The impact of stress on quality of life in female infertility patients with polycystic ovary syndrome

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Abstract

Objectives: Women with polycystic ovary syndrome (PCOS) are not only at high risk of reproductive, metabolic or physical health problems, but also easily suffer from psychological disorders such as stress, depression, anxiety, this has been proven to lower quality of life. Determining the negative effects of stress in infertile women with PCOS on quality of life is important and practically significant. This study aims to: (1) Describe stress levels and quality of life in female infertility patients with PCOS. (2) Identify some factors affecting quality of life in infertile women with PCOS. **Materials and Methods:** A cross-sectional study on 210 female infertile patients diagnosed with Polycystic Ovary Syndrome (PCOS) based on Rotterdam criteria Holland 2003 who came for examination and treatment at Hue Center for Reproductive Endocrinology and Infertility (HueCREI), Hue University of Medicine and Pharmacy hospital from May 2023 to May 2024. The DASS-21 scale (Depression Anxiety Stress-21) and the MPCOSQ one (the modified PCOS health-related QoL questionnaire) were used to survey the patient's stress level and quality of life, respectively. The correlation between stress levels and patients' quality of life scores was analyzed using the Pearson correlation coefficient (r). Comparing factors in terms of the diagnostic criteria for PCOS, other elements with quality of life, then finding relationships and making discussion. **Results:** In total of 210 patients recruited in this study, there were 75 patients suffering stress at different levels from mild, moderate to severe and highly severe, accounting for 21.0%, 10.5%, 3.3% and 1%, respectively. The average mPCOSQ score in terms of infertility factor was the lowest, at 3.71 ± 1.31 points. The study found a strong negative correlation between the average score of stress level based on the DASS-21 and the average score of quality of life based on the mPCOSQ ($r = -0.861$, $p<0.001$). What is more, the quality of life score in terms of infertility illness was the lowest, regardless of stress level ($p<0.001$). Furthermore, factors such as income level, BMI, acne and hirsutism have a statistically significant association with the quality of life of female infertile patients with PCOS ($p<0.05$). **Conclusion:** Stress has taken a toll on the quality of life in infertile women with PCOS. Particularly, of six domains related to the quality of life in female infertile patients with PCOS, infertility problems were obtained the lowest score no matter what stress level they are. On top of that, income, BMI and other factors such as acne, hirsutism can have a significant implication of the quality of life in infertile PCOS female patients.

Key words: *Polycystic ovary syndrome (PCOS), stress, quality of life, female infertility.*

1. INTRODUCTION

Polycystic ovary syndrome (PCOS) is a common endocrine and metabolic disorder, accounting for from 3% to 26% in women of reproductive age, according to the 2003 Rotterdam criteria [1]. Patients with PCOS have many different manifestations which include menstrual disorders, increased androgen secretion and polycystic ovary images on ultrasound [2]. There are about 65-75% of women with PCOS having hirsutism [3], 38-88% of women are obese and overweight [4], approximately 30-40% of women with PCOS having acne [5], and around 20% - 30% of patients with PCOS coping with female pattern hair loss (FPHL) [6].

The psychological implications caused by PCOS can stem from dissatisfaction with changes in body image and feminine identity related to obesity, acne, hirsutism, baldness, irregular menstruation, amenorrhea, fear and anxiety when suffering from chronic illness. In addition, infertility as a result of PCOS can cause negative emotions such as guilt, shame, and low self-esteem in women, leading to varying levels of stress, anxiety, and poor quality of life. Some studies have documented that PCOS worsens reproductive dysfunction, fertilization failure and spontaneous abortion. Therefore, infertile women with PCOS will be more likely to abolish their treatment cycles and make treatment more difficult. Symptoms of PCOS not only lead to anxiety, suffering, and discomfort but can also lower the

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patient's quality of life. Therefore, assessing quality of life in patients with PCOS will provide important information for treatment as well as intervention and prevention of psychological disorders.

Stress and its impact on quality of life in infertile patients with PCOS is an issue that deserves research attention because this syndrome affects many women worldwide. In addition, understanding other factors wreaking a havoc on the quality of life of infertile patients with PCOS is crucial in order to have appropriate interventions and support during the healthcare process, then helping improve patient's quality of life. Based on those scientific foundations, this study is conducted with the following two objectives:

1. Describing stress levels and quality of life in female infertility patients with PCOS.

2. Identifying some factors affecting quality of life in infertile women with PCOS.

2. MATERIALS AND METHODS

Study subjects

A total of 210 female infertility patients diagnosed with PCOS according to Rotterdam Netherlands 2003 criteria came for examination and treatment at the Center for Reproductive Endocrinology and Infertility, Hue University of Medicine and Pharmacy Hospital (HUECREI) since May 2023 to May 2024. Patients who do not have PCOS, are used to suffer from psychological disorders, have limited verbal communication, or have hyperandrogenism due to other causes were not recruited into this study.

Methods

The study was conducted using a cross-sectional method, the sample size was calculated according to the formula to estimate a proportion:

$$n = \frac{Z^2_{1-\alpha/2} p(1-p)}{d^2}$$

In which, n is the minimum sample size, p is the proportion of patients with PCOS according to Le Minh Tam, et al. 2017 study [7] which is 51,5%, $Z^2_{1-\alpha/2}$ = 1.96 with 95% confidence, and d is the allowable error (choose d=0.05). After calculation, the minimum sample size is 196 patients. In this study, a total of 210 infertile female patients with PCOS was recruited.

Patients who met the inclusion and exclusion criteria were invited to participate in the study. Collecting data on administrative characteristics, clinical and paraclinical features of PCOS background. The subscale of stress was taken from DASS-21 scale including 7 questions 1, 6, 8, 11, 12, 14, 18 related to mental health and stress was used to survey the patient's stress. The Vietnamese translation of DASS-21 has been interpreted and standardized by Nguyen Van Hung and his colleagues, having reliability and decent sensitivity and specificity [8]. Score ranged from 0 to 3 for each item in which, particularly 0 points - not true for me at all, 1 point - partially true for me, 2 points - mostly true for me to completely true for me which is 3 points. The interviewee responded by describing the situation that most closely resembles the situation they have felt in the past week, including today. The stress score is calculated by calculating the total score of each item of 7 questions, then multiplying by 2 and comparing with the assessment table. The total score ranges from 0 to 42 corresponding to increasing symptom levels, specifically: no stress (0-14 points), mild stress (15-18 points), moderate stress (19-25 points), severe stress (26-33 points), and highly severe stress (higher 34 points).

The mPCOSQ scale evaluates quality of life in patients with PCOS, including 30 questions surveying 6 different domains of emotions (8 questions), hirsutism (5 questions), weight (5 questions), infertility (4 questions), menstrual problems (4 questions), acne (4 questions). Each item in each question is answered based on a 7-point Likert scale. Each domain score is the average point of all items in that domain. The overall score is obtained by adding the six domain scores. The higher score represents better function. In each item, 1 point represents the most frequent, the most severe; 7 points is no time, not serious. The scale was translated back and forth from English to Vietnamese by the research team, then a trial survey was conducted on 10 patients to adjust inappropriate variables and check the reliability of the scale using Cronbach's Alpha coefficients, with an overall Cronbach's α of 0.925.

Data analysis

All data were performed using SPSS software, version 22.0 (SPSS Inc.,Chicago, II, USA). Continious variables are expressed as the mean ± standard deviation. Quantitative variables were tested for normal distribution using parametric or non-parametric tests. Categorical variables are expressed as percentages. T-test and One-way Anova are used to express the association between two groups. The association between two quantitative variables is expressed by the Pearson (r) or Spearman (r) correlation coefficient. A p value <0.05 was considered statistically significant, at 2-sided.

3. RESULT

Table 1. Characteristics of study subjects with Polycystic Ovary Syndrome

Characteristics		Total (n=210)	Percentage (%)
	Or mean, standard deviation		
General features			
Age group	< 35 years old	167	79.5
	≥ 35 years old	43	20.5
Average age: 31.60 ± 3.91 (Youngest: 20 years old; Oldest: 44 years old)			
Income level (Millions VND)	< 5,000,000	37	17.6
	5,000,000 - 10,000,000	149	71
	> 10,000,000	24	11.4
Clinical features			
BMI (Kg/m²)	< 18.5	16	7.6
	18.5 - 22.9	142	67.6
	23 - 24.9	26	12.4
	≥ 25	26	12.4
Waist/hip ratio	≥ 0.8 cm	154	73.3
	< 0.8 cm	56	26.7
Menstrual cycle	Regular	101	48.1
	Irregular	109	51.9
Acne	Yes	73	34.8
	No	137	65.2
Hair loss	Yes	49	23.3
	No	161	76.7
Hirsutism	Yes	62	29.5
	No	148	70.5
PCO imaging	Unilateral	66	31.4
	Bilateral	144	68.6
Estradiol (pg/ml)		1.36 ± 0.74	
LH/FSH ratio		40.51 ± 30.13	
AMH (ng/ml)		5.64 ± 3.34	

The average age was 31.60 ± 3.9; The youngest was 20 years old, the oldest was 44 years old, the majority of patients under 35 years old were 79.5%. Most patients earned an income of 5,000,000 - 10,000,000 million VND/month, accounting for 71.0%. Patients with BMI in the range of 18.5 kg/m² - 22.9 kg/m² represented the highest rate of 67.6%. There were 51.9% of patients having irregular menstrual cycles, the majority of patients did not have clinical manifestations such as acne, hair loss and hirsutism . The PCO image on ultrasound is PCO on both sides of the ovaries, accounting for a higher rate of 68.6%.

Table 2. Stress level according to DASS-21 scale and quality of life scores of infertile patients with Polycystic Ovary Syndrome

Stress level according to DASS-21	Total (n=210)	Percentage (%)
No stress	135	64.3
Mild	44	21.0
Moderate	22	10.5
Severe	7	3.3
Highly severe	2	First
Quality of life score according to mPCOSQ of six domains	**Score (Mean ± SD)**	
Emotions	4.76 ± 1.31	
Hirsutism	6.19 ± 1.33	
Weight	5.60 ± 1.60	
Infertility problems	3.71 ± 1.31	
Menstrual problems	5.03 ± 1.18	
Acne	6.11 ± 1.34	
Average score	5.23 ± 0.90	

The proportion of patients with stress was 35.7% (75/210), in which mild, moderate, severe and highly severe stress accounting for 21%, 10.5%, 3.3%, 1.0%, respectively. The average quality of life score was 5.23 ± 0.90 points, in particular hirsutism was obtained the highest average score of 6.19 ± 1.33 points and infertility was obtained the lowest average score of 3.71 ± 1.31 points.

Table 3. The association between stress level and quality of life score in infertile female patients with Polycystic Ovary Syndrome

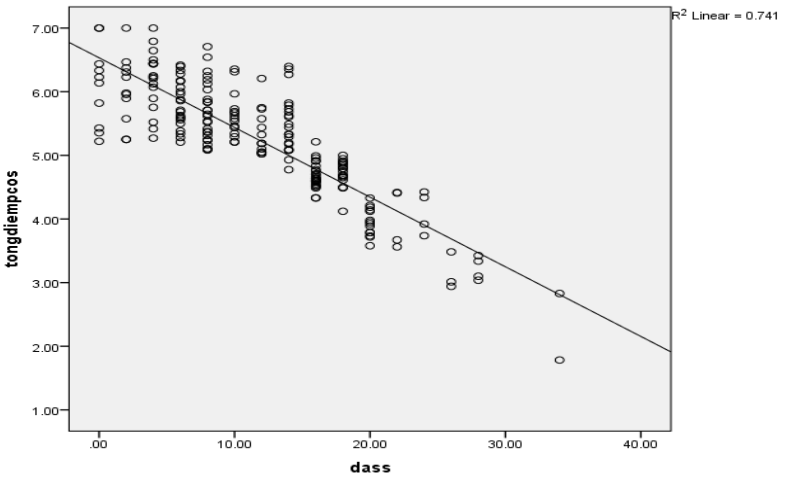
Characteristic	No stress	Mild stress	Moderate stress	Severe stress	Highly severe stress	P
Emotions	5.40 ± 1.05	3.97 ± 0.87	3.32 ± 0.75	3.02 ± 0.52	1.69 ± 0.97	<0.001
Hirsutism	6.62 ± 0.83	6.19 ± 1.16	4.79 ± 1.63	3.43 ± 1.61	2.60 ± 0.85	<0.001
Weight	6.21 ± 1.16	4.73 ± 1.69	4.55 ± 1.64	3.63 ± 1.52	1.80 ± 0.85	<0.001
Infertility	4.28 ± 1.15	2.93 ± 0.84	2.44 ± 0.94	2.07 ± 0.43	1.50 ± 0.35	<0.001
Menstrual problems	5.47 ± 0.94	4.70 ± 1.07	3.92 ± 0.79	2.86 ± 0.80	2.75 ± 2.12	<0.001
Acne	6.59 ± 0.89	5.65 ± 1.39	4.93 ± 1.69	4.14 ± 1.57	3.50 ± 0.01	<0.001
Average score	5.76 ± 0.51	4.70 ± 0.20	3.99 ± 0.28	3.19 ± 0.22	2.31 ± 0.74	<0.001

It is noticeable that the stress level is higher, the quality of life is lower (p<0.001). Notably, the quality of life score in terms of infertility problems had the lowest score regardless of stress level (p<0.001).

Table 4. Association between the average score of stress level according to the DASS-21 scale and the average score of quality of life according to the mPCOSQ scale

Characteristic	Average mPCOSQ score	
	R	P
DASS-21 average score	-0.861	<0.001

There was a robustly negative association between the average quality of life score according to mPCOSQ and the average DASS-21 stress level one (r = -0.861, p<0.001).



Linear regression equation y= -6.773x+47.31

Figure 1. The association between stress level and quality of life score of infertile patients with Polycystic Ovary Syndrome

Table 5. Some factors affect the quality of life in infertile female patients with Polycystic Ovary Syndrome

Factors		Mean ±SD	P
Age group	≥ 35 years old	5.44 ± 0.77	0.086
	< 35 years old	5.17 ± 0.92	
Income (Millions VND)	< 5,000,000	5.23 ± 0.88	**0.003**
	5,000,000 - 10,000,000	5.18 ± 0.79	
	> 10,000,000	4.87 ± 0.89	
BMI (Kg/m²)	< 18.5	5.36 ± 0.93	**0.016**
	18.5 - 22.9	5.33 ± 0.87	
	23 - 24.9	5.14 ± 0.83	
	≥ 25	4.73 ± 0.95	
Waist/hip ratio	≥ 0.8 cm	5.17 ± 0.89	0.144
	< 0.8 cm	5.38 ± 0.92	
Menstrual cycle	Regular	5.34 ± 0.87	0.081
	Irregular	5.12 ± 0.91	
Acne	Yes	4.85 ± 0.94	**<0.001**
	No	5.43 ± 0.82	
Hair loss	Yes	5.28 ± 0.93	0.680
	No	5.22 ± 0.89	
Hirsutism	Yes	4.73 ± 0.94	**<0.001**
	No	5.44 ± 0.79	
PCO imaging	Unilateral PCO	5.46 ± 0.82	**0.014**
	Bilateral PCO	5.13 ± 0.92	
LH/FSH ratio		1.36 ± 0.74	0.389
Estradiol		40.51 ± 30·13	0.709
AMH		5.64 ± 3·34	0.504

BMI, income level and clinical features of PCOS such as acne, hirsutism and PCO image on ultrasound have a statistically significant association with the quality of life of infertile patients suffering from PCOS ($p<0.05$).

4. DISCUSSION

Women with polycystic ovary syndrome (PCOS) not only face reproductive problems, metabolic problems, and physical ones, but also suffer adverse effects on mental health such as stress, depression. and anxiety. This study aims to understand the impact of psychological stress on quality of life in infertile patients with PCOS. Research results demonstrated that 35.7% (75/210) of patients being stress at different levels from mild, moderate to severe and highly severe, accounting for 21.0%, 10.0%, 3.3%, and 1.0%, respectively (Table 1). In contrast, other studies showed a higher rate of patients with stress such as Kite C et al. (2021) found the percentge of mild stress was 64.6% [9]. Alamri AS et al studied 168 patients in 2022, determined the proportion of stress disorders in women with PCOS was 85.71%, of which mild, moderate, and severe levels were 27.77%, 54.16%, 18.05%, respectively [10]. On the other hand, some domestic studies as the study of Ho Thi Thanh Tam et al illustrated the lower percentage of stress disorders was 13.6%, specifically mild, moderate, severe and highly severe levels, accounting for respectively 8%, 4.2%, 1.4% and 0% [11]. Similarly, research by Phan Thi Nhu Quynh in 2023 showed that the proportion of mild, moderate, severe, and highly severe stress were 5.1%; 7.4%; 0.6%; 0.8%, in turn [12]. This distinction can be explained regarding differences in sample size, characteristics of research subjects and methods. On top of that, the burden of mental health in patients with PCOS can be attributable to demographic factors, physical health, lifestyle factors, psychological problems and social impacts [13] .

Looking from table 2, the results showed that the average score of quality of life in infertile patients with PCOS was 5.23 ± 0.90 points. Particularly, hirsutism was obtained the highest score of 6.19 ± 1.33 points, followed by the acne with 6.11±1.34 points; weight with 5.60 ± 1.60 points; menstruation was 5.03 ± 1.18 points; emotions was 4.76 ± 1.31 points, and infertility is the area with the lowest score, 3.71 ± 1.31 points. It was also similar to the study of Bazarganipour F et al (2013) [14] and Behboodi Moghadam Z et al (2018) [15]. On the contrary, Jiskoot G et al (2023) [16] showed that the quality of life score for the menstrual problems was the lowest, with 3.41 ± 1.40 points, and the average score was 3.97 ± 1.20 , these results were lower than our findings. The differences of religion, culture, society, and marital status can be a catalyst for these heterogeneity among studies.

There were statistically significant correlations between stress levels and quality of life scores in six domains including emotions, hirsutism, weight, infertility, menstrual problems, and acne ($p<0.001$) (Table 3). The more stressed the infertile patient, the lower the average quality of life score and the points in each domain. This study also analyzed the correlation between the average score on stress and the average score on quality of life, finding a robustly negative correlation with $r=-0.861$, $p<0.001$ (table 3, Figure 1). This result is consistent with other studies as Ching HL et al. (2007) [17] and Chaudhari et al. (2018) [18]. Of the six domains surveyed, infertility had the lowest quality of life score regardless of stress level. This is comparable to the finding by Khomami MB et all (2015) [19] and Behboodi Moghadam Z et al (2018) [15]. Infertility has been proved its significant impact on mental well being and relationships of women with PCOS [20]. For Asian women, motherhood is a sacred duty, emphasizing the important role of women in maintaining the race. Social impacts when women are unable to get pregnant have taken a toll on their psychology, greatly affecting their quality of life [21].

Additionally, self-image is an important factor in a woman's perception of quality of life. Infertile Women with PCOS have poorer self-esteem and body image due to clinical manifestions such as menstrual problems, hirsutism, acne, overweight, and obesity. PCOS symptoms can lead to a significant decline in quality of life and cause more stressfully, negatively affecting psychological and sexual health [22]. In the study of McCook JG and colleagues (2005), it was found that a common concern about patients' quality of life was weight [23]. Jiskoot G et al (2023) found menstrual problems to be the worst factor affecting quality of life [16]. Hirsutism has been a typical clinical feature in those with PCOS. The patient felt guilty about his body, more masculine and always unhappy. Removing body hair and covering up the appearance of hair made the patient feel tired and waste a lot of time and money. Patients could not permanently remove hair but regularly found ways to tackle this situation after a certain period of time. Due to such symptoms, those

with PCOS would feel frustrated and stressed [24]. Endocrine disorders played an important role in the development of acne through increased activity of sebaceous glands on the face, less commonly on the back and chest. Besides, acne was also influenced by external factors such as environment, work, use of drugs, cosmetics and also influenced by psychological factors. In the study of Zari S and colleagues (2017), it was demonstrated that increased stress levels were strongly correlated with increased acne severity [25] and thereby quality of life of infertile patients were decreasing day by day. However, our findings showed that hirsutism had the least impact on patients' quality of life, with a higher quality of life score than other studies [15,16] . This difference can be explained by various racial factors; women of Hispanic, Middle Eastern, South Asian, and African American descent having higher rates of hirsutism than white, Asian, and African-American women, Ashkenazi Jews and Native Americans suffering with PCOS [26] .

In addition, the study also found a statistically significant relationship between income level and quality of life in female infertility patients with PCOS (p=0.003)(Table 4). Specifically, the lower the income level, the worsen the quality of life score. This may be because the infertility treatment fee was quite expensive, depending on the treatment method, but in general this cost can increase up to tens of millions of dong, so patients must have a reasonable spending plan, save and accumulate to be able to monitor long-term treatment, leading to increased life pressure. When the medical cost increases, the paying for other expenses will decrease, thereby reducing the patient's standard of living. Some studies of Le Dai Minh and colleagues (2022) [27] and Nguyen Thi Thuy Hang (2022) [28] have proven that the less financial burden a patient has, the higher their quality of life. Furthermore, BMI and factors such as acne, hirsutism and PCO image on ultrasound also have a statistically significant association with the quality of life of infertile patients with PCOS (p<0, 05) (Table 4). Similarly, the association between higher BMI and lower QoL was reported in studies by Benetti-Pinto et al (2015) [27], Rzońca E et al (2018) [28], and Hahn S et al (2005) [29]. High BMI not only reflects physical health but can also create poor body image, lead to loss of self-confidence and affect mental illness [17]. Tasoula et al (2012) also showed a statistically significant association between the impact of acne on quality of life and the severity of acne (p<0.0001) [18]. Physical symptoms such as itching, pain, psychological problems such as somatic complaints, embarrassment, low self-esteem, lack of confidence, acne treatment costs, and spending a lot of time on makeup to cover acne have serious implications of the quality of life. Hirsutism is also a factor that affects the quality of life of infertile patients with PCOS, this result is similar to Khomami MB et al (2015) [19] .Infertile patients will feel frustrated, depressed and ashamed because they are perceived to lack femininity, seriously affecting self-esteem and lessen quality of life. The finding showed a statistically significant association between the appearance of polycystic ovaries on ultrasound and the quality of life of infertile patients with PCOS ($p < 0.05$) (Table 4). Infertile patients with unilateral PCO had a higher mean quality of life score than counterparts with bilateral PCO. In contrast, the study did not find a significant relationship between other factors including age, waist/hip ratio, menstrual cycle, hair loss, endocrine tests (AMH, Estradiol), LH/FSH ratio) ($p>0.05$).

5. CONCLUSION

Stress has taken a toll on the quality of life in infertile women with PCOS. Particularly, of six domains related to the quality of life in female infertile patients with PCOS, infertility problems were obtained the lowest score no matter what stress level they are. On top of that, income, BMI and other factors as acne, hirsutism can have a significant implication of the quality of life in infertile PCOS female patients.

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