RESEARCH ARTICLE

Polycystic ovarian syndrome: A KAP study among pharmacy and engineering students in a private college, Telangana state, India

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Abstract

Background: Polycystic Ovarian Syndrome (PCOS) is a chronic health condition, which has no cure and is largely neglected by females.

Objectives: The main objectives were to assess the Knowledge, Attitude and Practice (KAP) regarding PCOS among female students from a private Pharmacy and Engineering college in Telangana State, India.

Methodology: A prospective, cross-sectional study among 418 female undergraduate students aged between 18 and 25 years was conducted using a pre-validated PCOS – KAP questionnaire. The data were collected in class room setting between September, 2022 and February. 2023. Informed consent forms were signed before collection of survey questionnaires. The correct responses were graded giving one point for correct responses and zero points for incorrect answers in knowledge and practice section whereas, five point likerts scale was used to test the attitude. The sum of the scores and overall KAP scores were categorized according to Blooms original cutoff scores.

Results: Among the 500 survey forms distributed, 418 (response rate = 84%) complete survey forms were retrieved. Overall correct responses were given by 41% of respondents with a median score of 8(7) ranging from 0 to 19. The overall Total Knowledge Score (TKS) as per Blooms cutoff scale was found to be with significantly poor (76%) knowledge [median (IQR) score = 8 (7)], p <.001. Whereas, about 59% of respondents had a neutral attitude (Median score of 42 (8), range 20 to 48; p < .001), and about 72% of respondents had poor practice scores (Median (IQR) = 6 (4), ranging 1 to 11; p < .001). The total KAP score was found to be moderate (51%) with the median (IQR) score of 55(11), ranging from 34 to 89; p < .001). The study reported a significant association (p<0.01) between TKAPS, TKS, TAS, and TPS overall and individually among groups (Pharmacy and Engineering).

Conclusion: This study shows that the respondents' overall PCOS knowledge scores are poor and the total KAP scores were moderate. This study makes it evident that health education and awareness regarding PCOS needs to be improved among pharmacy and engineering students

Keywords: Polycystic ovarian syndrome ▪ knowledge ▪ attitude ▪ practice ▪ pharmacy and engineering students

Introduction

Polycystic Ovarian Syndrome (PCOS) is a common disorder, often complicated by chronic an ovulatory infertility and hyperandrogenism with the clinical manifestation of oligomenorrhoea, hirsutism and acne. It is recognized as the most common endocrinopathy in reproductive women, frequently becomes manifest during adolescence [1]. An endocrine and metabolic condition called Polycystic Ovarian Syndrome (PCOS) is characterised by an excess of testosterone, ovulatory failure, and/or polycystic ovaries. The most prevalent endocrine problem in women of reproductive age is polycystic ovarian syndrome Most women with PCOS are also overweight or obese, further enhancing androgen secretion while impairing metabolism and reproductive functions and possibly favoring the development of the PCOS phenotype [2]. Many women with this condition are obese and have a higher prevalence of impaired glucose tolerance, type 2 diabetes and sleep apnea that is observed in the general population. They exhibit an adverse cardiovascular risk pro- file, characteristic of the cardio metabolic syndrome as suggested by a higher reported incidence of hypertension, dyslipidemia, visceral obesity, insulin resistance and hyfperinsulinaemia [3]. Family history of PCOS is the main risk factor. The chance of getting PCOS is higher if other women in the family have the disease, irregular menstrual cycle or diabetes mellitus. PCOS can be inherited from either the mother's or father's side. Ultrasonography is one of the main investigations that helps in the differential diagnosis and may demonstrate the polycystic ovaries that have recently been vetted as an alternative to oligonovulation as a diagnostic criterion [1]. Lifestyle Modification (LSM) programs, comprising diet and/or physical activity, are recommended for high-risk patients (prediabetic) to delay the onset of adult type 2 diabetes, one of the most serious complications of PCOS. In addition, overweight and obese women with PCOS may benefit from LSM through adiposity reduction, improved ovulatory function, and a reduction in overall cardiovascular risk. Whether LSM may improve some aspects of the phenotype in normal-weight women with PCOS is still unclear. However, sustained weight loss achieved after bariatric surgery or long-term dietary intervention has been found to significantly improve the phenotype in most women with PCOS [4]. It is important that there is a good understanding of the long-term implications of the diagnosis in order to offer a holistic approach to the disorder. Because the symptoms of PCOS emerge insidiously and are coincident with changes that accompany normal pubertal development, subtle features may not be realized in the early stages; this may account for the failure to identify the disorder in young girls. The disease PCOS is not communicable which has been largely ignored. It is one of the ubiquitous reasons why women struggle to conceive. I t is a life- long health issue that persists even past reproductive age [5]. The psychological burden of PCOS is highlighted by the fact that most PCOS-diagnosed female patients also suffer from depression, anxiety, stress, and eating disorders [6, 7]. The Indian health budget is insufficient for PCOS treatment; thus, it is an economic burden [8]. The failure of the patient to become aware of irregular menses, hirsutism (excessive hair growth), or other symptoms, or the overlapping of PCOS features with normal biological maturation during the 2 years following menarche, delaying the clinical detection of PCOS and adding to the burden of the patient's illness. Endometrial hyperplasia and malignancy are also more prevalent in PCOS patients which burdens women who get diagnosed [9].

Methodology

Study design

A cross- sectional prospective study.

Inclusion criteria

It involved female students from pharmacy and engineering who were willing to participate, aged between 18 and 25, and who signed an ICF.

Exclusion criteria

Students who were male, unwilling, didn't complete the questionnaire, didn't sign the Informed Consent Forms (ICF), didn' t meet the inclusion criteria, included in the pilot study, or were females with PCOD and thyroid problems were excluded from the study.

Target study population and study time

The target group included undergraduate students of bachelor of pharmacy, doctor of pharmacy, masters of pharmacy, engineering, courses enrolled in a private college, Telangana state, India and they were aged between 18 years and 25 years. The research was conducted between September 2022 and February 2023 for a period of six months.

Recruitment of study participants

The research participants were recruited based on their age and gender. The purpose and objectives were explained to the study participants, and assurance of strict confidentiality was given followed by an ICF and a request for time and cooperation in completing the survey questionnaire.

Modality of obtaining response

ICF were signed by each participant before handing out the questionnaires in the class room settings. The time taken to complete questionnaire on an average was about

15 minutes, and the completed questionnaires were collected and processed for data analysis.

- **Study setting**

Geethanjali College of Pharmacy and Geethanjali Engineering College campus.

- **Sample size calculation**

Using the Rao soft sample size calculator, the size of samples was determined from the entire student population. The estimated sample size was determined at 95% confidence level, a 5% margin of error, and a 50% response distribution. The size of samples needed was rounded off to 350 after adding a 20% for dropouts.

- **Development and validation of questionnaire**

Development of the questionnaire: The questionnaire related to PCOS was designed in English. It has four sections: The first section covers the demographic information about the study participants, which includes things like age, marital status, level of education, height, weight, family history of diabetes or PCOS, their known history of thyroid problems, PCOS, PCOD, etc. The second section includes 20 knowledge - based questions or statements relevant to symptoms, diagnosis, treatment, complications, and risk factors of PCOS; The third section consists of 12 attitude -based questions or statements that assess the participants' attitude towards PCOS; and the fourth section has 12 practice-based questions related to lifestyle habits of the involved participants. Questions based on knowledge were scored using a three-point Likert scale; questions based on attitude towards PCOS were scored using a five -point Likert scale; and questions based on practice were scored using a two-point Likert scale. All the information of the questionnaire was adapted from a thorough review of literature.

- **Validation of the questionnaire**

Content Validation: Five pharmacy practice experts from Geethanjali College of Pharmacy validated the questionnaire for its content and construct and appropriate modifications suggested by the faculty were added.

Face validation: Thirty potential respondents were put to face validation, and they had no issues filling out the questionnaire.

Reliability (Cronbach's Alpha Coefficient): A pilot study was done involving 30 participants (22 and 8 students from pharmacy and engineering were involved in our KAP study). For assessing the reliability of the questionnaire this test was done using Cronbach's alpha coefficient, it talks about how closely linked a group of items is to one another, a measure of internal consistency. According to George and Mallery's rule, Cronbach's alpha typically falls between 0 - 1, and its meaning is as follow s: really excellent > 0.9, good >0.8, acceptable >0.7, questionable >0.6, poor >0.5, unacceptable <0.5. For knowledge related questions, Cronbach's α coefficient was found to be 0.939; for attitude related questions, it was 0.998; and for practice- based questions, it was 0.999. This signifies excellent reliability and internal consistency. The students filled the questionnaire within 15 -20 minutes.

KAP study among the study population and overall response: Number of questionnaire forms distributed: 500, Number of questionnaire forms retrieved: 418, Number of valid questionnaire forms: 418, Response rate: 83.6%.

Demographic characteristics: In this study, demographic characteristics included in Section A part of the questionnaire were: age, marital status, educational qualification, year of study, height, weight, family monthly income, family history of diabetes or PCOS, known history of thyroid, PCOD, and PCOS and the study participant's relationship with them, age of puberty, and total number of periods per year. Educational qualification is taken to distinguish between students studying engineering and those studying pharmacy. Height and weight are gathered to determine the respondent's BMI, which is calculated to determine whether they are overweight, which is a risk factor for PCOS for which many of the respondents are unaware of.

KAP measured: The level of KAP was measured using questions included in the study, which have four sections. Section A has demographic data contains roll number, age in years; marital status with 1 point for single and 2 for married educational qualification with 1 for pharmacy and 2 for engineering; year of study with 1 for first year 2 for second year 3 for third year 4 for fourth year 5 for fifth year 6 for sixth year; Height in feet and weight in kilogram; Family history of diabetes/PCOS with 1 for yes and 2 for no; if family history is yes then relationship with 1 for grandmother 2 for mother, 3 for siblings, 4 for aunt, 5 for others; Family monthly income with 1 for < or =20,000, 2 for 20,000-30,000, 3 for 30,000 -40,000, 4 for 40,000 -50,000, 5 for > or =50,000; Age of puberty(first period) with 1 for <10, 2 for 10, 3 for 11, 4 for 12, 5 for 15, 6 for >15; Total number of periods per year with 1 for <8periods/year, 2 for 8-10 periods/year, and 3 for 10-12 periods/year. Section B contains 20 knowledge- based questions about PCOS, which were measured using a 3 - point Likert scale with 1 for each correct response, 2 for incorrect responses, and 3 for unsure responses. Section C contains 12 attitude-based questions about PCOS measured using a 5 -point Likert scale with 5 for strongly agreeing, 4 for agreeing, 3 for neutral, 2 for disagreeing, and 1 for strongly disagreeing.

Section D contains 12 practice- based questions about PCOS measured using a 2 -point Likert scale with 1 for a correct option and 2 for an incorrect option. Utilizing a modified Bloom's cutoff score, the KAP level was determined. A score of 80%–100% of correct responses indicated good KAP; a score of 60%–79% indicated medium-level KAP; and a score of <60% indicated poor KAP.

Data cleaning: The collected data were transcribed into an Excel spreadsheet, reviewed for errors and blank cells manually to make sure no data was missing, and then it was transmitted to SPSS (version 24).

Tests for normality of data: The Shapiro-Wilk and Kolmogorov-Smirnov tests were run to verify the assumption that the data are regularly distributed. The hypotheses were tested for the distribution of data:

If a test does not rule out normality (p >0. 05), it is possible to employ repeated ANOVA, a parametric approach that makes this assumption. However, it is advised to use non-parametric testing if the test rejects normality (p <0.05). The data in this research is not normally distributed, which was verified by the Shapiro-Wilk test.

Statistical analysis: By using IBM SPSS Statistics for Windows, data analysis was carried out (SPSS version 23). Utilizing frequency and percentage, descriptive statistics for categorical variables were calculated. Numbers given as median (IQR) with non-normal distribution (IQR) the association test using Chi-square. For all tests, the level of significance was set at 0.5, and p values below 0.05 were regarded as significant.

Ethical considerations: The research protocol and questionnaire were submitted to the institutional ethical committee, and their approval was taken before starting the survey. Before taking part in the study, every participant was asked to sign a written consent form.

Results

- **Response rate**

Among 500 questionnaire forms distributed in the College, 418 forms were retrieved from the students the overall response rate was 83.6%. The dropouts were mainly due to age below 18 years, incomplete forms, and non- retrievable survey forms.

- **Socio-demographics details**

An average age of 418 respondents (**TABLE 1**) who participated in the survey is 21.5, and most of the respondents were between the ages of 18 and 20 at a rate of 61.7% (N=258). The vast majority of the respondents were single (N=417, 99.8%). Among the respondents, pharmacy students have given more response rate (N=230, 55%) compared to engineering students (N=188, 45%). In comparison to all previous study years, third -year students had a high response rate (N=138, 33%). Many respondents reported a significant family history of diabetes/PCOS. The majority of the respondents (N=108, 25.8%) had monthly incomes of around 20,000 rupees. Most participants at the age of 13 experienced their first menstruation (N=103, 24.6%), second -highest was when they were 12 years old (N=99, 23.7%). Considerably fewer respondents than other groups have fewer than 8 periods per year (N=34, 8.1%).

TABLE 1. Represents the socio- demographic data of the respondents

Variable:	Frequency (N)	Percentage
Age in years		
18-20	258	61
21-23	157	38
24-26	3	1
Educational Qualification		
Pharmacy	230	55
Engineering	188	45
Year Of Study		
1st year	105	25
2nd year	94	23

3rd year	138	33
4th year	53	13
5th year	16	4
6th year	12	3
Family history of Diabetes/ PCOS		
Yes	75	18
No	343	82
Family monthly income		
<20,000	108	26
20,000-30,000	101	24
30,000-40,000	48	12
40,000-50,000	53	13
>50,000	108	26
Age of puberty (first period)		
<10	13	3
10	12	3
11	49	12
12	99	24
13	103	25
14	74	18
15	51	12
>15	17	4
Total number of periods per years		
<8 periods/year	34	8
8- 10 periods/year	65	16
10-12 periods/year	319	76

- **Knowledge responses towards PCOS**

Table 2 summarizes the knowledge related responses towards PCOS among study respondents. Most of the respondents had heard about PCOS (64%). Most of them were aware about the common problems of PCOS (59%), as well as common symptoms like facial acne (44%), sudden weight gain (52%), hair thinning and hair loss (51%), etc. Most of the respondents knew PCOS can be managed with diet and exercise (63%), has an increased risk of uterine cancer (36%), infertility (59%) and sedentary lifestyle is a risk factor (37%). About one third of respondents had irregular menstrual cycles (33%). Many experienced pelvic pains (62%). PCOS is a lifetime disorder and has only symptomatic treatment (41%), along with increased risk of cardiac diseases (21%), breast cancer (28%), and diabetes (24%).

TABLE 2. Responses to knowledge based items towards PCOS (N=418)

Qn. No.	Knowledge items	Correct Response	Incorrect Response	*P value
1	Do you know what is polycystic ovarian syndrome (PCOS)?	266 (64)	152 (36)	<.001*
2	Do you know about the problems of PCOS?	243 (58)	175 (42)	.001*
3	Do you have an Irregular menstrual cycle?	138 (33)	280 (67)	<.001*
4	Do you know facial acne is a symptom of PCOS?	184 (44)	234 (56)	.014*
5	Do you know sudden weight gain is a symptom of PCOS?	222 (53)	196 (47)	.203
6	Do you know hair thinning and hair loss are also the symptoms of PCOS?	214 (51)	204 (49)	.625
7	Have you ever experienced Pelvic pain? [lower Abdomen pain]	261(62)	157 (38)	<.001*
8	Do you know that patients with PCOS report psychological disturbance?	141 (34)	277 (66)	<.001*
9	Do you know how PCOS is diagnosed?	120 (29)	298 (71)	<.001*
10	Do you know that an ultrasound scan of the ovaries will be taken to diagnose PCOS?	168 (40)	250 (60)	<.001*
11	Do you know the methods of treatment?	113 (27)	305 (73)	<.001*
12	Are you aware that PCOS can be managed with diet and exercise?	262 (63)	156 (37)	<.001*
13	Do you know PCOS is a lifetime disorder and has only symptomatic treatment?	122 (29)	296 (71)	<.001*
14	Do you know PCOS patients have an increased risk of cardiac diseases	89 (21)	329 (79)	<.001*
15	Do you know PCOS patients have an increased risk of breast cancer	116 (28)	302 (72)	<.001*
16	Do you know PCOS patients have increased risk of Diabetes	102 (24)	318 (76)	<.001*
17	Do you know PCOS patients have an increased risk of Uterine cancer	151 (36)	267 (64)	<.001*
18	Do you know PCOS patients have an increased risk of infertility	247 (59)	171 (61)	<.001*
19	Do you know Sedentary lifestyle is a risk factor for PCOS?	156 (37)	262 (63)	<.001*
	Percentage Knowledge Score based on Response	41%	59%	
	**Median Knowledge Scores	8 (7); 0→19		

*Chi square test (p <.05 is considered statistically significant). **Median (IQR); Min →Max

- **Attitude responses towards PCOS**

Table 3 summarizes the attitudes related responses towards PCOS among the study respondents. The majority of respondents strongly disagreed with consulting a doctor if diagnosed with PCOS (54%), Most of them were aware that PCOS leads to infertility, impact negative self-confidence (35%), cause depression or anxiety (41%), and need emotional support (42%). Further, there were aware if diagnosed with PCOS, it would affect study or work negatively (33%), PCOS can be managed with lifestyle modifications (36%), and includes both lifestyle and medical treatment (44%), lifestyle management improves psycho logical symptoms (44%). Many respondents have a neutral attitude towards preferring symptomatic treatment (39%), homoeopathy treatment (44%), and hormone regulating herbs (50%) if PCOS positive.

TABLE 3. Responses for attitude based items (N=418)

Q. No	Attitude towards PCOS	SA	A	N	D	SD	P-value
		N (%)	N (%)	N (%)	N (%)	N (%)	
1.	Do you think it is necessary to consult a doctor, if you are diagnosed with PCOS?	17(4)	8(2)	25(2)	144(34)	224(54)	<.001*
2.	Do you think being diagnosed with PCOS leads to infertility (unable to conceive a child)?	12(3)	65(16)	135(32)	154(37)	52(12)	<.001*
3.	Do you think being diagnosed with PCOS would impact your self- confidence negatively?	27(7)	86(21)	133(32)	146(4)	26(6)	<.001*
4.	Do you think being diagnosed with PCOS, will make you feel depressed/ anxious?	21(5)	51(12)	116(28)	172(41)	58(14)	<.001*
5.	Do you think being diagnosed with PCOS need emotional support?	17(4)	38(9)	73(18)	174(42)	116(28)	<.001*
6.	Do you think it would affect your work/ study negatively, if you are diagnosed with PCOS?	25(6)	78(19)	130(30)	137(33)	48(12)	<.001*
7.	Do you think PCOS can be managed only with lifestyle modifications?	12(3)	64(15)	139(33)	152(36)	51(12)	<.001*
8.	PCOS management should include both lifestyle management and medical treatment	12(3)	12(3)	54(13)	182(45)	158(38)	<.001*
9.	Do you think if you are diagnosed with PCOS, Will you prefer symptomatic treatment?	16(4)	45(11)	163(39)	149(35)	45(11)	<.001*
10.	Do you think if you are diagnosed with PCOS, Will you prefer homeopathy medicines?	27(7)	70(17)	182(43)	109(26)	30(7)	<.001*
11.	PCOS lifestyle management will improve psychological symptoms.	10(2)	50(12)	138(33)	184(44)	36(9)	<.001*
12.	If you get diagnosed with Polycystic ovary syndrome, will you prefer using hormone- regulating herbs?	25(6)	85(20)	209(50)	78(19)	21(5)	<.001*
	Percentage Attitude Score based on Response	5%	13%	30%	34%	18%	
	**Median Attitude Scores	42 (8); 20→59					

SD - Strongly disagree, D - Disagree, N- Neutral, A- Agree, SA- Strongly agree. *Chi squared test, p<. 05 is considered significant; **Median (IQR); Min →Max

- **Responses towards Practice based PCOS Questions**

The response for practice-based questions towards PCOS is summarized in (**TABLE 4**). Among the responses, 273 (65%) respondents claimed that they always read the nutrition labels before purchasing packaged foods, 244 (58%) on the otherwise reported that they are able to manage their stress. About 325 (71%) claimed that they receive 7-8 hours of sleep each night, 253 (61%) said they limit or avoid processed foods, 260 (62%) stated that they follow a balanced diet, and some respondents said they get exposed to early morning for 10-15 minutes (N=291, 70%) respectively. While a majority of respondents (N=260, 62%) did not exercise regularly, a similar percentage (N=281,67%) did not engage in daily relaxation practices such as yoga and/or meditation. The majority of respondents (N=255, 61%) stated that they don't overindulge on food or junk when they are feeling unhappy. The vast majority of respondents (90%) have not had any hormone tests. All responses showed a high statistical significance (p< .001).

TABLE 4. Responses to Practice based items towards PCOS (N=418)

Q. NO	Practice towards PCOS	YES N(%)	NO N(%)	P value
1.	Do you read the nutrition labels when you buy packaged food?	273(65)	145(35)	<.001*
2.	Do you exercise regularly (3 -5 days/week)?	158(38)	260(62)	<.001*
3.	Do you know how to manage your stress?	244(58)	174(42)	<.001*
4.	Do you sleep for 7 hours-8 hours daily?	325(78)	93(22)	<.001*
5.	Do you avoid or limit the processed foods in your diet?	253(60)	165(40)	<.001*
6.	Do you practice balanced diet (fresh fruits, vegetables, whole grains, legumes, nuts, protein) in your food habits?	260(62)	158(38)	<.001*
7.	Do you practice yoga and/ or meditation daily for relaxation?	137(33)	281(67)	<.001*
8.	Do you practice seed cycling (practice of eating specific seeds to support the key hormones for irregular periods)?	109(26)	309(74)	<.001*
9.	Do you check your body weight regularly?	206(49)	212(51)	<.001*
10.	Do you get exposed to early morning sunlight (10 -15minutes) regularly?	291(70)	127(30)	<.001*
11.	Do you eat more (binge eat) food/ junk in response to negative emotions?	163(39)	255(61)	<.001*
12.	Have you undergone any hormone tests (luteinizing hormone/ total testosterone, insulin)?	51(12)	367(88)	<.001*
	Percentage Practice Score based on Response	49%	50%	
	**Median Practice Scores	6 (4); 1→11		

Chi Square Test; P < .05 is considered significant; **Median (IQR); Min →Max

- **Association of total KAP scores among sociodemographic variables**

Association of total KAP scores with sociodemographic factors: (TABLE 5) depicts the correlation of total KAP scores with sociodemographic factors. The study observed a significant association (p<0.01) among KAP scores and education category, year of study, and family monthly income. Whereas there were no significant association (p>0.05) among total KAP scores and age, marital status, age of puberty, total number of periods per year and BMI.

TABLE: 5 ; Respondent' s TKAPS distribution towards PCOS and their sociodemographic characteristics

Demographic Variables	TKAPS			P Value
	Poor	Moderate	Good	
Age in Years				
18-20	136 (32)	115 (27)	7 (1)	.007
21-23	54 (12)	99 (23)	4 (1)	
24-26	2 (0)	1 (0)	0 (0)	
Marital Status				
Single	2 (0)	1 (0)	0 (0)	.623
Married	192 (45)	214 (51)	11 (2)	
Educational Qualification				
Pharmacy	77 (18)	145 (34)	8 (2)	<.001
Engineering	115 (27)	70 (16)	3 (0)	
Year of Study				
Year 1	57 (13)	48 (11)	0 (0)	
Year 2	53 (12)	40 (9)	1 (0)	
Year 3	70 (16)	64 (15)	4 (0)	
Year 4	8 (2)	42 (10)	3 (0)	
Year 5	4 (1)	12 (2)	0 (0)	
Year 6	0 (0)	9 (2)	3 (0)	
Average Monthly Income				
<20,000	57 (13)	51(12)	0(0)	<.001
20,000-30,000	53 (12)	48 (11)	0(0)	
30,000-40,000	23 (5)	24 (5)	1 (0)	
40,000-50,000	17 (4)	33 (7)	3 (0)	
>50,000	42 (10)	59 (14)	7 (1)	
Age of puberty (first period)				
<10	9 (2)	4 (1)	0 (0)	.14
10	7 (1)	5 (1)	0 (0)	
11	28 (6)	17 (4)	4 (0)	
12	47 (11)	51 (12)	1 (0)	
13	38 (9)	62 (14)	3 (0)	
14	34 (8)	39 (9)	1 (0)	
15	21 (5)	28 (6)	2 (0)	
>15	$ (2)	9 (2)	0 (0)	
Total number of periods per years				
<8 periods/year	10 (2)	17 (4)	1 (0)	.377
8-10 periods/year	26 (6)	38 (9)	1 (0)	
10-12 periods/year	156 (37)	160 (38)	9 (2)	
BMI				
Underweight	55 (13)	58 (13)	3 (0)	.665
Ideal weight	92 (22)	120 (28)	6 (1)	
Overweight	34 (8)	26(6)	1 (0)	
Obese	11 (2)	11 (2)	1 (0)	

TKAPS: Total Knowledge, Attitude, and Practice Scores; Chi Square Test; P < .05 is considered significant

- **Total knowledge score comparison between pharmacy and engineering students**

There were 418 responders, of whom 188 were from engineering and 23 0 were from pharmacy. Comparing the overall knowledge levels of engineering and pharmacy students is summarized in (TABLE 6). Pharmacy students have more knowledge towards PCOS compared to engineering students. Majority of the respondents of pharmacy have given correct responses to knowledge- based questions of PCOS. The study observed a significant association (p<0. 01) among most of the knowledge questions (**TABLE 6**).

TABLE 6: Knowledge Comparison between Pharmacy the and Engineering Students

Q. No.	Pharmacy (N=230)			Engineering (N=188)		
	Correct (N%)	Incorrect (N%)	P value	Correct (N%)	Incorrect (N%)	P value
KQ_1	185 (80)	45 (20)	<.001	81(43)	107 (57)	.058
KQ_2	174 (76)	56 (24)	<.001	69(37)	119 (63)	<.001
KQ_3	72 (31)	158 (69)	<.001	66(35)	122 (65)	<.001
KQ_4	103 (45)	127 (55)	.114	81(43)	107 (57)	.058
KQ_5	151 (66)	79 (34)	<.001	71(38)	117 (62)	<.001
KQ_6	135 (59)	95 (41)	.008	79(42)	109 (58)	.029
KQ_7	164 (71)	66 (29)	<.001	97(52)	91 (48)	.662
KQ_8	103 (45)	127 (55)	.114	38(20)	150 (80)	<.001
KQ_9	102 (44)	128 (56)	.086	18(10)	170 (90)	<.001
KQ_10	118 (51)	112 (49)	.692	50(27)	138 (73)	<.001
KQ_11	79 (34)	151 (66)	<.001	34(18)	154 (82)	<.001
KQ_12	167 (73)	63 (27)	<.001	95(51)	93 (49)	.884
KQ_13	91 (40)	139 (60)	.002	31(16)	157 (84)	<.001
KQ_14	59 (26)	171 (74)	<.001	30(16)	158 (84)	<.001
KQ_15	81 (35)	149 (65)	<.001	35(19)	153 (81)	<.001
KQ_16	63 (27)	167 (73)	<.001	39 (21)	149 (79)	<.001
KQ_17	114 (50)	116 (50)	.895	37 (20)	151 (80)	<.001
KQ_18	175 (76)	55 (24)	<.001	72 (38)	116 (62)	.001
KQ_19	116 (50)	114 (50)	.895	40 (21)	148 (79)	<.001
Average % KS	52%	48%		30%	70%	
Median (IQR)	10 (6); 0→19			5 (5); 0→19		

*Chi Square Test; P < .05 is considered significant; **Median (IQR); Min →Max

- **Total attitude score comparison between pharmacy and engineering students**

A total of 418 individuals 230 pharmacy students and 188 engineering students participated in the study. The comparison of the overall attitude score between engineering and pharmacy students is shown in (**TABLE 7**) below. The study observed a significant association among all the attitude-based questions. Most of the respondents have a positive attitude towards PCOS; some have a neutral response, but very few respondents showed a negative attitude.

TABLE 7. Comparison of attitude score between Pharmacy and Engineering students

Attitude Qns.	Pharmacy (N=230)					P value	Engineering (N=188)					P value
	SD N(%)	D N(%)	N N(%)	A N(%)	SA N(%)		SD N(%)	D N(%)	N N(%)	A N(%)	SA N(%)	
AQ1	3 (1)	0 (0)	8 (3)	87 (38)	132 (57)	<.001	14 (7)	8 (4)	17 (9)	57 (30)	92 (49)	<.001
AQ2	5 (2)	50 (22)	76 (33)	74 (32)	25 (11)	<.001	7 (4)	15 (8)	59 (31)	80 (43)	27 (14)	<.001
AQ3	11 (5)	64 (28)	73 (32)	69 (30)	13 (6)	<.001	16 (9)	22 (12)	60 (32)	77 (41)	13 (7)	<.001
AQ4	11 (5)	33 (14)	49 (21)	104 (45)	33 (14)	<.001	10 (5)	18 (10)	67 (36)	68 (36)	25 (13)	<.001
AQ5	4 (2)	25 (11)	39 (17)	97 (42)	65 (28)	<.001	13 (7)	13 (7)	34 (18)	77 (41)	51 (27)	<.001
AQ6	13 (2)	57 (25)	66 (29)	75 (33)	19 (8)	<.001	12 (6)	21 (11)	64 (34)	62 (33)	29 (15)	<.001
AQ7	6 (3)	42 (18)	75 (33)	86 (38)	21 (9)	<.001	6 (3)	22 (12)	64 (34)	66 (35)	30 (16)	<.001
AQ8	1 (0)	6 (3)	20 (44)	101 (44)	102 (44)	<.001	11 (5)	6 (3)	34 (18)	81 (43)	56 (30)	<.001
AQ9	4 (2)	22 (10)	89 (39)	92 (40)	23 (10)	<.001	12 (6)	23 (12)	74 (39)	57 (30)	22 (12)	<.001
AQ 10	10 (4)	43 (19)	102 (44)	64 (28)	11 (5)	<.001	7 (9)	23 (14)	61 (43)	82 (24)	15 (10)	<.001
AQ 11	3 (1)	27 (12)	77 (33)	102 (44)	21 (9)	<.001	7 (4)	23 (12)	61 (32)	82 (43)	15 (8)	<.001
AQ 12	13 (6)	52 (23)	115 (50)	40 (17)	10 (4)	<.001	12 (6)	33 (18)	94 (50)	38 (20)	11 (6)	<.001
Average %	3%	15%	31%	36%	17%		6%	9%	31%	41%	19%	
Median	42 (7); 27→57						42 (8); 20→59					

SD- Strongly disagree, D- Disagree, N- Neutral, A- Agree, SA- Strongly agree, *Chi Square Test; p value < .05 is significant; **Median (IQR); Min →Max

- **Total practice score comparison between pharmacy and engineering students**

Among 418 members participated in the study 188 were engineering and 230 were of pharmacy. (**TABLE 8**) demonstrates the comparison of TPS among pharmacy and engineering students. Majority of the respondents have given correct responses in pharmacy compared to engineering. Most of the practice-based questions had a significant association (p<0.01).

TABLE 8 : Comparison of practice score between Engineering and Pharmacy students

PQ. No.	Practice Score	Pharmacy (N=230)			Engineering (N=188)		
		Correct N(%)	Incorrect N(%)	P value	Correct N(%)	Incorrect N(%)	P value
1	Do you read the nutrition labels when you buy packaged food?	168 (73)	62 (27)	<.001*	105 (46)	83 (44)	.109
2	Do you exercise regularly (3-5 days /week)?	98 (43)	132 (57)	.025*	60 (26)	128 (68)	<.001*
3	Do you know how to manage your stress?	158 (69)	72 (31)	<.001*	86 (37)	102 (54)	.243
4	Do you sleep for 7 hours -8 hours daily?	177 (77)	53 (23)	<.001*	148 (64)	40 (21)	<.001*
5	Do you avoid or limit the processed foods in your diet?	151 (66)	79 (34)	<.001*	102 (44)	86 (37)	.243
6	Do you practice balanced diet (fresh fruits, vegetables, whole grains, legumes, nuts protein) in your food habits?	157 (68)	73 (32)	<.001*	103 (45)	85 (45)	.189
7	Do you practice yoga and or meditation daily for relaxation?	76 (33)	154 (67)	<.001*	61 (27)	127 (68)	<.001*
8	Do you practice seed cycling (practice of eating specific seeds to support the key hormones for irregular periods)?	60 (26)	170 (74)	<.001*	49 (21)	139 (74)	<.001*
9	Do you check your body weight regularly?	130 (57)	100 (43)	.048*	76 (33)	112 (60)	.009*
10	Do you get exposed to early morning sunlight (10-15minutes) regularly?	174 (76)	56 (24)	<.001*	117 (51)	71 (38)	.001*
11	Do you eat more (binge eat) food/junks in response to negative emotions?	83 (36)	147 (64)	<.001*	80 (35)	108 (57)	.041*
12	Have you undergone any hormone tests (luteinizing hormone/ total testosterone,	20 (9)	210 (91)	<.001*	31 (13)	157 (84)	<.001*
	Average Practice Score	53%	47%		36%	54%	
	**Median Practice Score	6 (3); 1→11			5 (3); 1→11		

*Chi Square Test; P <.05 is significant; **Median (IQR); Min →Max

- **Overall total score distribution of the respondents**

(**TABLE 9**) summarizes the overall total score distribution for each section studied. The TKS was found to be poor (76%) with a median (IQR) score of 8 (7), whereas the TAS was found to have neutral results (59%) with a median (IQR) score of 42 (8), and poor practice scores (72%) with a median (IQR) score of 6 (4) and the (**TABLE 9**) also demonstrates the total KAP score to be moderate (51) and poor (46) with a very low percentage of good (3%) with the median (IQR)(IQR) score of 55 (11). The study reported significant association ($p<0.01$) between TKAPS, TKS, TAS, and TPS.

TABLE 9. Overall Median and percentage scores distribution among Respondents

Variables	N	Median (IQR)	Range	Poor/Negative N(%)	Moderate/Neutral N(%)	Good/Positive N(%)	p value
TKS	418	8 (7)	0 to 19	317 (76)	77 (18)	24 (7)	<.001*
TAS	418	42 (8)	20 to 59	152 (37)	247 (59)	19 (5)	<.001*
TPS	418	6 (4)	1 to 11	300 (72)	89 (21)	29 (7)	<.001*
TKAPS	418	55 (11)	34 to 89	192 (46)	215 (51)	11 (3)	<.001*

*Chi square Test; P <.05 is significant; * TKS- Total Knowledge Score, TAS- Total Attitude Score, TPS - Total Practice Score, TKAPS- Total knowledge, Attitude, Practice Score. N - Frequency, IQR- Interquartile Range

TABLE 10. Median and percentage scores distribution among Pharmacy and Engineering Respondents

Variables	N	Median (IQR)	Range	Poor/Negative N(%)	Moderate/Neutral N(%)	Good/Positive N(%)	p value
Pharmacy							
TKS	230	10 (6)	0 to 19	145 (63)	66 (29)	19 (8)	<.001*
TAS	230	42 (7)	27 to 57	88 (38)	132 (57)	10 (5)	<.001*
TPS	230	6 (3)	1 to 11	152 (66)	57 (25)	21 (9)	<.001*
TKAPS	230	58.5 (12)	36 to 85	77 (34)	145 (63)	8 (4)	<.001*
Engineering							
TKS	188	5 (5)	0 to 19	172 (92)	11 (6)	5 (3)	<.001*
TAS	188	42 (8)	20 to 59	64 (34)	115 (61)	9 (5)	<.001*
TPS	188	5 (3)	1 to 11	148 (79)	32 (17)	8 (4)	<.001*
TKAPS	188	53 (9)	34 to 89	115 (61)	70 (37)	3 (2)	<.001*

*Chi square Test; P <.05 is significant; * TKS- Total Knowledge Score, TAS- Total Attitude Score, TPS - Total Practice Score, TKAPS- Total knowledge, Attitude, Practice Score. N - Frequency, IQR- Interquartile Range

Discussion

Information regarding respondents' socio -demographics was listed in (TABLE 1), in the present study 18 -20 year of age group are in majority compared to other age groups, single percentage is more compared to married this may be due to the study site is an undergraduate college. Pharmacy respondents were more in number compared to engineers. 1st year students and 3rd year student percentage is more compared to other years, there are equal percentage of students whose monthly income is <20,000 and >50,000. A lot of respondents' age of puberty was around 13 years. A very less percentage of respondents have <8periods/year. This study was carried out to evaluate the current status of knowledge, attitude, and practice towards PCOS because many previous studies focused only on clinical findings and diagnostic criteria rather than identifying the awareness of the severity of PCOS. Lack of understanding and attitude about PCOS is the cause given for the higher incidence of the condition. As far as we are aware, this is the first study to be carried out in the Indian state of Telangana. The study is consistent with Anandraj vaithy. k et al analysis and highlighting of knowledge, attitude, and awareness regarding PCOS among the southeastern population. The aim of this study was to create and validate a PCOS survey questionnaire and to measure the PCOS Knowledge, Attitudes, and Practices (KAP) of pharmacy and engineering students within 18 years to

25 years age group. As far as we are aware, no studies have examined the KAP level for PCOS among pharmacy and engineering students in Telangana, India [10-16].

- **Responses towards knowledge of PCOS**

About 43% of students are less acquainted with PCOS treatment options, and this result was similar in two studies, one of which was carried out in Chennai, India, and found that 96.3% of them were least aware of options available for PCOS treatment.; another study, which was carried out in Navi Mumbai, Maharashtra, India, by Safa et al., 78.7% of students were least knowledgeable of the fact that female adults who have PCOS condition have more of a chance of getting cardiac diseases, Unfortunately, this result was also consistent in one Malaysian study, where 320 respondents (78%) were least knowledgeable about this 76% of students were less enlightened that women with a previous diagnosis of PCOS have more of a chance of developing diabetes, and the similar findings were seen in a survey-based cross-sectional study conducted by Ruba et al. 64% of students stated they were less aware that women with a previous medical history of PCOS have a more risk of getting diagnosed with endometrial cancer and identical findings were also found in a survey -based cross-sectional study by Ruba et al. Plenty of students (66%) are unaware that patients with previous medical history of PCOS experience psychological disturbance. These results were consistent in research performed within Malaysia's Klang Valley women. The vast majority of survey participants (71%) are unaware that PCOS is a chronic disease with only symptomatic treatment. CDC states that PCOS is a lifelong health condition persist much past the reproductive years. (35) 63% respondents are aware that food and exercise can help in managing PCOS, but they are unaware that lifestyle changes are the primary method of PCOS treatment. Lifestyle modification is recommended by Evidence- Based clinical guidelines for PCOS (2018), as the initial PCOS treatment, which includes diet, exercise, and behavioral therapies to help with weight management. This study population who was unaware that PCOS diagnosed women have increased risk of getting breast cancer in 72% of the cases. PCOS was likely a contributing factor that needed to be understood, to identify the causes of ER - positive breast cancer and discover ways to prevent it. Factors which increase the risk of PCOS include sedentary lifestyle, yet 63% of participants were unaware that this was the case [17-21].

- **Responses towards attitude-based questions on PCOS**

This study shows that the 54% of students strongly disagree with seeking medical attention for PCOS therapy. 37% are disagreed to the statement that PCOS leads to infertility. 32% of respondents that the PCOS would have a detrimental impact on self- confidence. 41% of students agreed that PCOS will make them feel anxious or unhappy. Statement that receiving diagnosis of PCOS needs emotional support is disagreed by 42% of respondents. 33% of students disagreed with the statement that receiving a PCOS diagnosis will have a negative effect on them. 36% of students disagree that PCOS may only be managed with changes related to lifestyle. 45% disagreed that PCOS management involves both changes related to lifestyle and pharmacological intervention. 39% of students who responded to the survey said they favor symptomatic treatment for PCOS. When asked they would prefer homeopathy medicines to treat PCOS, 43% of students responded in the negative 44% of students disagree to the statement that psychological disorders like anxiety or despair can be improved by adjusting one's lifestyle. With 50% of students gave neutral response towards usage of hormone regulating herbs when they are diagnosed with PCOS [22-26]

- **Responses towards practice-based questions on PCOS**

In this research, 65% of participants read nutritional labels while purchasing packaged foods; these results were consistent in an investigation of Malaysian Klang Valley women.(18) In this research 62% of sample population do not exercise regularly, contrarily it was observed in research done by Preet et al., 2020(22) 33% of the sample population practices yoga or meditation for relaxation purposes. Contrarily, i t was noted that 37% of respondents who are having previous diagnosis of PCOS engaged in yoga practice a research by Preet et al, in 2020(22) 74% of respondents from this research were not practicing seed cycling in case of irregular periods, Seed cycling uses four different seeds, flaxseed and pumpkin seeds (consumed during the first phase of menstrual cycle which is follicular phase, lasts for 14 days), and sunflower seeds and sesame seeds (consumed during the second phase which is luteal phase, lasts for 14 days), A review article written in 2021 by Irfan et al. claimed that omega -3 fatty acids, which are rich in flaxseed, pumpkin, sunflower, and sesame seeds, could help treat PCOS since they can help lower insulin resistance, high triglyceride, high LDL, and low HDL levels, as concluded in this entire review article. These seeds are essential for maintaining the balance of the hormonal cycle in the body.

- **Respondents Total KAP Score Distribution (TKAP) towards PCOS and their sociodemographic characteristics**

Participants aged 18 to 26 have a poor TKAP score (32%). Nearly most of the students are unmarried, and they display moderate TKAP score (51%). Students in years 1st, 2nd, 4th, 5th and 6th showed a decline in the poor TKAP score towards PCOS (13%, 12 %, 2%, 1%, and 0%) showing that the higher the degree of education, the greater decline in the poor TKAP score. (Year 3 (16%) was an exception, as there were more engineering students in that year). Underweight respondents (27%) and ideal weight respondents (52%) exhibit a moderate TKAP score towards PCOS, whereas overweight and obese respondents (14 and 5%) exhibit a low total TKAP score towards PCOS (29).

- **Comparison of TKS among engineering and pharmacy students**

The many of them in engineering have a vague idea related to PCOS compared to pharmacy respondents; pharmacy students gave 80% of correct answers whereas engineering students gave only 43% right answers for KQ1. Students from pharmacy have a better idea about clinical PCOS compared to engineering students; the pharmacy percentage for incorrect responses of was 4% whereas for engineering students it is 63%. This analysis suggests that this field of study has had a notable impact on knowledge about PCOS. Respondents with a healthcare background show a favorable level of knowledge than students without it, as stated by Frontiers in Medicine. A lot of students from pharmacy and engineering students have a less awareness on clinical manifestations of PCOS, patients with previous history of PCOS report psychological disturbances that could be understood by a study stated the condition frequently includes psychiatric symptoms including anxiety and sadness. PCOS diagnosis and methods of treatment both pharmacy and engineering students are least aware that PCOS is a long -standing disorder and causes complications and research in Saudi depicted that two -thirds female population had inaccurate knowledge about risks of PCOS. Students from pharmacy displayed better awareness that sedentary lifestyle (inactive) serves as a risk factor for developing PCOS, whereas engineering students have the least awareness of this (30).

- **Comparison of TAS among engineering and pharmacy students**

This investigation revealed that AQ 1, AQ 2, AQ 3, AQ 4, AQ 5, AQ 6, AQ 7, AQ 8, AQ 9 and AQ11 attitude questions or statements had a positive response and for AQ 10 & AQ 12 observed a neutral response in tendency to prefer hormone regulating herbs in treating the PCOS. It was found that the study population had a positive attitude towards PCOS. The findings observed in this research and another research performed at Jordan within PCOS patients had a positive attitude towards PCOS. However, research in Pakistan performed within PCOS patients, observed negative attitude which likely developed to be from the psychological effects, but this research had a positive attitude towards psychological effects such as feeling depressed or anxious (29).

- **Comparison of TPS between engineering and pharmacy students**

In this research, 73% of pharmacy students responded that they read nutritional labels while purchasing packaged foods; these results were consistent with an investigation of Malaysian Klang Valley women (18). Compared to 60% of engineering students, 98% of pharmacy students in this study said they exercise daily. Compared to 61% of engineering students, 76% of pharmacy students in this study said they do yoga or meditation for relaxation. In this study, 73.9% of engineering and pharmacy students said they did not engage in seed cycling (32).

- **Overall knowledge score**

Approximately 76% of female respondents have demonstrated a poor TKS of PCOS, which is consistent with research completed in Jordan. Research in Chennai revealed that 96.3% of females were not aware of the signs, symptoms, and treatment of PCOS. Research done by Safa et al., showed that there is not enough knowledge related to PCOS management (like the benefits of exercise and options for treatment). Research done in Pune, people who have a previous history of PCOS are less knowledgeable of its complications and how beneficial exercise is for preventing them. In an online poll taken at the campuses of Texas Women's University in Dallas, Denton, and Houston, the most of the female adults (63.3%) rated their knowledge of PCOS as " Know some" or less. In contrast to our study results, a Saudi Arabian study reported in 2020 showed that 74.8% of them had a good knowledge level about PCOS. (21) Around 59% of population involved in this study indicated neutral attitude towards PCOS, which is in contrary to a study done by Ruba M Jaber et al., which stated overall, the respondents have expressed positive attitudes towards PCOS. (19) 72% of women had poor practices towards PCOS, which is consistent with the study performed in klang valley Malaysia stated almost 50% of them had poor knowledge (47.30%) and poor practice (47.60%). Total KAP score was moderate/neutral with the percentage of 51% [18].

Conclusion

This study shows that respondent's knowledge, attitudes, and practice scores relation to PCOS are moderate. While respondents are more knowledgeable of PCOS symptoms, most respondents had a limited understanding of the complications and diagnosis related to this lifelong disorder. The responders are also unaware of the available therapy options. There were a lot of respondents who expressed a negative attitude towards seeking medical attention if they were to be detected with PCOS in the future; this suggests that they are unaware of the chronic health effects that PCOS may have. This study made it evident that health education and awareness related to PCOS within pharmacy and engineering students is required. As PCOS affects women at the ages of 18 years and 45 years, a delay in diagnosis and therapy will result from respondents' failure to become aware of the condition. Women should undergo regular health check - ups, maintain healthy day- to-day routines that support good reproductive health, and be willing to l earn about the facts of reproductive health, all of which are thought to be imperative for the wellbeing of their physical and psychological health. Women should also be encouraged to seek early PCOS detection and prevention help halt the continuously increasing prevalence of the disease. Students studying pharmacy mainly have insufficient knowledge. It is crucial for future healthcare professionals to increase their knowledge of PCOS. Consequently, attention should be given to improving healthcare student's knowledge and comprehension of the seriousness of PCOS through educational interventions.

Limitations

The outcome of this research is limited for different reasons. The results might not be representative of all students due to differences in age, distribution of study years, and educational background. Additionally, only one college in a specific Telangana state locality was used for the study; therefore, it cannot be said to be representative of the entire population. The study is also self-reported, which could be biased because the participants did not think about their responses as they were being given. Due to the short study period, no intervention could be planned.

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Conflict of interest

The authors declare that there is no conflict of interest

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