

Increased Risk of Psychiatric Disorders in Women with Polycystic Ovary Syndrome in Southwest China

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Abstract

Background: Polycystic ovary syndrome (PCOS) and its characteristic symptoms have been associated with physical and psychological issues in women of reproductive age. The current study was conducted in response to the dearth of systematic research related to psychological functioning and quality of life in patients with PCOS in Southwest China, and to determine whether patients with PCOS exhibit poorer mental health (MH) compared to healthy women of the same age and living in the same region, without a PCOS diagnosis.

Methods: We enrolled 120 outpatients with PCOS and 100 healthy controls in this study. Standardized questionnaires were administered to assess general MH conditions (General Health Questionnaire-12-item version), anxiety (State-Trait Anxiety Inventory), depression (Beck Depression Inventory), as well as health-related quality of life (HRQoL) measured using the 36-item short-form health survey. The independent samples *t*-test was conducted for continuous study variables. For categorical variables, the Pearson Chi-square test, Fisher's exact test, and logistic regression were performed.

Results: The prevalence of anxiety (13.3% vs. 2.0%) and depression (27.5% vs. 3.0%) was higher in patients with PCOS compared to the controls (both $P < 0.05$). Patients with PCOS had decreased HRQoL. Patients with PCOS who had fertility requirements were more likely to be anxious and depressed than those without fertility requirements (anxiety: 22.6% [12/53] vs. 5.9% [4/67], $\chi^2 = 7.117$, $P = 0.008$; depression: 37.7% (20/53) vs. 19.4% (13/67), $\chi^2 = 4.988$, $P = 0.026$).

Conclusions: PCOS and related symptoms may be risk factors for depression and anxiety. Professionals should be concerned with the MH of women with PCOS, and psychological therapy should be considered.

Key words: Anxiety; Depression; Health-related Quality of Life; Mental Health; Polycystic Ovary Syndrome; Psychiatric Disorders

INTRODUCTION

With a worldwide prevalence rate of around 6.6%, polycystic ovary syndrome (PCOS) has been reported to be the most common endocrine disorder among women of reproductive age.^[1] This condition presents as a complicated mixture of both endocrine and metabolic disorders. Typical clinical symptoms include oligomenorrhea or amenorrhea, hirsutism and/or acne, infertility, and obesity. Although not all of those symptoms are necessarily present in each patient, when evident, they can cause numerous nonphysical problems for women with PCOS. Several surveys have confirmed that PCOS is clearly associated with psychological disorders such as depression, anxiety, and binge eating disorder, and health-related quality of life (HRQoL).^[2-5] Most studies concerning the impact of PCOS on women's psychological health

originate from developed countries. Due to differences in genotype, ethnics, cultures, society, and clinical symptoms, the surveys used in these studies may not fully reveal the mental health (MH) status, the risks of mental illness, and HRQoL among Chinese women with PCOS. Therefore, this study was conducted to investigate the MH status of Chinese women with PCOS, and to screen for risk factors of mental disorders, such as depression and anxiety, in Chinese patients with PCOS.

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METHODS

This study was approved by the Sichuan University Ethics Committee. Participants with PCOS were aged between 18 and 35 years, and were outpatients recruited from the Reproductive Endocrinology Division of West China Second University Hospital, between October 2013 and October 2014. Diagnosis of PCOS was made in accordance with the 2003 Rotterdam criteria, and exclusive criteria for the PCOS group included (1) suffering from any other conditions affecting fertility; (2) receiving treatment for psychiatric disorders; and (3) a body mass index (BMI) of <18 or >30 . Concurrently, women from the local community and universities in Chengdu were chosen as study controls. Inclusion criteria for control group included (1) a regular menstrual cycle of 28–35 days after menarche; (2) being aged between 18 and 35 years; and (3) agreeing to participate in this survey voluntarily. The exclusion criteria were (1) suffering any other conditions except infertility; (2) being in treatment for psychiatric disorders; (3) being pregnant or lactating; and (4) a BMI of <18 or >30 . Each participant was numbered according to the inclusion sequence so that they could complete the questionnaires anonymously. Information of all the participants was recorded. Basic information such as age, height, and body weight were recorded. BMI was calculated ($\text{BMI} = \text{body weight [kg]} / \text{height [m]}^2$); degree of education, defined as years spent in education; menarche age; menstrual pattern; mean length of menstrual cycles in the past 12 months; marriage and pregnancy-labor history; and current desire to have children were collected and recorded. A BMI of <23 was recorded as “normal,” a BMI of between 23 and 25 was recorded as “overweight,” and “obesity” was defined by a BMI ≥ 25 . “Infertility” was defined as the inability to conceive with regular sex without contraception for more than 1 year. Hirsutism was assessed according to the Ferriman-Gallwey (F-G) standard, and F-G scores >5 were considered as evidence of hirsutism. Acne was assessed by the global acne grading system, and scores >0 were considered as indicative of acne. Age and educational experience of the two groups were matched. Questionnaires were administered in both electronic and printed form. Participants could fill out the questionnaires anytime. When filling out the questionnaires, participants were assigned numbers and their names were not used. Participants were asked to recall their mental state in the past several days or weeks and fill the questionnaires truthfully. Questionnaires were collected and checked after they were completed. Overall, 143 women in the PCOS group and 126 controls completed all questionnaires and were enrolled in the study. However, 23 women with PCOS and 26 controls were excluded from the study according to the exclusive criteria.

Measurements

All participants completed the 12-item version of General Health Questionnaire (GHQ-12), 36-item short-form health survey (SF-36), Beck Depression Inventory (BDI), and

State-Trait Anxiety Inventory (STAI). The psychological questionnaires were administered measured simultaneously. The GHQ-12 was developed as a reliable and valid aid to measure current mental states,^[6,7] and comprises 12 items; each having a 4-point scale (“never,” “a few times,” “several times,” and “always”) scoring from 1 to 4, with a total score of 12 to 48. Lower scores indicate healthier mental states. Psychological morbidity was defined as scoring >27 , and scoring no more than 27 was considered “normal.” HRQoL was assessed by the SF-36, a multifunctional and composite instrument including eight dimensions. Each dimension reflects a physical or mental function: physical function, role-physical (RP), body pain (BP), general health (GH), vitality, social function, MH, and role-emotion. The first four dimensions make up the physical components subscale (PCS) and the last four dimensions comprise the mental components subscale (MCS). HRQoL is defined as the sum of PCS and MCS. Higher scores in each dimension indicate better functioning and higher quality of life.^[8,9] The BDI was administered to assess the severity of depression and is a self-report inventory comprised 21 multiple-choice questions, each scored from 0 to 3. Based on the most current version, mild, moderate, and severe depression were defined by scores of 5–8, 9–16, and >16 , respectively. “Not depressed” was defined as scoring no more than 4. Based on the *Diagnostic and Statistical Manual of Mental Disorders-4th Edition* criteria of depression, its reliability and validity has been attested.^[10]

The severity of anxiety was assessed by the Dutch version of the STAI, a self-report scale including 2 separate subscales: the State-Anxiety Inventory (SAI) and the Trait-Anxiety Inventory (TAI), each comprised 20-item, where each item is scored on a 4-point scale of frequency from 1, “never,” to 4, “always.” Participants were asked to choose the most appropriate frequency statement based on their current feelings. Based on a total score ranging from 20 to 80, SAI scores >55 indicated state anxiety, and TAI scores >57 suggested trait anxiety; greater severity of anxiety was indicated by higher scores on both subscales.^[11]

Statistical analysis

All data were analyzed using SPSS (version 17.0, IBM, Chicago, IL, USA) software. Continuous variables which were normally distributed, such as age, BMI, waist to hip ratio (WHR), menarche age, menstrual cycle, education experience, and scores of each questionnaire, were reported as mean \pm standard deviation (SD), and the independent sample *t*-test was conducted. Continuous variables which were not normally distributed such as F-G score assessing hirsutism and GSAS score assessing acnes were reported as median values (P25, P75), and Wilcoxon rank-sum test was conducted. Categorical variables such as obesity, hirsutism, acnes, marriage status, infertility, education experience, anxiety, depression, and mental illness were reported as percentages, and Pearson Chi-square test and Fisher’s exact test were applied. Logistic regression was also conducted to

analyze possible interferences between clinical features and mental disorders. Statistical significance was determined as a $P < 0.05$, all P values were two-tailed.

RESULTS

Basic information

Data from 220 participants (120 women with PCOS and 100 controls) were analyzed. No significant differences in mean age, mean BMI, degree of education, age at menarche onset, and marriage status were identified between the two groups. The WHR of the PCOS group was higher than that of the control group, and a larger portion of women with PCOS were overweight and obese. The majority of the PCOS group presented irregular menstrual cycles manifesting as oligomenorrhea and even amenorrhea, their mean menstrual cycle was 49.4 ± 8.7 days, and mean duration of PCOS was 5.8 ± 2.1 years. In addition, a large portion of the PCOS group exhibited hirsutism and/or acne. A large portion of the PCOS group was classified as being infertile while only 3 of controls were infertile [Table 1].

General mental health (General Health Questionnaire-12)

Although mean GHQ-12 scores for the PCOS and control groups were both <27 , the mean score for the PCOS group was significantly higher [Table 2]. Based on GHQ-12 scores >27 , 36.7% (44/120) of the PCOS group and 4% (4/100) of controls suffered from psychological morbidity ($\chi^2 = 34.1$, $P = 0.000$).

Health-related quality of life

Significantly decreased HRQoL was observed in the PCOS group, both in the PCS, MCS subscales [Table 2].

Depression (Beck Depression Inventory)

While the mean scores of both groups were in the “not clinically depressed” range for depression, the PCOS group had a significantly higher mean score [Table 2]. Based on a BDI score of <5 , 23.3% (28/120) of the PCOS group and 65% (65/100) of controls showed no evidence of depression ($\chi^2 = 38.8$, $P = 0.000$). However, 27.5% (33/120) of the PCOS group and 3% (3/100) of controls had clinically significant depression scores of 16 or more ($\chi^2 = 23.9$, $P < 0.001$).

Anxiety (State-Anxiety Inventory and Trait-Anxiety Inventory)

Both SAI and TAI scores of PCOS group were higher than that of control group, but still within the normal range [Table 2]; 16 (13.3%) women in the PCOS group and 2 (2%) controls showed evidence of trait anxiety, with TAI scores of more than 57 ($\chi^2 = 9.2$, $P = 0.002$). According to SAI cutoff scores of >55 , 5.8% (7/120) of the PCOS group and 1% (1/100) of controls exhibited state anxiety, but no significant differences were detected between two groups ($\chi^2 = 3.6$, $P > 0.05$).

Mental disorders and clinical features

Logistic regression showed that PCOS contributed to anxiety (odds ratio [OR] = 5.75, $P < 0.001$) and impaired

Table 1: Basic information of all participants

Characteristics	PCOS group (n = 120)	Control group (n = 100)	Statistical value	P
Age (years)	24.8 ± 3.8	25.0 ± 3.5	0.8*	0.400
BMI (kg/m ²)	21.4 ± 3.0	20.8 ± 1.9	1.2*	0.201
Overweight, n (%)	21 (17.5)	16 (16.0)	0.09 [†]	0.767
Obese, n (%)	27 (22.5)	15 (15.0)	2.0 [†]	0.159
WHR [§]	0.80 ± 0.02	0.70 ± 0.03	2.5*	0.012
Menarche age (years)	12.4 ± 1.0	12.0 ± 1.3	1.1*	0.233
Hirsutism, n (%)	38 (31.6)	2 (2)	30.3 [†]	0.000
Hirsutism (F–G score) [§]	3 (0, 6)	1 (0, 4)	2.7 [‡]	0.003
Acnes, n (%)	69 (57.5)	3 (3.0)	73.6 [†]	0.000
Acnes (GSAS score) [§]	2 (0, 4)	0	7.0 [‡]	0.000
Menstrual cycle (days)	49.5 ± 8.7	30.0 ± 2.3	5.3*	0.000
Education experience, years, n (%)				
<15	38 (36.7)	35 (35)	0.3 [†]	0.601
≥15	82 (68.3)	65 (65)	0.3 [†]	0.601

* t value, [†] χ^2 value, [‡] U value, [§] $P < 0.05$. F–G: Ferriman–Gallwey; PCOS: Polycystic ovary syndrome; GSAS: Global acne grading system.

Table 2: Comparison between PCOS and controls

Items	PCOS group (n = 120)	Control group (n = 100)	t	P
GHQ-12	24.8 ± 5.5	22.1 ± 3.1	4.4	0.000
PCS	75.8 ± 11.8	82.4 ± 9.4	4.5	0.000
MCS	68.8 ± 13.2	71.0 ± 10.8	2.2	0.02
HRQoL	144.6 ± 21.2	153.4 ± 16.5	7.1	0.000
BDI	12.1 ± 7.3	7.8 ± 5.3	8.2	0.000
SAI	42.7 ± 11.7	34.2 ± 10.1	7.8	0.000
TAI	43.4 ± 9.8	36.1 ± 9.4	8.9	0.000

PCOS: Polycystic ovary syndrome; GHQ-12: General Health Questionnaire-12-item version; PCS: Physical components subscale; MCS: Mental components subscale; HRQoL: Health-related quality of life; BDI: Beck Depression Inventory; SAI: State-Anxiety Inventory; TAI: Trait-Anxiety Inventory.

general MH independently ($OR = 1.73$, $P = 0.000$); infertility contributed to both anxiety ($OR = 2.58$, $P = 0.045$) and depression ($OR = 3.34$, $P = 0.042$) independently. However, BMI, hirsutism, and acne seemed not correlated with anxiety or depression. In the PCOS group, when compared to overweight or obese patients, women in the PCOS group with normal BMI scored higher in HRQoL, and lower in GHQ-12 and BDI questionnaires, although no significant differences were detected [Table 3]. The prevalence of severe depression and mental illness in women in the PCOS group with normal body weight was both lower than that of those in the group who were overweight or obese; however, no significant differences were observed [Table 3]. Mean TAI scores and prevalence of anxiety in the subgroup of overweight or obese women with PCOS were higher than those of women with normal BMIs and PCOS [Table 3].

Women with PCOS who were infertile had higher scores on the GHQ-12, BDI, TAI, and SAI, but no statistically

Table 3: Comparison in the patients with PCOS

Items	BMI		Statistical value	P	Infertility		Statistical value	P
	<23 kg/m ²	≥23 kg/m ²			Yes	No		
GHQ-12 (mean ± SD)	24.6 ± 5.5	25.2 ± 5.7	1.120*	0.265	25.3 ± 5.0	24.5 ± 5.9	0.568*	0.571
Mental illness, n (%)	24 (33.3)	20 (41.7)	0.861 [†]	0.353	20 (37.7)	24 (35.8)	0.047 [†]	0.829
HRQoL (mean ± SD)	145.1 ± 19.5	143.9 ± 23.6	1.513*	0.133	141.3 ± 22.5	149.3 ± 18.3	2.181*	0.036
TAI (mean ± SD)	38.5 ± 10.8	43.6 ± 13.7	2.342*	0.024	41.5 ± 13.6	39.8 ± 11.2	0.403*	0.687
Anxiety, n (%)	4 (5.5)	12 (25.0)	9.423 [†]	0.002	12 (22.6)	4 (5.9)	7.117 [†]	0.008
BDI (mean ± SD)	9.6 ± 7.0	11.2 ± 8.4	1.423*	0.157	10.2 ± 7.6	9.8 ± 7.5	0.199*	0.843
Depression, n (%)	17 (23.6)	16 (33.3)	1.365 [†]	0.243	20 (37.7)	13 (19.4)	4.988 [†]	0.026

**t* value, [†] χ^2 value. PCOS: Polycystic ovary syndrome; GHQ-12: General Health Questionnaire-12-item version; HRQoL: Health-related quality of life; TAI: Trait-Anxiety Inventory; BDI: Beck Depression Inventory; SD: Standard deviation; BMI: Body mass index.

significant results were detected [Table 3]. The prevalence of severe depression in women with PCOS and infertility was higher than that of women with PCOS but without infertility [Table 3]. The prevalence of state anxiety within women with PCOS and infertility was 9.4% (5/53), higher than 2.98% (2/67) in women with PCOS and without infertility, but no statistically significant results were found ($\chi^2 = 2.2$, $P > 0.05$). The prevalence of trait anxiety was 22.6% (12/53) in overweight/obese patients, and 5.97% (4/67) in patients with normal BMI [Table 3].

DISCUSSION

In our study, the mean GHQ-12 score of the PCOS group (24.8 ± 5.5) was higher than that of control group (22.1 ± 3.1). The prevalence of mental disorders as assessed by the GHQ-12 was 36.7% in the PCOS group, significantly higher than that of controls (4%), indicating a higher risk of mental disorders in women with PCOS compared to controls, with $OR = 1.73$. Rassi *et al.* reported similar results, with different instruments.^[4,12]

We also found an increased risk of depression and anxiety in patients with PCOS. In our study, the BDI score of the PCOS group was significantly higher than that of control group. The prevalence of severe depression, as assessed by the BDI, was 27.5% in the PCOS group. Compared to only 3% in the control group, the PCOS group showed an 8-fold increase in the risk of depression, indicating a strong correlation between PCOS and depression, as reported by Cinar *et al.*^[2,13,14] However, logistic regression analysis reported no significant correlations between PCOS and depression in our study. This conflict could be due to our sample of 120 not being sufficiently large, and that infertility level in the PCOS and control groups was not matched. The prevalence of anxiety in the PCOS group was 13.3%; compared to of 2% in controls, women with PCOS had increased propensity toward anxiety ($OR = 5.75$, $P < 0.001$), similar to recent reports.^[2,13,14]

It has been reported that PCOS decreases HRQoL with different instruments.^[15] In our study, HRQoL in the PCOS group significantly decreased compared to the control group. While scores in both HRQoL subscales decreased, this was

more evident in the PCS rather than the MCS subscale. Of the eight dimensions, GH was the most influenced by PCOS. BP was the least influenced dimension because PCOS does not cause BP. Several studies have revealed that PCOS decreases HRQoL, both in terms of physical and mental function.^[16,17] In our study, differences focus on the PCS instead of the MCS subscales; the dimensions of GH and RP were the most affected. Reasons for this conflict could include the use of different instruments in assessing HRQoL and physical and mental function between studies.

Infertility contributed to depression ($OR = 2.58$) and anxiety ($OR = 3.34$), independent of PCOS, as well as HRQoL. Obesity, acne, and hirsutism were reported as independent predictors of dissatisfaction with self-image and depression,^[3,18] but in our study, we did not find significant correlations between those factors and depression or anxiety; this could be due to the difference in ethics and study population. In Chinese patients with PCOS, hyperandrogenism symptoms such as hirsutism and acne were not as severe as they are in western patients. Hirsutism in Chinese patients with PCOS usually shows around the nipples or medioventral line instead of on the face and body, which has a decreased effect on dissatisfaction with appearance and self-image. In our study, most participants in the PCOS and control groups had a normal body weight, and the prevalence of obesity in both groups was low, which is why we set a BMI of no more than 30 as inclusion criteria. Lower BMI in our study limited the influence of obesity on depression and anxiety, as well as HRQoL. On the other hand, we found that women with PCOS and higher BMIs were more likely to be anxious compared to women with normal body weight and PCOS; this may be a result of the significant weight gain, negatively affect their appearance.

Infertility is a very common and troubling issue facing married women with PCOS. We found that infertility contributed to anxiety, depression, and decreased HRQoL independent of PCOS. The PCOS patients with infertility had lower HRQoL scores and had a higher prevalence of anxiety and depression, the result similar to a report from Iran.^[3,18] Studies have revealed that women feel greater pressure when in an infertile couple, regardless of whether they are

the cause of infertility.^[19] In addition to the effects brought on by infertility itself, Chinese women with PCOS and infertility also experience pressure from within their family and marriage, and even society.^[20,21] A large proportion of women feel guilty and helpless due of infertility.^[19] Increased pressure and disturbed stress responses^[22] result in higher risks of psychiatric disorders and decreased quality of life.

Our study has some limitations. First, all of the patients in our PCOS group were recruited from one hospital, instead of multiple centers, which is a limitation in our study population. Second, the study sample is small and cannot be used to analyze the effects of PCOS in different phenotypes. To get more information, a multiple center survey with a larger sample study is required.

In conclusion, PCOS results in a reduced quality of life and an increased risk of mental disorders, such as depression and anxiety. Therefore, the MH of women with PCOS should be considered as should the importance of psychological guidance.

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Conflicts of interest

There are no conflicts of interest.

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