Research Square

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Knowledge Attitudes and Practices Regarding Polycystic Ovary Syndrome and Associated Factors among Female Students at Ibb University in Yemen

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Abstract

Background

Polycystic ovary syndrome (PCOS) is a prevalent endocrine disorder affecting approximately 26.7% of female university students in Yemen. However, empirical data on cognitive and behavioral dimensions of PCOS literacy in this demographic remain scarce.

Objective

This study aimed to assess PCOS-related knowledge, attitudes, and practices (KAP) and their associated factors among female students at Ibb University, Yemen.

Methods

A descriptive cross-sectional study was conducted among 386 female students using a simple random sampling technique. Data were collected via a structured, self-administered electronic questionnaire. Data analysis was performed using SPSS version 26.0.

Results

Overall knowledge was moderate (mean = 9.61 ± 4.66, median = 10.00, IQR = 7.00–13.00; 60.1% correct); attitudes were favorable (mean = 5.42 ± 1.21, median = 6.00, IQR = 5.00–6.00; 77.5% agreement); practices were suboptimal (mean = 2.28 ± 1.45, median = 3.00, IQR = 1.00–4.00; 57.1% endorsed). Knowledge correlated moderately with attitudes ($\rho = 0.414$, $p < 0.001$) and practices ($\rho = 0.368$, $p < 0.001$); the attitude–practice correlation was weak ($\rho = 0.128$, $p = 0.012$). Urban residence (AOR = 3.36, $p = 0.004$) and higher income significantly predicted adequate knowledge, whereas Arts (AOR = 0.03, $p = 0.001$) and Engineering (AOR = 0.10, $p = 0.004$) enrollment predicted lower odds. Menstrual irregularity (AOR = 2.85, $p = 0.002$) and hirsutism (AOR = 3.12, $p < 0.001$) independently predicted better practices, while medical students paradoxically exhibited poorer practices (AOR = 0.26, $p = 0.001$).

Conclusion

Despite favorable attitudes and moderate knowledge, health-seeking and preventive practices remain insufficient. Targeted educational interventions addressing metabolic risks and bridging the attitude–practice gap is urgently required.

Introduction

Polycystic ovary syndrome (PCOS) is the most common endocrine disorder affecting women of reproductive age, with far-reaching implications for reproductive, metabolic, psychological, and cardiovascular health. Global prevalence estimates vary substantially depending on diagnostic criteria, ranging from 5% to 20% [1]. Salari et al. [2], in a meta-analysis encompassing over 12.3 million participants, reported a global pooled prevalence of 9.2%. However, regional estimates vary dramatically, with Neven et al. [3] documenting a substantially higher burden in the Eastern Mediterranean region (15.1%), underscoring the relevance of the Yemeni context.

In the Yemeni context, although national data remain sparse, a pivotal study conducted in Aden documented an alarmingly high prevalence of 26.7% among female university students [4]. This figure, derived from a small-scale study (n = 60), warrants confirmation through larger, more robust investigations.

Despite the high prevalence and serious health consequences, global awareness and knowledge regarding PCOS remain critically insufficient. A landmark systematic review by Navneetha et al. [5], analyzing 89 studies across 23 countries, concluded that PCOS knowledge is generally inadequate across most populations, particularly among adolescents, rural communities, and the general public. This pattern is reflected across diverse settings: in the United Arab Emirates, Zaitoun et al. [6] found that while 84.3% of women had heard of PCOS, only 21.7% possessed sufficient overall awareness, with knowledge of long-term complications being particularly poor (19.1%). Similarly, in Ethiopia, Erku et al. [7] reported that only 20.5% of healthcare providers demonstrated good knowledge of PCOS diagnosis.

Among university populations, Rizvi et al. [8] found inadequate knowledge among Pakistani undergraduates, with major barriers including lack of self-knowledge (31.6%) and shyness (21.4%). Even medical students are not exempt; Salama et al. [9] reported that 66.0% of medical students in the UAE had low to moderate PCOS awareness, while Jaiswal et al. [10] noted that despite 85.4% of Indian female medical students having heard of PCOS, only 46.3% would consult a physician if symptomatic. The literature consistently reveals a discordance between positive attitudes and actual practices [7, 11–12]. Encouragingly, structured educational interventions have proven highly effective in bridging these gaps [13–14].

While numerous KAP studies have been conducted across Asia, the Middle East, and Africa [15–18], a conspicuous geographic void persists in Yemen. To date, no empirical research has systematically assessed PCOS KAP among female students in Yemen. This gap is particularly concerning given Yemen's protracted humanitarian crisis, fragile health infrastructure, and limited access to reproductive health information. Therefore, this study aimed to describe PCOS-related knowledge, attitudes, and practices and their associated factors among female students at Ibb University, Yemen.

Methods

Study Design, Setting, and Duration

A descriptive cross-sectional design was used to describe PCOS-related KAP among female university students at a single time point [19]. The study was conducted at Ibb University, located in Ibb Governorate, Yemen, one of the largest public universities in the country, encompassing multiple colleges and attracting a diverse student body from both urban and rural areas. Data collection was carried out over a period of six months, from March 1, 2026, to August 1, 2026.

Study Population and Selection Criteria

The target population comprised 6,000 female undergraduate students officially enrolled at Ibb University for the 2025/2026 academic year, drawn from eight colleges: Human Medicine, Dentistry, Engineering, Education, Arts, Administrative Sciences, Computer Science, and Sharia and Law. Inclusion criteria required current enrollment in a bachelor's program, age between 19 and 28 years, and provision of informed consent. Students enrolled in postgraduate studies or two-year diploma programs were excluded.

Sample Size and Sampling Technique

Sample Size: The minimum sample size was calculated using Cochran's formula for categorical data, assuming a 95% confidence level (Z = 1.96) and a 5% margin of error (d = 0.05) [20–21], yielding an initial estimate of 384 participants. Given the finite population (N = 6,000), the finite population correction (FPC) was applied, adjusting the sample to 361. To compensate for anticipated incomplete or invalid responses, the sample was oversampled by approximately 6.9%, establishing the final sample size at 386 eligible participants. This figure aligns with the Krejcie and Morgan [22] table for comparable populations and ensures a realized margin of error below 5% [23–24].

Sampling technique

Simple random sampling (SRS) was employed as the primary probability sampling strategy. Participants were selected using an electronic questionnaire distributed to the target population. This method ensures that every individual has an equal and independent probability of selection, thereby minimizing selection bias and facilitating robust generalization of findings to the entire female student population at Ibb University.

Data Collection Tool

The primary data collection instrument was a structured, self-administered electronic questionnaire, purpose-designed for the present investigation. The instrument was primarily informed by the validated tool of **Rizvi et al.** [8] and the theoretical framework proposed by **Kou et al.** [12]. All items were meticulously refined and culturally adapted to suit the Yemeni university context, while rigorously preserving the original psychometric properties and structural validity. The questionnaire was developed concurrently in both English and Arabic; however, the Arabic version constituted the final disseminated form to ensure optimal participant comprehension. The developmental phase entailed an exhaustive synthesis and critical review of previously validated KAP studies pertaining to PCOS.

The final questionnaire comprised five distinct sections: (1) sociodemographic characteristics, encompassing age, place of residence, marital status, family history of PCOS, monthly household income, college affiliation, and academic year; (2) lifestyle factors and clinical symptomatology, assessing stress levels, sleep quality, physical activity, and self-reported PCOS-related manifestations, including menstrual irregularities, hirsutism, acne, alopecia, weight gain, and hormonal disturbances; (3) knowledge of PCOS, operationalized through 16 dichotomous items (correct/incorrect), with a maximum composite score of 16; (4) attitudes toward PCOS, measured using 7 items (agree/disagree), yielding a maximum score of 7; and (5) preventive practices regarding PCOS, evaluated via 4 dichotomous items (yes/no), with a maximum score of 4. The estimated completion time for the questionnaire ranged between 15 and 20 minutes.

All items were formatted as dichotomous (yes/no) and multiple-choice questions to facilitate standardized data capture. The definitive Arabic version was administered electronically via a secure Google Forms link. To uphold strict participant confidentiality and ensure the independence of responses, unique personalized invitation links were disseminated through email, WhatsApp, and Telegram, thereby precluding any external influence or duplicate submissions.

Validity and Reliability

Validity

Content validity was verified by a panel of three academic experts in obstetrics, gynecology, and internal medicine. The Content Validity Index (CVI) was calculated, retaining only items with CVI > 0.80.

Pilot Study

A pilot study was conducted with 30 female students from colleges not included in the main study. Minor linguistic modifications were made, and two knowledge items were reworded. Pilot responses were excluded from the final analysis.

Reliability

Cronbach's alpha coefficients were 0.82 for Knowledge, 0.78 for Attitude, and 0.75 for Practice. The overall alpha coefficient for the questionnaire was 0.84, exceeding the acceptable threshold of 0.70 [25].

Scoring System for KAP

A standardized dichotomous scoring system was applied: correct/incorrect for knowledge (1/0), agree/disagree for attitudes (1/0), and yes/no for practices (1/0). For analytical purposes and to maintain consistency with Bloom's descriptive cut-offs, total scores were dichotomized using a unified 60% threshold. Accordingly, knowledge scores (0–16) were classified as

inadequate (≤ 9) and adequate (≥ 10); practice scores (0–4) were classified as poor (≤ 2) and good (≥ 3); and attitude scores (0–7) were classified as unfavorable (≤ 4) and favorable (≥ 5). This threshold (≥ 60%) is widely adopted in health-related KAP studies [26].

Statistical Analysis

All statistical analyses were performed using IBM SPSS Statistics version 26.0. Descriptive statistics were employed to summarize participants' responses across the three KAP domains. Bivariate associations between categorical variables and each domain were examined using the Chi-square test, while Spearman's rho correlation coefficient was utilized to assess inter-domain relationships. Following the purposeful selection method [27], variables attaining a univariate p-value < 0.25 were considered candidates and subsequently entered into three separate binary logistic regression models to identify independent predictors of adequate knowledge, positive attitudes, and good practices, respectively. Adjusted odds ratios (AOR) with 95% confidence intervals (CI) were calculated for each final model. Model calibration and goodness-of-fit were evaluated using the Hosmer–Lemeshow test, with a p-value > 0.05 indicating acceptable fit. All statistical tests were two-tailed, and significance was set at $p < 0.05$, consistent with established analytical frameworks in KAP research [24, 28–29].

Results

Sociodemographic and Clinical Characteristics of Participants

A total of 386 female students participated. The predominant age group was 21–23 years (46.9%, n = 181); the majority resided in urban areas (90.4%, n = 349) and were single (89.1%, n = 344). A positive family history of PCOS was reported by over one-third (35.2%, n = 136); moderate income was most frequent (62.4%, n = 241). The College of Human Medicine constituted the largest proportion (28.0%, n = 108), followed by Administrative Sciences (18.4%, n = 71); second-year students were the most prevalent academic level (32.6%, n = 126) (Table 1).

Table 1
Sociodemographic Characteristics of Participants (N = 386)

Variable	Category	Frequency (n)	Percentage (%)
Age Group	< 21 years	141	36.5
	21–23 years	181	46.9
	> 23 years	64	16.6
Residence	Urban	349	90.4
	Rural	37	9.6
Marital Status	Single	344	89.1
	Married	42	10.9
Family History of PCOS	No	250	64.8
	Yes	136	35.2
Monthly Family Income	Low	77	19.9
	Moderate	241	62.4
	High	68	17.6
College	Human Medicine	108	28.0
	Dentistry	36	9.3
	Engineering	13	3.4
	Education	33	8.5
	Arts	17	4.4
	Administrative Sciences	71	18.4
	Computer Science	48	12.4
	Sharia and Law	60	15.5
Academic Level	Level 1	66	17.1
	Level 2	126	32.6
	Level 3	101	26.2
	Level 4	93	24.1

Lifestyle Factors and Clinical Symptoms

Psychosocial stress was nearly ubiquitous: 84.9% (n = 328) reported frequent (always/sometimes) experiences. Insomnia/difficulty sleeping was endorsed by 42.5% (n = 164). Physical activity levels were predominantly moderate (64.2%, n = 248). Among clinical manifestations, hair loss was the most prevalent symptom (68.4%, n = 264), followed by acne (46.6%, n = 180), hormonal imbalances (43.0%, n = 166), hirsutism (32.6%, n = 126), excessive weight gain (31.3%, n = 121), and menstrual irregularities (26.2%, n = 101) (Table 2).

Table 2
Lifestyle factors and clinical symptoms among participants (N = 386)

Domain / Variable	Category	Frequency (n)	Percentage (%)
Stress and psychological pressure	Rarely	58	15.0
	Sometimes	170	44.0
	Always	158	40.9
Difficulty sleeping or insomnia	No	222	57.5
	Yes	164	42.5
Daily physical activity	Sedentary (sitting)	78	20.2
	Moderate	248	64.2
	Active (high effort)	60	15.5
Menstrual cessation or irregularity	No	285	73.8
	Yes	101	26.2
Excessive facial hair growth (hirsutism)	No	260	67.4
	Yes	126	32.6
Spread of acne	No	206	53.4
	Yes	180	46.6
Hair loss	No	122	31.6
	Yes	264	68.4
Excessive weight gain	No	265	68.7
	Yes	121	31.3
General hormonal disorders	No	220	57.0
	Yes	166	43.0

Overall KAP regarding PCOS

The overall knowledge level among participants was moderate, with a mean score of 9.61 ± 4.66 (out of 16), a median of 10.00, and an interquartile range (IQR) of 7.00–13.00, corresponding to 60.1% correct responses. Attitudes toward PCOS were relatively favorable, yielding a mean of 5.42 ± 1.21 (out of 7), a median of 6.00, an IQR of 5.00–6.00, and an overall agreement rate of 77.5%. Conversely, practices related to PCOS prevention and management were suboptimal, with a mean score of 2.28 ± 1.45 (out of 4), a median of 3.00, an IQR of 1.00–4.00, and an aggregate affirmative response rate of 57.1% (Fig. 1).

Knowledge of PCOS

Item-level analysis indicated that basic symptomatology was best recognized: menstrual irregularity (80.3%), fertility impact (76.4%), and hormonal classification (75.9%). Metabolic associations, particularly diabetes risk (29.5%) and insulin resistance (40.7%), were least recognized. Awareness of diagnostic ultrasound (51.6%) and family history (50.0%) also remained suboptimal. Moderate recognition (50.3%–68.9%) was observed for lifestyle and dermatological items (Table 3).

Table 3
Knowledge of PCOS Among Participants (N = 386)

No.	Knowledge Item	Correct n (%)	Incorrect n (%)
1	PCOS is classified as a hormonal disorder.	293 (75.9)	93 (24.1)
2	The syndrome causes menstrual irregularity.	310 (80.3)	76 (19.7)
3	Negatively affects fertility and reproductive ability.	295 (76.4)	91 (23.6)
4	Weight gain increases the likelihood of developing PCOS.	221 (57.3)	165 (42.7)
5	Associated with the excessive appearance of acne.	266 (68.9)	120 (31.1)
6	Leads to hirsutism (excessive hair growth on face/body).	251 (65.0)	135 (35.0)
7	Physical activity and sports help alleviate symptoms.	194 (50.3)	192 (49.7)
8	Medications are available to help control symptoms.	285 (73.8)	101 (26.2)
9	Having PCOS raises the risk of developing diabetes.	114 (29.5)	272 (70.5)
10	Associated with psychological disorders (anxiety/depression).	260 (67.4)	126 (32.6)
11	Lack of sleep exacerbates the severity of symptoms.	188 (48.7)	198 (51.3)
12	Fast food/unhealthy diet increases symptom severity.	215 (55.7)	171 (44.3)
13	Closely associated with insulin resistance.	157 (40.7)	229 (59.3)
14	A woman may have PCOS even with normal/low weight.	269 (69.7)	117 (30.3)
15	Family history raises the risk of PCOS.	193 (50.0)	193 (50.0)
16	Ultrasound (sonography) is a fundamental diagnostic tool.	199 (51.6)	187 (48.4)

Attitudes Toward PCOS

A strong consensus (≥ 85%) was recorded for statements endorsing public awareness (93.5%), dissemination within academic and women's circles (90.7%), early diagnosis (90.2%), and psychological health care (85.2%). Moderate endorsement (≥ 77.5%) was observed for lifestyle modification (77.5%) and the desire to further personal knowledge (78.2%). Conversely, the lowest agreement rate was noted for the perceived negative impact of PCOS symptoms on self-confidence, with only 27.2% of participants agreeing, whereas the majority (72.8%) disagreed with this statement (Table 4).

Table 4
Attitudes Toward PCOS Among Participants (N = 386)

No.	Attitude Item	Agree n (%)	Disagree n (%)
1	PCOS deserves awareness and attention.	361 (93.5)	25 (6.5)
2	Affected individuals need psychological support and special health care.	329 (85.2)	57 (14.8)
3	Early diagnosis of the syndrome is essential.	348 (90.2)	38 (9.8)
4	Lifestyle modification is a fundamental pillar for controlling PCOS.	299 (77.5)	87 (22.5)
5	Syndrome symptoms negatively affect self-confidence.	105 (27.2)	281 (72.8)
6	Awareness is considered necessary in academic and women's circles.	350 (90.7)	36 (9.3)
7	I have a desire to increase my knowledge about PCOS.	302 (78.2)	84 (21.8)

Practices Toward PCOS

The majority of participants reported having undergone diagnostic investigations (63.2%, n = 244), consulted a gynecologist (60.1%, n = 232), and utilized digital cycle-tracking applications (64.0%, n = 247). Conversely, regular menstrual cycle tracking was the least adopted practice, with only 40.9% (n = 158) reporting this behavior (Table 5).

Table 5
Practices related to PCOS among participants (N = 386)

No.	Practice item	Yes n (%)	No n (%)
1	I have previously undergone an examination (ultrasound or laboratory test) to detect PCOS.	244 (63.2)	142 (36.8)
2	I have previously consulted a gynecologist regarding symptoms I think are related to PCOS.	232 (60.1)	154 (39.9)
3	I am keen on regularly following up and recording my menstrual cycle dates.	158 (40.9)	228 (59.1)
4	I use smartphone applications or digital calendars to track my menstrual cycle.	247 (64.0)	139 (36.0)

Correlations Between Knowledge, Attitude, and Practice

Knowledge showed moderate positive correlations with attitude ($\rho = 0.414$, $p < 0.001$) and practice ($\rho = 0.368$, $p < 0.001$). The attitude–practice correlation was weak but statistically significant ($\rho = 0.128$, $p = 0.012$).

Factors Associated with Knowledge, Attitudes, and Practices

The bivariate analysis revealed distinct patterns of associations across the three KAP domains (Table 6). For knowledge, significant associations were observed with urban residence ($p = 0.006$), a positive family history of PCOS ($p = 0.012$), higher monthly family income ($p = 0.007$), and college affiliation ($p < 0.001$). Additionally, the presence of self-reported clinical symptoms, specifically menstrual irregularity, hirsutism, acne, weight gain, and hormonal disorders, was consistently linked to lower knowledge levels (all $p \leq 0.001$).

Regarding attitudes, only daily physical activity ($p = 0.002$), hair loss ($p = 0.019$), and general hormonal disorders ($p = 0.009$) demonstrated statistically significant associations. Conversely, the practice domain exhibited the most extensive set of significant correlates. Good practices were significantly associated with marital status ($p = 0.046$), absence of family history ($p < 0.001$), college affiliation ($p = 0.005$), and higher academic level ($p = 0.011$). Notably, all six clinical symptoms—menstrual irregularity, hirsutism, acne, hair loss, weight gain, and hormonal disorders—were robustly associated with practice levels (all $p \leq 0.011$), with the strongest associations observed for menstrual irregularities and hirsutism (both $p < 0.001$). In contrast, variables including age group, stress, and insomnia showed no substantial association across any of the three domains (all $p > 0.05$).

Table.6

Factors Associated with Knowledge, Attitudes, and Practices (N = 386)

Variable	Category	Knowledge		Attitude		Practice		p-value
		Poor (≤ 9) n (%)	Good (≥ 10) n (%)	Negative (≤ 4) n (%)	Positive (≥ 5) n (%)	Poor (≤ 2) n (%)	Good (≥ 3) n (%)	K / A / P
Age group	< 21 Y	69 (48.9)	72 (51.1)	26 (18.4)	115 (81.6)	60 (42.6)	81 (57.4)	0.639 / 0.460 / 0.060
	21–23 Y	82 (45.3)	99 (54.7)	35 (19.3)	146 (80.7)	94 (51.9)	87 (48.1)	
	> 23 Y	27 (42.2)	37 (57.8)	8 (12.5)	56 (87.5)	38 (59.4)	26 (40.6)	
Residence	Urban	153 (43.8)	196 (56.2)	61 (17.5)	288 (82.5)	179 (51.3)	170 (48.7)	0.006 / 0.532 / 0.062
	Rural	25 (67.6)	12 (32.4)	8 (21.6)	29 (78.4)	13 (35.1)	24 (64.9)	
Marital status	Single	158 (45.9)	186 (54.1)	64 (18.6)	280 (81.4)	165 (48.0)	179 (52.0)	0.836 / 0.285 / 0.046
	Married	20 (47.6)	22 (52.4)	5 (11.9)	37 (88.1)	27 (64.3)	15 (35.7)	
Family history of PCOS	No	127 (50.8)	123 (49.2)	43 (17.2)	207 (82.8)	106 (42.4)	144 (57.6)	0.012 / 0.639 / <0.001
	Yes	51 (37.5)	85 (62.5)	26 (19.1)	110 (80.9)	86 (63.2)	50 (36.8)	
Monthly family income	Low	45 (58.4)	32 (41.6)	9 (11.7)	68 (88.3)	39 (50.6)	38 (49.4)	0.007 / 0.260 / 0.485
	Moderate	111 (46.1)	130 (53.9)	48 (19.9)	193 (80.1)	115 (47.7)	126 (52.3)	
	High	22 (32.4)	46 (67.6)	12 (17.6)	56 (82.4)	38 (55.9)	30 (44.1)	
College	Medicine	36 (33.3)	72 (66.7)	24 (22.2)	84 (77.8)	64 (59.3)	44 (40.7)	< 0.001 / 0.054 / 0.005
	Dentistry	18 (50.0)	18 (50.0)	8 (22.2)	28 (77.8)	18 (50.0)	18 (50.0)	
	Engineering	10 (76.9)	3 (23.1)	3 (23.1)	10 (76.9)	3 (23.1)	10 (76.9)	
	Education	14 (42.4)	19 (57.6)	4 (12.1)	29 (87.9)	20 (60.6)	13 (39.4)	
	Arts	16 (94.1)	1 (5.9)	7 (41.2)	10 (58.8)	8 (47.1)	9 (52.9)	
	Administrative	36 (50.7)	35 (49.3)	6 (8.5)	65 (91.5)	41 (57.7)	30 (42.3)	
	Computer	25 (52.1)	23 (47.9)	7 (14.6)	41 (85.4)	17 (35.4)	31 (64.6)	
	Sharia and Law	23 (38.3)	37 (61.7)	10 (16.7)	50 (83.3)	21 (35.0)	39 (65.0)	
Level of study	Level 1	31 (47.0)	35 (53.0)	11 (16.7)	55 (83.3)	39 (59.1)	27 (40.9)	0.228 / 0.293 / 0.011

	Level 2	66 (52.4)	60 (47.6)	27 (21.4)	99 (78.6)	52 (41.3)	74 (58.7)	
	Level 3	39 (38.6)	62 (61.4)	20 (19.8)	81 (80.2)	45 (44.6)	56 (55.4)	
	Level 4	42 (45.2)	51 (54.8)	11 (11.8)	82 (88.2)	56 (60.2)	37 (39.8)	
Stress & psychological pressure	Rarely	28 (48.3)	30 (51.7)	4 (6.9)	54 (93.1)	29 (50.0)	29 (50.0)	0.870 / 0.059 / 0.993
	Sometimes	76 (44.7)	94 (55.3)	33 (19.4)	137 (80.6)	84 (49.4)	86 (50.6)	
	Always	74 (46.8)	84 (53.2)	32 (20.3)	126 (79.7)	79 (50.0)	79 (50.0)	
Difficulty sleeping/insomnia	No	107 (48.2)	115 (51.8)	39 (17.6)	183 (82.4)	103 (46.4)	119 (53.6)	0.339 / 0.854 / 0.126
	Yes	71 (43.3)	93 (56.7)	30 (18.3)	134 (81.7)	89 (54.3)	75 (45.7)	
Daily physical activity	Sedentary	40 (51.3)	38 (48.7)	24 (30.8)	54 (69.2)	38 (48.7)	40 (51.3)	0.510 / 0.002 / 0.940
	Moderate	113 (45.6)	135 (54.4)	39 (15.7)	209 (84.3)	125 (50.4)	123 (49.6)	
	Active (high effort)	25 (41.7)	35 (58.3)	6 (10.0)	54 (90.0)	29 (48.3)	31 (51.7)	
Menstrual irregularity	No	148 (51.9)	137 (48.1)	51 (17.9)	234 (82.1)	115 (40.4)	170 (59.6)	< 0.001 / 0.987 / <0.001
	Yes	30 (29.7)	71 (70.3)	18 (17.8)	83 (82.2)	77 (76.2)	24 (23.8)	
Hirsutism	No	138 (53.1)	122 (46.9)	52 (20.0)	208 (80.0)	99 (38.1)	161 (61.9)	< 0.001 / 0.118 / <0.001
	Yes	40 (31.7)	86 (68.3)	17 (13.5)	109 (86.5)	93 (73.8)	33 (26.2)	
Acne	No	113 (54.9)	93 (45.1)	43 (20.9)	163 (79.1)	88 (42.7)	118 (57.3)	< 0.001 / 0.100 / 0.003
	Yes	65 (36.1)	115 (63.9)	26 (14.4)	154 (85.6)	104 (57.8)	76 (42.2)	
Hair loss	No	65 (53.3)	57 (46.7)	30 (24.6)	92 (75.4)	49 (40.2)	73 (59.8)	0.055 / 0.019 / 0.011
	Yes	113 (42.8)	151 (57.2)	39 (14.8)	225 (85.2)	143 (54.2)	121 (45.8)	
Weight gain	No	137 (51.7)	128 (48.3)	47 (17.7)	218 (82.3)	107 (40.4)	158 (59.6)	0.001 / 0.916 / <0.001
	Yes	41 (33.9)	80 (66.1)	22 (18.2)	99 (81.8)	85 (70.2)	36 (29.8)	
Hormonal disorders	No	117 (53.2)	103 (46.8)	49 (22.3)	171 (77.7)	82 (37.3)	138 (62.7)	0.001 / 0.009 / <0.001
	Yes	61 (36.7)	105 (63.3)	20 (12.0)	146 (88.0)	110 (66.3)	56 (33.7)	

p-values are derived from Pearson Chi-square tests. Statistically significant associations (p < 0.05) are highlighted in **bold**.

Note

Knowledge: Poor (0–9 correct answers) vs. Good (10–16 correct answers); Attitude: Negative (score ≤ 4) vs. Positive (score ≥ 5); Practice: Poor (score ≤ 2) vs. Good (score ≥ 3).

Multivariable Logistic Regression Analysis

The multivariable logistic regression models identified distinct independent predictors for each KAP domain (Table 7). Regarding knowledge, urban residence (AOR = 3.36, p = 0.004) and being in the third academic level (AOR = 1.96, p = 0.050) significantly increased the odds of adequate knowledge. Conversely, low monthly income (AOR = 0.37, p = 0.013), enrollment in Engineering or Arts colleges (AOR = 0.10 and 0.03, respectively; both p ≤ 0.004), and the presence of clinical symptoms—including menstrual irregularity, hirsutism, acne, and hair loss—were independently associated with reduced odds of good knowledge (all p ≤ 0.041).

Concerning attitudes, rarely experiencing stress emerged as the strongest positive predictor of favorable attitudes (AOR = 4.04, p = 0.016). In contrast, a sedentary lifestyle, hair loss, and hormonal disorders were significantly associated with lower odds of positive attitudes (AOR = 0.26, 0.55, and 0.44, respectively; all p ≤ 0.039).

For practices, a notably distinct pattern was observed. While being in the third academic level increased the odds of good practices (AOR = 2.04, p = 0.038), affiliation with Human Medicine or Administrative Sciences colleges significantly reduced these odds compared to Sharia and Law (AOR = 0.26 and 0.38, respectively; both p ≤ 0.023). Remarkably, the presence of self-reported menstrual irregularities and hirsutism substantially increased the likelihood of good practices (AOR = 2.85, p = 0.002; and AOR = 3.12, p < 0.001, respectively), suggesting that symptom burden may serve as a catalyst for proactive health behaviors.

Table 7
Factors Associated with KAP Levels Regarding PCOS (N = 386)

Outcome Model	Factor	Category (Reference)	AOR (95% CI)	p-value
Knowledge (Good vs. Poor)	Residence	Urban (vs. Rural)	3.36 (1.48–7.64)	0.004
	Monthly family income	Low (vs. High)	0.37 (0.17–0.81)	0.013
	College affiliation	Engineering (vs. Sharia & Law)	0.10 (0.02–0.48)	0.004
		Arts (vs. Sharia & Law)	0.03 (0.00–0.22)	0.001
	Level of study	Level 3 (vs. Level 4)	1.96 (1.00–3.85)	0.050
	Menstrual irregularity	Yes (vs. No)	0.52 (0.28–0.97)	0.041
	Hirsutism	Yes (vs. No)	0.55 (0.31–0.96)	0.034
	Acne	Yes (vs. No)	0.53 (0.32–0.88)	0.014
	Hair loss	Yes (vs. No)	0.56 (0.34–0.93)	0.025
Attitude (Positive vs. Negative)‡	Daily physical activity	Sedentary (vs. Active)	0.26 (0.10–0.71)	0.009
	Hair loss	Yes (vs. No)	0.55 (0.31–0.97)	0.039
	Hormonal disorders	Yes (vs. No)	0.44 (0.25–0.81)	0.008
	Stress & psychological pressure	Rarely (vs. Always)	4.04 (1.30–12.56)	0.016
Practice (Good vs. Poor)§	College	Human Medicine (vs. Sharia & Law)	0.26 (0.12–0.58)	0.001
		Administrative Sciences (vs. Sharia & Law)	0.38 (0.16–0.88)	0.023
	Level of study	Level 3 (vs. Level 4)	2.04 (1.04–3.97)	0.038
	Menstrual irregularity	Yes (vs. No)	2.85 (1.45–5.60)	0.002
	Hirsutism	Yes (vs. No)	3.12 (1.78–5.47)	< 0.001

Note: AOR = Adjusted Odds Ratio; CI = Confidence Interval. Hosmer –Lemeshow goodness-of-fit: Knowledge ($\chi^2 = 8.14$, $p = 0.42$), Attitude ($\chi^2 = 6.92$, $p = 0.55$), Practice ($\chi^2 = 7.56$, $p = 0.48$). Reference category for attitude: Negative (score ≤ 4).‡ Reference category for practice: Poor (score ≤ 2).

Discussion

The study sample predominantly comprised young, urban-dwelling, and single female students, a demographic profile that mirrors the broader landscape of higher education in Yemen and aligns with investigations from other developing nations where urban residency is associated with enhanced access to health information [5–6]. The inclusion of eight distinct

academic disciplines facilitated robust cross-disciplinary comparisons, corroborating the well-documented pattern wherein medical and health science students demonstrate superior PCOS knowledge relative to their non-medical counterparts [8–9, 18]. The observed 35.2% prevalence of a positive family history is consistent with the heritable component of PCOS [1]; its robust association with enhanced knowledge and proactive practices underscores the salience of personal and familial experience in shaping health awareness and illness perception.

Clinical symptomatology was notably prevalent, with hair loss (68.4%), acne (46.6%), and self-reported hormonal imbalances (43.0%) emerging as the most frequently reported manifestations. These prevalence rates exceed those documented in regional studies [4, 11], a discrepancy potentially attributable to heightened health consciousness among university populations or a selection bias wherein symptomatic individuals may have been more inclined to participate. The substantial proportion of participants reporting psychosocial stress (84.9%) and sleep difficulties (42.5%) is particularly concerning, given the established bidirectional relationship between these factors and PCOS pathophysiology, whereby chronic stress exacerbates neuroendocrine dysfunction and sleep disruption aggravates metabolic and inflammatory profiles [1, 30].

The overall knowledge level was moderate, with a mean correct response rate of 60.1%. This finding closely approximates those reported among university students in Pakistan [8] and India [18], while exceeding the rates documented among Palestinian women [15]. Nevertheless, it falls substantially below the 98% awareness reported among Nepalese medical students [17], a disparity likely attributable to fundamental methodological differences between assessing simple "awareness" and measuring "correct knowledge" using comprehensive, validated psychometric scales. Attitudes were overwhelmingly favorable, with an overall agreement rate of 77.5%, reflecting strong receptivity toward public awareness campaigns, early diagnosis, and psychological support. Conversely, practices remained suboptimal, with an aggregate affirmative response rate of 57.1%, revealing a persistent and well-documented knowledge-practice and attitude-practice gap consistently observed in KAP frameworks across various chronic conditions [12, 29].

Item-level analysis demonstrated that basic symptomatology—specifically menstrual irregularity (80.3%), fertility impact (76.4%), and hormonal classification (75.9%)—was the most widely recognized, mirroring patterns observed in some reports [16, 31]. This likely reflects the predominance of public health messaging centered on reproductive consequences, which overshadow the systemic nature of the syndrome. Critical and clinically significant gaps emerged in metabolic associations; alarmingly, only 29.5% of participants recognized the elevated risk of diabetes, and merely 40.7% identified insulin resistance as a core pathophysiological feature. This deficit is particularly concerning given the established roles of hyperinsulinemia and compensatory hyperandrogenism in PCOS pathogenesis [1, 31]. Comparable deficiencies were documented among UAE medical students [9], suggesting that this metabolic knowledge gap transcends non-medical populations and permeates health sciences education. Furthermore, suboptimal recognition of lifestyle-related factors—including the role of physical activity (50.3%), the impact of sleep deprivation (48.7%), and the heritable nature of the condition (50.0%)—indicates that participants predominantly conceptualize PCOS as a reproductive disorder rather than a complex, systemic metabolic-endocrine syndrome.

The favorable attitudes observed (77.5%) denote a growing societal awareness of the substantial psychosocial burden associated with PCOS, including the heightened risks of anxiety, depression, and diminished quality of life. The strong desire to augment personal knowledge (78.2%) presents a strategic opportunity for targeted health education interventions. However, the relatively lower agreement (27.2% agreement rate) regarding the negative impact of symptoms on self-confidence is striking, as the majority (72.8%) disagreed that symptoms negatively affect self-confidence. This may reflect either limited personal experience with the phenotypic manifestations of PCOS or a fundamental underestimation of the psychological consequences among asymptomatic or mildly affected participants. This finding underscores the imperative to integrate comprehensive psychosocial dimensions—including body image, self-efficacy, and emotional well-being—into standard educational curricula [24].

The suboptimal practice scores (57.1% overall) reveal a substantial disconnect between positive attitudinal dispositions and tangible health behaviors. Regular menstrual cycle tracking was the sole practice adopted by the majority (59.1%), likely due to its simplicity, immediate personal relevance, and low resource requirements. Conversely, fewer than 40% of participants had

ever consulted a gynecologist (39.9%), undergone diagnostic evaluation (36.8%), or utilized digital cycle-tracking applications (36.0%). This finding is clinically concerning given that early diagnosis and timely intervention are paramount in mitigating long-term metabolic, cardiovascular, and reproductive complications [1]. Rizvi et al. [8] similarly reported low consultation rates, identifying barriers such as perceived stigma, shyness, lack of self-knowledge, and cultural reluctance to discuss reproductive health. The notably low uptake of digital health tools is more likely attributable to limited awareness and health literacy rather than restricted access, suggesting considerable potential for mobile health (mHealth) interventions and technology-assisted behavioral change strategies in this demographic.

Knowledge exhibited moderate positive correlations with attitude and practice, providing empirical support for the Health Belief Model framework, which posits that knowledge is a precursor to favorable beliefs and, subsequently, adaptive health behaviors [24]. However, the weak but statistically significant correlation between attitude and practice indicates that positive attitudes alone are insufficient to guarantee health-promoting behaviors, a finding consistent with Mu et al. [29]. This dissonance reflects the multifaceted nature of behavioral translation, which requires not only positive dispositions but also practical skills, self-efficacy, and enabling environmental factors [33]. Structural barriers—including limited healthcare accessibility, financial constraints, deeply ingrained cultural norms, and perceived low personal risk among young, asymptomatic women—may further impede the translation of favorable attitudes into concrete health actions.

A positive family history of PCOS emerged as a consistent predictor across domains, demonstrating significant associations with higher knowledge and enhanced practices in bivariate analyses. This aligns closely with the other findings [6, 34], reflecting the heightened personal salience, illness vigilance, and experiential learning that occur within affected families.

Significant bivariate associations were observed across all three domains; however, adjusted analyses revealed paradoxical effects. Students affiliated with Human Medicine and Administrative Sciences exhibited significantly lower odds of reporting good practices compared to their counterparts in Sharia and Law. This counterintuitive finding may reflect a differential emphasis on theoretical knowledge acquisition versus practical, applied health behaviors, or may be attributable to high academic workloads that constrain time for self-care. Conversely, students in Arts and Engineering disciplines demonstrated substantially lower knowledge levels, underscoring the critical need for broad-based, university-wide health education initiatives that transcend disciplinary boundaries.

Urban residence significantly predicted higher knowledge, reflecting superior access to healthcare facilities, information sources, and health-promoting infrastructures. Low monthly family income independently reduced the odds of adequate knowledge, highlighting pervasive socioeconomic disparities in health awareness that mirror broader patterns of health inequity.

In adjusted models, the presence of specific clinical symptoms exhibited a paradoxical dual effect. Excessive facial hair and acne were paradoxically associated with lower odds of adequate knowledge, potentially reflecting a "learning paradox" wherein symptomatic individuals acquire only superficial, symptom-focused knowledge without understanding the underlying pathophysiological mechanisms. Conversely, menstrual irregularity and hirsutism strongly predicted enhanced practices, suggesting that experiencing salient, bothersome symptoms—particularly those that disrupt daily life or signify reproductive dysfunction—potently motivates health-seeking behaviors. This observation is consistent with the Health Belief Model's emphasis on perceived susceptibility and severity as primary drivers of behavioral change [24].

Limitations

This study has several limitations. The cross-sectional design and reliance on self-reported data preclude causal inferences and introduce recall and social desirability biases. All clinical symptoms were based on subjective reports without objective validation (e.g., Ferriman-Gallwey score), making findings susceptible to culturally modulated reporting biases and potential misclassification. Consequently, observed paradoxical associations should be interpreted cautiously and not considered clinically confirmed risk factors.

Conclusions

PCOS knowledge among Yemeni female university students is moderate, with critical gaps identified in metabolic associations, particularly regarding diabetes risk and insulin resistance. Attitudes are overwhelmingly favorable, yet practices remain suboptimal, confirming a persistent and well-documented knowledge-attitude-practice disconnect. Family history, academic discipline, urban residence, and socioeconomic status emerged as key independent predictors of KAP levels. Notably, the weak attitude-practice correlation underscores that positive dispositions alone are insufficient without practical skills, self-efficacy, and structural enablers. The paradoxical associations observed between clinical symptomatology and KAP levels suggest that symptom burden may simultaneously hinder knowledge acquisition while catalyzing proactive health behaviors. Academic institutions should integrate multidisciplinary PCOS education across curricula with peer-led initiatives and targeted campaigns for low-knowledge disciplines. Healthcare systems need strengthened screening protocols, referral pathways, and biopsychosocially competent provider training. Public health strategies require culturally sensitive campaigns and mHealth tool evaluation to address low digital uptake.

Abbreviations

95% CI
95% Confidence Intervals
AOR
Adjusted Odds Ratios
CVI
Content Validity Index
FPC
Finite Population Correction
KAP
Knowledge, Attitude, and Practice
P value
Probability value
PCOS
Polycystic ovary syndrome
SRS
Simple Random Sampling
IQR
Interquartile Range

Declarations

Ethics approval and consent to participate

The study protocol and data collection instrument were approved by Ibb University's Faculty of Medicine and Health Sciences (Approval No. IRB-IU-2025-042) and were carried out in accordance with the Declaration of Helsinki and Yemeni public health laws and regulations. All participants provided written informed consent before participating in the study. Participants were clearly explained the study's objectives in the questionnaire's introduction, emphasizing that participation was totally voluntary. Participants were assured of strict confidentiality and anonymity, as no personal identifying information was collected. Furthermore, no negative consequences would result if the prospective participant did not choose to participate.

Clinical trial number

Not applicable.

Consent for publication

Not applicable.

Competing Interests

Not applicable

Conflict of interest

The authors declare that they have no competing interests.

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Author Contribution

Ahmed A, Alshoaibi I, and Mohammed A conceived the study; Al-Falahi G, Huwairith J, Al Wasili R, and Al Samman R collected the data; Al Wasili R, Mahdi S, Mohammed A, and Qassim E processed the data; Al-Dalali A, Shomais A, and Alshoaibi I analyzed and interpreted the data. Qassim E, Ahmed A, Al-Falahi G, and Al-Shehari W wrote the first draft manuscript. Shomais A and Edrees W reviewed and edited the final manuscript. All authors revised and approved the manuscript for submission.

Data Availability

The datasets used and analyzed during this analysis are available from the corresponding author, who will provide any relevant data upon reasonable request.

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Figures

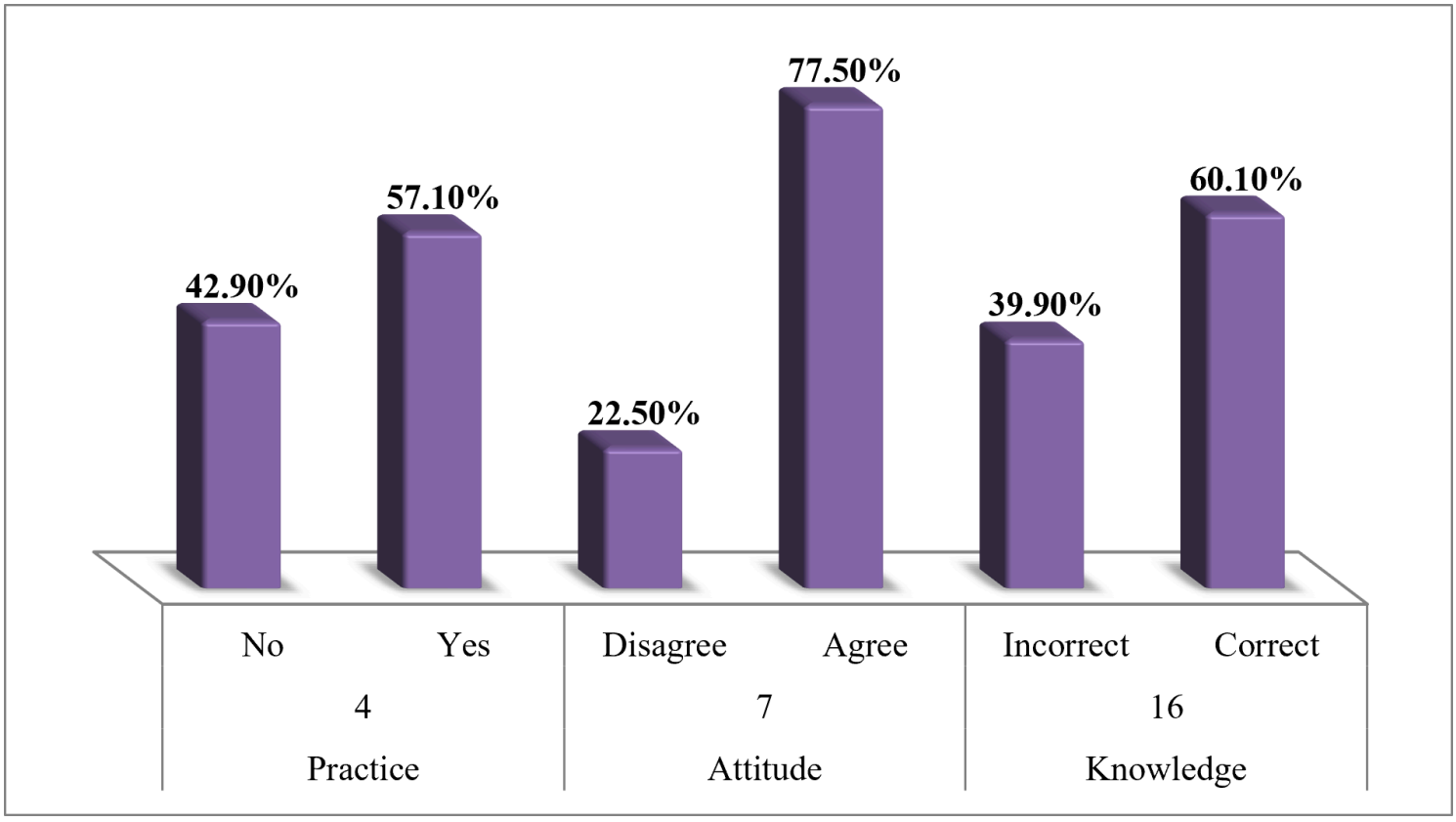


Figure 1

Overall distribution of responses across KAP domains (N = 386)