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Mediating role of anxiety between body image distress and quality of life among women with polycystic ovary syndrome: a multicentre cross-sectional study

Mengyuan Sun¹ and Qifeng Yi^{1*}

Abstract

Background Polycystic ovary syndrome (PCOS) is the most common endocrine disorder in women of reproductive age. Body image distress (BID) refers to psychological distress caused by deviations in the individual's self-aesthetic ability. The objectives of this study are to investigate the prevalence of psychological distress; and to assess the role of anxiety in the relationship between body image distress and quality of life (QoL) among women with polycystic ovary syndrome using a path analysis approach.

Method A multi-center cross-sectional study design was conducted among 294 women with PCOS in 29 provinces in mainland China from July 2021 to December 2021, and the data were analyzed using path analysis. The Multidimensional Body-Self Relations Questionnaire-Appearance Scales, Modified Polycystic Ovary Syndrome Questionnaire, and Hospital Anxiety and Depression Scale were administered to women who gave informed consent to participate.

Result The results of path analysis are indicated that anxiety significantly mediated BID and QoL in women with PCOS ($p < 0.05$) and the structural equation model analysis further confirmed the statistical significance of this mediating effect. The fit indices CFI = 1.00, TLI = 1.00, and RMSEA = 0.00, indicating that the model represents the data well. A good fit of the proposed model to the observed data was obtained, which revealed that BID not only directly influenced QoL, but also had a significant indirect effect on QoL via anxiety.

Conclusion Psychological counseling clinics is as well needed to provide patients with individualized psychological counseling and avoid mental health problems caused by body image troubles. Anxiety mediated the relationship between BID and QoL, adding to the paucity of research for women with polycystic ovary syndrome.

Keywords Polycystic ovary syndrome, Quality of life, Body image, Psychological distress

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Introduction

Polycystic ovary syndrome (PCOS) is the most common endocrine disorder in reproductive women [1], with a prevalence of 5–20% of women of childbearing age worldwide [2]. In China, the prevalence of PCOS in women of reproductive age reached 7.8% in 2020, an increase of nearly 65% from a decade ago [3]. PCOS is a lifelong disease with a high recurrence rate. No treatments can be considered entirely curative currently. Existing treatments only manage symptoms and reduce the risk of complications. PCOS patients are mostly women of childbearing age, and their clinical manifestations are mainly menstrual disorders, hirsutism, obesity, infertility, and acne [4].

Body image distress (BID) is prevalent among women with PCOS. It refers to psychological distress caused by deviations in the individual's self-aesthetic ability. Women with PCOS have a higher risk of BID than healthy women of reproductive age, and the degree of BID is significantly associated with anxiety and depression [5]. To meet the societal standards of beauty, e.g., a smooth and fair complexion, they take immediate measurements to reduce or disguise any discrepancy [6]. Regardless of their phenotypic appearance, women with PCOS are metabolically obese [7]. However, due to the sociocultural internalization of the thinness ideal, women have a positive implicit attitude toward thinness [8]. Obesity and hirsutism often lead to body dissatisfaction, a lack of self-confidence, and loss of social adaptability in PCOS patients [9, 10]. Moreover, in China, having children is considered an obligation of women and respectful to one's parents, which may cause low self-esteem, depression, and family tensions in those infertile women [4]. Kitzinger et al. [6] found women with PCOS reported feeling freakish and abnormal due to excess hair growth, irregular, absent, or disrupted periods, and infertility. They perceived a lack of femininity and questioned their ability to be defined as normal women.

Additionally, the development of the disease can lead to numerous psychological problems, such as distress, guilt, impaired self-esteem, and stress susceptibility [11–13], which lead to significant deterioration in the quality of life (QoL), and contribute to the high prevalence of depression and anxiety among women with PCOS. QoL is an important aspect of overall human health [14]. It refers to an individual's perception of his or her health and well-being as well as an individual's perception concerning the outcome and treatment of any illness that may affect his or her life status [15]. Reduced quality of life may not only affect the patient's psychological health but may also aggravate the patient's condition and increase the patient's financial burden [16]. Factors potentially associated with the QoL among women with PCOS have been reported in previous studies, including

obesity, infertility, menstrual disorders and hirsutism, depression, body mass index, occupation, menstrual cycle intervals, sexual satisfaction, etc [17–21]. Given the apparent disparities in socio-demographic factors, cultural aspects, healthcare systems, and service provision between countries, how lower QoL is experienced and communicated are likely to vary.

The evidence for BID in women with PCOS is limited. To date, no studies have analyzed the relationship between body image, psychological distress, and QoL among women with PCOS in mainland China. Investigating the mediation effect of these variables may provide healthcare providers suggestions about how to address low QoL among women with PCOS. Moreover, it would help healthcare providers in detecting those who are vulnerable to suffering from stress and low QoL and provide prompt medical services for patients in need. To address these gaps, we conducted a multi-center cross-sectional study in mainland China. The objectives of this study are: (1) to investigate the prevalence of psychological distress; and (2) to assess the role of anxiety in the relationship between BID and QoL among women with polycystic ovary syndrome using a path analysis approach.

Method

Study design and participants

Convenient sampling was used in this study. We recruited participants from gynecological clinics in two hospitals in Hunan province and sent the online survey link to the WeChat groups, which from our networks. The number of women with PCOS in the Wechat group is range from 20 to 400. According to a previous study [12], the prevalence of PCOS in Chinese women between the ages of 19 and 50 years is 5.6%. Substitute into the formula $N = u_{\alpha/2}^2 \pi(1-\pi)/\delta^2$, and δ is the allowable error set to 3.0%, we calculated the sample size as 226. Considering the 20% of invalid questionnaires, the final sample size was set at 271. From July 2021 to December 2021, we conducted a multicenter cross-sectional survey among 294 participants who voluntarily agreed to participate in the study from 29 provinces or autonomous regions in mainland China. Data was collected by using Questionnaire Star (www.wjx.cn). Participants accessed to the online questionnaire via a QR code.

Patients were eligible if they (1) had been diagnosed with PCOS by a gynecologist according to the criteria of the PCOS international consensus held at Rotterdam in 2003; (2) were aged between 18 and 50; (3) were able to understand all questions, and (4) provided informed consent. Patients who had used applied hormonal drugs or with other major chronic medical diseases, mental disorders, or diseases affecting questionnaire completion were excluded from the study. This study was approved by the ethics committee of the Xiangya Nursing School

of Central South University (Decree No: E202146). Any deceptive behavior toward study subjects was prohibited during the study.

Measures

Demographic information

Disease-related variables were obtained from participants, such as age, BMI, menarche age, residence, education level, marital status, fertility demand, occupation, monthly income, medical payments, and time from diagnosis.

Multidimensional body-self relations questionnaire-appearance scales, MBSRQ- AS

The Multidimensional Body Self Relations Questionnaire-Appearance Scales (MBSRO-AS) was used to investigate the body image, which includes 34 items scored on a 5-point Likert scale (1=Strongly disagree, 2=Disagree, 3=Neutral, 4=Totally disagree, 5=Strongly agree) and divided into five dimensions [22]. It includes the following five subscales: appearance evaluation scale (7 items), appearance orientation scale (12 items), body areas satisfaction scale (9 items), overweight preoccupation subscale (4 items), and self-classified weight subscale (2 items). The Cronbach's α coefficients of the subscales ranged from 0.7 to 0.94 with good reliability and validity [23, 24].

The MBSRQ has been translated into Chinese by Ma et al. [25], and this version has also been rigorously validated. Forward and backward translation, content confirmation, exploratory and confirmatory factor analysis, test-retest reliability, and internal consistency checking by providers and patients led to the final version of the instrument employed in the survey, with 5 domains and 34 items. The good internal reliability of the Chinese version of the MBSRQ was established by Cronbach's alpha coefficient of 0.7–0.94 for the 5 subscales [26]. Cronbach's α ranged from 0.74 to 0.87 in the present study.

Modified polycystic ovary syndrome questionnaire, MPCOSQ

To assess the quality of life in patients with polycystic ovary syndrome in recent two weeks, the Modified Polycystic Ovary Syndrome Questionnaire (MPCOSQ) scale was used [15]. The scale consists of 7 dimensions and 30 items assessing patients' weight, infertility, menstrual predictability, menstrual symptoms, acne, hirsutism, and emotional disturbance. Each item was scored using a 7-point Likert-type scale (1 = "maximum impairment" to 7 = "no impairment"). Cronbach's alpha coefficient for the MPCOSQ total score was 0.90, with five subscales ranging from 0.70 to 0.97 [27].

The MPCOSQ has been translated into Chinese by Luo et al., and this version has also been rigorously validated [28]. Forward and backward translation, content

confirmation, exploratory and confirmatory factor analysis, test-retest reliability, and internal consistency checking by providers and PCOS patients led to the final version of the instrument employed in the survey with 30 items. The internal consistency of Cronbach's alpha coefficient of the Chinese version for the seven dimensions mentioned above ranged from 0.83 to 0.91 [26]. Cronbach's α ranged from 0.78 to 0.92 in the present study.

Hospital anxiety and depression scale, HADS

The 14-item Hospital Anxiety and Depression Scale (HADS) was developed by Zigmond and Snaith, translated into Chinese by Ye, and a 4-point Likert scale was applied [29]. Higher values indicated higher levels of anxiety or depression one month ago, with scores above 8 indicating anxiety or depression potent. Item scores were summarized separately for the depression and anxiety categories. The scores for each category ranged from 0 to 21. The Chinese version of Cronbach's α coefficient for the anxiety subscale was 0.92, and the Cronbach's α coefficient for the depression subscale was 0.84 [30]. Cronbach's α was 0.89 for anxiety subscale and 0.86 for depression subscale.

Statistical analysis

All collected data were analyzed by SPSS 23.0 software for Windows (IBM Corp, Armonk, New York). Demographic information and the scores of all variables were presented as frequencies and percentages, mean, and standard deviations. The Pearson correlation coefficient was used to show the level of association among all subscales of the MBSRQ-AS, HADS, and MPCOSQ. Path analysis was implemented with the MPlus program (Version 7.4; Los Angeles, CA: Muthén & Muthén). MPlus calculates standardized path coefficients related to these hypotheses and provides overall fit measures for the entire model. Several fit indices for the model were used, including the comparative fit index (CFI), the Tucker Lewis index (TLI) and the root mean square error of approximation (RMSEA).

Results

Demographic characteristics and MBSRQ- AS, HADS and MPCOSQ scores

From July 2021 to December 2021, we enrolled 294 PCOS patients, and 287 participants (95%) finished the questionnaire, and participants were from 29 provinces or autonomous regions in mainland China. The average age and menarche age were 23.55 ± 3.15 and 13.28 ± 1.36 respectively. Among these women with PCOS, two-thirds of the participants' BMIs were in optimum range, and most of the participants had a bachelor's degree or above (85.7%) and were single (84.0%). Approximately two-fifths of participants had the idea or need for fertility

(40.4%) and ¥3000–6000 monthly income of a person in a family (40.8%). In addition, approximately one-third of PCOS women worked in enterprises or public institutions. Nearly half of the participants paid their medical expenses through urban medical insurance and had been diagnosed for 1–5 years. More detailed information is presented in Table 1.

Scores on MBSRQ- AS, HADS and MPCOSQ in young PCOS patients

For the MPCOSQ scale, patients showed the highest level in the menstrual symptom dimension, followed by acne, hirsutism, emotional disturbance, weight, infertility, menstrual predictability. Compared to the depression level, patients showed a higher level of anxiety. For the MBSRQ-AS scale, patients showed the highest score in

the appearance orientation dimension, while showed the lowest in the overweight preoccupation dimension. More detailed information is presented in Table 2. The prevalence of anxiety and depression are presented in Table 3. 22.30% of participants had the potential of anxiety and 18.12% reported anxiety. 16.03% of participants had the potential of depression and 10.45% reported depression.

Correlations among body image, anxiety and depression, and Quality of Life

As shown in Table 4, appearance evaluation and body area satisfaction were significantly negatively correlated with anxiety and depression ($p < 0.01$), but positively correlated with all subscales of the MPCOSP ($p < 0.01$). Appearance Orientation was negatively correlated with infertility and acne ($p < 0.05$). Overweight Preoccupation were positively correlated with depression and negatively correlated with weight, acne, and emotional disturbance. Self-classified weight was negatively correlated with weight. Anxiety and depression were negatively associated with quality of life ($p < 0.01$).

The mediating effect of anxiety between BID and QoL

The results of path analysis are indicated that anxiety, in contrast to depression, significantly mediated BID and QoL in women with PCOS ($p < 0.05$). The structural equation model analysis further confirmed the statistical significance of this mediating effect. Figure 1 shows the mediation model. The fit indices CFI=1.00, TLI=1.00, and RMSEA=0.00, indicating that the model represents the data well. A good fit of the proposed model to the observed data was obtained, which revealed that BID not only directly influenced QoL, but also had a significant indirect effect on QoL via anxiety. All paths from appearance evaluation to anxiety QoL were significant, including the paths from appearance assessment to anxiety ($\beta = -0.361 \pm 0.091$, $P < 0.001$) and from anxiety to weight ($\beta = -0.228 \pm 0.055$, $P < 0.001$), infertility ($\beta = -0.370 \pm 0.077$, $P < 0.001$), menstrual predictability ($\beta = -0.439 \pm 0.081$, $P < 0.001$), menstrual symptoms ($\beta = -0.409 \pm 0.088$, $P < 0.001$), acne ($\beta = -0.182 \pm 0.091$, $P = 0.045$), hirsutism ($\beta = -0.242 \pm 0.093$, $P = 0.010$), emotional disturbance ($\beta = -0.381 \pm 0.071$, $P < 0.001$).

Most of the indirect effects from appearance evaluation to anxiety to quality of life were significant, with appearance evaluation on weight ($P = 0.007$), infertility ($P = 0.002$), menstrual predictability ($P = 0.003$), menstrual symptoms ($P = 0.004$), hirsutism ($P = 0.044$), and emotional disturbance ($P = 0.002$). This result provides support for the presence of mediators and the results are shown in Table 5.

Table 1 Demographics characters of participants (N=287)

Demographics characters	N	%
BMI (kg/m²)		
< 18.5 (Underweight)	59	20.56
18.5–24.9 (Optimum range)	190	66.20
25–29.9 (Overweight)	27	9.41
≥ 30 (Obesity)	11	3.83
Residence		
Rural	41	14.3
Cities and towns	246	85.7
Educational level		
Middle school and below	6	2.1
High school or junior college	36	12.5
University and below	245	85.4
Marital status		
Married	43	15.0
Single	241	84.0
Widowed/ Divorced	3	1.0
Fertility demand		
Yes	116	40.4
No	171	59.6
Occupation		
Worker or Farmer	4	1.4
Enterprise or Public institution	90	31.4
Others	193	67.2
Monthly income, RMB		
≤ 3000	69	24.0
3000–6000	117	40.8
≥ 6000	101	35.2
Medical payments		
Urban medical insurance	137	47.7
New rural cooperative medical system	40	13.9
Commercial health insurance	7	2.4
Self-paying	103	35.9
Time from diagnosis		
Within 1 year	84	29.3
1–5 years	149	51.9
Above 5 years	54	18.8

Table 2 Scores on MBSRQ- AS, HADS and MPCOSQ of participants

Variables	Dimensions	Score Range	Score Distribution	Mean \pm SD
MPCOSQ	Weight	1–7	1–7	3.79 \pm 1.59
	Infertility	1–7	1–7	3.72 \pm 1.69
	Menstrual predictability	1–7	1–7	3.69 \pm 1.53
	Menstrual symptom	1–7	1–7	4.72 \pm 1.43
	Acne	1–7	1–7	4.48 \pm 1.83
	Hirsutism	1–7	1–7	4.45 \pm 1.64
	Emotional disturbance	1–7	1–7	3.94 \pm 1.40
HADS	Anxiety	0–21	0–20	6.94 \pm 3.85
	Depression	0–21	0–17	5.61 \pm 3.50
MBSRQ- AS	Appearance Evaluation	1–5	1–5	2.97 \pm 0.65
	Appearance Orientation	1–5	2.25–5	3.59 \pm 0.45
	Body Areas Satisfaction	1–5	1.22–5	2.92 \pm 0.67
	Overweight Preoccupation	1–5	1–5	2.82 \pm 0.79
	Self-Classified Weight	1–5	1–5	3.35 \pm 0.88

Abbreviations: HADS, Hospital Anxiety and Depression Scale; MBSRQ- AS, The Multidimensional Body-Self Relations Questionnaire-Appearance Scales; MPCOSQ, Modified Polycystic Ovary Syndrome Questionnaire

Table 3 Anxiety and depression among women with PCOS (N = 287)

	Score Range	n	%
anxiety	0–7	171	59.58
	8–10	64	22.30
	11–21	52	18.12
depression	0–7	211	73.52
	8–10	46	16.03
	11–21	30	10.45

Discussion

To our knowledge, this study is the first multi-center cross-sectional to analyze the relationship between QoL, psychological distress, and body image among Chinese women with PCOS. The study aimed to examine the role of anxiety in the relationship between BID and QoL among women with polycystic ovary syndrome. The key finding identified in this study was that anxiety mediated the relationship between BID and QoL, adding to the paucity of research for women with polycystic ovary syndrome. Mediation analysis results suggested that anxiety significantly mediated BID and QoL in women with PCOS. The results implied that women

Table 4 The Pearson correlations between all dimensions of MBSRQ- AS, HADS and MPCOSQ of participants

Variables	HADS		MPCOSQ						
	Anxiety	Depression	Weight	Infertility	Menstrual predictability	Menstrual symptom	Acne	Hirsutism	Emotional disturbance
MBSRQ- AS									
Appearance Evaluation	-0.361**	-0.390**	0.521**	0.328**	0.218**	0.190**	0.300**	0.298**	0.464**
Appearance Orientation	0.017	-0.041	-0.110	-0.130*	-0.089	-0.075	-0.148*	-0.094	-0.115
Body Areas Satisfaction	-0.295**	-0.328**	0.525**	0.232**	0.248**	0.187**	0.278**	0.280**	0.386**
Overweight Preoccupation	0.113	0.144*	-0.543**	-0.114	-0.086	-0.090	-0.149*	-0.077	-0.163**
Self-Classified Weight	0.031	0.039	-0.659**	-0.033	-0.059	-0.025	-0.014	-0.071	-0.084
HADS									
Anxiety	1	0.755**	-0.343**	-0.336**	-0.437**	-0.393**	-0.362**	-0.329**	-0.544**
Depression	0.755**	1	-0.317**	-0.243**	-0.329**	-0.295**	-0.340**	-0.278**	-0.475**

Abbreviations: HADS, Hospital Anxiety and Depression Scale; MBSRQ- AS, The Multidimensional Body-Self Relations Questionnaire-Appearance Scales; MPCOSQ, Modified Polycystic Ovary Syndrome Questionnaire

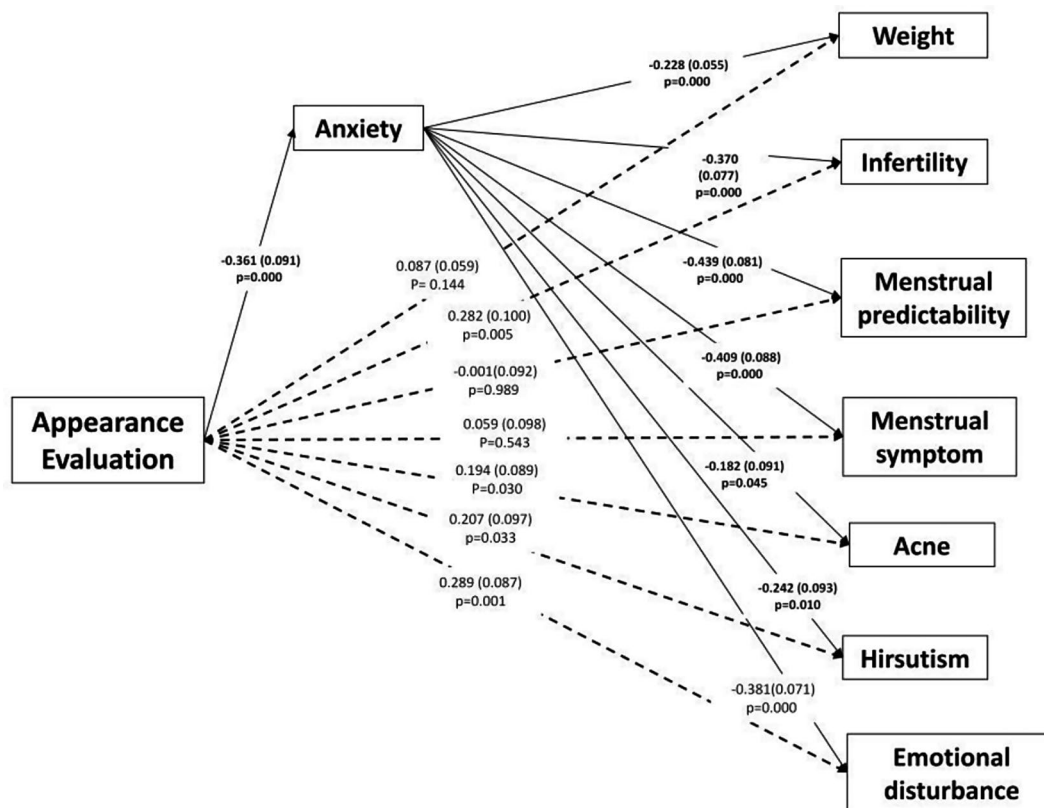


Fig. 1 Mediation model for the effect of anxiety on the relationship between BID and QoL. Standardized coefficients, standard errors and p values provided

with PCOS perceived to be having a lower level of BID tended to have a higher psychological distress, which in turn is associated with a lower level of QoL. PCOS symptoms can contribute to significant deterioration in quality of life and be highly stressful affecting psychological well-being and sexuality [41]. Women with PCOS were less likely to feel they are good looking. They were more likely to dislike their physique, did not feel as sexually appealing and felt more physically unattractive [31]. The physical symptoms of PCOS, such as hirsutism and acne, may have made these women more focused on their appearance, implying a need to do something about their appearance, which ultimately may affect their mental health and QoL [31]. Placing greater emphasis on satisfaction with their health may make women with PCOS more anxious [36]. In China, there is a stereotyping that women should have a thin body, a smooth and fair complexion. However, the manifestation of PCOS may result in altered feminine identity and BID [27]. These reduced their appearance satisfaction and affecting their mental health, which may lead to low QoL finally. Previous study found a significantly higher proportion of women with PCOS have been diagnosed or treated for depression, anxiety, or other mental illness, and suffered from or sought help for psychological distress symptoms or

consulted a mental health professional [38]. Physical exercise may be an alternative to non-pharmacological treatment for women with PCOS [37, 39]. It has been identified that exercises may improve QoL, well-being, and psychological health among women with PCOS [39, 40]. Women with PCOS who valued fitness and were more likely to be involved in physical activity [31]. Therefore, women with PCOS should be encouraged to pursue a physical activity for both symptom management and psychological benefits. The spectrum of PCOS symptoms has negative impact on the individuals' psychological and interpersonal functioning.

Deeks et al. showed that BID are predictors of anxiety and depression, however, our study showed BID is predictor of anxiety, rather than depression [42]. The result of our study is consistent with a systematic review that women with PCOS suffer from depression, anxiety, and experience a lower QoL [43]. A total of 22.30% and 16.03% of women had the potential of anxiety and depression respectively, and 18.12% and 10.45% reported anxiety and depression respectively, which is lower than women with PCOS in Australia and India [31, 44]. This may result from the BMI of the investigated women in Australia being higher and nearly half of them being unemployed. Women with PCOS in mainland China are

Table 5 The bootstrap-based test for mediating effects: appearance assessment → quality of life

The Path of Effect	Est.	S.E.	Est./S.E.	P
Appearance Evaluation → Weight				
Total effect	0.174	0.064	2.721	0.006
Direct effect	0.087	0.059	1.461	0.144
Total indirect effect	0.087	0.028	3.083	0.002
Appearance Evaluation → Anxiety → Weight	0.082	0.030	2.696	0.007
Appearance Evaluation → Infertility				
Total effect	0.359	0.101	3.568	0.000
Direct effect	0.282	0.100	2.811	0.005
Total indirect effect	0.078	0.035	2.197	0.028
Appearance Evaluation → Anxiety → Infertility	0.134	0.044	3.063	0.002
Appearance Evaluation → Menstrual predictability				
Total effect	0.143	0.098	1.456	0.145
Direct effect	-0.001	0.092	-0.014	0.989
Total indirect effect	0.144	0.049	2.968	0.003
Appearance Evaluation → Anxiety → Menstrual predictability	0.158	0.054	2.951	0.003
Appearance Evaluation → Menstrual symptom				
Total effect	0.185	0.102	1.815	0.070
Direct effect	0.059	0.098	0.608	0.543
Total indirect effect	0.125	0.042	2.960	0.003
Appearance Evaluation → Anxiety → Menstrual symptom	0.147	0.051	2.906	0.004
Appearance Evaluation → Hirsutism				
Total effect	0.287	0.103	2.796	0.005
Direct effect	0.207	0.097	2.133	0.033
Total indirect effect	0.080	0.034	2.356	0.018
Appearance Evaluation → Anxiety → Hirsutism	0.087	0.043	2.017	0.044
Appearance Evaluation → Emotional disturbance				
Total effect	0.441	0.094	4.698	0.000
Direct effect	0.289	0.087	3.311	0.001
Total indirect effect	0.151	0.043	3.515	0.000
Appearance Evaluation → Anxiety → Emotional disturbance	0.137	0.044	3.095	0.002

Abbreviations: HADS, Hospital Anxiety and Depression Scale; MBSRQ- AS, The Multidimensional Body-Self Relations Questionnaire-Appearance Scales; MPCOSQ, Modified Polycystic Ovary Syndrome Questionnaire

with reduced QoL scores. They focused mostly on menstrual symptoms, weight, and infertility. There were some differences from other studies [32, 33], which mostly focus on weight and hirsutism. This may be due to the Chinese social culture that having children is considered an obligation of women and respectful to one's parents [4], which may cause low self-esteem and depression to them. In other countries, women may pay more attention to weight to meet the thinness ideal. Obesity often leads to a lack of self-confidence and loss of social adaptability, which may affect their mental health and finally lead to lower QoL [9, 10]. Healthcare professionals should provide interventions to women with PCOS to improve their QoL as early as possible. For BID, women showed the highest score in the appearance orientation dimension. A smooth face, fair skin, and a slim body have been pervasive in Chinese media [34]. The manifestation of PCOS may considerably lead to an altered feminine identity and negative body image [27]. The symptoms of hirsutism, acne, and alopecia may induce a sense of loss of

femininity and sexual attractiveness, thereby reducing their appearance satisfaction and negatively affecting their mental health [35]. To meet the societal standards of beauty, e.g., a smooth and fair complexion, they take immediate measurements to reduce or disguise any discrepancy [6].

Strengthens

Our study has several strengths. This is a multi-center study. Participants are from 29 provinces in mainland China. Therefore, this study is with good generalizability. Additionally, to our knowledge, this study is the first study to analyse the mediating effect of psychological distress between BID and QoL among Chinese women with PCOS. Moreover, we used a disease specific QoL measure and body image measure. Universal measurements lack sensitivity and may be too broad to reflect the real situation of women with PCOS because they may undergo infertility, acne, hirsutism, and emotional disturbance that leads to changes in their concept of self.

Limitations

There are some limitations to this study. First of all, the range of age among the participant is not broad enough and most of them were single, which may not allow the current results to represent all women with PCOS. Second, the results are based on a multicenter cross-sectional study, however, any causal relationship should be inferred cautiously based on the association observed in our study. Third, all results from this survey were obtained through a self-report questionnaire, which may have been subject to response bias. Lastly, convenient sampling method may cause selection bias.

Implications for practice

Despite these limitations, the findings suggest some potential implications for future studies. Healthcare professionals may improve women's QoL by accuracy assessment and provision of appropriate services. Attention should be paid to the screening, counseling and treatment of body image troubles as the higher predisposition for BID and its association with other psychological distress symptoms and lower QoL. A holistic approach can be adopted for the care of women with PCOS. In order to provide comprehensive care, the collaboration with nutritionists, endocrinologists and behavioral health specialists is essential. Psychological counseling clinics is as well needed to provide patients with individualized psychological counseling and avoid mental health problems caused by body image troubles. With the rapid development of technology and Internet resources can be made full use.

Conclusions

The results of this study showed that 18.12% and 10.45% of the women with PCOS reported anxiety and depression, respectively. The key finding identified in this study was that anxiety mediated the relationship between BID and QoL, adding to the paucity of research for women with polycystic ovary syndrome. More effort is needed to identify services and interventions that address the BID, psychological distress, and improve QoL in order to improve health-related outcomes of the women with PCOS.

Abbreviations

PCOS	Polycystic ovary syndrome
BID	Body image distress
QoL	Quality of life
HADS	Hospital Anxiety and Depression Scale
MBSRQ-AS	The Multidimensional Body-Self Relations Questionnaire-Appearance Scales; MPCOSQ: Modified Polycystic Ovary Syndrome Questionnaire

Author contributions

MS was responsible for conceptualization, data curation, formal analysis, investigation, methodology, supervision, writing – original draft, and writing

– review & editing. QY was responsible for conceptualization, methodology, resources, and writing-review & editing.

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Data availability

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

Declarations

Ethical approval

This study was approved by the ethics committee of the Xiangya Nursing School of Central South University (Decree No: E202146). All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the Helsinki declaration.

Competing interests

The authors declare no competing interests.

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References

- Goodarzi MO, Dumesic DA, Chazenbalk G, Azziz R. Polycystic ovary syndrome: etiology, pathogenesis and diagnosis. *Nat Rev Endocrinol*. 2011;7:219–31. <https://doi.org/10.1038/nrendo.2010.217>.
- Azziz R, Carmina E, Chen Z, Dunaif A, Laven JS, Legro RS, Lizneva D, Natterson-Horowitz B, Teede HJ, Yildiz BO. Polycystic ovary syndrome. *Nat Rev Dis Primers*. 2016;2:16057. <https://doi.org/10.1038/nrdp.2016.57>.
- Yang R, Li Q, Zhou Z, Qian W, Zhang J, Wu Z, Jin L, Wu X, Zhang C, Zheng B, et al. Changes in the prevalence of polycystic ovary syndrome in China over the past decade. *Lancet Reg Health West Pac*. 2022;25:100494. <https://doi.org/10.1016/j.lanwpc.2022.100494>.
- Zhang D, Gao J, Qin H, Chang H, Wu X. Phenotypic features and fertility outcomes of women with polycystic ovary syndrome: the effect of quality of life. *J Obstet Gynaecol Res*. 2020. <https://doi.org/10.1111/jog.14478>.
- Alur-Gupta S, Chemerinski A, Liu C, Lipson J, Allison K, Sammel MD, Dokras A. Body-image distress is increased in women with polycystic ovary syndrome and mediates depression and anxiety. *Fertil Steril*. 2019;112:930–38. <https://doi.org/10.1016/j.fertnstert.2019.06.018>.
- Kitzinger C, Willmott J. The thief of womanhood': women's experience of polycystic ovarian syndrome. *Soc Sci Med*. 2002;54:349–61. [https://doi.org/10.1016/s0277-9536\(01\)00034-x](https://doi.org/10.1016/s0277-9536(01)00034-x).
- Ali AT, Guidozzi F. Midlife women's health consequences associated with polycystic ovary syndrome. *Climacteric*. 2020;23:116–22. <https://doi.org/10.1080/13697137.2019.1679111>.
- Hernandez-Lopez M, Antequera-Rubio A, Rodriguez-Valverde M. Implicit attitudes to female body shape in Spanish Women with High and low body dissatisfaction. *Front Psychol*. 2019;10:2102. <https://doi.org/10.3389/fpsyg.2019.02102>.
- Acmaç G, Albayrak E, Acmaç B, Baser M, Soyak M, Zararsiz G, IpekMuderris I. Level of anxiety, depression, self-esteem, social anxiety, and quality of life among the women with polycystic ovary syndrome. *ScientificWorldJournal*. 2013;2013(851815). <https://doi.org/10.1155/2013/851815>.
- Kogure GS, Ribeiro VB, Lopes IP, Furtado C, Kodato S, Silva DSM, Ferriani RA, Lara L, Maria DRR. Body image and its relationships with sexual functioning, anxiety, and depression in women with polycystic ovary syndrome. *J Affect Disord*. 2019;253:385–93. <https://doi.org/10.1016/j.jad.2019.05.006>.
- Brennan L, Teede H, Skouteris H, Linardon J, Hill B, Moran L. Lifestyle and behavioral management of polycystic ovary syndrome. *J Womens Health (Larchmt)*. 2017;26:836–48. <https://doi.org/10.1089/jwh.2016.5792>.
- Teede HJ, Misso ML, Costello MF, Dokras A, Laven J, Moran L, Piltonen T, Norman RJ. Recommendations from the international evidence-based guideline for the assessment and management of polycystic ovary syndrome. *Fertil Steril*. 2018;110:364–79. <https://doi.org/10.1016/j.fertnstert.2018.05.004>.

13. Nasiri AF, Ramezani TF, Simbar M, Montazeri A, Mohammadpour TR. The experience of women affected by polycystic ovary syndrome: a qualitative study from Iran. *Int J Endocrinol Metab*. 2014;12:e13612. <https://doi.org/10.5812/ijem.13612>.
14. Wilson NA, Pena AS. Quality of life in adolescent girls with polycystic ovary syndrome. *J Paediatr Child Health*. 2020;56:1351–57. <https://doi.org/10.1111/jpc.15097>.
15. Barnard L, Ferriday D, Guenther N, Strauss B, Balen AH, Dye L. Quality of life and psychological well being in polycystic ovary syndrome. *Hum Reprod*. 2007;22:2279–86. <https://doi.org/10.1093/humrep/dem108>.
16. de Lima NR, Dos SJ, Cobucci RN, Pichini GS, Soares GM, de Oliveira MT, Dantas P. Lifestyle interventions and quality of life for women with polycystic ovary syndrome: a systematic review and meta-analysis protocol. *Med (Baltim)*. 2019;98:e18323. <https://doi.org/10.1097/MD.00000000000018323>.
17. Aliasghari F, Mirghafourvand M, Charandabi SM, Lak TB. The predictors of quality of life in women with polycystic ovarian syndrome. *Int J Nurs Pract*. 2017;23. <https://doi.org/10.1111/ijn.12526>.
18. Shishegar F, Ramezani TF, Mirmiran P, Hajian S, Baghestani AR. Comparison of the Association of Excess Weight on Health Related Quality of Life of Women with polycystic ovary syndrome: an age- and BMI-Matched Case Control Study. *PLoS ONE*. 2016;11:e162911. <https://doi.org/10.1371/journal.pone.0162911>.
19. Becker CB, Verzijl CL, Kilpela LS, Wilfred SA, Stewart T. Body image in adult women: associations with health behaviors, quality of life, and functional impairment. *J Health Psychol*. 2019;24:1536–47. <https://doi.org/10.1177/1359105317710815>.
20. Kowalczyk R, Skrzypulec V, Lew-Starowicz Z, Nowosielski K, Grabski B, Merk W. Psychological gender of patients with polycystic ovary syndrome. *Acta Obstet Gynecol Scand*. 2012;91:710–14. <https://doi.org/10.1111/j.1600-0412.012.01408.x>.
21. Hahn S, Benson S, Elsenbruch S, Plegier K, Tan S, Mann K, Schedlowski M, van Halteren WB, Kimmig R, Janssen OE. Metformin treatment of polycystic ovary syndrome improves health-related quality-of-life, emotional distress and sexuality. *Hum Reprod*. 2006;21:1925–34. <https://doi.org/10.1093/humrep/dei069>.
22. Cash TF, Morrow JA, Hrabosky JI, Perry AA. How has body image changed? A cross-sectional investigation of college women and men from 1983 to 2001. *J Consult Clin Psychol*. 2004;72:1081–89. <https://doi.org/10.1037/0022-006X.72.6.1081>.
23. Roncero M, Perpina C, Marco JH, Sanchez-Reales S. Confirmatory factor analysis and psychometric properties of the Spanish version of the Multidimensional Body-Self relations Questionnaire-Appearance Scales. *Body Image*. 2015;14:47–53. <https://doi.org/10.1016/j.bodyim.2015.03.005>.
24. Vossbeck-Elsebusch AN, Waldorf M, Legenbauer T, Bauer A, Cordes M, Vocks S. German version of the Multidimensional Body-Self relations Questionnaire - Appearance Scales (MBSRQ-AS): confirmatory factor analysis and validation. *Body Image*. 2014;11:191–200. <https://doi.org/10.1016/j.bodyim.2014.02.002>.
25. Ma R. Initial revision of MBSRQ and the Research on Relativity Between MBSRQ and personality types. Fourth Military Med Univ (2006).
26. Luo YYXLX. Psychometric properties of the Chinese version of the modified polycystic ovary syndrome health-related quality-of-life questionnaire. *Health Qual Life Outcomes*. 2020;18:131.
27. Bazarganipour F, Ziaei S, Montazeri A, Foroozanfard F, Kazemnejad A, Faghihzadeh S. Health-related quality of life in patients with polycystic ovary syndrome (PCOS): a model-based study of predictive factors. *J Sex Med*. 2014;11:1023–32. <https://doi.org/10.1111/jsm.12405>.
28. Li MOYWX. Reliability and validity of Chinese Version of Polycystic Ovary Syndrome Questionnaire. *J Nurs*. 2015;22:60–4.
29. Zigmond AS, Snaith RP. The hospital anxiety and depression scale. *Acta Psychiatr Scand*. 1983;67:361–70. <https://doi.org/10.1111/j.1600-0447.1983.tb09716.x>.
30. Hou Y. The impact of anxiety and depression on PCI patients and the effectiveness of mindfulness-based intervention. Suzhou University, 2017.
31. Deeks AA, Gibson-Helm ME, Paul E, Teede HJ. Is having polycystic ovary syndrome a predictor of poor psychological function including anxiety and depression? *Hum Reprod*. 2011;26:1399–407. <https://doi.org/10.1093/humrep/der071>.
32. Zahra BM, Bita F, Mohsen S, Ali M. Measures of health-related quality of life in PCOS women: a systematic review. *Int J women's health* (2018) 10.
33. Chloë K, Dagmar M, Haller, Michal Y. Health-related quality of life in adolescents and young adults with polycystic ovary syndrome: a systematic review. *J Pediatr Adolesc Gynecol* (2016).
34. Jung J. Young Women's perceptions of traditional and contemporary female beauty ideals in China. *Family Consumer Sci Res J*. 2018;1:56–72.
35. Bazarganipour F, Ziaei S, Montazeri A, Foroozanfard F, Faghihzadeh S. Body image satisfaction and self-esteem status among the patients with polycystic ovary syndrome. *Iran J Reproductive Med*. 2013;11:829–36.
36. Damone AL, Joham AE, Loxton D, Earnest A, Teede HJ, Moran LJ. Depression, anxiety and perceived stress in women with and without PCOS: a community-based study. *Psychol Med*. 2019;49:1510–20. <https://doi.org/10.1017/S0033291718002076>.
37. Kogure GS, Lara L, Ribeiro VB, Lopes IP, Mendes MC, Kodato S, Ferriani RA, Furtado C, Dos RR. Distinct protocols of physical Exercise May improve different aspects of well-being in Women with Polycystic Ovary Syndrome. *Am J Lifestyle Med*. 2023;17:140–51. <https://doi.org/10.1177/15598276211001330>.
38. Ramos FK, Lara LA, Kogure GS, Silva RC, Ferriani RA, Silva DSM, Reis RM. Quality of life in women with polycystic ovary syndrome after a program of Resistance Exercise Training. *Rev Bras Ginecol Obstet*. 2016;38:340–47. <https://doi.org/10.1055/s-0036-1585457>.
39. Podfigurna-Stopa A, Luisi S, Regini C, Katulski K, Centini G, Meczekalski B, Petraglia F. Mood disorders and quality of life in polycystic ovary syndrome. *Gynecol Endocrinol*. 2015;31:431–34. <https://doi.org/10.3109/09513590.2015.1009437>.
40. Kogure GS, Silva Lara LA, Ribeiro VA, et al. Distinct protocols of physical Exercise May improve different aspects of well-being in Women with Polycystic Ovary Syndrome. *Am J Lifestyle Med*. 2021;17:140–51. <https://doi.org/10.1177/15598276211001330>.
41. Pinto J, Cera N, Pignatelli. Psychological symptoms and brain activity alterations in women with PCOS and their relation to the reduced quality of life: a narrative review. *J Endocrinol Invest*. 2024;47:1–22. <https://doi.org/10.1007/s40618-024-02329-y>.
42. Deeks AA, Gibson-Helm ME, Teede HJ. Is having polycystic ovary syndrome a predictor of poor psychological function including anxiety and depression? *Hum Reprod*. 2011;26:1399–407. <https://doi.org/10.1093/humrep/der071>.
43. Yin X, Ji Y, Chan CLW, Chan CHY. The mental health of women with polycystic ovary syndrome: a systematic review and meta-analysis. *Arch Womens Ment Health*. 2021;24:11–27. <https://doi.org/10.1007/s00737-020-01043-x>.
44. Chaudhari AP, Mazumdar K, Mehta PD. Anxiety, Depression, and quality of life in women with polycystic ovarian syndrome. *Indian J Psychol Med*. 2018;40:239–46. https://doi.org/10.4103/IJPSYM.IJPSYM_561_17.

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