

# Mental and personality disorders in infertile women with polycystic ovary: a case-control study

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## Abstract

**Background:** Polycystic Ovarian Syndrome (PCOS) is one of the most common causes of infertility in women.

**Objective:** The current study investigated mental and personality disorders in infertile women with and without PCOS.

**Methods:** This case-control study evaluated 400 infertile women who referred to the Infertility Center in Babol city (North of Iran). Participants were categorized into the case group (201 PCOS) and the control group (199 without PCOS). All of the participants completed the Millon Clinical Multi-axial Inventory-III (MCMI-III).

**Results:** The mean scores for clinical personality patterns were significantly higher for six personality disorders (schizoid, avoidant, antisocial, depressive, sadistic, and negativistic) and for three classes of severe personality disorder patterns (schizotypal, borderline, and paranoid) in infertile women with PCOS than in women without PCOS. The mean scores for eight clinical disorders (somatoform, manic disorder, dysthymia, alcohol-dependence, drug-dependence, post-trauma stress disorder, major depression, and delusion disorder) were also higher in infertile women with PCOS than in women without PCOS.

**Conclusion:** The scores of many mental and personality disorders are higher in infertile women with PCOS than in women without PCOS. Thus, clinicians should prioritize recognizing and treating psychological problems of infertile women with PCOS.

**Keywords:** Polycystic ovarian syndrome, infertility, personality disorders.

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## Introduction

Polycystic Ovarian Syndrome (PCOS) is the most prevalent endocrinopathy in fertile age and features hyperandrogenism, polycystic ovary, and chronic anovulation. This disease affects various systems and requires a comprehensive view in healthcare for effective treatment. Metabolic disorders and related complications of PCOS include insulin resistance, diabetes,

hyperlipidemia, hypertension, fatty liver, and fertility problems like oligomenorrhea, amenorrhea, and infertility.<sup>1</sup> Among women with PCOS, 85% have clinical symptoms of irregular menstruation.<sup>2</sup> Menstruation disorders in PCOS result from anovulation and are in the forms of oligomenorrhea and amenorrhea.<sup>3</sup> Most women with PCOS are obese or overweight. Obesity intensifies many aspects of PCOS, such that studies have shown that women with PCOS also have non-alcoholic fatty liver.<sup>4,5</sup> Women with PCOS are at increased risk of subclinical vascular diseases such as coronary arteries calcification and increased thickness of the intima.<sup>6</sup> They also have various risk factors for endometrial cancer, including obesity, metabolic disorder, and oligomenorrhea due to long-term contact with estrogen due to anovulation. Their risk for endometrial cancer is 2.7 times higher than that of the general population.<sup>7,8</sup> Obesity, the formation of unwanted hair, the possibility of psychological disorders emerging, and decreased life quality are increased in women with PCOS. There is a linear relationship between testosterone level and mood symptoms.<sup>9</sup> In examining women with PCOS, it was found that 16% of them have major depression and 2% have bipolar disorder.<sup>10</sup> Depression and anxiety are more prevalent in women with PCOS than in the general population.<sup>11</sup>

Infertility is defined as one year of regular unprotected intercourse with a lack of pregnancy. This problem affects 8-12% of couples at fertile age throughout the world.<sup>12</sup> Ovulation factors, including anovulation, cause infertility in women in 30-40% of cases, and the most prevalent cause of anovulation in the general population and infertile women is PCOS.<sup>13</sup> Studies have shown that infertility is related to increased risks for psychological problems,<sup>14</sup> but psychological interventions may decrease many of them.<sup>15-17</sup>

The investigation of the relationship between PCOS and personality and mental disorders is important for three reasons: First, the possibility of developing psychological problems is higher in PCOS patients. Secondly, studies on the mental status of infertile patients with PCOS are few.<sup>18</sup> Thirdly, to the best of the authors' knowledge, no published study has reported on personality disorders with 14 patterns in women with PCOS. Therefore, the psychological disorders and personal characteristics of two groups of infertile women (those with and those without PCOS) were compared in order to answer three important questions: 1) Are personality disorders (schizoid, avoidant, narcissistic, antisocial,

depressive, sadistic, compulsive, negativistic, dependent, histrionic, masochistic) different in infertile women with and those without PCOS? 2) Are the three classifications of severe personality disorders (schizotypal, borderline, paranoid) different in infertile women with and those without PCOS? 3) Are the symptoms of clinical disorders (somatoform, manic disorder, dysthymia, alcohol-dependence, drug-dependence, after-shock stress, major depression, and delirium disorder) different in infertile women with and those without PCOS?

## **Method**

### **Subjects**

This case-control study evaluated 400 infertile women who referred to the Fateme-Zahra Infertility Center in Babol city from March 2016 to October 2018. The convenient sampling method was used. Participants were categorized into the case group (201 women with PCOS) and the control group (199 women without PCOS).

Inclusion criteria for both groups were aged between 15 and 50 years, having at least an elementary school education, and providing consent to participate in the study. For women with PCOS, the criterion of absolute recognition of PCOS was added. Participants in both groups were matched for age, education, and infertility period. Exclusion criteria for both groups were incomplete questionnaire and inability to conceive due to infertility of the male partner (oligospermia and azoospermia).

This study was approved by the Ethics Committee of the University of Medical Sciences of Babol (No. MUBABOL.HRI.REC.1395.42). All participants provided completed consent forms.

### **Identifying PCOS**

Since PCOS includes a wide range of symptoms of ovary dysfunction, the 2003 Rotterdam consensus workshop proposed criteria for this syndrome, which includes hyperandrogenism and morphology of polycystic ovary as the main symptoms. According to the Rotterdam criteria, the presence of two of three symptoms is enough to diagnose PCOS, including menstruation cycle disorders, biochemical or clinical hyperandrogenism (acne, hirsutism, male baldness), and sonogram symptoms of polycystic ovary.<sup>19</sup> The sonogram index for recognizing polycystic ovary is the presence of 10 or more follicles 2-8 mm in diameter which encompass the environmental stroma of a compressed nucleus, and the stroma is increased everywhere.<sup>20,21</sup>

## Collecting information

After providing participants with the required information on the study and its purposes and obtaining consent, participants were enrolled in the study and took part in a 30-minute interview conducted by a physician. In this session, the required demographic or medical information was collected and the inclusion criteria were reexamined. Then, patients completed the Millon Clinical Multi-axial Inventory-III (MCMI-III). Then, the patients' Millon test reports were introduced into the Millon Test software (Azmoonyar Pooya) for correction. When we met severe psychiatric disorders in the participants, we referred promptly them to mental clinics.

## Tools

The Millon Clinical Multi-axial Inventory-III (MCMI-III) comprises 175 questions in the two sections of mental and personality disorders. The validity and reliability of the MCMI show that it has high internal consistency. Test-retest validity has been reported with 379 days interval with mode 0.91.<sup>22</sup> Moreover, this tool has been validated in Iran.<sup>23</sup>

**Personality disorders:** The personality disorders section of the MCMI-III assesses 11 types of disorders and three classes of severe disorders. The personality disorders are 1) Schizoid: these persons avoid close relationships and are anti-social. 2) Avoidant: these individuals are willing to have contact with others, and if they are assured that others won't bother them, they are willing to find new friends. 3) Depressive: these persons are unable to feel joy again. 4) Dependent: these individuals are dependent on others for support, safety, and guidance and wait for others to show them the right way. 5) Histrionic: these individuals show good social skills for obtaining respect but, at the same time, have a hidden fear of acting independently. 6) Narcissistic: these people value themselves too much and are self-interested, arrogant, and proud. 7) Antisocial: these persons violate social rules and regulations to achieve their goals, and they don't fear lying and committing crimes. 8) Sadistic: these people violate the rights of others through verbal and behavioral aggression. 9) Compulsive: these people behave in a regular, inflexible, and cold manner. 10) Negativistic: these individuals doubt others are paying attention or feel they are neglected. 11) Masochistic: these people gain position by harming themselves and allowing others to manipulate them.

Three classes of severe clinical personality disorders:

The MCMI-III test also recognizes three classes of severe personality disorders. I. Schizotypal: such persons have a medium level of excitement, show feelings with caution, and have an anxious mood. They usually have no reliance on social relationships. II. Borderline: these people have unstable moods, troublesome reactions and behaviors, and seek dependence and unstable relationships. III. Paranoid: these individuals are bound to their feelings, and their thought patterns are doubtful and defensive. They usually think others are trying to control them.

**Psychological disorder syndrome:** The MCMI-III recognizes 10 psychological disorders which are: 1) Anxiety: stress, tension, physical problems; 2) Somatoform: unknown physical problems, doubt, exhaustion; 3) Bipolar: high energy, increased self-esteem, high activity, thought skip; 4) Dysthymia: symptoms like depressive mood, lack of energy, moaning periods, hatred, and feeling guilt for at least for two years; 5) Alcohol-dependent: alcohol abuse, signs like aggression and convulsion; 6) Post-traumatic stress disorder: nightmares, repetition of trauma scenes during sleep and awakening, irritability after trauma; 7) Drug-dependent: a history of drug abuse related to problems in interpersonal relationships; 8) Thought disorder: deliriums, unwanted thoughts, and delusions; 9) Major depressive disorder: lack of joy, disability, and disappointment; 10) Delusion disorder: delusional thoughts like hauteur, trauma, and harm.<sup>24,25</sup>

## Statistical analysis

First, the patients' Millon test reports were introduced into the Millon Test software. Then, the scores of 14 personality disorders and 10 psychological disorders were obtained for each psychological profile. The demographic characteristics of the two groups, including age, education, infertility period, and regularity of menstruation, were compared using the chi-square test, and the t-test was used to compare the mean scores of mental and personality disorders for the two groups. Also, we used a series of adjusted logistic regression models based on 14 types of personality disorders and 10 psychological disorders as the independent variables and the PCOS as the dependent variable in the adjusted regression analysis. Age, education, and duration of infertility as the controlling variables were included in all the adjusted logistic regression models. The Odds ratios (OR) and 95% confidence intervals were reported. Statistical analysis was done by SPSS 22 software, and the significance level was considered as  $p < 0.05$ .

The protocol, which we used for matching controls to the cases (age, education, duration of infertility), was Frequency. So that, we matched case and control groups according to the frequency of the factors which we intended to match. In case of the frequency matching protocol, it does not need to apply conditional logistic regression. However, we still need to control for the matching variables in the analysis (e.g., unconditional logistic regression with the matching variables as covariates). Finally, we used unconditional logistic regression.

## Results

Among the participants, the lowest and highest ages were 17 and 47 years, respectively. Among the women's husbands, the lowest age was 23 and the highest age was 55 years. The mean age of women with PCOS was  $28 \pm 5.00$  years, and the mean age of their husbands was  $32 \pm 4.00$  years. The mean age of women without PCOS was  $30 \pm 5.00$  years, and of their husbands was  $33 \pm 6.07$  years.

**Table 1.** Characteristics of the study participants

Characteristics	Women with PCO (n=201)		Women without PCO (n=199)		*P value
	N	%	N	%	
<b>Age(year)</b>					
18-25	55	27.4	36	18.1	0.13
26-30	76	37.8	63	31.7	
31-35	46	22.9	61	30.7	
36-47	24	11.9	39	19.6	
<b>Education level</b>					
Primary school	51	25.4	38	19.1	0.148
High school	105	52.2	102	51.3	
University	45	22.4	59	29.6	
<b>Duration of infertility</b>					
1-10	43	22.5	55	28.5	0.11
11-20	148	77.5	138	71.5	
<b>Regular of Menstruation</b>					
Yes	84	44	174	87	<0.001

\*chi-square test used to compare frequencies in two groups

As can be seen in Table 1, there was no significant difference between the two groups in terms of age, educa-

tion, or infertility period. However, irregular menstruation was significantly higher in women with PCOS than in those without PCOS.

**Table 2.** comparison of mean and standard deviations of personality disorders in women with and without PCOS

Personality disorder	Women without PCOS (n=199)	Women with PCOS (n=201)	*P value
	Mean±SD	Mean±SD	
Schizoid	38±21.00	47±44.00	0.015
Avoidant	40±20.00	44±20.00	0.034
Depressive	48±27.00	54±26.00	0.036
Dependent	36±24.05	48±22.00	0.079
Histrionic	50±22.01	54±23.00	0.056
Narcissistic	47±35.00	41±20.03	0.044
Antisocial	25±17.00	30±18.00	0.007
Sadistic	34±34.00	39±17.00	<0.001
Compulsive	67±21.00	65±21.00	<0.001
Negativistic	44±24.00	52±21.00	0.001
Masochistic	35±20.00	39±20.00	0.085
Schizotypal	37±18.00	39±18.03	<0.001
Borderline	40±17.09	45±17.00	0.002
Paranoid	43±20.06	48±17.00	0.009

\*t-test used to compare mean scores in two groups

Table 2 shows the personality disorder scores for both groups. The results of means comparison by t-test show that the mean scores of infertile women with PCOS are significantly higher than those of women without PCOS for six personality disorders: schizoid, avoidant, antisocial, depressive, sadistic, and negativistic

( $p < 0.05$ ). The mean scores of three severe clinical personality disorders, i.e. schizotypal, borderline, and paranoid, were higher in infertile women with PCOS than in infertile women without PCOS ( $p < 0.05$ ). The mean scores of narcissistic and compulsive personality disorders were significantly lower in women with PCOS than in women without PCOS ( $p < 0.05$ ).

**Table 3.** comparison of mean and standard deviations clinical disorders in women with and without PCOS

Clinical disorder	Women without PCOS (n=199)	Women with PCOS (n=201)	*P value
	Mean±SD	Mean±SD	
Anxiety	49±22.00	53±21.00	0.068
Somatoform	36±21.00	43±59.00	<0.001
Bipolar	30±24.07	39±25.00	<0.001
Dysthymia	37±20.00	41±21.00	0.023
Alcohol Dependent	17±14.00	20±14.00	0.029
Drug Dependent	19±14.00	20±13.00	<0.001
Post-traumatic stress disorder	29±24.00	32±24.00	<0.001
Thought disorder	44±21.00	49±19.00	0.05
Major depression	35±24.00	42±23.00	<0.001
Delusion disorder	29±20.00	33±20.00	0.034

\*t-test used to compare mean scores in two groups

Table 3 shows the mean scores of psychological disorders for both groups. The results of means comparisons using the t-test show that the mean scores of infertile women with PCOS are significantly higher than those of infertile women without PCOS for 8 psychological disorders: somatoform, manic disorder, alcohol-dependent, drug-dependent, dysthymia, major depressive disorder, delirium disorder, and post-trauma stress disorder ( $p < 0.05$ ). Only the mean score of thought disorder was not different between the two groups ( $p > 0.05$ ). Table 4 shows the results of adjusted logistic regression models (mental disorders as independent variables and the PCOS as the dependent variable). The women with some personality disorders or mental disorders were more prone to PCOS including; schizoid (OR=1.01, 95% CI: 1.00, 1.02), antisocial (OR=1.01, 95% CI: 1.002, 1.03), negativistic (OR=1.01, 95% CI: 1.004, 1.02), borderline (OR=1.01, 95% CI: 1.001, 1.03), bipolar (OR=1.01, 95% CI: 1.004, 1.02), major depression (OR=1.01, 95% CI: 1.001, 1.02).

## Discussion

In the current study, the mean scores of schizoid, avoidant, antisocial, depressive, sadistic, and negativistic personality disorders were higher in infertile women with PCOS than in infertile women without PCOS. The mean scores of severe (schizotypal, borderline, and paranoid) personality disorders were also higher in infertile women with PCOS than in infertile women without PCOS. Although there is no published article that has compared mental and personality disorders in infertile women with and without PCOS using the MCMI tool, there are some studies that have been done in fertile populations and/or with tools other than the MCMI. In a study by Scaruffi et al.<sup>26</sup>, patients with PCOS were compared with 40 healthy women of the same age using the MMCI-III. Their results showed that 4.1% of patients with PCOS had schizoid, depressive, sadistic, negativistic, and masochistic personalities. Moreover, 6.1% had avoidant personality, 12.2% had dependent personality, 20.4% had obsessive personality, and 16.3%

hadelfish personality.<sup>26</sup> Sahingoz et al.<sup>27</sup> investigated personality disorders in women with PCOS. They concluded that personality disorders are higher in women with PCOS than in the control group (23.3% vs. 9.6%), and avoidant personality disorder had the highest difference with the control group (12.3% vs. 1.4%).<sup>27</sup>

In the current study, infertile women with PCOS suffered somatoform, manic, depression, alcohol-dependent, drug-dependent, post-trauma stress, major, and delirium disorders more than women without PCOS. Li et al.<sup>28</sup> compared mental disorders among 103 infertile women with PCOS and 110 infertile women without PCOS using Symptom Checklist 90 (SCL-90). They concluded that infertile women with PCOS suffer interpersonal sensitivity, somatization, anxiety, hostility, obsessive-compulsive, and paranoid ideation more than infertile women without PCOS.<sup>28</sup> Scaruffi et al. showed that 10.2% and 4.1% of women with PCOS had anxiety disorder and thought disorder, respectively, than women in the control group. Moreover, somatoform disorder, major depression disorder, and delirium disorder were 2%, 16.3% and 44.9% higher in women with PCOS than in the control group.<sup>26</sup> In a study on psychological disorders in women with PCOS, higher risks for depression disorder (2.79% higher), anxiety disorder (2.75% higher), bipolar disorder (1.78% higher), and major depression disorder (1.37% higher) were reported for women with this syndrome than the general population.<sup>29</sup> Moreover, the risk of eating disorders was higher for these women than for the general population.<sup>30</sup> Li et al. showed that the mean score of depression is higher in infertile women with PCOS than in infertile women without PCOS.<sup>28</sup> Blay et al.<sup>31</sup> conducted a meta-analysis on women with and without PCOS in order to show the relationship between mental disorders and PCOS. They concluded that anxiety (2.76% higher) and depression (3.51% higher) disorders are higher in women with PCOS than in women without PCOS.<sup>31</sup> In a meta-analysis on 57 articles, Brutocao et al.<sup>29</sup> concluded that PCOS is related to increased risk for depression (2.79% higher), anxiety (2.75% higher), bipolar disorder (1.78% higher), and obsession disorder (1.37% higher) as well as intensifying symptoms of depression, anxiety, and obsession.<sup>32</sup> However, a recent study reported that the mean score of state-anxiety did not differ between infertile women with PCOS and without PCOS women,<sup>33</sup>

In explanation of the mechanism of higher scores of mental and personality disorders in women with PCOS,

some hypotheses can be presented. First, patients with PCOS are under more mental pressure due to clinical demonstrations of menstruation disorder and hirsutism. The current study also showed that women with irregular menstruation showed more symptoms of mental problems. Second, infertile women with PCOS experience treatment resistance and induction-resistant ovaries. As a result, ovulation induction failure is higher in these women, leading to aborted treatment cycles and more mental harm in this group. Third, patients with PCOS receive more additional treatments for their symptoms than patients without PCOS.

The current study is the first of its kind to compare mental and personality disorders in infertile women simultaneously. Despite this important strength, this study has some limitations. First, mental and personality disorders were examined by questionnaire in this study, which is not enough for absolute recognition. It is suggested that further studies use clinical interviews for recognition in addition to questionnaire. Second, the study was conducted in an infertility clinic. The participants were infertile PCOS who wanted to treat with ART (assisted reproduction technology). Therefore, the results of this study cannot be generalized to all infertile women with PCOS. Third, some participants didn't complete the questionnaire due to the high number of questions and were excluded from study (not completing more than 12 questions). Therefore, the study results may be biased due to including or excluding individuals. Fourth, this was an observational study. Therefore, there were some unmeasured confounders that may be affected the results. This study suggests that further longitudinal research, especially cohort studies, should be conducted to identify factors influenced increasing personality disorders or mental problems in infertile women with PCOS.

## Conclusion

The prevalence of schizoid, avoidant, antisocial, depressive, sadistic, negativistic, schizotypal, borderline, and paranoid personality disorders is higher in infertile women with PCOS than in infertile women without PCOS. Moreover, infertile women with PCOS suffer somatoform, manic, depression, alcohol-dependent, drug-dependent, post-trauma stress, major and delirium mental disorders more than women without PCOS. These findings suggest that experts and physicians of medical centers should pay more attention to recognizing mental and personality disorders in infertile women with PCOS, help them choose a suitable treatment, and provide them with the appropriate mental support.

## Conflict of interest

Authors have no competing interest to declare.

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