Pelvic floor muscle dysfunction in women with polycystic ovary syndrome: a comparative study

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Objectives: To compare the prevalence of pelvic floor muscle dysfunction (PFMD) in patients with and without polycystic ovary syndrome (PCOS); to test PFMD in women with different PCOS phenotypes.

Methods: This was a case-control study of 202 women who were recruited in an infertility clinic in Hormozgan, Iran: PCOS (n=103) and control groups who were healthy women whose husbands were diagnosed with male infertility (n=99). According to the presence or absence of menstrual dysfunction (M), hyperandrogenism (HA) and polycystic ovaries on ultrasonoghraphy (PCO), patients with PCOS were divided into three phenotypes: HA+PCO, M+PCO and M+HA+PCO. PFMD was assessed by the Pelvic Floor Distress Inventory-20 (PFDI-20.

Results: The reported PFMD symptoms were higher in PCOS (P=0.05) than the non-PCOS group. The mean PFDI score in the HA+M+PCO was higher compared to other phenotypes, although the difference did not reach significance level (P>0.05). The mean LH level was higher in HA+M+PCO than the two other phenotypes. There was a significant positive correlation between LH level and PFDI score (P<0.04).

Conclusion: The findings suggest that a high level of LH may cause PFMD. Further studies are needed to determine the precise role of LH levels and potential treatment options in women with PCOS and PFMD.

Keywords: polycystic ovary syndrome, pelvic floor distress inventory, pelvic floor muscle dysfunction

Introduction

Pelvic floor muscle dysfunction (PFMD) is associated with a number of clinical conditions including urinary incontinence, fecal incontinence, and pelvic organ prolapse (9). Studies have shown benefits from the use of androgens and anabolic steroids to increase muscle mass and strength (2-4). Some animal studies have demonstrated that androgens may have a potential role in the restructuring of the urinary tract and pelvic floor muscles as androgen receptors are abundant in these structures (3, 5, 6).

Polycystic ovary syndrome (PCOS) is the most common cause of increased androgen levels in the women (1). A recent study showed a higher prevalence of urinary incontinence in a non-PCOS control group compared with a PCOS group (8). Montezuma (2011) reported higher prevalence of urinary incontinence in a control group of obese women compared with a PCOS group (9) while another study showed increased abdominal pressure related to obesity which caused pudenda nerve tension and pressure on the pelvic floor muscle (10). Due to the association of obesity and PCOS related hyperandrogenism, it seems that the women with PCOS have more muscle mass than the general population (11).

PFMD may cause significant morbidity for women including pelvic floor muscle relaxation, pelvic organ prolapse, pelvic organ dysfunction, dyspareunia, back pain, sexual dysfunction reduced sexual satisfaction and their quality of life (12). The cost of treatment of PFMD is estimated to cost more than one billion dollars per year in the United States (13). Despite the high prevalence of PCOS and PFMD separately, there is little known about the effects of PCOS or different PCOS phenotypes on PFMD. There is no comprehensive study relating PFMD affecting the bladder, anorectal and pelvic organs, or evaluations of the combined effects of these conditions on individual women's quality of life and the health care system as a whole. Given the importance of women's reproductive health issues in the economic and social development of countries, the high prevalence of obesity in patients with PCOS, which is correlated with PFMD, the researchers of this study were encouraged to undertake this study. The purpose of this study was a): to compare the prevalence of PFMD in patients with and without PCOS; b) to test the PFMD according to different PCOS phenotypes.

Methods

Design and data collection

This was a case-control study of women with PCOS who attended an infertility clinic in Omeliela Hospital, Hormozgan Province, Iran from May to September 2014. This clinic is the only referral center for infertility in Province, Iran. The sample size (202) was calculated using Antonio et al's study findings (2013) (14). Patients with a confirmed diagnosis of PCOS were invited to participate in the study as case group. After explaining the study objectives, written consent was obtained from each patient. Women were randomly allocated to PCOS (n=103), and control groups; the PCOS women were healthy women whose husbands had male infertility (n=99). The women were requested to complete the study questionnaires in the clinic.

Patients were eligible if they met each of the criteria in Table 1. The Human Reproduction and Embryology (ESHRE) in 2003 established new criteria for diagnosis in order to standardize the working definition of the syndrome. According to the presence or absence of menstrual dysfunction (M), hyperandrogenism (HA) and polycystic ovaries on ultrasonoghraphy (PCO), patients with PCOS were divided into three phenotypes: HA+PCO, M+PCO and M+HA+PCO.

Measures

1. Menstrual history: patients' menstrual patterns during the preceding 12 months were categorized to < 21 days, 21-34 days, 35-60 days (oligomenorrhea), > 199 days (amenorrhea) and variable.
2. BMI: weight and height were calculated by weight/ height squared [kg/m2] in all patients.
3. Body hair: Clinical assessment of hirsutism was determined using the Ferriman-Gallwey Scoring System (F/G score). Nine body sites (the upper lip, chin, chest, upper back, lower back, upper abdomen, lower abdomen, arm, and thigh) were graded by researcher from 0 (no terminal hair) to 4 (severe hirsutism). Scores can range from zero to 36. A score of seven or above was considered positive for hirsutism (15).
4. Acne: the Global Acne Grading System (GAGS) determined acne in six locations on the face and chest/upper back, with a factor for each location based toughly on surface area, distribution, and density of pilosebaceous units. Each of the six locations was graded separately on 0-to-4 scale, with the most severe lesion within that location determining the local score and a global score produced as a summation of all local scores (16).

5. PFMD: PFMD was measured by the Pelvic Floor Distress Inventory–20 (PFDI-20), a valid and reliable condition specific questionnaire that serves as both a symptom inventory and a measure of the degree of symptoms and distress that are caused by PFMD. The PFDI consists of 20 questions that are separate into 3 subscales: the Pelvic Organ Prolapse Distress Inventory–6 (POPDI-6), the Colorectal-Anal Distress Inventory–8 (CRADI-8), and the Urinary Distress Inventory–6 (UDI-6). With these inventories, the respondents are asked whether they experience specific symptoms and, if so, the degree to which the symptom bothers them on a 4-point scale from "Not at all" to "Quite a bit." Each subscale is scored from 0-100; higher scores indicate greater symptom burden. The PFDI-20 total score is the sum o these 3 subscale scores (0-300) (17).

6. Socio-demographic status: The study used years of formal education as a measure of socioeconomic status and it was categorized into five levels: no education, first level (1 to 5 years), second level (6–9 years), third level (10–12 years) and fourth level (more than 12 years). Studies from Iran showed that education can be a good proxy measure for socioeconomic status for Iranians (18).

7. Laboratory measures: An overnight 8- hour fasting venous blood sample was obtained from each patient. Follicle- stimulating hormone (FSH) and Luteinising hormone (LH) were assessed in all participants by ELIZA (DRG Instruments GmbH, Marburg, Germany).

Statistical analysis

Data were presented as mean± Standard Deviation (SD) and frequency (percent) for quantitative and qualitative variables, respectively. Pearson Chi square test was used for comparing the percents of demographic variables in two groups. Ordinal demographic variables were compared in two groups by Mann-Whitney U test. Independent samples t-test was utilized for the comparison of the means of in two groups. Data analysis was carried out using the SPSS, version16. P values were set as 0.05 for all analyses.

Ethical considerations

The Ethics Committee of the Hormozgan Medical University approved the study.

Results

The study sample

Overall, 202 women were included in the study during the five-month enrollment. Socio-economic and clinical characteristic of the patients are presented in Table 2. There were no significant differences in the socio-economic and clinical characteristics of the patients between groups except for BMI, menstrual interval, LH level and having infertility (P<0.05).

Comparison of sum scores of PFDI-20

Analysis of the subscale of PFMD showed a significant difference in the POPDI-6 domain of two groups (P=0.05) (Table 3). The reported PFMD symptoms were higher in the PCOS group.

Multivariable linear regression was performed for factors that were significantly associated with POPDI-6 (Table 2). PCOS status was a significant factor associated with POPDI-6 (adjusted R2= 0.14) (Table 4).

Comparison of sum scores of PFDI-20 according to PCOS phenotypes

PFMD was higher in HA+M+ PCO (30.50± 31.51) and HA+ PCO (20.62 ± 13.32) than M+PCO (17.35±19.55), although it did not reach statistically significant difference (P>0.05).

There are a positive correlation between LH level and PFDI-20 score (P=0.04). Moreover, the LH level mean was higher in HA+M+PCOS (9.40±5.74) was higher than HA+PCO (8.94±6.51) and M+PCO phenotypes (6.47±4.28) (P<0.05).

Discussion

This is the first study that simultaneously examined pelvic organ prolapse distress, the colorectal-anal distress, and the urinary distress in PCOS. The pathogenesis and etiology of PFMD is not well known. A number of factors have been associated with this condition including age, parity, smoking, obesity and chronic respiratory disease (14); damage to the connective tissue of pelvic floor from trauma at childbirth and increased intra-abdominal pressure resulting from obesity and chronic cough (15, 16). In the present study, there were no significant differences between different phenotypes of patients related to these characteristics.

Although previous studies report that PCOS might act as a protective factor against PFMD due to the high number of androgen receptors in these structures, our results did not support this. In this study, we demonstrated that PFMD was no lower in PCOS compared to the healthy group. Antonio et al (2013) have shown that pelvic floor muscle strength in PCOS women does not differ from a control group (14). Other studies by Montezuma et al (2011) also reported no significant difference in frequency of reports of urine loss between the PCOS and control groups with normal BMI and BMI>25. However, the level of hyperandrogenism in PCOS that would be protective against PFMD is unknown.

The phenotype of PCOS with high androgen (HA+M+ PCO) is expected the prevalence of PFMD be lower than two other. On contrary, from this study we found that PFMD was higher in HA+M+ PCO phenotype than the other two. Analysis of previous studies (2, 19) showed that PCOS phenotypes had different hormonal and metabolic patterns. In particular, HA+M+PCO phenotypes was associated with elevated LH (14) that agreement with our finding. On the other hand, based previous studies related to expression of luteinizing hormone receptor (LHR) in pelvic floor compartments suggest that high LH level on postmenopausal women may contribute to pelvic floor relaxation and increased incidence of PFMD (20). In present study, a higher LH level in HA+M+PCO may cause pelvic floor relaxation and therefore PFMD than in the two other phenotypes of PCOS. However, there is a need for further studies with larger samples to confirm the real effect of different phenotypes of PCOS.

The present study extends previous researches by describing the relationship between pelvic organ prolapse distress, colorectal-anal distress, and urinary distress by considering different phenotypes of PCOS. There were a few limitations in this study. Firstly, as the data were self-reported by the participants, the possibility of inaccurate reporting cannot be excluded. We used the PFDI-20 as a measure of PFMD. This could result in misclassification of some participants. Symptoms based diagnosis could underestimate the real prevalence of PFMD. Secondly, due to the cross-sectional nature of the study, it is difficult to determine the causality. Participants in this study were selected by convenience sampling, which limits the generalizability of findings. Samples from individuals who voluntarily attend a clinic may differ from that of the general population, although it was a merit to ours with unbiased diagnosis of PCOS. A lack of other tests such as physical examination for pelvic organ prolapse, valsalva or cough test for stress incontinence and urodynamics is

another limitation. Finally, we used a self-reported hirsutism and acne score as marker of androgen level rather than blood androgen levels. Therefore, the results of the present study have to be interpreted with some caution. Further studies are now needed with regard to larger samples, including community participants, and more comprehensive evaluation of pelvic floor structures.

Conclusion

The findings suggest that high level of LH may be cause to PFMD. Further studies are needed to determine the precise role of LH level and potential treatment options in women with PCOS and PFMD.

Conflict of interest

The authors declare that they have no conflict of interest.

Authors' Roles

All authors were involved in designing of the study, data collection and analysis, interpretation of results and manuscript preparation. All authors read and approved the final manuscript.

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Table 1: Inclusion criteria

15–40 years of age
Married
Not having given birth during last three months
Absence of non-classic adrenal hyperplasia, thyroid dysfunction, hyperprolactinemia
Non-smoking
Non-chronic cough (bronchitis) during the last three months
Lack of gastrointestinal disease, asthma, diabetes, urinary tract infection
Ability to speak and understand
Iranian
Not taking any prescription medication (except allergy medications and occasional pain medications) for at least three months before entering the study
Having two of the following Rotterdam diagnostic criteria: 1) Polycystic ovaries visualized on ultrasound scan (presence of 12 follicles or more in one or both ovaries and/or increased ovarian volume i.e., >10 ml), 2) Clinical signs of hyperandrogenism (hirsutism score based on hirsutism score greater than 7 or obvious acne) , 3) Having an interval between menstrual periods >35 days and/or amenorrhea, defined as the absence of vaginal bleeding for at least 6 months (i.e. 199 days).

Table 2: Characteristics of participants (n=202)

Variable	PCOS (n=103)	Control (n=99)	P value
Age (years)*	28.76± 5.33	28.48±4.87	0.69
Education (years) *	10.98±4.24	10.65±3.89	0.58
Acne score*	2.05±4.68	2.20±.3.93	0.81
Interval between menstruation(days) **			
<21	3(2.9)	9(9.1)	<0.001
21-34	35(34)	78(78.8)	
35-60	23(22.3)	2(2)	
>199	17(16.5)	5(5.1)	
Variable	25(24.3)	4(4)	
Having infertility **	90(87.4)	98(99)	0.001
BMI**			
<25	47(45.6)	69(69.7)	0.001
≥25	56(54.6)	30(30.3)	
Parity *	0.17 ± 0.45	0.10±0.33	0.41
FG>7 **	32(31.1)	28(28.3)	0.66
LH*	8.02±5.85	5.94±3.69	0.003
FSH*	6.43±5.27	6.07±2.42	0.64

* Mean± SD

**Frequency (percent)

Table 3: Comparison of sum scores of PFDI and subscales among participants (n=202)

Group	Pelvic Organ Prolapse Distress Inventory–6	Colorectal-Anal Distress Inventory–8	Urinary Distress Inventory–6 (UDI-6)	Total scores of PFDI-20
PCOS (n=103)	10.08± 10.93	2.96±7.29	6.63±13.2	20.25±22.23
Control (n=99)	8.08±12.10	2.82±5.94	5.95±11.67	17.11±26.50
P value	**0.05**	0.87	9.69	0.36

Table 4: multiple linear regression: factors that significant affect PFMD **(n=202)**

Variable	S.E	t	β	P value
PCOS status	0.32	3.81	1.24	**<0.001**
Age	0.34	-0.34	-0.12	0.72
Education	0.44	-1.23	-0.55	0.21
BMI	0.39	1.40	0.54	0.16
Parity	0.39	0.49	2.19	0.61