

Comparison of Sexual Function in Fertile and Infertile Women with Polycystic Ovary Syndrome (PCOS): A Comparative Cross-Sectional Study

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Abstract

Background: Polycystic Ovarian Syndrome (PCOS) is a common hormonal disorder that affects approximately 5-20% of women of childbearing age. Physical and psychological changes caused by PCOS might impair women's sexual function. Infertility is one of the most important complications that may be seen in women with PCOS. This study aimed to compare sexual function in fertile and infertile women with PCOS diagnosis.

Method: This cross-sectional study was conducted on 364 fertile and 239 infertile women that diagnosed with PCOS according to the Rotterdam criteria from May 2018 to February 2019. All participants were asked to fill out included demographic survey and Female Sexual Function Index (FSFI) questionnaires.

Result: The mean total FSFI score in fertile and infertile women was 23.70 ± 6.26 and 24.65 ± 4.04 , respectively. With regard to FSFI, the differences between the two groups were not statistically significant in terms of total FSFI score, desire, lubrication, satisfaction, and arousal score ($P > 0.05$). However, the pain score, was significantly higher in the fertile group. (3.51 ± 1.27 , 3.10 ± 1.11 , $P < 0.001$).

Conclusion: Impaired sexual function in infertile women diagnosed with PCOS can be more associated with PCOS-related complications and other concurrent factors that affects sexual function rather than infertility. It seems that the effects of infertility on sexual function can be different in infertile women according to each person's condition. Hence, screening for sexual dysfunction in women with PCOS and infertility should be deemed as a part of clinical assessment, leading to early diagnosing and improving their quality of life.

Introduction

Polycystic Ovarian Syndrome (PCOS) is presented as a heterogeneous endocrine disorder that affects approximately 5-20% of reproductive aged women (1). This condition is characterized by Ovulatory Dysfunction (OD), biochemical or clinical manifestations of Hyperandrogenism (HA) such as hirsutism, acne, obesity and Polycystic Ovarian Morphology (PCOM) (2). Furthermore, infertility is defined as the inability to conceive after a year of regular intercourses without any contraception and affects 70-80% of women with PCOS (3, 4). As 71.8% of infertile women suffer from sexual dysfunction, infertility is considered a risk factor for it (5). Infertility not only has a devastating effect on patients' self-esteem, but also it imposes a lot of financial and psychological burdens on them and consequently, infertility may affect couples' relationships and their satisfaction of sexual intercourse (6, 7). It seems that PCOS is associated with an increased risk of sexual dysfunction as follows: aesthetic factors such as hirsutism, acne and obesity change the women's attitude to their bodies, leading to diminished feminine identity, imbalance in hormonal profile, HA and hyperinsulinemia can lead to depression and anxiety that have manifold effects on quality of life (QoL), mental health and consequently change women's sexual function (8-11).

Although in many studies it is proved that infertility is strongly related to impaired sexual dysfunction, data on the association between sexual function and PCOS are limited and often contradicting (12-15). Thus, in light of previous studies on the detrimental effects of infertility and PCOS on sexual function, and the synergistic effects that infertility and PCOS have on each other, infertile PCOS patients might suffer from sexual dysfunction markedly as comorbidity. Consequently, this study was designed to compare sexual function in PCOS women with and without infertility.

Methods

This prospective cross-sectional study was undertaken with the approval of Ethical Committee of Tarbiat Modares University of Medical Sciences (IR.MODARES.REC.1397.211). This study was conducted on women with PCOS referred to the gynecological clinics affiliated with Tehran University of Medical Sciences, Iran over the period of 12 months from May 2018 to February 2019 through convenience sampling method. Based on the results of previous studies the sample size was estimated 554 in both groups by using the appropriate formula and considering the 95% confidence interval and 10% sample loss:

$$n = \left(\frac{z_{1-\alpha/2} \times \sigma}{d} \right)^2$$

$$n = \left(\frac{1.96 \times 6}{0.50} \right)^2 = 554$$

Where, $1-\beta = 0.90$ is power, $\sigma = 6$ is the standard deviation of sexual function, $d = 0.5$ is accuracy of measurement, α and β represent type I and II errors, respectively

($\alpha = 0.05 \Rightarrow z_{\alpha/2} = 1.96, \beta = 0.10 \Rightarrow z_{\beta} = 1.28$). Consequently, for evaluation purposes, 603 eligible women with PCOS diagnosis according to the Rotterdam criteria (16) were recruited after obtaining a written consent, then they were divided into the two groups according to the presence or absence of infertility (364 in fertile group and 239 in infertile group). The infertile group included women who had referred themselves or had been referred by other physicians for diagnostic and therapeutic infertility assessments and they had a history of ≥ 12 month of infertility either primary or secondary infertility. The fertile group included women who had no history of infertility, according to their own report. Inclusion criteria were as follow: married women in reproductive age (18-45years) who were sexually active for the past 4 weeks, and willing to participate in this study. The exclusion criteria to avoid possible confounding factors included: pregnancy, breastfeeding, suffering from endocrine and chronic diseases (such as diabetes, cardiovascular disease, kidney disease, benign and malignant tumors, etc.), taking any hormonal and herbal medicines in the last month as its possible impacts on sexual function and androgen levels. Finally, all participants were asked to complete questionnaires included demographic survey and Female Sexual Function Index (FSFI).

Anthropometric measurements contained weight, height, Hip Circumference (HC), and Waist Circumference (WC) were assessed by the same health-care expert. Body Mass Index (BMI) was calculated based on dividing weight in kilogram by square of height in meter for assessing the obesity (17). Additionally, WC was measured at the narrowest point between the lower rib and iliac crest in the standing position and HC at widest part of the buttocks (18).

Clinical and para-clinical features

In order to identify PCOM based on the Rotterdam PCOS criteria an ovarian volume >10 ml or containing 12 or more follicles 2–9 mm was distinguished as a positive PCOM (19).

All required laboratory tests, including Testosterone, Sex Hormone Binding Globulin (SHBG), were done on the same laboratory (ELISA method).

Questionnaires

A socio demographic questionnaire emphasizing on assessing past medical history, menstrual dating and regularity, gynecological history, medications, and family history was completed.

To assess sexual function, all participants were asked to fill out FSFI questionnaire included 19 questions to measure women's sexual performance in six areas: desire, arousal, lubrication, orgasm, sexual satisfaction and sexual pain through the Likert scale. Total score was obtained by summing the six domain scores. A higher score is associated with a lower degree of sexual dysfunction and total score of 23 the optimal cut score for differentiating women with and without sexual dysfunction (20). The reliability and validity of this questionnaire have been confirmed in Iran (21).

Statistical method

All analyses were carried out using SPSS software (ver. 25.0) (SPSS, Chicago, IL, USA). Normality was assessed by Kolmogorov-Smirnov test and data presented as Mean+SD for quantitative data which were compared using the Mann-Whitney's U test (MW). Also two groups were compared in terms of qualitative variables through the chi-square test and data were presented as number and percentage. P 0.05 was considered to be statistically significant.

Results

Overall, 25 of the 646 eligible women who were asked to complete the surveys declined to participate in the study due to the length of time required to complete it and the sexual-related content of questionnaire. A total of 603 women were participated in the trial, 18 were excluded due to sexual inactivity (n=7), and unwillingness to complete questionnaires (n=11) (Figure 1). The mean age of fertile women was 30.75 ± 5.22 years, and infertile women was 30.76 ± 5.56 . Table 1 shows an overview of some of the main characteristics of the two groups. The mean duration of infertility in infertile women was 4.1 ± 3.06 years and a significant proportion of infertile women had primary infertility (64.8%). Although there was no

significant difference in mean level of testosterone between fertile and infertile groups ($P > 0.05$), SHBG level was significantly different between these groups ($P < 0.05$).

Table 1: Basic features of PCOS women in fertile and infertile groups

valuable	Fertile group n = 364	Infertile group n = 239	P value
TT(nmol/L) *	2.32±2.72	2.34±1.33	0.08
SHBG(nmol/L) *	28.84±24.19	36.50±25.45	0.02

Data are given as Mean ± SD. TT: Total Testosterone. SHBG: Sex Hormone Binding Globulin.

As can be seen from the table 2 there was no significant difference in terms of age and BMI ($P > 0.05$), however WC and HC were significantly higher in the infertile group ($P < 0.05$). Two groups had significant differences in terms of occupation status and education level and the level of education in the fertile group was higher than the infertile group ($P < 0.05$).

Table 2: Comparison of demographic and anthropometric characteristics between fertile and infertile groups

valuable	Fertile group n=364	Infertile group n=239	P-value
Age*	30.75±5.22	30.76±5.56	0.90
BMI*	26.40±3.93	26.48±4.13	0.90
WC**	45.66±42.07	80.57±17.93	<0.001
HC**	52.16±47.70	92.50±18.96	<0.001
WHR**	0.85±.012	0.86±0.11	0.13
Education level			<0.001
	187)52.8(152)63.6(
	167)47.2(87)36.4(
Occupation status			<0.001
Housewife	297)81.6(215)90(
Employed	67)18.4(24)10(
Number of children*			0.05
0	205(56.3)	171(71.5)	
1	119(32.7)	59(24.7)	
2≤	40(11)	9(3.7)	
Number of abortion*			0.14
0	282)77.5)	191)79.9)	
1	50(13.7)	30(12.6)	
2≤	32)8.8(18)7.6(

WC: Waist Circumference, BMI: Body Mass Index, WHR: Waist to Hip Ratio, HC: Hip Circumference

* Values are given as mean ± SD by using Mann-Whitney's U test (MW) test.

** Values are given as number/percent by using chi-square test

Table 3 provides evaluation of the two groups with regard to FSFI. It reveals that no significant differences were evidenced in terms of total score, desire, arousal, lubrication, and satisfaction scores (P>0.05), however pain scores were significantly higher in the fertile women (P<0.05).

Table 3: Comparison of FSFI and its domains between fertile and infertile groups

valuable	Fertile group n=364	Infertile group n=239	P-value
Desire	3.65 0.88	3.67 0.83	0.86
Arousal	3.85 1.10	3.06 1.04	0.40
Lubrication	4.74±1.76	4.68±0.96	0.58
Orgasm	4.49±1.07	4.51±1.01	0.90
Satisfaction	4.62±1.12	4.79±1.05	0.11
Pain	3.51±1.27	3.10±1.11	<0.001
Total FSFI	23.70±6.26	24.65±4.04	0.39

* Values are given as mean ± SD by using Mann-Whitney's U test (MW)

Discussion

PCOS as a common hormonal disorder can affect various aspects of women's life. The results of previous studies revealed that women diagnosed with PCOS suffer from sexual dysfunction (12). As mentioned earlier hormonal imbalances, HA and its related clinical features such as obesity, acne, hirsutism, and alopecia lead to physical and psychological changes that reduce women's sexual satisfaction (22). Infertility and its treatment as common complications that PCOS women are faced with can affect the women's sexual function (23, 24). In addition, some studies have suggested that infertility is a risk factor for sexual dysfunction in women diagnosed with infertility; however, the results of previous researches were controversial (24, 25).

The present study was designed to compare sexual function in fertile and infertile women diagnosed with PCOS according to the Rotterdam criteria. The most interesting finding of this study was that there was no significant difference between fertile and infertile PCOS women in FSFI characteristic except from pain. The findings of the present study are similar to the results of study conducted by Mwembi et al. (26) who reported that there was no statistically significant difference in different dimensions of sexual function in fertile and infertile women. Furthermore, Monga et al. (27) reported that infertility did not significantly affect women's sexual function. Also in order to investigate the effects of infertility on couples' relationships, some studies have revealed that infertility did not have any significant effect on sexual function and marital relationship (28-30). In addition, infertility-related psychological complications have been reported uncommon (31).

This outcome is contrary to that of Luk et al. (32) who found that infertility can affect psychological well-being, marital relationships, sexual relationships, and QoL of couples' lives. Furthermore, Moghaddam et

al. (33) not only reported significant reduction in infertile women's sexual function compared with fertile women, but also found an inverse relationship between desire and infertility. Coskuner et al. (34) argued that although sexual function was significantly different between fertile and infertile women, sexual QoL was same between these groups.

There are various explanations for the inconsistency of the association between infertility and sexual function. For instance, although previous researches have shown strong association between the level of androgens and sexual function, no significant difference was observed between fertile and infertile women in terms of testosterone level in our study, (35). It seems that the results of comparing sexual function between these groups may be affected by this association.

SHBG was significantly higher in infertile women and Zheng et al. (36) reported a significant negative association between sexual desire and SHBG. The findings of our study are supported by Nazarpour et al. (37) and Moghassemi et al. (38) study, they also reported that there was no significant association between serum SHBG levels and female sexual function. Different results of the studies mentioned above imply that the relationship between infertility and sexual function is a complex process, which might be influenced by multiple factors, including age, economic status, duration of marriage, type of marriage, duration of infertility's treatment and marriage satisfaction (39).

As a matter of fact, the longer duration of infertility they face, the more sexual dysfunction they suffer (40). Moreover, Hassanin et al. (41) stated that infertility is one of the most important cause of sexual dysfunction in four to six years after infertility diagnosis. In other words, increasing the duration of infertility and unsuccessful treatment reduces the hope of having children and can have adverse effects on sexual function. In our study the mean duration of infertility in infertile group was 4.1 ± 3.60 and the effects of infertility on women's sexual function may be displayed over a longer period of time.

oskayet al.(42) in their study with the aim of evaluation sexual function in Turkish infertile women argued that simply having the purpose of achieving pregnancy through sexual intercourse and the frequency of sexual intercourse per week can affect sexual function in infertile women. They reported that by the increasing frequency of intercourse per week sexual function in all domain increase. Also another important factors that can affect sexual function in infertile women is the cause of infertility. Infertile women that have been diagnosed with mixed factor compared to women with unknown cause are more likely to have sexual dysfunction. From this it is conclude that in women diagnosed with infertility the effect of infertility on sexual function can vary depending on the cause and severity of infertility and the importance of having children in couples.

Furthermore, Pakpour et al. (43) reported that older age, self-reported depression, secondary infertility, lower educational level and higher partner education as the further risk factors for female sexual dysfunction in infertile couples.

In our study, the level of education in the fertile group was higher than infertile group. Based on the results of some previous studies, it was expected that an increase in education level would be associated with an

increase in sexual satisfaction (44). Also in the study of samimi et al (45). The quality of women's sexual life with increasing education level has shown a statistically significant increase. However, the finding that higher levels of education raise women's sexual satisfaction and improve sexual performance has been rejected by some recent studies (46, 47).

Another important factor that may affect the quality of life and consequently the quality of sexual life is an individual's occupation. Based on the result of study by Nikbina et al. (44), the type of occupation had a statistically significant relationship with the scores of different areas of female sexual function. Contrary to these results, in the study of Alizadeh et al. (48), there was no statistically significant difference between the sexual performance of employed and housewives women. Although employment might lead to being independent and expression of women in society, it has not been affected in being satisfied from married life.

Women's sexual function is related to their mental health status (49). Depression significantly affects the quality of women's sexual life (50). Kim et al. (51) showed strong relationship between depression and taking infertility treatment in infertile women. Possible explanation for this association can include experiencing abortion after pregnancy with infertility treatments, anxiety of high risk pregnancy, burden of pregnancy and importance of having child.

Different cultural conditions may explain this inconsistency between the results. Hence, in eastern societies, fertility and motherhood ability are considered as the important social and family values, infertility impose psychological burden to individuals (52, 53). What can be deduced from the results of various studies is that although infertility can influence sexual function through various ways, the other manifestations and complications of PCOS and other concurrent factor are more influential factors in patients' sexual dysfunction.

The results of our study showed that the pain score was significantly higher in the fertile group. Factors that can affect sexual pain in women includes younger age, lower BMI, less emotional intimacy with a sexual partner, vaginal infections, especially fungal infections, and severe depression (54). In our study, there were no significant difference between two groups in terms of age and BMI, but accurate information on other factors that may affect sexual pain was not available. Consequently, for the best comparison of sexual function between fertile and infertile women with PCOS, evaluation of many factors is required. The main weakness of this study was the paucity of adequate information about women's mental health status such as depression, anxiety, cause and severity of infertility, sexual problem in partner and burden of infertility which could affect their sexual function. Further studies, which take these variables into account, will need to be undertaken.

Conclusion

The present study was designed to evaluate the simultaneous effects of infertility and PCOS on female sexual function. One of the more significant findings to emerge from this study is that infertility merely is not a risk factor for sexual dysfunction without considering other factors. What can be deduced from the

results of the present study and several other similar studies in this field is that infertility can affect women's sexual function but this effect varies depending on various factor that can affect women's sexual function which was discussed earlier . In fact, in addition to various individual socio-cultural variables that affect women's sexual function, the effect of factors such as the cause, severity and duration of infertility as well as the attitudes of women's to their problem can be different on sexual function. In order to improve the quality of life of infertile women, interventions should be designed and presented by women's health professionals according to the circumstances of each person and taking into account these differences.

Abbreviations

PCOS: Polycystic Ovary Syndrome

PCO: Polycystic Ovaries

OD: Ovulatory Dysfunction

FSFI: Female Sexual Function Index

WC: Waist Circumference

BMI: Body Mass Index

WHR: Waist to Hip Ratio

HA: Hyperandrogenism

TT: Total Testosterone

HC: Hip Circumference

MW: Mann-Whitney

QoL: Quality of Life

FSD: Female Sexual Dysfunction

Declarations

Ethics approval and consent to participate

This study was approved by the institutional review board and the Ethics Committee of Tarbiat Modares University of Medical Sciences (IR.MODARES.REC.1397.211) approved the study protocol. All procedures were in accordance with the ethical standards of the Regional Research Committee and with the Declaration of Helsinki 1964 and its later amendments. After explaining the study's purposes, a written

consent and a verbal assent were collected from all participants. They were informed that their participation was voluntary, confidential and anonymous, and that they had the right to withdraw from the research at any time.

Consent for publication

Not applicable.

Availability of data and materials

The data sets used and analyzed for the current study are available upon reasonable request.

Competing interests

The authors declare no conflicts of interest.

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Authors' contributions

Sh.JS and Kh.A contributed to the conception and design of the study; Kh.A, N.M, N.J and Sh.JS did the literature search; M.N, N.M and Sh.JS performed the statistical analysis; Kh.A, N.M, Sh.JS, N.J and M.N wrote the first draft of the manuscript. All authors contributed to the manuscript revision, and read and approved the submitted version.

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Figures

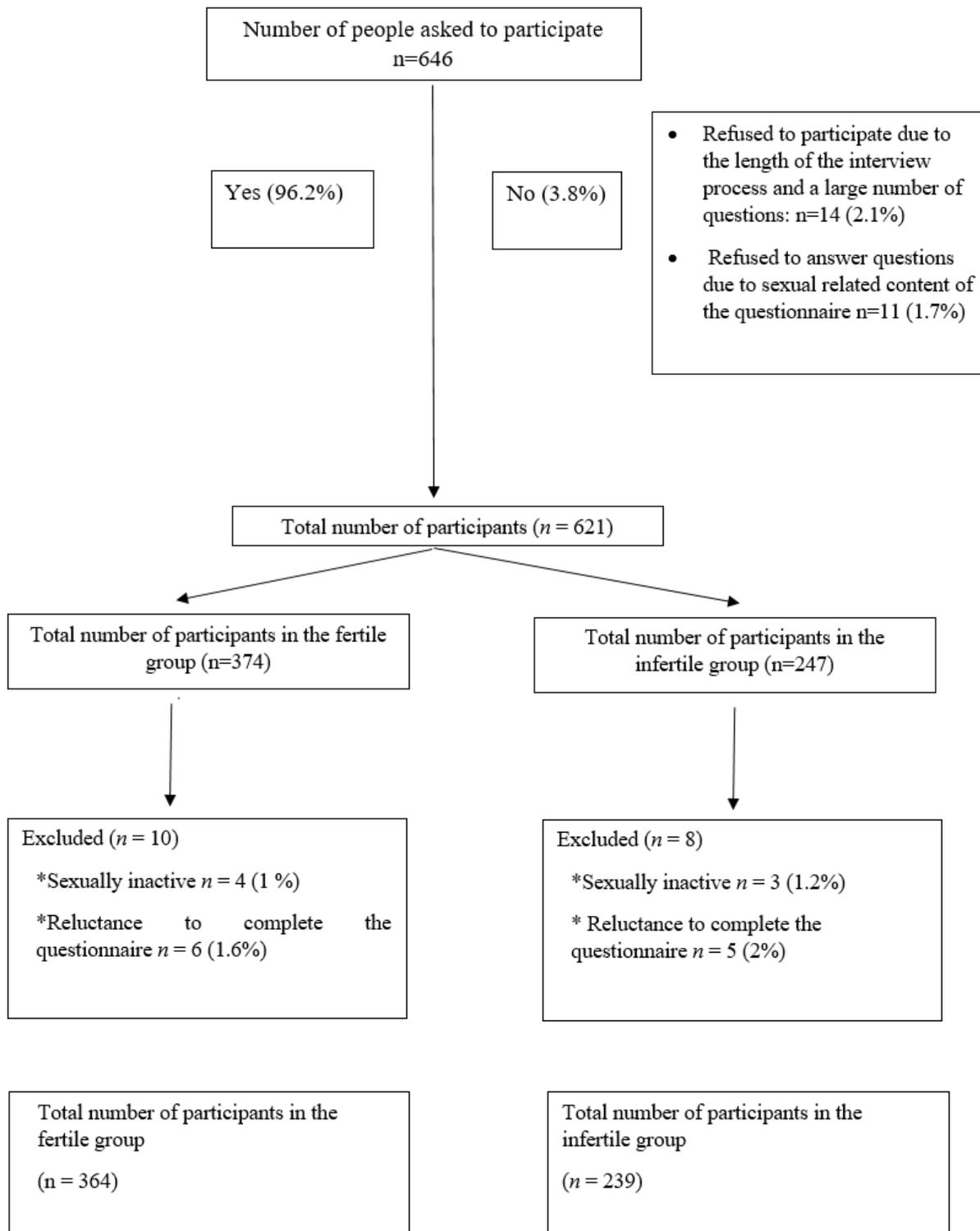


Figure 1

Flowchart of the participants included in the study