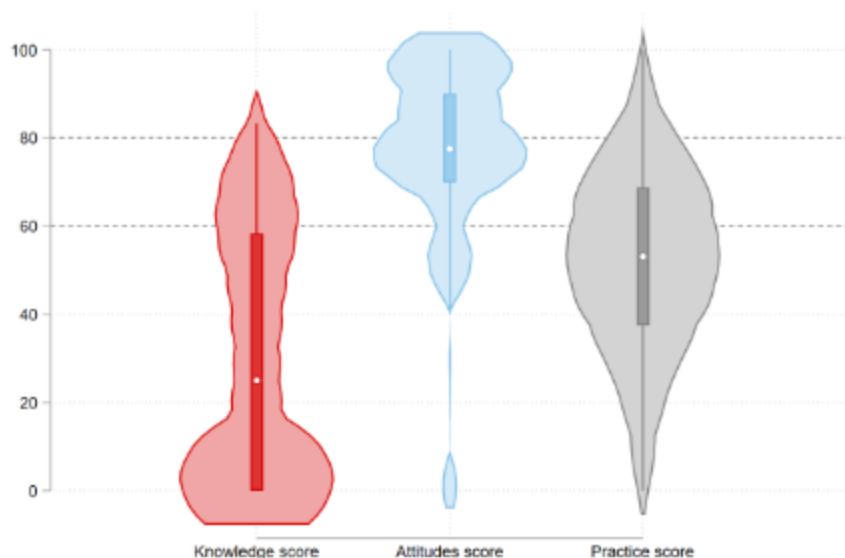


Figure 1

Violin plot of Knowledge, Attitude, and Practice Scores

The dashed lines divide the graph into the three categories poor, moderate, and good according to Bloom’s cutoffs; boxes represent the interquartile range and the white dot represents the median; wider distributions at a given value correspond to higher frequency.

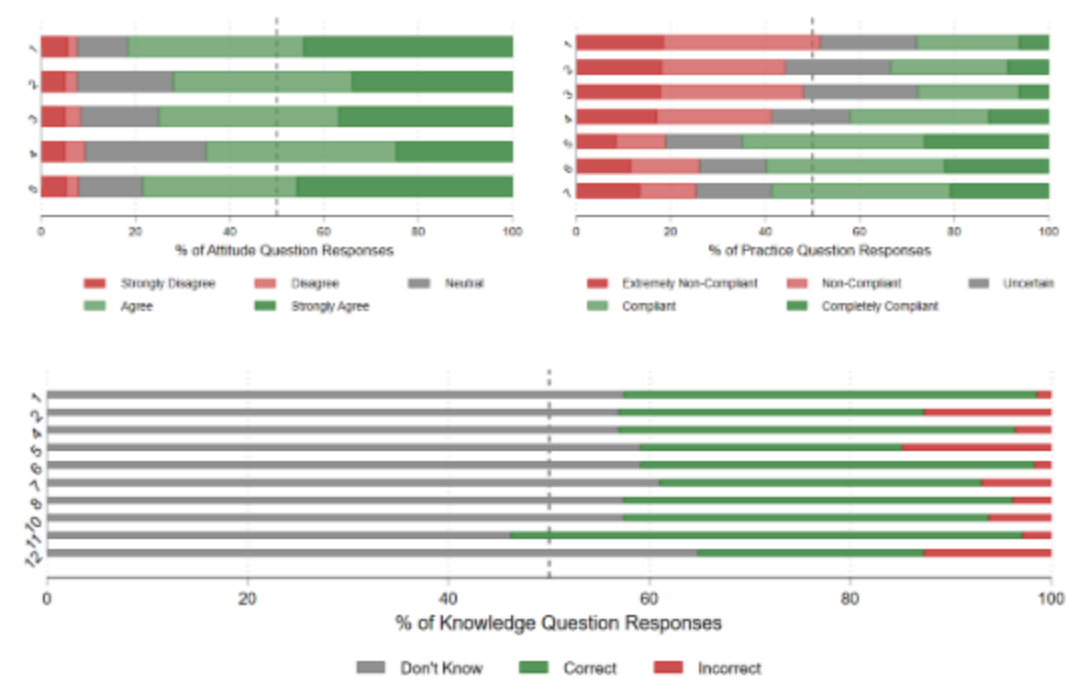


Figure 2

Horizontal Bar Chart of Percentage Responses to Each Questions for Each Domain

Dashed lines at the 50th percentile represent the median in each graph. Knowledge items K3 & K9 are diametrically opposite and were only used for screening. Attitude item A6 and A6.1 as well as practice item P8 were not plotted since their response categories differ.

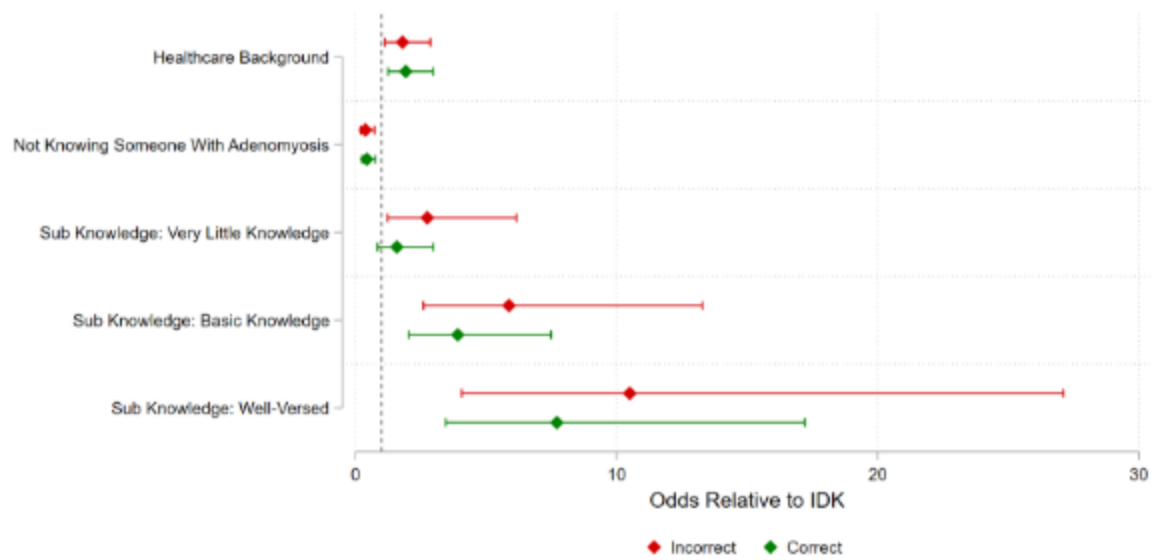


Figure 3

Odds of Answering Correctly or Incorrectly vs IDK

Only predictors with statistically significant results are shown

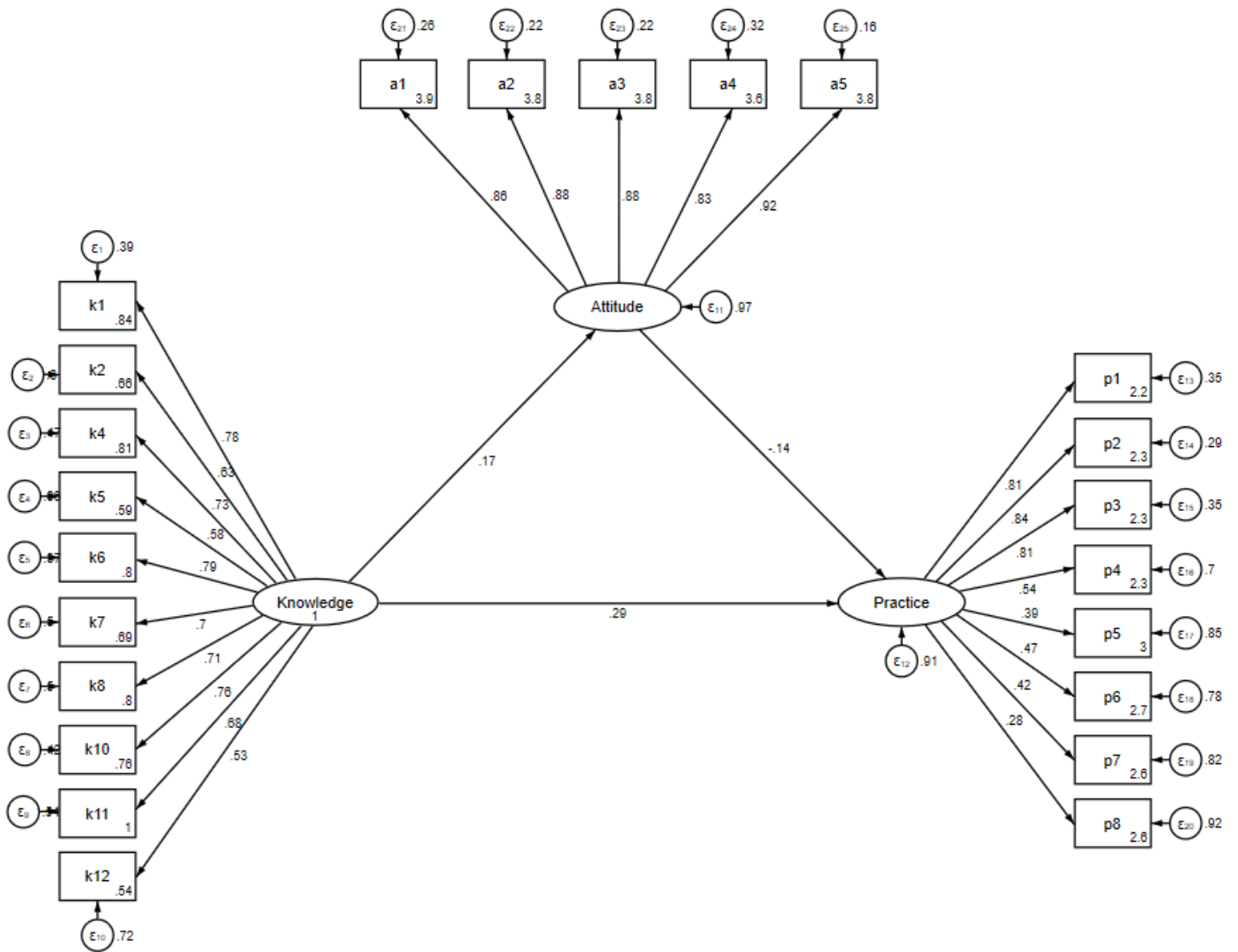


Figure 4

Knowledge, Attitude, and Practice Structural Equation Model
 standardized coefficients are shown

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- [AdenomyosisSupplementary.docx](#)