



Knowledge of Polycystic Ovarian Syndrome, Its Complications, and Management among Lebanese Women: A Cross-Sectional Survey

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J Health Allied Sci^{NU} 2022;12:267–273.

Abstract

Introduction Polycystic ovarian syndrome (PCOS) is a multi-spectrum disease where a failure to address it correctly can result in various clinical complications. This study aimed to assess the Lebanese women's knowledge and perceptions of PCOS and its management.

Materials and Methods This cross-sectional study included women whose ages ranged between 18 and 45 years. Women's demographic characteristics, reproductive health, knowledge, and perception of PCOS were analyzed through an online validated questionnaire.

Results Among the 450 included women, 196 (43.6%) had good knowledge about PCOS. The majority of participants were aware that menstrual irregularity is a symptom of PCOS, 327 (72.7%), while only 231 (51.3%) women knew that PCOS may lead to infertility. Almost two-thirds of women were aware of the contribution of metformin, diet, and exercise in refining the progress of the disease. More than 60% of participants believed that PCOS patients need social support and have a low body image. Married women ($p < 0.001$) and those with undergraduate/ postgraduate degrees ($p < 0.001$) had better PCOS knowledge.

Conclusion A significant percentage of Lebanese women have inadequate knowledge of PCOS and its complications.

Keywords

- ▶ polycystic ovary syndrome
- ▶ health knowledge, attitudes, practice
- ▶ female
- ▶ Lebanon

Introduction

Polycystic ovarian syndrome (PCOS) is the most common metabolic and endocrine disorder known to affect women of reproductive age, with a prevalence ranging from 6% to 20%.¹

PCOS can be diagnosed by one of the following accepted diagnostic criteria: Rotterdam, National Institute of Health, and Androgen Excess PCOS Society, where a minimum of 10 cysts of 2 to 8 mm diameter is often present on the ultrasound of one or both ovaries.² Ovarian volume is usually increased in at least one ovary by more than 10 mL.² Notably,

presenting symptoms among adult women tend to be heterogeneous, making it a diagnostic challenge.² Additionally, underdiagnosis may be prominent due to a possible lack of knowledge and awareness among women.

Generally, menstrual irregularities, hirsutism, infertility, miscarriage, or accompanying metabolic disorders (e.g., obesity, dyslipidemia, or insulin resistance) lead to adventitious clinical visits that elicit diagnosis. In this sense, more than half of women with PCOS report to the physician for infertility problems, and the third quarter of them complain chiefly of

published online
December 1, 2021

DOI <https://doi.org/10.1055/s-0041-1740025>.
ISSN 2582-4287.

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oligomenorrhea or amenorrhea.³ Therefore, clinical features may differ broadly depending on which of the four phenotypes, suggested by Rotterdam, the patient is presenting with.⁴

Many hypotheses have been suggested to understand better the pathophysiology of PCOS; however, little is known about its precise etiology.^{5,6} It is also claimed that PCOS may be heritable with PCOS-susceptibility loci and leptin receptor gene being suggested as possible genetic attributes.^{7,8}

PCOS therapy is largely limited to symptomatic management of posed complications and lifestyle modifications. Strikingly, dietary restrictions and physical exercise can restore normal hormone levels, reduce cyst size, induce ovulation, and mitigate disturbing symptoms.⁹

Overall, the reproductive and metabolic complications suffered by women with PCOS impose a heavy financial burden.^{10,11} By comparing women with PCOS to healthy volunteers, Hart et al have found in their study that PCOS are twice more likely to be admitted to hospital.¹² Effects may also extend beyond physiologic complications, where PCOS patients are 3.8 times more likely to suffer from depression.¹³ Patients may also suffer from anxiety and a poor quality of life.¹³

A study conducted by Patel et al reported that only 40% of Indian women were aware of PCOS.¹⁴ Another study assessing the prevalence and awareness of female university students in Pakistan reported an increased incidence of PCOS but limited awareness.¹⁵ Similar reports were obtained from other countries in the middle east (Saudi Arabia and Jordan) where limited awareness was found among women.^{16,17} More importantly, research suggests that many women with PCOS tend to search the internet for information rather than consulting with a healthcare professional due to a possible hesitation to talk about reproductive issues.¹⁸ This condition may lead to a discrepancy in the level of patients' knowledge-accuracy, underdiagnosis, and significant disease complications.

Given the importance of this topic, much effort has been dedicated to research in Lebanon to address this complex problem; however, none of the latter has tackled the prevalence and public awareness of this syndrome. It is therefore not clear if Lebanese women are aware of PCOS and its complications. Thereby, this study sought to evaluate the Lebanese women's knowledge of PCOS and its management.

Materials and Methods

Study Design and Questionnaire Development

This cross-sectional observational study analyzed Lebanese women's knowledge and perception of PCOS. Adult women of reproductive age (18–45 years) were included in the study, except for those refusing to sign up for the electronic consent; thus, participation was voluntary and anonymous. This study was reviewed and approved by the Institutional Review Board of the Lebanese International University, School of Pharmacy–Beirut. Data were collected from January until June 2020.

The research was conducted using a questionnaire that was adapted from previous similar studies on PCOS.^{17,19} After drafting the questionnaire, it was examined by five expert

academics and five women for the face and content validity. Based on their feedback, several changes were made to the language of questions to improve clarity, and several statements were adjusted to ensure that all items were comprehended. The final questionnaire was written in English and then translated into Arabic. Following the completion of the translation, the questionnaire was back-translated from Arabic to English to ensure consistency. The questionnaire was later available online in a Google form, and the survey link was randomly circulated online through the different social media platforms (i.e., Facebook and Whatsapp) for a duration of 8 weeks.

On the first page of the questionnaire, the study's objective was explained to the participants, and they were assured that the information they provide will be kept confidential and anonymous. The questionnaire included 41 items and was organized into three sections. The first section covered the sociodemographic characteristics including the smoking status that was labeled per the CDC definitions: Current smokers included adults who have smoked 100 cigarettes in their lifetime and who currently smoke, ex-smokers included former smokers who have smoked 100 cigarettes in their lifetime but are not currently smoking, while non-smokers included persons who have had less than 100 cigarettes in their lifetime or have never smoked.²⁰ In the second section, participants were asked 24 questions to assess their knowledge about the physiology of the female reproductive system, the pathophysiology, complications, and management of PCOS. Knowledge score was calculated by summing the number of correct answers. Scores ranged from 0 to 24, with 0–9: inadequate knowledge, 10–17: satisfactory, 18–24: good knowledge. In the last section, women also answered to what extent they agree with the seven variables related to PCOS to assess their perception of the disorder.

The calculated minimum sample needed sample was 343 based on an estimated prevalence of PCOS knowledge of 50% in the Lebanese reproductive-aged female population as there are no previous similar studies conducted in Lebanon. The calculations assumed a confidence level of 95%, a margin of error of 5% using the Epi info sample size calculator.

Statistical Analysis

Data analysis was performed using SPSS (Statistical Package for Social Sciences) version 25.0 (IBM SPSS Inc., Armonk, NY, USA). Mean and standard deviation were used to describe continuous variables, while percentages were used for qualitative variables. Factors significantly associated with PCOS knowledge in the simple regression were included in the multiple linear regression model. The logistic regression analysis was adjusted for age, marital status, educational level, employment status, physical activity, use of contraceptives, and history of infertility. A *p*-value below or equal to 0.05 was considered significant for all analyses.

Results

Four hundred fifty questionnaires were wholly filled and analyzed. The demographic characteristics of participants

are presented in ►Table 1. The mean age of participating women was 29.8 years ± 12.2. In this study, 324 (72%) participants were single, with 259 (57.6%) women attending and 98 (21.8%) others had attended college. The majority of women, 299 (64.4%) were not working, 325 (72.2%) were non-smokers, and 341 (75.8%) were free of chronic diseases. Comparable percentages of participants engaged in variable levels of activity: 150 (33.3%) seldom practiced, 157 (34.9%) occasionally, and 143 (31.8%) did that often.

When surveying the females' reproductive health, 306 (68%) reported non-use of oral contraceptives, 294 (65.3%) had a cycle length within the average interval (25–34). In comparison, a total of 72 (16%) married women had a history of infertility.

Participants' understanding of the different PCOS aspects is illustrated in ►Table 2. Women had a relatively decreased level of knowledge of the reproductive system's physiology. However, women reported the best knowledge in this section of the cysts' definition, where 290 (64.4%) women knew that cysts are follicles with a single egg inside. A comparable percentage of women did not know that ovulation is essential for fertility, progesterone released after ovulation is responsible for uterine shedding, and that this shedding is a protective factor against uterine cancer. Interestingly, more than half of the participating women failed to recognize that the amount of free testosterone is affected by body fat and insulin (237 [52.7%] and 297 [66%], respectively).

Participants in this study demonstrated a better degree of recognition of the pathophysiology of PCOS. Around 70% of participants perceived that a polycystic ovary has more follicles than a regular one and 273 (60.7%) of them knew that these ovaries tend to ovulate less than the average. Irregularity or absence of menses was recognized as a symptom of PCOS by 325 (72.2%) participants compared with 254 (56.4%) women being aware that testosterone level production is increased and other 341 (75.8%) knowing that these elevated levels may result in undesired features (e.g., acne, alopecia, and hirsutism). In addition, 302 (67.1%) women realized that high insulin levels are expected in women with PCOS. The majority of participants were also aware of the diagnostic tools—ultrasound recognized by 299 (66.4%) women, and specific blood tests known to 303 (67.3%) of participants.

Women participating in this study had substantially poor knowledge of PCOS complications. Around half of the participants knew that PCOS might result in infertility. Similarly, 247 (54.9%) women were aware of the fact that increased insulin levels increase the risk of diabetes. However, fewer people, 185 (41.1%), knew that PCOS might cause metabolic syndrome which is a group of symptoms that result in increased risk for diabetes and CVD, a definition only perceived by some, 182 (40.4%).

Almost all participants, 384 (85.3%), knew that diet and exercise greatly help PCOS complications by decreasing insulin levels, a mechanism known to nearly two-thirds of the participants, 332 (73.8%). A similar proportion of women also knew that medications could also lower insulin. Around half of the women knew that by reducing insulin, free

Table 1 Demographic characteristics of the studied women (N = 450)

Characteristic	Number (%)
Age (y)	
18–24	229 (50.9)
25–35	82 (18.2)
≥36	139 (30.9)
Mean (SD)	29.8 (12.2)
Marital status	
Single	324 (72.0)
Married	79 (17.6)
Divorced	47 (10.4)
Educational level	
Secondary education	93 (20.7)
Undergraduate education	259 (57.6)
Postgraduate education	98 (21.8)
Employment status	
Not working	290 (64.4)
Working full-time	110 (24.4)
Working part-time	50 (11.1)
Physical activity	
Seldom	150 (33.3)
Occasionally	157 (34.9)
Often	143 (31.8)
Smoking status	
Non-smoker	327 (72.7)
Current smoker	100 (22.2)
Ex-smoker	23 (5.1)
Having chronic medical conditions	
Yes	109 (24.2)
No	341 (75.8)
Interval between menstruation (days)	
< 25 days	40 (8.9)
25–34 days	294 (65.3)
35–60 days	94 (20.9)
Totally variable	22 (4.9)
Having a history of infertility	
Yes	72 (16.0)
No	378 (84.0)
Using oral contraceptives	
Yes	144 (32.0)
No	306 (68.0)

testosterone could be decreased, and ovulation can be promoted. Similarly, 240 (53.3%) participants were aware that decreased testosterone results in reduced hirsutism, acne, and alopecia.

Table 2 Participants' knowledge about PCOS

Parameter	True N (%)	False N (%)	Do not know N (%)
Basic knowledge about the physiology of the female reproductive system of participants			
A follicle is a small fluid-filled sac with a single egg inside and the follicles are often called cysts	290 (64.4)	56 (12.4)	104 (23.1)
Ovulating more frequently will improve my fertility	251 (55.8)	95 (21.1)	104 (23.1)
After egg release (ovulation), the hormone progesterone is released; progesterone would allow my uterine lining to shed and allow me to have a normal menstrual period	263 (58.4)	66 (14.7)	121 (26.9)
Having monthly increases in progesterone, and therefore menstrual periods would decrease my risk for cancer of the uterus	239 (53.1)	12 (2.7)	199 (44.2)
The amount of fat in the body affects the amount of free testosterone in my body	213 (47.3)	45 (10.0)	192 (42.7)
Insulin helps the ovary to make more male hormone	153 (34.0)	50 (11.1)	247 (54.9)
Participants' knowledge of the pathophysiology of PCOS			
Polycystic ovaries contain more visible follicles than the average ovary	320 (71.1)	20 (4.4)	110 (24.4)
Polycystic ovaries tend to ovulate less frequently than the average ovary	273 (60.7)	32 (7.1)	145 (32.2)
Irregular or absence of menstrual (period) cycle is a symptom of PCOS	327 (72.7)	33 (7.3)	90 (20.0)
Polycystic ovaries tend to make more male hormone-like (testosterone) than the average ovary	254 (56.4)	18 (4.0)	178 (39.6)
More free testosterone promotes unwanted hair growth, acne, and scalp hair loss (alopecia)	341 (75.8)	29 (6.4)	80 (17.8)
High insulin levels are common in women with PCOS	302 (67.1)	18 (4.0)	130 (28.9)
PCOs diagnosis can be confirmed by ultrasound	299 (66.4)	24 (5.3)	127 (28.2)
Specific blood tests can be used for the diagnosis of PCOS	303 (67.3)	51 (11.3)	96 (21.3)
Knowledge of complications with PCOS			
High insulin levels place individuals at risk for diabetes	247 (54.9)	60 (13.3)	143 (31.8)
A metabolic syndrome is a group of symptoms that increases my risk for diabetes and cardiovascular disease	182 (40.4)	74 (16.4)	194 (43.1)
Metabolic syndrome is common in women with PCOS	185 (41.1)	25 (5.6)	240 (53.3)
PCOS may lead to infertility (inability to have children)	231 (51.3)	33 (7.3)	186 (41.3)
Knowledge of PCOS management			
Medications that stop the production of male hormone by the ovary (like hormonal contraception) or block the effects of male hormone would help with unwanted hair growth, acne, and alopecia	240 (53.3)	57 (12.7)	153 (34.0)
Lowering insulin levels may help decrease free testosterone, help with weight loss and help trigger ovulation	235 (52.2)	28 (6.2)	187 (41.6)
Insulin levels can be lowered by exercise and by certain changes in diet	332 (73.8)	56 (12.4)	62 (13.8)
Insulin levels can be lowered by medications that make the body more sensitive to insulin, like metformin	330 (73.3)	47 (10.4)	73 (16.2)
Increasing the amount of muscle in my body will increase my body's metabolic rate, that is my body's ability to burn calories	260 (57.8)	45 (10.0)	145 (32.2)
Exercise, healthy dieting, and weight loss can decrease the risk of having metabolic syndrome	384 (85.3)	2(0.4)	64 (14.2)
Knowledge score (/24) Mean(SD)	15.44 (7.26)		

Table 3 Study participants' perception of PCOS

Parameter	Strongly disagree N (%)	Disagree N (%)	Agree N (%)	Strongly agree N (%)	Mean (SD)
The name PCOS is confusing and gives no clue about the disease	48 (10.7)	114 (25.3)	152 (33.8)	136 (30.2)	2.84 (0.98)
PCOS is a permanent condition and cannot be cured	40 (8.9)	170 (37.8)	127 (28.2)	113 (25.1)	2.7 (0.94)
PCOS cannot be managed through diet and exercise	48 (10.7)	156 (34.7)	141 (31.3)	105 (23.3)	2.67 (0.95)
PCOS patients have low body image	12 (2.7)	162 (36.0)	179 (39.8)	97 (21.6)	2.8 (0.80)
PCOS patients require support social support	31 (6.9)	78 (17.3)	200 (44.4)	141 (31.3)	3.0 (0.87)
PCOS patients cannot have children (women's fertility)	61 (13.6)	152 (33.8)	167 (37.1)	70 (15.6)	2.55 (0.91)
Hirsutism due to PCOS can decrease social performance	29 (6.4)	151 (33.6)	158 (35.1)	112 (24.9)	2.78 (0.89)

Strongly disagree = 1, disagree = 2, agree = 3, strongly agree = 4.

Participants had no dominant perception of PCOS, as observed in **Table 3**. However, a slightly increased percentage of women believed that PCOS patients require social support (3 ± 0.87), the term PCOS may be confusing and not define the disease (2.84 ± 0.98), and that patients might have a low body image (2.8 ± 0.8).

Multiple linear regression was performed to assess the possible factors that shape Lebanese women's knowledge of PCOS (**Table 4**). Older age and oral contraceptives were negatively associated with good PCOS knowledge, 0.002 and 0.012, respectively. However, married women ($p = 0.001$) and women with an increased level of physical activity ($p < 0.001$) or with undergraduate/postgraduate degrees ($p < 0.001$) tend to have better PCOS knowledge.

Discussion

Studies conducted in the middle east have reported a PCOS prevalence rate of 6 to 16%.²¹ Given the high prevalence of the disease and the broad range of metabolic, reproductive, and psychological issues that it may precipitate, it was cardinal to study the public's relative knowledge of PCOS and their perception of this syndrome.

As observed, women incorporated in this study reported considerably varying degrees of knowledge of PCOS. Twenty percent had inadequate knowledge (0–9), 36.4% had satisfactory knowledge (10–17), and 43.6% had good knowledge (18–24). The mean knowledge score was determined to be 15.44 ± 7.26 and was graded as satisfactory. A significantly higher percentage of well-aware women was documented compared with other studies, which only compromised a limited percentage (21%) of participants having good knowledge.⁹ Thus, many participants were missing some vital details. Women in this study demonstrated good knowledge of the pathophysiology and management but lacked understanding of the physiology and complications. A patient's engagement in all disease aspects is undoubtedly indispensable for a successful treatment plan.^{19,22} Individuals would

also improve their attitude toward the disease and minimize concern about possible complications once they acknowledge them.¹⁹

Most participants (85.3%) in this study knew that diet and exercise could influence PCOS by decreasing the risk of

Table 4 Factors associated with participants' knowledge about PCOS

Variable	β (95.0% confidence interval)	p-Value
Age		
< 25 years	–	
≥ 25 years	–147(–3.488, –0.777)	0.002*
Marital status		
Single	–	
Married	0.553 (6.844, 11.031)	0.001*
Educational level		
Secondary	–	
Undergraduate/postgraduate	0.583 (9.087, 11.797)	0.001*
Employment status		
Not working	–	
Working (FT/PT)	0.074(0.027, 2.208)	0.045*
Physical activity		
Seldom	–	
Occasionally/often	0.140 (1.079, 3.230)	0.001*
Smoking status		
Non-smoker	–	
Smoker	0.094 (0.173, 2.897)	0.027*
Having chronic medical conditions	–0.021(–1.678, 0.972)	0.601
Having a history of infertility	–0.017(–0.559, 0.336)	0.624
Using oral contraceptives	–0.104 (–1.613, –0.204)	0.012

having metabolic syndrome. Contrarily, a lower percentage (64%) of respondents in other studies were aware that diet modifications could help with PCOS symptoms.⁹ Oxidative metabolism in tissues, including ovaries, is induced by physical exercises. This stimulation ultimately results in enhanced follicular growth and ovulation.⁹ Most of all, adopting a healthier lifestyle through diet and regular exercise protects against major metabolic diseases and other psychological events.

The most recognized PCOS features were the androgen-related adverse effects (75.8%), followed by the irregularity of menses (72.7%) that was better noticed in the Jordanian study (90.3%).¹⁷ In particular, women must be aware of the syndrome's features to relate to the disease and seek further investigations if they occur. In addition, more Lebanese women, around two-thirds, compared with Jordanian women, were aware of the different diagnostic criteria, who mostly knew about the ultrasound (66.5%) and not blood test diagnosis (33.5%).¹⁷ Lastly, women responding to queries about PCOS management had varying degrees of knowledge of different questions. Almost two-thirds of participating women were aware of the contribution of metformin, diet, and exercise in refining the progress of the disease. Adopting any of these three measures can result in decreased BMI and restored insulin sensitivity.⁴ Similarly, 80.6% of participants from another study knew that PCOS greatly benefits from reduced weight.¹⁷ While such a decrease in weight can alone restore the menstrual cycle to its regular rhythm naturally, this strategy cannot be suggested in non-obese or minimally overweight women because of limited data on the role of diet and exercise in this population.⁴

As for the participant's perception of the disease, most women agreed that PCOS requires social support and that most women with PCOS have a poor body image. Women also believed that PCOS naming is confusing and may not define the syndrome, similar to the study's findings conducted by Teede et al.²² To a lesser extent, participants also agreed that hirsutism associated with PCOS could be socially intimidating. Hirsutism has been noted to have a pronounced negative impact on health-related quality of life, where social support can be of particular help in this regard.²³ In contrast, only an estimated half of the participants agreed that PCOS is a permanent disease that cannot be cured. Literature-based evidence builds upon these beliefs where a broad range of hampering psychological effects are affiliated with PCOS.¹³ Lastly, there was no clear consensus among women sharing in this study about the impact of PCOS on fertility. It is noteworthy that the new guidelines suggest that PCOS may result in infertility only in the case of oligo-ovulation or anovulation.⁴ In these cases, women may also benefit from an extended reproductive period due to increased ovarian reserve near menopause.⁴

Overall, married women were found to be more knowledgeable of PCOS, similar to the finding of other studies.¹⁷ This may be explained by the fact that married women may attend more meetings with gynecologists and be more likely involved in conversations about reproductive issues than unmarried women. However, those visits did not boost

unmarried females' sexual and reproductive health knowledge, according to a study conducted by Hamdaniah et al.²⁴ In addition, women with higher educational levels had a greater degree of knowledge, similar to what was observed in other studies.^{17,25}

This is the first research study to estimate Lebanese women's knowledge and perception toward PCOS that enrolled subjects representative of the general population. Nevertheless, a significant limitation of this study is that the questionnaires were filled online without an inspector's observation. This may have increased the odds of miscomprehension of some questions. Also, participation in this study was voluntary, and it is possible that more confident and knowledgeable women were more eager to participate. Some women may not have had access to the internet, which limits the generalizability of the results. In addition, the research did not take into account the educational specialization of the participants.

Conclusion

According to the findings of this study, a significant percentage of Lebanese women have inadequate knowledge of PCOS and its complications. Women who were married and had a higher educational level had more knowledge about PCOS. Thus, improving women's knowledge regarding PCOS through public health awareness campaigns and support groups that target patients affected by PCOS is crucial to avoid unnecessary complications imposing heavy financial burdens.

Authors' Contributions

F.A. collected the data. F.A. and B.C. analyzed the data and were involved in writing and reviewing the final version of the manuscript.

Ethics Approval

Ethical approval was obtained for the study.

Availability of Data and Material

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflict of Interest

None declared.

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