Published in final edited form as:
J Sex Med. 2012 January ; 9(1): 224–230. doi:10.1111/j.1743-6109.2011.02539.x.

Sexual Function in Women with Polycystic Ovary Syndrome

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Abstract

Introduction—Polycystic ovary syndrome (PCOS) is a common endocrinologic disorder. Little is known about the effects of PCOS on overall sexual functioning, phases of the sexual response cycle, and sexual satisfaction.

Aim—To compare the differences in sexual function between women with PCOS and controls, and to assess the relationship of serum testosterone, body mass index (BMI), hirsutism, and acne with sexual function scores in women with PCOS.

Methods—A cross-sectional analysis in which women who met the National Institute of Child Health and Human Development criteria for PCOS were compared with a group of healthy volunteers.

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Conflict of Interest: None.

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Main Outcome Measures—Results from the validated Changes in Sexual Functioning Questionnaire (CSFQ) were used to assess sexual function. In women with PCOS, serum testosterone levels, BMI, self-reported hirsutism, and acne were assessed as independent variables.

Results—Ninety-two women with PCOS and 82 controls were studied. Based on total CSFQ scores, sexual dysfunction was present in 27.2% of cases vs. 24.4% of controls (not signifcant).Women with PCOS had a significantly lower orgasm/completion score compared with women in the control group ($P < 0.001$).Women with PCOS whose testosterone levels were >1 standard deviation above the mean had significantly better sexual functioning vs. those within 1 SD ($P = 0.015$) and those >1 SD below the mean ($P = 0.033$). In women with PCOS, increasing BMI was associated with a significant reduction in the orgasm/completion subdomain, but no significant associations were found in regard to acne or hirsutism.

Conclusions—Women with PCOS have similar sexual functioning scores compared with controls except in regard to orgasm/completion. The subpopulation of women with PCOS whose serum testosterone levels are in the normal reproductive range are at increased risk for sexual dysfunction.

Keywords

Polycystic Ovary Syndrome; Sexual Dysfunction; CSFQ; Body Mass Index; Total Serum Testosterone; Sexual Satisfaction in PCOS

Introduction

Polycystic ovarian syndrome (PCOS) is a common endocrine disorder that affects approximately 6.5% of reproductive-aged women [1]. Parameters used to define PCOS include irregular menses, hirsutism, acne, and elevated serum testosterone levels [2]. Although obesity is not included in the diagnostic criteria for PCOS, many women with PCOS are obese [3]. The impact of these physical and physiologic characteristics on general well-being, quality of life, and sexual satisfaction has been studied. More specifically, a recent systematic review of this subject revealed that based on results from the health-related quality-of-life questionnaire, PCOS has an overall negative impact on quality of life [4,5]. Still, there are many components of normal sexual function, and it is clear that further research is needed to evaluate the impact of hormones on sexual function [6].

Some investigators have studied the association between PCOS and sexual satisfaction. In many of these studies, a 100 mm visual analog scale (VAS) was used to assess general sexual satisfaction. One such study found that while patients with PCOS had the same partner status and frequency of sexual intercourse as controls, they were significantly less satisfied with their sex life [7]. Another study, also using a VAS, evaluated how women with PCOS differed from controls in regard to their sexual health [8]. These authors found that patients with PCOS did not differ from controls in the number of sexual thoughts and fantasies or in their views of the importance of a satisfying sex life. They also found no differences in the frequency of sexual intercourse between controls and women with PCOS or in the proportion of sexually active women. However, women with PCOS were significantly less satisfied with their sex life and thought they were less sexually attractive.

Aims

We evaluated the sexual functioning of women with untreated PCOS in comparison with controls. Furthermore, we examined specific aspects of sexual functioning that might be associated with PCOS. In addition, we evaluated the association of total serum testosterone

levels, BMI, hirsutism, and acne with the components of sexual functioning in women with PCOS.

Materials and Methods

The primary population under investigation was comprised of treatment-naive women diagnosed with PCOS (cases) who had agreed to participate in a complementary and alternative therapy randomized clinical trial. A control group without PCOS was defined a priori and evaluated for comparison. This study was a cross-sectional analysis of baseline data collected prior to any intervention. In regard to the women with PCOS, participants who qualified for the study between January 2006 and June 2009 and who had complete data points were included in the study. A control group was defined and evaluated in 2009. The University of Virginia Institutional Review Board approved this protocol (UVA IRB #12045), and all study participants signed an informed consent.

Enrollment Criteria

In regard to the cases, inclusion criteria were: (i) a diagnosis of PCOS using the NICHD criteria of oligomenorrhea, nondiabetic, with self-reported hirsutism and/or acne and/or elevated free testosterone [9]; (ii) age 18 to 43 years; (iii) weight ≤ 250 pounds (113 kg); and (iv) at least one menses in the past 6 months but no more than eight menstrual periods in the most recent 12 months without hormonal intervention. The control group was selected from women in the waiting rooms from three University Obstetrics and Gynecology clinics and one Family Medicine clinic. These women completed the surveys anonymously and were not compensated for survey completion [10]. Control group inclusion criteria were: (i) no prior or current diagnosis of PCOS; (ii) age 18 to 45 years; (iii) nondiabetic; (iv) weight ≤ 250 pounds (113 kg); (v) nonhirsute; and (vi) regular monthly cyclic menses. Exclusion criteria included: (i) prior or current use of oral hypoglycemic agents or insulin; (ii) the use of hormonal contraceptives or any other hormonal intervention in the 60 days prior to enrollment; (iii) currently pregnant or breastfeeding during the prior 30 days; (iv) immune deficiency; (v) fasting blood glucose level > 125 mg/dL; and (vi) hemoglobin A1C (HgbA1C) level > 6.0%.

Data Sources

Both hirsutism and acne were self-reported as “yes” or “no.” Height and weight were measured by a research nurse for all study participants. BMI was calculated as weight in kilograms divided by height in meters squared (kg/m^2). All assays (except HgbA1C) were run by the University of Virginia General Clinical Research Center Core Lab. Venous blood glucose values were assayed by the glucose-oxidase method (YSI 2300, Yellow Spring Instruments, Yellow Spring, OH, USA), and subsequently converted to plasma glucose. Free testosterone was calculated from total testosterone and sex hormone blinding globulin levels [11–13] using >6.8 pg/mL as the definition of an elevated level among females [14].

Assessment of Sexual Function

The methodology used to assess sexual function was the Changes in Sexual Functioning Questionnaire (CSFQ) [15]. The CSFQ contains 14 questions that are designed to assess multiple aspects of sexual function. The results of the questionnaire yield a total sexual function score and scores for five subscales of sexual function defined as pleasure/satisfaction, desire/frequency, desire/interest, arousal/excitement, and orgasm/completion. Higher scores are associated with better sexual functioning. Concurrent validity between the CSFQ and the Derogatis Interview for Sexual Functioning-Self Report and test-retest reliability over 1 month for the CSFQ have been documented in both clinical and nonclinical (normal) samples [16,17]. Cutoff/threshold scores used to define sexual dysfunction for the

total score and all subscales were established where there was nonoverlap of 95% confidence intervals. The internal consistency of the CSFQ in our sample was assessed by calculating the Cronbach's alpha, a coefficient of reliability. The Cronbach's alpha score in our study was 0.891.

Statistical Analyses

Mean and standard deviations (SD) were calculated for each continuous variable including age, BMI, and serum hormone levels. For comparison between groups, mean scores for total sexual functioning and all five sexual function subscales were calculated. Furthermore, the CSFQ established cut-point thresholds for sexual dysfunction were used to calculate the percentage of women with sexual dysfunction in each group. In regard to comparison of mean CSFQ scores between groups, an absolute difference of 0.5 in any category and a difference of 2.5 on total CSFQ score has been previously defined as being clinically significant.

To assess independent variables for sexual dysfunction in the group of women with PCOS, the effects of BMI, total serum testosterone, acne, and hirsutism on CSFQ scores were evaluated. The definitions for the various BMI categories were normal (18.5–24.9), overweight (25–30), and obese (>30). In regard to serum testosterone levels, we compared mean CSFQ scores in women with PCOS defined by one of three serum testosterone categories: those within one SD of the mean population level, those > one SD above the mean level, and those > one SD below the mean. Furthermore, we compared the percentage of women in each of these three hormone strata who had CSFQ scores below the sexual dysfunction threshold.

Participant mean CSFQ scores were compared using the *t*-test. Differences in percentages between groups were compared using either the Mantel-Haenszel chi-square test or Fisher's exact test. An alpha level of 0.05 was used to evaluate statistical significance. With respect to multivariate analyses, the initial goal was to examine how well sexual function scores could be predicted based on BMI and mean serum testosterone levels (continuous measure). These models were evaluated with R^2 coefficients and the Wald *P* value for the BMI coefficient. All modeling was performed with SAS (version 9.1.3, Cary, NC, USA).

Results

A total of 92 women with PCOS and 82 controls were enrolled in the study. The mean age of cases and controls was 27.3 ± 2.12 and 29.6 ± 4.85, respectively (not significant). The mean BMI of cases was 31.17 ± 7.18 kg/m^2. The BMI for the control group was not recorded in all subjects; and therefore, is not available. The mean total and free serum testosterone levels in the women with PCOS were 62.6 ± 9.32 ng/dL and 13.0 ± 4.11 pg/mL, respectively. Furthermore, in the women with PCOS, 69.6% were hirsute and 47.8% had acne. As per inclusion criteria, none of the controls were hirsute. In the control group, 18.3% answered "yes" to taking either antianxiety or antidepression medication. The specific medication, dosage, and length of time on medication were not recorded. In the women with PCOS, 16 (17.4%) did not answer this question either "yes" or "no." Of the 76 women with PCOS who did answer this question, 10 (13.2%) answered "yes": the specifics of medication type, dosage, and length of time on therapy was not recorded. In regard to race/ethnicity, 72.3% of cases were Caucasian as compared with 68.1% of controls, and 14.9% of PCOS cases were African American as compared with 24.5% of controls.

The differences between groups for the total CSFQ scores were not statistically different (Table 1). In regard to all of the CSFQ subscales (indicators of problem areas), the mean CSFQ scores for women with PCOS were lower in every category as compared with

controls, but the differences were only statistically significant for orgasm/completion (10.03 vs. 11.67, $P < 0.001$). In regard to the percentage of women whose scores fell below the cut-point for dysfunction, the percentages were greater in the women with PCOS as compared with controls in every category; however, the differences were only significant for the orgasm/completion category ($P < 0.01$). The mean total scores for the CSFQ were not below the threshold for dysfunction in either group; however, the mean scores for both the PCOS and control groups were below the sexual dysfunction threshold for pleasure/satisfaction (3.25 vs. 3.53), desire/interest (8.27 vs. 8.43), arousal/excitement (10.04 vs. 10.21), and orgasm/completion (10.07 vs. 11.67), respectively.

In regard to the association of serum testosterone levels with sexual functioning, the R^2 coefficient for the total sexual function scores vs. total testosterone (0.0283) and free testosterone (0.0225) were not significant. For further comparison, women with PCOS were divided into three trata based on their total serum testosterone levels as previously outlined. Table 2 contains both the mean ± SD CSFQ scores and the percentage of study participants with scores below the threshold for dysfunction in each of the CSFQ categories per total serum testosterone levels. In regard to mean CSFQ scores, women with PCOS who had total serum testosterone levels greater than one SD above the mean for that population had significantly higher sexual functioning scores for desire/frequency, arousal/excitement, orgasm/completion, and total score as compared with women within one SD of the population mean ($P = 0.015$) and vs. those with total serum testosterone levels >1 SD below the mean by CSFQ total scores ($P = 0.033$). Furthermore, in all of the categories with significant differences, sexual function scores consistently fell with decreasing serum testosterone levels. In regard to the percentage of women with PCOS whose CSFQ scores fell below the cut-point for dysfunction, the differences were not significant in any category but approached significance in the desire/frequency and orgasm/completion categories.

Of the study participants with PCOS, 28 (30.4%) had a normal BMI, 9 (9.8%) were overweight, and 55 (59.8%) were obese. The data in regard to the association of BMI on sexual function scores and the percentage of subjects with sexual dysfunction based on BMI are shown in Table 3. The R^2 coefficient for the total sexual function scores vs. BMI (0.0164) was not significant. Furthermore, there were no significant differences between any of the BMI categories in regard to the mean CSFQ scores in any of the subscales. In regard to the percentage of subjects whose CSFQ scores were below the cut-point for dysfunction, the only significant difference was found in the orgasm/completion subscale. In this subscale, a significantly lower percentage of women with a normal BMI were found to be dysfunctional as compared with the women who were obese (55.1% vs. 70.9%, respectively). There were no differences in regard to the presence or absence of either hirsutism or acne and any of the CSFQ subscales (data not shown).

Discussion

Women with PCOS have been reported to have reduced sexual satisfaction. This study assessed sexual functioning in women with PCOS. After comparing the mean CSFQ total and subdomain sexual function scores between controls and women with PCOS, the only significant differences we found were in regard to the orgasm/completion scores. Furthermore, when we compared the percentage of women in each domain whose scores were below the cut-point for dysfunction, the only significant differences were again in the orgasm/completion domain. A study with greater statistical power might have revealed significant differences in many, if not all, aspects of sexual functioning as assessed by the CSFQ.

Clearly, the potential impact of any single independent variable on sexual functioning is not likely to produce an effect on all aspects of sexual function. The association between serum testosterone levels and sexual functioning in women with PCOS is important to study, as hyperandrogenemia is one of the hallmarks of this syndrome. In general, we found that women with PCOS who had the lowest total serum testosterone levels tended to have the lowest sexual function scores, although significant differences were not seen in either the pleasure/satisfaction or desire/interest subscales. Higher testosterone levels were not associated with higher desire/interest scores, but were associated with greater desire/frequency. This is an interesting finding, as testosterone has been advocated as a possible treatment for sexual dysfunction. One could argue that the findings in our PCOS study population represent the effects of long-term high serum testosterone levels on sexual function in a population of women at high risk for dysfunction, and that this population of women represents a naturally occurring biological model. In that regard, the otherwise pathologic condition of hyperandrogenemia was positively associated with better sexual functioning as seen in the total score and many of the subscales of the CSFQ. However, we do not know the duration of our subjects' hyperandrogenemia nor do we know the mechanism by which testosterone might affect sexual functioning in women with PCOS. Furthermore, it appears that the serum levels of testosterone that are required to produce a potential effect in this population of women are supraphysiologic and as such would have a negative overall effect on health. In fact, elevated serum testosterone levels in women with PCOS are associated with elevations in cholesterol and cardiovascular disease, and therefore, clinically require correction in this population. The mean serum testosterone levels in the <1 SD PCOS group in our study were within the normal serum levels, as previously published, for women of reproductive age who have regular menstrual cycles and are not hirsute [18].

Investigators have found that the physical features of PCOS have a significant effect on the psychological well-being of patients even beyond that of other chronic illnesses [19,20]. A recent study determined that both hirsutism and BMI were negatively associated with many psychological variables in women with PCOS [21]. Changes in physical appearance associated with PCOS may lead to decreased sexual satisfaction [8]. Therefore, we studied the associations between BMI, acne, and hirsutism on sexual functioning in this population of women. The only significant differences found between any of these variables and sexual dysfunction were in regard to BMI and orgasm/completion, with a greater percentage of obese women with PCOS affected by this problem as compared with their normal weight counterparts. Although this evidence does not clearly establish a relationship between increasing BMI and sexual dysfunction in women with PCOS, it is an area that requires further investigation. One could speculate that the effect of BMI on sexual functioning is related to a reduction in one's perception of sexual attractiveness. And although the same could be said for both acne and hirsutism, we did not find any association between these two variables and sexual dysfunction.

A high percentage of the women in our control group had sexual complaints related to specific phases of the sexual response cycle. In fact, approximately 81% of women in the control group had scores below the cut-point for dysfunction in the excitement/arousal subscale, and approximately 24% (20/82) had scores below the cut-point for dysfunction in the total CSFQ scale. Furthermore, the percentage of women in our control group who answered "yes" to taking either antidepressants or anxiolytic agents was similar, but higher than the percentage of women in the PCOS group who answered "yes" to taking these medications. This suggests that antidepressant or antianxiety medication use might have negatively affected sexual functioning in the control group. These data also suggest that the control group did not represent a population of women with an unusually high level of sexual functioning, reducing the likelihood of selection bias.

One recent study regarding sexuality and psychological well-being in women with PCOS used the nine-item McCoy questionnaire of female satisfaction and a Psychological General Well-Being Index [22]. These investigators found that almost half of the women with PCOS in their study thought that PCOS had a great effect on their sex life, and that women with PCOS were generally less satisfied with their sex lives. We elected to use the CSFQ to assess specific components of sexual functioning. The CSFQ has been used to evaluate the illness- and medication-associated changes in sexual functioning, and has high test-retest reliability. Its concurrent validity has been established with the Derogatis Interview for Sexual Functioning-Self-Report. Furthermore, our Cronbach's alpha score of 0.891 suggests a relatively high consistency between our test items. To our knowledge, this is the first study that has utilized the CSFQ to evaluate women with PCOS.

Our study has several limitations. First, we only had "yes/no" data in regard to our assessment of both hirsutism and acne, and a better assessment of the potential effects of these variables on sexual function in women with PCOS would require a continuous measurement of these parameters. Second, we did not have information on the relationship status of the participants in our study. And finally, we only had "yes/no" data in regard to both antidepressant and antianxiolytic medications and; therefore, could not comprehensively assess the potential effects of these pharmaceutical agents in either cases or controls. Sexual function is commonly impaired in couples affected by chronic illness, and depression screening is strongly recommended in women with sexual dysfunction [23].

Conclusions

The data from this study clearly indicate that there are not many differences in regard to sexual functioning between women with PCOS and controls, except in regard to orgasm/completion. Although the data from this study demonstrate that serum testosterone levels may play a significant role in sexual function in women with PCOS, further investigation is required to determine the potential effect(s) of BMI, acne, and hirsutism on sexual function in this population. Once both the components of sexual dysfunction and the variables that can cause these problems in women with PCOS are better understood, specific methods to treat these difficulties can be initiated. Effective treatment options in women affected by PCOS may include both psychological counseling and participation in support groups to help alleviate psychological components of this disease. Based on the data from this study, therapies that primarily reduce serum testosterone levels may not be effective in the treatment of sexual dysfunction in women with PCOS. However, treatment regimens that result in either weight reduction in obese women with PCOS or reductions in serum testosterone levels in women with hyperandrogenemia are of benefit to these patients from a metabolic perspective [3].

Acknowledgments

This study was funded by grant number R21 AT002520 from the National Center for Complementary and Alternative Medicine (NCCAM) at the National Institutes of Health, and Grant Number M01RR000847 from the National Center for Research Resources. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Center for Research Resources, NCCAM, or the National Institutes of Health.

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Table 1

Comparison of mean CSFQ total and subdomain sexual function scores and percent below the threshold for sexual dysfunction between women with PCOS and controls

Category	Threshold	PCOS	Controls	*P* value
Pleasure/satisfaction	≤4	3.23 ± 0.81	3.35 ± 1.01	NS
		78/92 (84.78)	61/82 (74.39)	NS
Desire/frequency	≤6	6.36 ± 0.71	6.70 ± 1.23	NS
		52/92 (56.52)	40/82 (48.78)	NS
Desire/interest	≤9	8.28 ± 1.64	8.43 ± 1.44	NS
		63/92 (68.48)	51/82 (62.20)	NS
Arousal/excitement	≤12	10.05 ± 2.01	10.21 ± 2.41	NS
		76/92 (82.61)	67/82 (81.71)	NS
Orgasm/completion	≤11	10.03 ± 3.89	11.67 ± 4.01	<0.001
		59/92 (64.13)	36/82 (43.90)	<0.01
Total score	≤41	46.59 ± 6.73	48.46 ± 7.09	NS
		25/92 (27.17)	20/82 (24.39)	NS

Numbers in ( ) are percentages

CSFQ = Changes in sexual functioning questionnaire; PCOS = Polycystic ovary syndrome; NS = not significant

Table 2

Comparison of sexual function based on mean CSFQ scores and the percentage of women with scores below the sexual dysfunction threshold in women with PCOS stratified by total serum testosterone levels

CSFQ category	T > 1 SD (>92 ng/dL)	T within 1 SD (33–92 ng/dL)	T < 1 SD (<33 ng/dL)	*P* values
Pleasure/satisfaction	2.5 ± 2.12	3.1 ± 1.35	3.5 ± 0.71	NS
	16/18 (88.9)	49/58 (84.5)	13/16 (81.2)	NS
Desire/frequency	6.5 ± 0.71 *	6.1 ± 1.89 *	6.0 ± 0.19	0.016
	6/18 (33.3)	36/58 (62.1)	10/16 (62.5)	NS
Desire/interest	9.5 ± 2.12	8.1 ± 2.59	8.5 ± 0.71	NS
	10/18 (55.6)	40/58 (69.0)	13/16 (81.2)	NS
Arousal/excitement	11.0 ± 1.41 *	9.7 ± 2.86 *	9.5 ± 3.54	0.021
	13/18 (72.2)	50/58 (86.2)	13/16 (81.2)	NS
Orgasm/completion	11.0 ± 5.66 *†	9.8 ± 3.43 *	8.5 ± 2.12 †	0.035 */0.023 †
	9/18 (50.0)	37/58 (63.8)	13/16 (81.2)	NS
Total score	49.0 ± 5.66 *†	45.5 ± 9.68 *	43.5 ± 7.78 †	0.015 */0.033 †
	2/18 (11.1)	18/58 (31.0)	5/16 (31.2)	NS

* and † denote groups compared, and the numbers in ( ) are percentages

CSFQ = Changes in sexual functioning questionnaire; PCOS = Polycystic ovary syndrome; NS = not significant

Table 3

Comparison of sexual function based on mean CSFQ scores and the percentage of women with scores below the sexual dysfunction threshold in women with PCOS stratified by BMI

CSFQ category	Normal BMI	Overweight	Obese	*P* values*
Pleasure/satisfaction	3.2 ± 1.27	3.3 ± 1.58	3.2 ± 1.23	NS
	24/29 (82.8)	6/8 (75.0)	48/55 (87.3)	NS
Desire/frequency	6.3 ± 1.65	5.9 ± 2.23	6.4 ± 1.74	NS
	17/29 (58.6)	4/8 (50.0)	31/55 (56.4)	NS
Desire/interest	8.4 ± 2.70	8.4 ± 2.92	8.2 ± 2.40	NS
	29/29 (65.5)	6/8 (75.0)	38/55 (69.1)	NS
Arousal/excitement	10.1 ± 2.67	9.3 ± 3.37	10.1 ± 2.61	NS
	25/29 (86.2)	7/8 (87.5)	44/55 (80.0)	NS
Orgasm/completion	10.2 ± 3.45	10.6 ± 4.41	9.8 ± 3.01	NS
	16/29 (55.1)	4/8 (50.0)	39/55 (70.9)	<0.05
Total score	47.4 ± 9.60	46.6 ± 13.0	46.2 ± 8.13	NS
	8/29 (27.6)	2/8 (25.0)	15/55 (27.3)	NS

*Comparisons are between obese to normal weight women. Definitions for body mass index (BMI) categories in kg/m^2 are normal (18.5–24.9), overweight (25–30), and obese (>30), and the numbers in ( ) are percentages

CSFQ = Changes in sexual functioning questionnaire; PCOS = Polycystic ovary syndrome; NS = not significant