



# Lebanese Women's Awareness of Polycystic Ovarian Syndrome and Its Complications: A Cross-Sectional Study

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## Abstract

**Background** Polycystic ovarian syndrome (PCOS) is a common disorder in females with many different presentations and potentially life-threatening complications. However, the awareness of females about this disorder tends to be lacking. This study aims to assess the knowledge about PCOS among Lebanese women in the reproductive age group.

**Methods** This cross-sectional study was performed on 421 women aged between 18 and 51 years from all governorates in Lebanon. Participants signed informed consent prior to their participation, and they were selected through convenient sampling. A well-conducted questionnaire was utilized after the Institutional Review Board's Committee approved the study at Beirut Arab University prior to data collection. Data entry was completed with SPSS (IBM version 23.1) and analyzed using mean, standard deviation, percentages, chi-squared test, and *p*-values.

**Results** Among 421 participants, 75% were aware of PCOS. Around 50% knew about PCOS's various signs and symptoms, whereas only a minority knew about its complications. Furthermore, most participants were aware of the importance of lifestyle modifications in alleviating PCOS symptoms.

**Conclusion** The results of this study show that Lebanese women were aware of common symptoms of PCOS. On the other hand, their knowledge was minimal regarding its more complex manifestations and complications.

## Keywords

- ▶ polycystic ovarian syndrome
- ▶ complications
- ▶ life-threatening
- ▶ awareness
- ▶ reproductive age group

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## Introduction

Polycystic ovarian syndrome (PCOS), a common reproductive and endocrinological disorder, is found in 6 to 10% of females. It usually presents in young females with oligomenorrhea, hirsutism, and infertility. Furthermore, it is characterized by hyperandrogenism, multiple ovarian cysts, chronic anovulation, and decreased fertility.<sup>1</sup> Typically, PCOS is associated with obesity and linked to excessive secretion of certain hormones, such as luteinizing hormones and androgens.<sup>2</sup>

Several criteria have been used throughout the years to establish the diagnosis of PCOS. The National Institutes of Health (NIH) consensus criteria 1990 require all the following: oligo-ovulation or anovulation, clinical and/or biochemical signs of hyperandrogenism, and exclusion of other disorders like Non-classical congenital adrenal hyperplasia (NCCAH) and androgen-secreting tumors. Another is the Rotterdam criteria 2003, developed by ESHRE and American Society for Reproductive Medicine (ASRM) and used by the American Academy of Family Physicians (AAFP). It necessitates two out of three of the following: Oligo- or anovulation, clinical and/or biochemical signs of hyperandrogenism, and polycystic ovaries by ultrasound. In comparison, the AES defined PCOS in 2008 as clinical and/or biochemical signs of hyperandrogenism, ovarian dysfunction oligo/anovulation, and/or polycystic ovaries on ultrasound and exclusion of other androgen excess or ovulation disorders.<sup>3</sup>

Numerous studies revealed that multiple organ system abnormalities might complicate PCOS. One is metabolic syndrome, which is 43 to 47% prevalent in women with PCOS.<sup>4</sup> It was shown that up to 40% of women with PCOS have glucose intolerance, and 10% have type 2 diabetes by the age of 40.<sup>5</sup> Also, a correlation between obstructive sleep apnea and PCOS was observed.<sup>6</sup> In addition, the prevalence of coronary artery calcification and subsequent atherosclerosis risk was higher in women with PCOS.<sup>7</sup> Moreover, serious complications such as endometrial cancer were correlated to PCOS.<sup>8</sup> Furthermore, PCOS increases the risk of several psychiatric disorders and suicidal attempts.<sup>9</sup>

However, several studies were conducted concerning the knowledge, awareness, and perception of female participants about PCOS. A study in Central India showed that among 400 participants, only 40% of the women were aware of PCOS.<sup>10</sup> Another study in Pakistan revealed increasing prevalence but a lack of awareness of PCOS among female science students at different public universities.<sup>11</sup>

Thus, given the lack of awareness of women about PCOS and due to the gap of literature in Lebanon targeting this topic, this research project was conducted to assess Lebanese women's awareness regarding PCOS and its complications.

## Participants and Methods

This descriptive population-based cross-sectional study gathered surveys from female participants from all governorates in Lebanon between June 2019 and September 2019. Based on the population residing in each governorate in

Lebanon, the percentages of participants were taken from those areas. The study's inclusion criteria involved only competent Lebanese women in their reproductive age group, ages ranging between 18 and 51 years. Samples were obtained, through the help of convenient sampling, from different public settings, including shopping malls, universities, parks, and as by-passers in a crowded street, where a total of 421 randomly selected participants completed the survey. This sample size was calculated based on a power of 80%, a 95% confidence level, a 5% margin of error, and the population size of women in Lebanon, which was estimated to be around four million giving our sample size an average size of 420 women. We utilized a survey developed by competent endocrinologists in Lebanon after a thorough systematic review of studies assessing awareness of PCOS and its complications. We included questions regarding basic demographic data about the participant's assessment of applicants' knowledge regarding PCOS like its symptoms, risk factors, complications, diagnostic methods, and management approaches. Data entry was completed with SPSS (IBM version 23.1), using built-range checks with automatic error prompts. Data analysis used descriptive measurements like mean and standard deviation for quantitative variables such as the number of children.

On the other hand, percentages were used for qualitative variables, such as whether candidates worked in the medical field or not. Frequencies were assessed for categorical variables. The chi-squared test and *p*-values were used to compare qualitative variables.

## Results

Four hundred twenty-one surveys were collected from female participants from all the governorates in Lebanon. Most participants were university graduates, and most did not work in the medical field. ► **Table 1** has the detailed basic demographic data of the participants.

### Awareness about Polycystic Ovarian Syndrome

Most participants have heard of the term "Polycystic Ovary Syndrome" and were aware of its common manifestations. Nevertheless, when it comes to more complex information, like whether it leads to insulin resistance or not, their knowledge was significantly lacking. ► **Table 2** has detailed information on participants' awareness of PCOS symptoms and complications.

### Awareness about Polycystic Ovarian Syndrome Comorbidities

Sixty-five percent participants believed that PCOS affects fertility. Around 65% were unaware if PCOS can lead to insulin resistance, and 60% did not know if PCOS is linked to type 2 diabetes mellitus. Only 24% thought PCOS increases the risk of type 2 diabetes mellitus. Around 60% think PCOS is a risk factor for developing anxiety, depression, and other psychologic disorders. Fifty-three percent participants were unaware if PCOS increased cardiovascular risk, and 20% thought it did. Fifty-four percent participants thought that

**Table 1** Basic demographic data of our participants

Basic demographic data		Frequency (%)
Education	Elementary school	12 (3)
	Middle school	31 (7)
	High school	51 (12)
	University	273 (65)
	Higher education	54 (13)
Health professional	Yes	74 (18)
	No	347 (82)
Governorate	Akkar	7 (2)
	Baalback/Hermel	2 (1)
	Beirut	63 (15)
	Beqaa	61 (15)
	Mount Lebanon	134 (32)
	Nabatieh	6 (1)
	North Lebanon	73 (17)
	South Lebanon	75 (18)
Marital status	Single	232 (55)
	Married	182 (43)
	Divorced	5 (1)
	Widowed	2 (1)
Children	Yes	156 (37)
	No	265 (63)
Number of children	0	265 (63)
	1	17 (4)
	2	65 (16)
	3	41 (10)
	4	24 (6)
	5	3 (1)
	6	3 (1)
Occupation	Employed	221 (53)
	Unemployed	78 (19)
	Retired	0 (0)
	Student	119 (28)
Monthly income	300–600\$	172 (51)
	601–1000\$	85 (25)
	1001–1500\$	50 (15)
	1501–2500\$	19 (6)
	More than 2500\$	11 (3)

PCOS increases breast cancer or uterine cancer risk. ► **Table 3** highlights the awareness of PCOS comorbidities.

### Participants' Knowledge about How Lifestyle Affects PCOS

Awareness about the effect of lifestyle intervention on PCOS was assessed. Sixty-six percent participants believed that

**Table 2** Awareness of female populations about PCOS symptoms and complications

Questions and responses		n (%)
Have you ever heard of PCOS?	Yes	312 (75)
	No	98 (23)
	IDK	9 (2)
If yes, how did you find out about it?	I have PCOS	70 (17)
	I know someone who has PCOS	172 (41)
	I've read about PCOS	176 (42)
Do you think that PCOS is?	Fatal	0(0)
	Noncurable	6 (1)
	Manageable	326 (77)
	IDK	88 (21)
Do you think that PCOS is hereditary or acquired?	Hereditary	88 (21)
	Acquired	185 (44)
	IDK	148 (35)
Do you think PCOS causes irregular menstrual cycles?	Yes	339 (81)
	No	8 (2)
	IDK	73 (17)
Do you think PCOS increases facial acne?	Yes	204 (49)
	No	48 (11)
	IDK	168 (40)
Do you think women with PCOS ovulate normally?	Yes	41 (10)
	No	264 (63)
	IDK	113 (27)
Do you think PCOS causes miscarriages?	Yes	192 (46)
	No	59 (14)
	IDK	169 (40)
Do you think PCOS causes weight gain?	Yes	235 (56)
	No	52 (12)
	IDK	133 (32)
Can PCOS lead to hirsutism (abnormal hair growth)?	Yes	229 (54)
	No	46 (11)
	IDK	145 (34)
Does PCOS cause baldness or frontal hair loss?	Yes	90 (21)
	No	100 (24)
	IDK	231 (56)
Do you think that the symptoms of PCOS continue after menopause?	Yes	149 (36)
	No	75 (18)
	IDK	194 (46)
Does PCOS lead to excess testosterone production in female?	Yes	146 (35)
	No	38 (9)
	IDK	237 (56)
Do you think PCOS affects fertility?	Yes	272 (65)
	No	36 (9)
	IDK	112 (27)

**Table 2** (Continued)

Questions and responses	n (%)	
Does PCOS cause resistance to insulin action?	Yes	107 (25)
	No	45 (11)
	IDK	268 (64)
Do you think PCOS can cause pelvic pain?	Yes	304 (73)
	No	13 (3)
	IDK	101 (24)
Do you think PCOS is a risk factor for developing anxiety, depression and other psychologic disorders?	Yes	247 (59)
	No	61 (14)
	IDK	112 (27)
Do you think PCOS is curable?	Yes	344 (82)
	No	16 (4)
	IDK	60 (14)

Abbreviations: IDK, I do not know; PCOS, polycystic ovary syndrome.

exercise decreases symptoms of PCOS, and 57% believed that weight loss helps. Forty-two percent participants thought eating protein-rich food decreases symptoms of PCOS, and 58% thought eating vegetables and fruits is beneficial. ► **Table 4** details the awareness about the effect of lifestyle intervention on improvement in PCOS symptoms.

**Association between Educational Level and PCOS Awareness**

Correlations were assessed between educational level and awareness of different aspects of PCOS. Our results revealed that the awareness that PCOS led to abnormal ovulation was particularly high and was specifically thought so among university graduates. Also, the knowledge of whether the use of oral contraceptives for regulating the menstrual cycle helps regulate ovulation significantly increases as the level of education increases ( $p = 0.003$ ). This portion of the population was also highly aware that PCOS affected fertility, despite the lack of evidence of a correlation between this variable and education level ( $p = 0.099$ ). No significant associations were found between educational level and the knowledge of the associations of PCOS with weight gain ( $p = 0.072$ ), as well as with insulin resistance ( $p = 0.437$ ). ► **Table 5** lists details on the association between education and PCOS awareness.

**Awareness about PCOS and Being in Medical Field**

Moreover, significant associations exist between being in the medical field and awareness about PCOS symptoms and complications. Participants in the medical field had significantly higher knowledge in regard to PCOS causing abnormal ovulation ( $p = 0.049$ ), its effect on fertility ( $p = 0.008$ ), as well as the effect on insulin resistance ( $p = 0.000$ ). ► **Table 6** has detailed information about the association between being in the medical field and PCOS awareness.

**Table 3** Misperception of female participants regarding PCOS

Questions and responses	Frequency (%)	
Do you think that PCOS is contagious?	Yes	8 (2)
	No	326 (78)
	IDK	86 (20)
Do you think patients with PCOS can live normally with the disease?	Yes	300 (71)
	No	35 (8)
	IDK	86 (21)
Do you think oral contraceptives help in cases of PCOS?	Yes	231 (55)
	No	33 (8)
	IDK	157 (37)
Do you think PCOS can be diagnosed by some blood tests?	Yes	131 (31)
	No	146 (35)
	IDK	144 (34)
Do you think vaginal ultrasound a diagnostic method for PCOS?	Yes	259 (62)
	No	22 (5)
	IDK	138 (33)
Do you think surgical intervention necessary in PCOS?	Yes	191 (45)
	No	108 (26)
	IDK	121 (29)
Do you think PCOS increases risk of diabetes mellitus?	Yes	99 (24)
	No	69 (16)
	IDK	252 (60)
Do you think PCOS increases risk of cardiovascular disease?	Yes	82 (20)
	No	114 (27)
	IDK	224 (53)
Do you think PCOS increases risk of breast or uterine cancer?	Yes	228 (54)
	No	48 (12)
	IDK	143 (34)
Does treating PCOS reduce the risk of cancer development?	Yes	147 (35)
	No	62 (15)
	IDK	211 (50)

Abbreviations: IDK, I do not know; PCOS, polycystic ovary syndrome.

**Correlations between Having Heard of PCOS and Knowing Its Symptoms and Complications**

As expected, most women who had heard about PCOS before were aware of the symptoms associated with this disorder. A strong association was found between having heard about PCOS before and knowing it leads to irregular menses ( $p < 0.001$ ). A similar association also exists between having heard about PCOS and knowing it leads to abnormal ovulation, affects fertility, causes acne, and weight gain leads to insulin resistance, increases testosterone levels, causes alopecia and hirsutism, pelvic pain, and increases the risk for developing anxiety and depression ( $p$ -values  $< 0.001$ ). ► **Fig. 1** provides bar chart for more information about the correlations between having heard of PCOS and knowing its symptoms and

**Table 4** Participants' knowledge about how lifestyle affects PCOS

Questions	Strongly agree/ agree (%)	Neutral (%)	Strongly disagree/ disagree (%)
Exercise decreases symptoms of PCOS	279 (66)	109 (26)	32 (8)
Losing weight decreases symptoms of PCOS	239 (57)	117 (28)	64 (15)
Eating vegetables and fruits decreases symptoms of PCOS	245 (58)	141 (34)	34 (8)
Eating protein rich food decreases symptoms of PCOS	177 (42)	193 (46)	59 (12)
Eating fat rich food decreases symptoms of PCOS	63 (15)	138 (33)	219 (52)

Abbreviation: PCOS, polycystic ovary syndrome.

**Table 5** Relationship between educational level and awareness about PCOS symptoms and complications

Questions and predefined responses		Education						p-Value
		Elementary (%)	Middle (%)	High (%)	Graduate (%)	Postgraduate (%)	Total (%)	
Do women with PCOS ovulate normally?	Yes	8	6	8	8	21	10	0.019
	No	33	65	57	65	64	63	
	IDK	58	29	35	26	15	27	
Do you think PCOS affects fertility?	Yes	67	55	59	66	70	65	0.099
	No	0	16	4	8	15	9	
	IDK	33	29	37	26	15	27	
Do you think PCOS causes weight gain?	Yes	25	52	59	58	52	56	0.072
	No	17	16	10	10	24	12	
	IDK	58	32	31	32	24	32	
Does PCOS cause resistance to insulin action?	Yes	17	17	25	26	28	25	0.437
	No	25	16	5	10	13	11	
	IDK	58	67	70	63	59	64	
Do you think oral contraceptives help in cases of PCOS?	Yes	42	65	75	81	85	78	0.003
	No	8	0	0	4	4	3	
	IDK	50	35	25	15	11	19	

Abbreviations: IDK, I don't know; PCOS, Polycystic ovary syndrome.

complications. On the other hand, only one-third of those with PCOS thought it led to miscarriages ( $p = 0.125$ ).

Similarly, no correlation exists between having PCOS and knowing it increases the risk of cardiovascular diseases ( $p = 0.280$ ). This is also true for knowing it increases the risk of developing uterine/breast cancer, where only 57% of patients with PCOS thought that it did so ( $p = 0.701$ ). There is also no significant correlation between having PCOS and knowing it increases the risk of anxiety ( $p = 0.895$ ).

## Discussion

The study assessed awareness about PCOS among Lebanese women in the reproductive age group. Most of our participants have heard about PCOS before, compared with a study conducted in India with 400 participants, where only 40% of the women were aware of the term PCOS. This generally reflects that Lebanese women know relatively well about the existence of this disease. Only 43.9% of our population

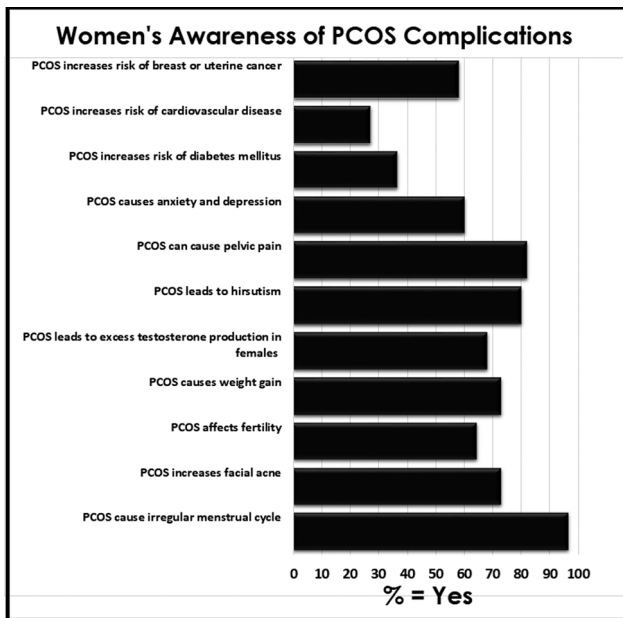
regarded PCOS as an acquired disease, while 20% thought it was hereditary. This represents that Lebanese women have a poor conception of this disease's risk factors/pathogenicity. The rest answered that they did not know if it was acquired/hereditary. PCOS is, in fact, a result of both environmental and genetic factors. Although environmental factors like obesity, smoking, and a sedentary lifestyle all play a major role in the development of the disease, genetic susceptibility due to family history is a key feature as well. Similarly, less than half of the study population thought PCOS led to miscarriages. In reality, women with PCOS are three times as likely to have a miscarriage in the early months of pregnancy as their normal counterparts.<sup>12</sup>

More than 80% of the population knew that PCOS led to irregular menstrual cycles, comparable to other studies assessing the same variables. One study in South Australia revealed that out of 57 PCOS patients, 86% thought that PCOS led to irregular menses, and out of 105 primary care physicians, 90% had the same answer.<sup>13</sup> Nevertheless, this value is

**Table 6** Relationship between being HCP and awareness about PCOS symptoms and complications

Questions and responses		HCP (%)	Non-HCP (%)	Total	p-Value
Do women with PCOS ovulate normally?	Yes	9	10	10	0.049
	No	77	60	63	
	IDK	14	30	27	
Do you think PCOS affects fertility?	Yes	82	61	65	0.008
	No	7	9	9	
	IDK	11	30	27	
Do you think PCOS causes weight gain?	Yes	62	54	56	0.399
	No	15	12	12	
	IDK	23	34	32	
Does PCOS cause resistance to insulin action?	Yes	60	18	25	0.000
	No	8	11	11	
	IDK	32	71	64	
Do you think oral contraceptives help in cases of PCOS?	Yes	85	77	78	0.004
	No	7	2	3	
	IDK	8	21	19	

Abbreviations: HCP, healthcare professional; IDK, I don't know; PCOS, polycystic ovary syndrome.



**Fig. 1** Correlations between having heard of polycystic ovarian syndrome (PCOS) and knowing its symptoms and complications.

still considered lower compared with a study conducted in the United States which revealed that almost 100% of the population thought irregular menses was one of the key clinical criteria to diagnose PCOS.<sup>14</sup> Moreover, compared with the Australian study, only 38% of the population sample thought PCOS decreased fertility rates. Also, in an Indian study, 63.5% of the study population did not know that PCOS was one of the major causes of infertility. More than two-thirds (68%) of our population thought it was a major contributor to decreased fertility.

Similarly, a greater proportion of women (56%) in our study thought PCOS increased the risk for weight gain compared with the Australian study, where only 34% did. Regarding body hair growth patterns, more than half of our population thought PCOS led to hirsutism, compared with the study conducted in South Australia, where only 32% of the study population thought that it led to hirsutism. However, almost 95% of women in the American study thought hirsutism was a symptom of PCOS. On the other hand, when asked about hair loss from the head, only 20% of our population answered that it led to alopecia. It is important to note that PCOS leads to hirsutism, but it also leads to head hair loss, where in females, it is usually abundantly present. So, while women know it leads to hirsutism, they do not recognize that it causes head hair loss.

A cross-sectional study was conducted in Jordan and found inadequate awareness about PCOS, with the major source of information being family and physicians. However, 90% of Jordanian participants knew that PCOS could lead to irregular or absent menstrual cycle is a symptom of PCOS. In their study, educational level and marital status factors were also significantly associated with participants' knowledge of PCOS.<sup>15</sup>

When assessing the complications of PCOS, only 19.5% of our population thought it led to an increased risk for cardiovascular diseases, as compared with an American study where approximately 70% of the population thought it did. Also, almost 98% of women in the latter study, and 72% in a Saudi Arabian study viewed exercise and dieting as a method to decrease symptoms of PCOS. In contrast, only 57% regarded so in our study.<sup>16,17</sup>

Other variables were assessed in our study concerning the knowledge of developing various cancers and psychological

disorders in PCOS patients. However, they were not assessed in other studies to be able to compare.

Even though the number of women in our study who have PCOS was minimal, it was found that their awareness was not significantly different from those who did not have the condition, and this was unexpected. This may be due to the minimal guidance the healthcare system provides regarding their disease or the small population of patients in our study who have it. In future studies, awareness about PCOS could be assessed only in PCOS patients.

Study limitations are due to unrest in Lebanon during the fall of 2019, as we had to ensure the safety of the team members. It also includes that the participants were selected by convenient sampling. In addition, participants who said they have PCOS might not have been clinically diagnosed as so and may have self-diagnosed themselves based on common symptoms. The opposite may be true for women who might have experienced clinical symptoms but have not received a clinical diagnosis for PCOS, thus selected as not having the disease while having it. In addition, awareness about some comorbidities, such as fatty liver disease and dyslipidemia, was not assessed.

## Conclusion

Our study aimed to assess awareness amongst Lebanese women regarding PCOS, having hypothesized that they knew very little. Overall, it was found that Lebanese women were aware of common symptoms of PCOS, like irregular menses and hirsutism. On the other hand, their knowledge was minimal regarding more complex manifestations of PCOS, like insulin resistance and developing cardiovascular diseases. Awareness levels were more prominent in university graduates. In conclusion, Lebanese women are aware of certain aspects of PCOS, but their general knowledge is still weak compared with other countries. Campaigns and more detailed explanations by physicians to PCOS patients in the future are important in raising awareness about PCOS among Lebanese women.

### Authors' Contributions

H.A. contributed to conception of the study and adoption of the survey instrument revision of the manuscript. All other authors contributed to data acquisition and analysis, drafting, and revising the manuscript. All authors reviewed and approved the final manuscript.

### Compliance with Ethical Principles

The study was approved by the IRB of the Beirut Arab University (Ref 2019A-0094-M-R-0350). Written informed consent was obtained from all participants prior to their participation.

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The study received no specific funding.

### Conflict of Interest

None declared.

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