



# Differences between infertile women with and without PCOS in terms of anxiety, coping styles, personality traits, and social adjustment: a case–control study

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## Abstract

**Purpose** The aim of the study was to identify differences in the level of anxiety, stress coping ways, personality traits, and social adjustments in infertile women with polycystic ovary syndrome (PCOS) compared to those without PCOS.

**Methods** In a case–control study, 257 infertile of women were recruited at Fatemeh Azahra Infertility and Reproductive Health Research Center (Babol, Iran) from May 2016 to December 2017. A total of 135 women with PCOS and 122 women without PCOS completed the following questionnaires; State-Trait Anxiety Inventory (STAI), Ways of Coping Questionnaire (WCQ), NEO Five-Factor Inventory (NEO-FFI), and Bell's Adjustment Inventory.

**Results** Infertile women with PCOS had a higher mean score of trait anxiety than those without PCOS ( $46.19 \pm 5.29$  vs  $44.49 \pm 5.13$ ,  $P = 0.004$ ), but no difference was observed for state anxiety. The two groups did not have any significant differences in the mean scores of social adjustment and ways of coping, except for social support and problem-focused coping which were higher in the PCOS group. The PCOS personality traits of PCOS infertile women were not different regarding neuroticism, extraversion, agreeableness, conscientiousness. The only exception was that infertile PCOS women had a significantly higher mean score of openness to experience than those without PCOS ( $P = 0.049$ ).

**Conclusions** Clinicians could take advantage of the psychological differences of infertile women with PCOS and without PCOS for better management of PCOS in infertility settings; despite higher levels of anxiety they are more likely to cope with stress and are welcome to new experiences.

**Keywords** Polycystic ovary syndrome · Infertility · Anxiety · Personality · Coping · Psychological adjustment

## Introduction

Polycystic ovarian syndrome (PCOS) is the most common endocrine disorder in women, with 5.6–16% prevalence of reproductive age [1]. Specifically, it occurs in 15–20% of

infertile women [2]. PCOS is considered as a multisystem disorder with reproductive features such as hyperandrogenism, anovulation, infertility, and metabolic features including insulin resistance and dyslipidemia [3]. Women with PCOS are more susceptible to developing serious health

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conditions and psychological problems [4, 5]. Clinical features of hyperandrogenism of PCOS (hirsutism and acne) and menstrual irregularity may exacerbate the psychological problems of the affected women [6].

Infertility is associated with psychological problems such as depression and anxiety [7, 8], which may be exacerbated by PCOS. PCOS, introduced as a stigmatic condition of “problems with feminine identity”, may aggravate the psychiatric disorders of infertile women [9]. Several systematic reviews have demonstrated increased psychiatric disorders, especially anxiety and depression in women with PCOS [10–12]. A recent review article concluded that screening for anxiety and depression should be considered at the time of diagnosis of PCOS [13].

There are associations between anxiety levels of women with PCOs and their coping ways [14]. Coping styles help people manage conditions that are perceived as stress [15]. Previous studies introduced coping styles as moderators of anxiety symptoms [16]. Adaptive coping styles and problem-focused coping resolve the stressor, while less maladaptive copings, including avoidance or escaping from feeling of distress, are less effective and associated with negative emotional outcome [17]. Interestingly, a study reported that most women with PCOS used adaptive coping styles [18].

Today, this theory is gaining popularity that personality traits of women with PCOS may be different from those of the normal population. A recent cohort study of 752 female twins with PCOS reported that neuroticism personality was significantly higher than in women without PCOS. Also, they concluded that there is a common genetic factor between neuroticism, PCOS, and major depressive disorders [19]. Another study compared the personality traits of 49 persons with PCOs with 34 healthy controls. They reported that women with PCOS had significantly higher scores on hysteria, psychasthenia hypomania, and depression compared with the controls [20].

Few previous studies have investigated personality traits, coping strategies, and social adjustment in PCOS patients. Further, sparse research has compared the stress caused by infertility in infertile women with PCOS and without it [21]. As differences of personality traits and social adjustments of infertile women with and without PCOS are not clear yet, the present study aimed to identify differences and similarities of psychological profiles of infertile women with and without PCOS. To the best of the authors’ knowledge, it has been the first study that compares the personality traits, anxiety, coping styles, and social adjustment of women with and without PCOS. The study will open up horizons for a better understanding of PCOS, infertility, and psychological characteristics. The hypotheses of the study are as follows:

1. The level of anxiety of women with PCOS is higher than that of those without it.

2. The women with PCOS have more maladaptive coping ways than those without it.
3. The women with PCOS have a lower social adjustment than those without it.
4. Personality traits of women with PCOS are different from those of PCOS-free women.

## Materials and methods

### Target population

This case–control study was conducted at Fatemeh Azahra Infertility and Reproductive Health Research Center (Babol, Iran). A total of 257 infertile women entered the study through census sampling method from May 2016 to December 2017. Specifically, 135 women with diagnosis of PCOS were selected as the case group, while 122 women who did not meet the diagnostic criteria of PCOS entered the study as the control group. These two groups were matched in terms of duration of the infertility, level of the education, and age. All women provided written informed consent if they met eligibility criteria.

The inclusion criteria for both groups were as follows: age 18–45 years, educational level above 5 years, no background of childbirth, and no report of severe mental retardation. On the other hand, women with a history of severe psychiatric disorders such as psychotic disorders, bipolar disorders, and those taking antidepressant medications were excluded. The exclusion criteria for participants of both study groups were diagnosis of azoospermia or oligospermia in the husbands as well as presence of other disorders which could mimic PCOS (adrenal hyperplasia, thyroid disease, or hyperprolactinemia). Evaluation of the disease was based on the assessment of T4, TSH, and prolactin in routine tests during primary evaluation of infertile women, or presence of the disease during history taking.

Further, the case group should have met the following criteria for diagnosis of PCOS based on Rotterdam: ultrasonography examination of PCOS (presence of about  $\leq 12$  follicles in one or both ovaries and/or increased ovarian volume  $> 10$  mL), clinical indications of hyperandrogenism (hirsutism or obvious acne), raised plasma testosterone levels, irregular menstrual periods (interval between menstrual periods  $> 35$  days, amenorrhea defined as the absence of vaginal bleeding for  $\geq 6$  months, and/or variable menstruation) [22].

Four staff of Fatemeh Azahra Infertility and Reproductive Health Research Center explained the study objectives to the participants. The staff interviewed the subjects and recorded demographic characteristics, medical history, and gynecological history. Furthermore, the subjects were asked to complete the questionnaires. The protocol enrolled 300

women (150 with and 150 without PCOS. Fifteen patients with PCOS and 28 patients without PCOS refused to fill the questionnaire. Finally, 135 women with PCOS and 122 women without it completed the questionnaires.

## Measurements

### State-Trait Anxiety Inventory (STAI)

Spielberger (1983) developed the scale which included 40 items with two subscales: 20 items assess trait anxiety (T-Anxiety) and 20 items assess state anxiety (S-Anxiety). T-anxiety evaluates relatively stable aspects of “anxiety proneness”, including general states of calmness, confidence, and security. S-Anxiety captures the current state of anxiety, asking how respondents feel “right now”. The tool has a four-point Likert scale, with the total scores ranging from 20 to 80; higher scores represent more anxiety [23]. The valid Persian STAI was used in this study [24].

### Ways of Coping Questionnaire (WCQ)

The scale was developed by Folkman and Lazarus [25] to identify thoughts and actions people use to cope with stressful events during their life. The questionnaire includes 66 items with eight subscales. Each item has a four-point Likert response format. The scale has eight ways of coping and two subscales. The eight ways of coping include: *seeking social support* (talking to others about the problem), *distancing* (mitigating distressing events), *planful problem-solving* (seeking to deal with the problem), *escape/avoidance* (avoiding people), *confrontive coping* (directly addressing the problem), *self-controlling* (trying to keep feeling away from interfering with activities), *accepting responsibility* (believing one is responsible for stressful events), and *positive reappraisal* (reevaluating the distressing occasions to find unexpected benefits) [25].

Also, Lazarus distinguished two subscales for coping ways: problem-focused coping and emotional-focused coping. *Problem-focused coping* involves active efforts to manage stressful situations and alter a problem or eliminate the sources of stress. Previous studies introduced problem-focused coping as a resolution to stress; this coping involves confrontive coping, seeking social support, accepting responsibility, and planful problem-solving [17]. *Emotion-focused coping* refers to regulative efforts for reducing the adverse consequences of feelings caused by stressful events including distancing, escape-avoidance, self-controlling, and positive reappraisal [25]. In general, adaptive coping (positive reappraisal, seeking social support, confrontive coping, and planful problem-solving) is mostly effective and problem-focused, while maladaptive coping [distancing, accepting responsibility (self-blame), escape-avoidance,

and self-control] are emotional-focused, less effective, and associated with negative emotional outcomes [17]. In this study, we used a valid Persian version of the WCQ [26].

### NEO Five-Factor Inventory (NEO-FFI)

This questionnaire is a personality test developed by Costa and MacCare [27] which consists of 60 items measuring the Big Five personality traits based on a five-point Likert-type scale. The scores of each personality trait range within 12–60. The five personality traits include *neuroticism*: the tendency to instability of emotion and experiencing negative emotional states such as fear, nervousness, and anger; *extraversion*: an overall high-energy approach in the society composed of characteristics such as talkativeness, activeness, assertiveness, and courageousness; *openness to experience*: the elements of an active imagination, originality, curiosity, ingenuity in aesthetic sense, and intellectual curiosity; *agreeableness*: cooperativeness with others; *conscientiousness*: the tendency to control impulses in a way approved by the society, responsibility, and adherence to rules and norms [27]. The valid Persian version of this questionnaire has already been used in many studies in Iranian society [28, 29].

### Bell's Adjustment Inventory

This scale first developed by Bell [30] consists of 160 items with five categories: home, school, health, social, and emotional adjustment. This study used the subscale of social adjustment composed of 32 items. The subjects responded to yes/no questions. They received a point whenever they answered questions (1, 3, 4, 6, 5, 7, 24, 22, 20, 18, 16, 15, 12, 11, 31, 29, 28, 27, 25) with “Yes” and answered the questions (23, 21, 19, 17, 14, 13, 9, 8, 2, 32, 30, 26) with “no”. The total scores ranged within 0–32. The higher scores indicated greater social adjustment [30]. The Iranian version of Bell's Adjustment Inventory was used in this study [31].

## Statistical analysis

Data analysis was conducted by STATA software (Version 15.0) (STATA Corp, College Station, TX, USA). Data were presented as means, percentages, and standard deviations. The Chi-square independence test was used to evaluate the differences between the groups for qualitative characteristics. On the other hand, the independent *t* test was employed to compare scores of anxiety, coping ways, personality traits, social adjustment, and quantitative variables between the two study groups (PCOS and without PCOS). A multiple logistic regression model was applied to measure the association between psychological variables (anxiety, coping

**Table 1** Demographic characteristics of women with and without PCOS

Variables	With PCOS N (%)	Without PCOS N (%)	P value
Age (years)			
18–25	30 (50.85)	29 (49.15)	0.77
26–35	81 (51.59)	76 (48.41)	
36–45	23 (57.50)	17 (42.50)	
Education			
High school and lower	43 (45.30)	52 (54.70)	0.19
Graduate university	74 (54)	63 (46)	
Duration of infertility (Years)			
1–5	63 (50.8)	61 (49.2)	0.20
6–10	24 (51.1)	23 (48.9)	
11–25	8 (80)	2 (20)	
Age of husband (years)			
18–25	4 (44.44)	5 (55.56)	0.87
26–35	93 (52.25)	85 (47.75)	
36–50	36 (53.73)	31 (46.27)	
Education of husband			
High school and lower	49 (47.10)	55 (52.90)	0.33
Graduate university	68 (53.50)	59 (46.50)	

ways, personality traits, social adjustment) and PCOs status. *P* value less than 0.05 were considered as significant.

## Results

Our response rate was 257 out of 300 invited patients (85.6%). Table 1 describes the characteristics of the population in the two groups of infertile women with and without PCOS. The mean age of the participants with and without PCOS was  $29.5 \pm 5.62$  and  $29.46 \pm 5.16$  ( $P=0.95$ ), respectively. The mean duration of infertility of infertile women with PCOS and without it was  $4.81 \pm 4.08$  and  $4.04 \pm 3.13$  ( $P=0.14$ ), respectively. There were no significant differences between PCOS women and those without it regarding the subjects' age, husbands' age, duration of infertility, educational level of the subjects, and educational level of their husbands.

Table 2 compares the mean scores of anxiety, ways of coping, social adjustment, and personality trait of infertile women in the two groups. The results of the student *t* test revealed no significant differences between the mean scores of state anxiety (S-Anxiety) between the women in the two groups. On the other hand, the

**Table 2** Comparison between infertile women with and without PCOS in means of personality traits, anxiety, coping strategies, and social adjustment

Variables	With PCOS ( <i>n</i> = 135) Mean (SD)	Without PCOS ( <i>n</i> = 122) Mean (SD)	P value
State anxiety	49.55 (5.10)	49.22 (4.66)	0.314
Trait anxiety	46.19 (5.29)	44.49 (5.13)	0.005
Coping styles with stress			
Confrontive coping	7.80 (2.94)	7.41 (3.02)	0.152
Distancing	8.18 (2.83)	8.06 (2.94)	0.370
Self-controlling	10.28 (3.14)	9.77 (2.94)	0.102
Seeking social supports	10.01 (3.53)	8.92 (3.57)	0.007
Planful problem-solving	8.42 (3.75)	8.13 (2.75)	0.226
Accepting responsibility	6.48 (2.13)	6.05 (2.22)	0.060
Escape/avoidance	9.86 (3.92)	9.16 (3.83)	0.074
Positive reappraisal	11.82 (3.54)	11.44 (3.34)	0.189
Problem-focused coping	36.74 (10.41)	34.55 (9.98)	0.044
Emotion-focused coping	36.14 (34.51)	34.42 (32.55)	0.085
Social adjustment	15.55 (7.92)	15.07 (7.95)	0.699
Personality traits			
Neuroticism	34.08 (6.24)	34.31 (5.84)	0.623
Extraversion	40.82 (4.13)	40.44 (4.19)	0.233
Openness to experience	39.61 (3.94)	38.82 (3.66)	0.049
Agreeableness	36.20 (4.32)	36.70 (4.30)	0.821
Conscientiousness	42.02 (3.21)	41.46 (3.44)	0.091

Range of scores: state anxiety, 20–80; trait anxiety, 20–80; social adjustment, 0–32; neuroticism 12–60, extraversion 12–60, openness to experience 12–60, agreeableness 12–60, conscientiousness 12–16

infertile women with PCOS had a higher mean score of trait anxiety (T-Anxiety) compared to those without PCOS ( $46.19 \pm 5.29$  vs  $44.49 \pm 5.13$ ,  $P = 0.004$ ). Note that the two groups did not have any significant difference in the mean value of 7 ways of coping including distancing, planful problem-solving, escape/avoidance, confrontive coping, self-controlling, accepting responsibility, positive reappraisal ( $P < 0.05$ ). On the other hand, the mean score of the way of coping, *seeking social support*, was significantly higher in women with PCOS than in those without PCOS ( $10.01 \pm 3.53$  vs  $8.92 \pm 3.57$ ,  $P = 0.007$ ). When we examined the subscales, infertile women with PCOS had significantly higher scores of problem-focused coping than women without it ( $10.01 \pm 3.53$  vs  $8.92 \pm 3.57$ ,  $P = 0.044$ ). However, there was no significant difference between the two groups for the mean scores of emotional-focused coping ( $P = 0.085$ ).

The comparison of mean scores of social adjustment between infertile women with PCOS and those without PCOS showed that there was no significant difference between them.

The comparison of mean scores of five personality traits between infertile women with PCOS and those without it revealed that the two groups did not have any significant difference in the mean of four personality traits; neuroticism, extraversion, agreeableness, and conscientiousness. However, the results indicated that the infertile women with PCOS had significantly higher mean scores of openness to experience compared to infertile women without PCOS.

Table 3 summarizes the results of multiple logistic regressions. The results indicate that the trait anxiety in infertile women was a significantly positive predictor of

PCOS (OR 1.06, 95% CI 1.01, 1.11). Also, the coping way of seeking social support positively predicted PCOS (OR 1.08, 95% CI 1.01, 1.17). On the other hand, other psychological factors including state anxiety, personality traits, seven coping ways, and social adjustment were not predictors of PCOS.

## Discussion

To better understand the similarities and differences of the psychological profile of infertile women with PCOS, we compared anxiety, coping ways, personality, and social adjustment in the two groups of infertile women with PCOS and those without it.

In line with our hypotheses, infertile PCOS women had higher levels of trait anxiety than those without PCOS. However, state anxiety did not differ between women with PCOS and those without it, which was incongruent with our findings. Tan et al. [32] reported that PCOS women had higher levels of both State-A and Trait-A than the control groups did. Androgen levels, hirsutism, obesity, insulin resistance, and infertility management processes were the suggested reasons for higher State-A anxiety for PCOS patients [5]. Elsewhere, a study reported the predictors of Stat-A in PCOS women. The regression analysis concluded that although body mass index, acne, and hirsutism were predictors of State-A in PCOS women, the results changed after introducing the trait anxiety into the model. Finally, the strongest predictor of stat anxiety was trait anxiety with trait anxiety accounting for 70% of the variability in the results of PCOS women with state anxiety [33].

**Table 3** Results of multiple logistic regression assessing the relationship between PCOS status and the psychological characteristics

Psychological characteristics	Odd ratio 95% CI	Standard error	P value
State anxiety	0.956 (0.894–1.022)	0.032	0.189
Trait anxiety	1.063 (1.013–1.116)	0.026	0.013
Confrontive	0.975 (0.857–1.109)	0.064	0.701
Distance	0.949 (0.845–1.067)	0.056	0.389
Self-controlling	1.026 (0.913–1.153)	0.061	0.662
Seeking social supports	1.089 (1.013–1.171)	0.040	0.019
Responsibility	1.002 (0.836–1.201)	0.092	0.982
Escape/avoidance	1.060 (0.963–1.166)	0.051	0.228
Reevaluation	0.939 (0.822–1.073)	0.063	0.36
Planful problem-solving	0.980 (0.859–1.117)	0.065	0.764
Neuroticism	0.981 (0.931–1.034)	0.026	0.479
Extraversion	1.012 (0.940–1.089)	0.038	0.749
Openness to experience	1.057 (0.975–1.145)	0.043	0.176
Agreeableness	0.948 (0.883–1.019)	0.034	0.152
Conscientiousness	1.043 (0.948–1.148)	0.051	0.381
Social adjustment	0.021 (.0001–3.746)	0.054	0.143

Contrary to our hypothesis, infertile women with PCOS applied some adaptive coping styles more frequently such as problem-focused coping and seeking social support than those without it. In accordance with this finding, Benson et al. [34] concluded that most women with PCOS used adaptive copings, including social support, problem-solving, and positive reappraisal. PCOS women who used maladaptive coping, including increased escape-avoidance coping with less problem-solving and positive reappraisal coping had increased psychological severity scores [34]. A study indicated that women employing maladaptive coping ways had a higher anxiety [21]. Similarly, another study reported that maladaptive coping ways were associated with higher levels of anxiety in pregnant women [35].

Contrary to our hypothesis, the scores of social adjustment of infertile women did not significantly differ between females with and without PCOS. A prior study reported that infertile women with PCOS had more social concerns compared with those without it [21].

Sayyah-Melli et al. [36] found that adjustment disorders did not differ between PCOS women and those without PCOS. A study reported that PCOS women with infertility had higher social anxiety scores compared to the control group [37]. Regarding the explanation of how infertile women with PCOS, despite higher anxiety, were not different from infertile women without PCOS concerning scores of social adjustment, perhaps infertile women with PCOS who used more adaptive coping, including seeking social support and problem-focused coping, could experience better social adjustment [38].

Notably, increased openness to experience scores was more often reported among infertile women with PCOS than those without it. The results of a large cohort study on newly born female twins revealed that the personality factor of neuroticism shares approximately half of the genetic and environmental components behind the phenotypic correlation between PCOS and major depressive disorders [28]. Scaruffi et al. [39] reported that PCOS women had higher scores on many clinical personality disorders compared with control healthy women [38]. Another study confirmed that PCOS infertile women had higher scores in many clinical and personality disorders compared with infertile women without PCOS [40].

Bolder manifestation of trait anxiety, higher scores of openness to experience, and more adaptive coping ways in infertile women with PCOS, observed in the present study, are relatively unique and should be explained further. None of the previous studies reported that PCOS was associated with higher Trait-A, but not State-A. The comorbidity of PCOS with infertility and high trait anxiety attributes could suggest that perhaps the three disorders may share many biological similarities. This study added that PCOS women with infertility are intrinsically more anxious than infertile

women without it. Previous studies reported that PCOS and infertility are associated genetically [8]. Further research with a large sample size of prospective cohort studies should test the assumption of comorbidity of PCOS, infertility, and trait anxiety.

Interestingly, infertile women with PCOS and high state anxiety experienced anxiety as much as women without PCOS under anxiety-provoking situations. How can we explain this important finding? It remains unclear whether and to what extent PCOS features of infertile women contribute to psychological profile in this patient population. An important assumption is that perhaps the high score of openness to experience in infertile women with PCOS may have helped them use their coping styles in anxiety-provoking situations, which is more effective, through seeking social support and adopting a problem-solving approach. Therefore, infertile women with PCOS, despite their high anxiety, are likely to benefit from the openness to experience; in anxiety-provoking situations, they use better coping styles, thereby less experiencing distress. Thus, it is supposed that there is a high-level mediation effect of openness to experience and adaptive coping between PCOS and state anxiety. Future research is still required to test this hypothesis in infertile women with PCOS.

There have been some limitations to the current study. Because of the case-control nature of the study, a causal relationship between PCOS and psychological profile cannot be concluded. Future researchers should also direct their attention to the use of a cohort study. The implementation of the project in single hospital was another limitation of the study. Therefore, the PCOS infertile women might not be a suitable representative of the other infertile PCOS cases. In future, multicenter and multinational studies with large sample sizes should be designed to test this hypothesis how the psychological profiles of the infertile women with PCOS are different from those of other infertile women. Finally, since the study was the first work revealing greater openness to experience in infertile females with PCOS, more studies on this area are required to examine the extent of the associations between personality traits in PCOS women with infertility. Additionally, future studies are required to explain how adaptive copings could develop in infertile women having PCOS with higher trait anxiety. Although the results presented an association between psychosocial individual characteristics and PCOS, further studies are required to characterize this association.

Keeping these limitations in mind, our study highlighted similarities and differences between women with PCOS and without it. Infertile women with PCOS had higher levels of trait anxiety, greater adaptive coping, and greater openness to experience than the ones without PCOS. The level of psychological adjustment and state-anxiety was the same

for both women with PCOS and without PCOS. Although the current study was a step to present the similarities and differences of psychological profiles of infertile women with PCOS and without it, further longitudinal studies are required to determine the reasons behind the relationship between PCOS, infertility, and psychological profile. These findings suggest that obstetricians, psychologists, psychiatrists, and all clinicians who visit PCOS women should pay more attention to the relationship between PCOS, infertility, and psychological profiles.

In conclusion, there are differences in the psychological characteristics of infertile women with PCOS and without it. Overall, the findings recommend that all physicians, especially obstetricians, pay more attention to the psychological profile of infertile PCOS women; despite higher levels of anxiety, they are more likely to cope with stress and are welcome to new experiences. The obstetricians can use this special psychological characteristic of the patients for better treatment of PCOS in infertility settings. These findings suggest that obstetricians dealing with infertility should consider that patients with PCOS may be more likely to welcome or accept the new protocols of infertility treatments or changes of medication, as compared to infertile women without PCOS.

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**Author contributions** ZB: protocol/project development, manuscript editing. MF: protocol/project development, manuscript writing/editing. MC: data analysis. MA: protocol/project development. FG: data collection. ZT: data collection.

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**Data availability** The data are available from the corresponding author on reasonable request.

## Compliance with ethical standards

**Conflict of interest** All authors declare that they have no competing interest.

**Informed consent** Informed written consent was completed by all participants.

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