






# Anxiety, quality of life, eating behaviors, and sexual life in women with polycystic ovary syndrome

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## ABSTRACT

**Objective:** This study aimed to reveal the effects of polycystic ovary syndrome (PCOS) on quality of life, anxiety, eating behavior, and sexual functions, and the relationships or interactions of these factors with each other.

**Material and Methods:** This cross-sectional study was performed in women diagnosed with PCOS. Sexually active 54 participants (28 with PCOS + 26 control) aged 22–35 years applying to the gynecology outpatient clinics due to menstrual irregularities were included in the study. The diagnosis of PCOS was made according to the Rotterdam 2003 criteria. Participants filled out data collection forms, including the Beck Anxiety Inventory (BAI), the Short-Form-36 (SF-36) Health Survey, the Three-Factor Eating Questionnaire, and the Female Sexual Function Index. Laboratory findings were obtained from the hospital's electronic patient registry.

**Results:** The PCOS group's BMI ( $29.6 \pm 7.1$ ) was significantly higher than the control group ( $24.7 \pm 3.9$ ), ( $p=0.004$ ). The PCOS group scores were significantly lower than the control group regarding the physical functionality ( $p=0.006$ ), role limitations due to emotional problems ( $p=0.002$ ), energy/fatigue ( $p=0.015$ ), and emotional well-being ( $p=0.025$ ) items of the short-form health survey. In addition, BAI score was higher ( $p=0.001$ ), and female sexual function index total score was lower ( $p=0.036$ ) in the PCOS group. There were significant correlations between luteinizing hormone (LH) and role limitations due to emotional problems ( $r=0.547$ ,  $p=0.003$ ), uncontrolled eating ( $r=0.415$ ,  $p=0.028$ ), emotional eating ( $r=0.413$ ,  $p=0.029$ ), and body mass index ( $r=0.487$ ,  $p=0.009$ ).

**Conclusion:** PCOS can cause anxiety, decreased quality of life, and increased anxiety, but it does not affect eating disorders. LH levels should be taken into account for weight control in women with PCOS. Women with menstrual irregularities need support concerning anxiety, even if they do not have PCOS.

**Keywords:** Anxiety, dyspareunia, luteinizing hormone, menstrual irregularity, polycystic ovary syndrome.

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## INTRODUCTION

Polycystic ovary syndrome (PCOS) is considered the most common endocrine disorder in women of reproductive age. Beyond affecting various metabolic processes, the primary phenotypic features of PCOS are hyperandrogenism, ovulatory dysfunction, and polycystic ovaries.<sup>[1]</sup>

The worldwide PCOS prevalence is relatively high. As a matter of fact, 6–10% PCOS proportions were reported in Turkey based on the National Institutes of Health (NIH), Rotterdam criteria, or the Androgen Excess Society.<sup>[2]</sup> Although there is no curative treatment for PCOS, it may cause multisystem health issues if untreated or recognized late. Among the harmful effects of long-term unmanaged PCOS are fatty liver, diabetes mellitus, hypertension, metabolic syndrome, infertility, depression, anxiety disorders, hypertension, and sleep apnea.<sup>[3]</sup> In addition, anxiety, depression, and perceived stress increase in women with PCOS compared to those without.<sup>[4]</sup>

Besides, PCOS may interfere with the lifestyles of the affected person. Significant differences in dietary intake have been reported in women with PCOS.<sup>[5]</sup> On the contrary, some studies have noted no difference in nutritional habits between women with PCOS and normoandrogenic women.<sup>[6]</sup> Moreover, PCOS may be associated with an increased risk of sleep disturbances and decreased sexual satisfaction.<sup>[7]</sup> Furthermore, it has also been stated that PCOS negatively affects women's quality of life.<sup>[8]</sup> Further investigation is needed concerning the associations and interactions of the PCOS-related factors.

## Objectives

This study aimed to reveal the effects of PCOS on quality of life, anxiety, eating behavior, and sexual functions, and the relationships or interactions of these factors with each other.

## MATERIAL AND METHODS

### Study Design

This cross-sectional study was carried out with women diagnosed with PCOS in one hospital between April 2021 and May 2021. Ethical approval (numbered 06/30 dated April 26, 2021) was received from the Erzincan Binali Yildirim University Clinical Research Ethics Committee. The reporting of the study was done according to the STROBE guideline.<sup>[9]</sup>

### Setting

The study was conducted in Erzincan Binali Yildirim University, Mengucek Gazi Training and Research Hospital, Department of Gynecology and Obstetrics, Erzincan, Turkey, between April 2021 and May 2021. With a capacity of 500 beds, the hospital provides inpatient treatment for an average of 3000 patients per month.

### Participants

Sexually active 54 patients (28 with PCOS + 26 non-PCOS) aged 22–35 years who applied to the gynecology outpatient clinics due to menstrual irregularities were included in the study.

The diagnosis of PCOS was made according to the Rotterdam 2003 criteria.<sup>[2]</sup> Accordingly, the presence of two of the following three criteria was considered sufficient for diagnosis: 1 –Chronic anovulation or oligomenorrhea, 2 – clinical or biochemical hyperandrogenism, and 3 – polycystic ovaries.

In the control group, patients were with menstrual irregularity which cause by – primary ovarian insufficiency (POI), eating disorders (anorexia nervosa or bulimia), elevated levels of the hormone prolactin, hormonal birth control (birth control pills, injections, or implants), hormone-containing intrauterine devices (IUDs), and Asherman's syndrome.

Participants diagnosed with PCOS according to anamnesis, ultrasonography (USG), and hormone profiles were classified as PCOS group and compared with the others. Women with comorbidities such as diabetes mellitus, thyroid disease, Cushing's syndrome, rheumatic disease, malignancy, hypertension, or sexually inactive women were excluded from the study.

## Variables

The primary outcome of this study was the “Beck Anxiety Inventory (BAI) score.” The other variables were age (years), BMI, HOMA score, thyroid-stimulating hormone (TSH) (mU/L), follicle-stimulating hormone (IU/L), luteinizing hormone (LH) (IU/L), testosterone (ng/dL), dehydroepiandrosterone sulfate (ng/dL), the Short-Form (36) Health Survey (SF-36) scores, three-factor eating questionnaire (TFEQ) scores, and female sexual function index (FSFI) scores. Cronbach's alpha values of the instruments used in this study were 0.876 for BAI, 0.753 for TFEQ, 0.920 for SF-36, and 0.784 for FSFI. Participants were asked to fill out the data collection forms in a convenient room while waiting for the appointment. Laboratory findings were obtained from the hospital's electronic patient registry.

## Study Size

A post hoc sample size calculation was performed based on the main outcome BAI score. Accordingly, using two-tailed p-value, 5% alpha error, and 0.80 (large) effect size, a sample size of 54 participants (28 with PCOS + 26 non-PCOS) made it possible to compare survey scores with the independent samples t-test with 82.1% power.

## Statistical Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS for Windows, Version 25.0, Chicago, IL, USA) software. While numerical variables were presented as mean±standard deviation, categorical data were given as frequency and percentage. The normal distribution of numerical data was evaluated with the Kolmogorov–Smirnov test. Comparisons between groups were made using the independent samples t-test or Mann–Whitney U-test according to conformance with the normal distribution. Correlations were assessed with the Spearman's test. P<0.05 was accepted as statistically significant.

## RESULTS

The age range of participants was 22–35. The PCOS group BMI (29.6±7.1) was significantly higher than the control group (24.7±3.9) (Z=2.891; p=0.004). The PCOS group scores were significantly

**Table 1: Comparison of groups regarding survey scores**

	Group	Mean	SD	Z/t	p
The short-form 36 health survey					
Physical functioning	PCOS	69.82	21.05	2.761	<b>0.006</b>
	Control	84.23	18.95		
Role limitations due to physical health	PCOS	40.18	46.81	1.963	0.050
	Control	62.50	36.22		
Role limitations due to emotional problems	PCOS	28.57	41.29	3.151	<b>0.002</b>
	Control	65.38	38.27		
Energy/fatigue	PCOS	40.00	18.10	2.521*	<b>0.015</b>
	Control	52.31	17.73		
Emotional well-being	PCOS	53.43	18.02	2.308*	<b>0.025</b>
	Control	63.69	14.26		
Social functioning	PCOS	55.80	28.76	1.534	0.125
	Control	66.35	22.85		
Pain	PCOS	58.39	27.41	0.837	0.403
	Control	65.10	23.02		
General health	PCOS	52.86	17.97	1.691*	0.097
	Control	60.77	16.29		
Beck Anxiety Inventory score	PCOS	40.96	9.83	3.198	<b>0.001</b>
	Control	32.69	9.41		
Three-factor eating questionnaire					
TFEQ score	PCOS	11.17	2.42	0.696*	0.490
	Control	11.60	2.04		
Uncontrolled eating	PCOS	22.57	5.25	0.621*	0.537
	Control	23.38	4.28		
Restrained eating	PCOS	16.50	3.39	0.417*	0.678
	Control	16.88	3.37		
Emotional eating	PCOS	7.17	3.17	1.380	0.167
	Control	8.42	3.20		
Female sexual function index					
Desire	PCOS	2.56	1.27	0.758	0.449
	Control	2.58	0.80		
Arousal	PCOS	3.10	1.31	0.239	0.831
	Control	2.95	0.98		
Lubrication	PCOS	3.54	1.37	0.901	0.367
	Control	4.00	0.71		
Orgasm	PCOS	3.07	1.42	0.461	0.645
	Control	3.43	0.54		
Satisfaction	PCOS	2.10	1.30	0.102	0.919
	Control	2.15	1.02		
Dyspareunia	PCOS	3.16	1.72	3,290*	<b>0.002</b>
	Control	4.60	1.39		
Total FSFI score	PCOS	18.76	4.77	2.096	<b>0.036</b>
	Control	20.92	2.50		

PCOS: Polycystic ovary syndrome; SD: Standard deviation; TFEQ: Three-Factor Eating Questionnaire; FSFI: Female Sexual Function Index; Z: Mann-Whitney U test value; \*t: Independent Samples t-test value.

lower than the control group regarding the physical functionality, role limitations due to emotional problems, energy/fatigue, and emotional well-being items of the short-form health questionnaire. In addition, BAI score was higher and FSFI total score was lower in the PCOS group (Table 1).

When the correlations of outcomes were evaluated, there were significant relationships between some variables. For instance, the HOMA score had a significant positive correlation with BMI and a negative correlation with pain score. Furthermore, TSH had positive relationship with social functioning score. It was noteworthy that there was a positive correlation between LH level and role limitations due to emotional problems score, TFEQ total score, uncontrolled eating score, emotional eating score, and negative correlation with body mass index. In addition, there were positive correlations between role limitations due to emotional health score and LH level, physical functioning score, role limitations due to physical health score, energy/fatigue score, social functioning score, pain score, general health score, Beck Depression Inventory total score, TFEQ score, uncontrolled eating score, emotional eating score, and BMI level. Furthermore, there were significant relationships between testosterone level and pain score, energy/fatigue score and emotional well-being score, social functioning score and general health score, and finally, uncontrolled eating score and emotional eating score at  $p < 0.01$  level (Table 2).

## DISCUSSION

### Key Findings

Women with PCOS have lower scores concerning physical functioning, role limitations due to emotional problems, energy/fatigue, emotional well-being, and dyspareunia. However, BAI scores were higher. In addition, there were some interesting correlations between the outcomes of women with PCOS. For instance, there was a significant relationship between LH and role limitations due to emotional problems, three-factor eating questionnaire total score, uncontrolled eating, emotional eating, and body mass index.

### Limitations

Some limitations of this study deserve to mention. First, menstrual irregularity reasons were not recorded. In addition, some parameters, such as causes of anxiety, were lacking. Another limitation is the shortage of duration of symptoms.

### Interpretation

Recently, there has been a tendency to evaluate PCOS as a multisystem disorder rather than a gynecological and dermatological entity.<sup>[10]</sup> In women with PCOS, factors such as insulin resistance, menstrual disorders, acne formation, ovulation disorders, infertility, impaired glucose tolerance, oxidative stress, endothelial dysfunction, sleep apnea, and hypertension limit daily living activities, and quality of life is significantly reduced.<sup>[11]</sup> Nevertheless, these symptoms are often associated with a deterioration in a woman's self-esteem and self-image and may result in psychological problems, such as anxiety and eating disorders.<sup>[10,12]</sup> Furthermore, sexual behavior can be affected by androgens.<sup>[13]</sup>

It was reported that women with PCOS had an increased prevalence of mild depressive and anxiety symptoms or increased mean depression and anxiety scores compared to control groups.<sup>[14,15]</sup> However, it was stated that this surge detected in these women was within normal limits.<sup>[16]</sup> In line with the previous studies, our findings showed that women with PCOS had higher BAI scores than women with other menstrual irregularities. However, both groups had quite high BAI scores (severe: Higher than 26). This finding suggested that menstrual irregularity was a risk factor for anxiety, with a higher rate in women with PCOS. As a matter of fact, positive associations between mental health problems and menstrual cycle irregularities were reported.<sup>[17]</sup> In addition, some studies were concerned with the potential psychological harmful effect of a diagnosis of PCOS.<sup>[18]</sup> Learning that a woman has PCOS increases anxiety, possibly due to a fear of infertility.<sup>[19]</sup>

Deviations in hormone levels associated with obesity and negative body image increase the rate of severe depression in patients by 40–45%.<sup>[20]</sup> This study supported previous researches. There was a correlation between BMI, LH, and role limitations due to emotional problems. The phenomenon that there is a correlation between BMI and LH in women with PCOS may be a finding of this study that may inspire further research.

The relationship between obesity and eating disorders is well established.<sup>[21]</sup> It was stated that eating disorders are more common in women with PCOS, and therefore, this should be asked when taking an anamnesis.<sup>[22]</sup> In addition, some studies have reported a correlation between BMI and eating disorders scores in women with PCOS.<sup>[10,23]</sup> Although numerically small, collectively, these studies suggest an increased risk of disordered eating in women with PCOS. In our study, there was no statistically significant difference in terms of the total TFEQ score or subscales of women with PCOS from other women with menstrual irregularities. This may indicate that the factor that constitutes the eating behavior disorder in PCOS also affects women with menstrual disorders. This situation can be further illuminated with well-organized studies.

Many studies have consistently shown that women with PCOS have lower quality of life scores compared to control groups or normal population data.<sup>[10,24,25]</sup> In a meta-analysis conducted by Bazarganipour et al.,<sup>[26]</sup> it was claimed that hirsutism and menstruation were key domains in the low scores detected. Our findings support previous studies and contribute to the literature. Indeed, although women with PCOS did not show a significant difference in the quality of life scores compared to women with menstrual irregularities, their physical functioning scores, role restrictions due to emotional problems, energy/fatigue, and emotional well-being subscales were lower.

When studies on the sexual function of PCOS patients are examined, conflicting results are observed. A recent meta-analysis stated that women with PCOS have significantly higher anxiety, lower quality of life but no significant sexual dysfunction.<sup>[27]</sup> In another recent meta-analysis, sexual dysfunction was reported to be more common in women with PCOS compared to control women. It has been noted in studies conducted with questionnaires that the differences observed are especially in the sub-scales of arousal, lubricity, orgasm, and sexual satisfaction.<sup>[28]</sup> The finding reported in this meta-analysis is interesting because women with PCOS have impaired arousal, lu-

Table 2: Correlation between laboratory findings and survey scores of PCOS group

	RLEP	EF	EWB	SF	Pain	GH	BD	TFE	UE	RE	EE	BMI	D	A	L	O	S	D
HOMA																		
r	0.264	0.017	0.147	0.177	0.436	0.215	0.288	0.152	0.102	0.168	0.106	0.581	0.124	0.100	0.241	0.105	0.230	0.276
p	0.175	0.933	0.457	0.367	0.020	0.273	0.137	0.440	0.604	0.392	0.591	0.001	0.546	0.626	0.237	0.610	0.259	0.172
TSH																		
r	0.106	0.083	0.033	0.378	0.171	0.199	0.312	0.069	0.089	0.049	0.116	0.078	0.049	0.027	0.355	0.003	0.074	0.373
p	0.591	0.673	0.870	0.047	0.383	0.311	0.107	0.728	0.654	0.805	0.557	0.695	0.811	0.894	0.075	0.989	0.720	0.060
FSH																		
r	0.132	0.250	0.326	0.315	0.244	0.397	0.283	0.082	0.048	0.259	0.008	0.234	0.047	0.327	0.205	0.093	0.094	0.279
p	0.504	0.199	0.091	0.103	0.211	0.037	0.144	0.678	0.807	0.184	0.967	0.230	0.821	0.103	0.314	0.650	0.649	0.167
LH																		
r	0.547	0.143	0.087	0.020	0.027	0.241	0.234	0.413	0.415	0.195	0.413	0.487	0.206	0.214	0.241	0.021	0.037	0.009
p	0.003	0.467	0.661	0.918	0.890	0.216	0.231	0.029	0.028	0.319	0.029	0.009	0.312	0.294	0.236	0.920	0.858	0.965
TES																		
r	0.362	0.335	0.001	0.242	0.640	0.356	0.271	0.050	0.144	0.082	0.151	0.081	0.303	0.121	0.040	0.115	0.155	0.084
p	0.059	0.081	0.997	0.214	<0.001	0.063	0.163	0.800	0.466	0.677	0.443	0.683	0.133	0.556	0.848	0.575	0.449	0.684
RLPP																		
r	0.452	0.207	0.083	0.347	0.263	0.422	0.217	0.371	0.346	0.484	0.121	0.153	0.119	0.072	0.143	0.072	0.078	0.214
p	0.016	0.289	0.676	0.071	0.176	0.025	0.268	0.052	0.072	0.009	0.540	0.438	0.562	0.727	0.485	0.728	0.703	0.293
RLEP																		
r	0.502	0.405	0.477	0.477	0.399	0.496	0.515	0.406	0.407	0.229	0.348	0.414	0.128	0.029	0.231	0.204	0.378	0.129
p	0.006	0.033	0.010	0.010	0.035	0.007	0.005	0.032	0.032	0.242	0.070	0.028	0.534	0.886	0.255	0.319	0.057	0.530
EF																		
r	0.732	0.498	0.732	0.498	0.265	0.576	0.555	0.222	0.204	0.073	0.310	0.096	0.054	0.284	0.209	0.405	0.177	0.064
p	<0.001	0.007	<0.001	0.007	0.172	0.001	0.002	0.256	0.297	0.711	0.109	0.628	0.793	0.160	0.305	0.040	0.387	0.757
EWB																		
r	0.423	0.137	0.423	0.137	0.137	0.539	0.515	0.056	0.029	0.110	0.196	0.194	0.011	0.216	0.092	0.211	0.058	0.205
p	0.025	0.488	0.025	0.488	0.488	0.003	0.005	0.775	0.885	0.576	0.318	0.322	0.957	0.288	0.656	0.301	0.780	0.316
SF																		
r	0.494	0.681	0.494	0.681	0.494	0.681	0.555	0.228	0.117	0.376	0.128	0.217	0.109	0.126	0.058	0.074	0.084	0.362
p	0.008	<0.001	0.008	<0.001	0.008	<0.001	0.002	0.242	0.553	0.049	0.518	0.268	0.594	0.541	0.778	0.721	0.682	0.069
Pain																		
r	0.504	0.440	0.504	0.440	0.504	0.440	0.440	0.015	0.168	0.125	0.100	0.277	0.332	0.122	0.307	0.309	0.259	0.421
p	0.006	0.019	0.006	0.019	0.006	0.019	0.938	0.392	0.392	0.525	0.613	0.154	0.098	0.552	0.127	0.125	0.202	0.032

Table 2 (cont.): Correlation between laboratory findings and survey scores of PCOS group

	RLEP	EF	EWB	SF	Pain	GH	BD	TFE	UE	RE	EE	BMI	D	A	L	O	S	D
GH																		
r						0.505	0.239	0.151	0.249	0.189	0.236	0.353	0.139	0.250	0.131	0.120	0.547	
p						0.006	0.222	0.442	0.201	0.335	0.227	0.077	0.499	0.217	0.524	0.560	0.004	
UE																		
r									0.538	0.686	0.268	0.239	0.133	0.105	0.138	0.324	0.022	
p									0.003	<0.001	0.167	0.240	0.518	0.610	0.501	0.106	0.916	
BMI																		
r												0.077	0.411	0.373	0.266	0.027	0.004	
p												0.708	0.037	0.061	0.190	0.897	0.986	
Desire																		
r													0.018	0.107	0.458	0.420	0.293	
p													0.931	0.602	0.019	0.033	0.147	
Arousal																		
r														0.443	0.438	0.345	0.011	
p														0.023	0.025	0.085	0.956	
L																		
r															0.443	0.238	0.322	
p															0.023	0.241	0.108	
O																		
r																0.609	0.199	
p																0.001	0.331	

HOMA: Homeostatic model assessment; TSH: Thyroid-stimulating hormone; FSH: Follicle-stimulating hormone; LH: Luteinizing hormone; r: Spearman's correlation coefficient; TES: Testosterone; RLEP: Role limitations due to emotional problems; RLPP: Role limitations due to physical health; EF: Energy/fatigue; EWB: Emotional well-being; SF: Social functioning; GH: General health; TFE: Three-factor eating questionnaire total score; UE: Uncontrolled eating; RE: Restrained eating; EE: Emotional eating; BMI: Body mass index; D: Desire; A: Arousal; L: Lubrication; O: Orgasm; S: Satisfaction; D: Dyspareunia.

bricity, orgasm, and sexual satisfaction, but dyspareunia is not more common than controls. Furthermore, this situation was tried to be explained as “dyspareunia is quite common in women without a medical disorder.”<sup>[29]</sup> In our study, women with PCOS experienced significantly more dyspareunia than other women with menstrual irregularities. Based on this, we recommend dyspareunia be questioned by the doctors in patients having PCOS.

Furthermore, we would like to draw attention to the importance of weight control in women with PCOS. BMI was associated with both HOMA and LH and role limitations due to emotional problems and arousal. Supporting our findings, it has been reported that the prevalence of type 2 diabetes does not increase in normal weight women with PCOS.<sup>[30]</sup> Improving the BMI can help increase the quality of life of women with PCOS. We suggest that the correlations between LH and eating behavior, quality of life, and BMI in women with PCOS should be taken into account when developing weight control strategies in these women.

## CONCLUSION

PCOS can cause anxiety, decreased quality of life, and increased dyspareunia, but it does not affect eating disorders in women with PCOS, compared with women having menstrual irregularity without PCOS. Lowering the BMI to normal limits can help improve the quality of life in these patients. The LH levels should be taken into account for weight control in women with PCOS. Since women with PCOS experience significantly more dyspareunia, this symptom should be questioned by doctors in these patients. Furthermore, women with menstrual irregularities need support concerning anxiety, even if they do not have PCOS.

## Statement

**Ethics Committee Approval:** The Binali Yıldırım University Clinical Research Ethics Committee granted approval for this study (date: 26.04.2021, number: 06/30).

**Informed Consent:** Written informed consent was obtained from patients who participated in this study.

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Concept – KU; Design – KU; Supervision – KU, PU; Resource – KU, PU, GB; Materials – TK, SK; Data Collection and/or Processing – KU, GB; Analysis and/or Interpretation – KU, PU, GB, TK, SK; Literature Search – TK, SK; Writing – KU; Critical Reviews – KU, PU.

**Conflict of Interest:** The authors have no conflict of interest to declare.

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