Prevalence of Pelvic Floor Dysfunction Among Women with Polycystic Ovarian Syndrome: A Case- Control Study

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ABSTRACT

Background: Pelvic floor dysfunction (PFD) involves a 333large array of conditions that negatively impact many women around the world. Polycystic ovarian syndrome (PCOS) is another disorder with long-term serious consequences. Being a disease of hormonal imbalances, PCOS may possibly affect the function of the pelvic floor muscles leading to PFD. **Purpose**: To explore the incidence of PFD among women with PCOS. **Methods**: This is an observational, case–control study. A total of 368 women, aged from 20 to 35 years, with a body mass index (BMI) range of 20 to 30 kg/m^2 recruited from Kasr El-Ainy university hospital. They were classified into case- group (PCOS patients; n=184) and control group (healthy participants, with matched age and BMI for comparison; n=184). All case- group women were diagnosed with PCOS, based on Rotterdam diagnostic criteria, while the control group women had regular menstrual cycles. Pelvic Floor Distress Inventory-20 (PFDI-20) was used to identify PFD in the tested groups. **Results**: 368 women were involved in the study with Age and BMI of 28.48±4.87 years and 25.9±5.8 kg/m2, respectively for the control group, and 28.76±5.33 years and 27±6.1 kg/m2, respectively PCOS group, with non-significant difference between groups (P > 0.05). The PFDI-20 score, the control group scored 17.11±26.50, while the PCOS group was 26.25±22.23. There was a statistically significant difference in the mean PFDI-20 total values between both groups (P=0.002). **Conclusion**: PFD was prevalent among women with PCOS, compared to the control group, suggesting a possible link between both conditions.

Keywords: Pelvic Floor Disorders, Polycystic ovary syndrome, Hyperandrogenism.

INTRODUCTION

Pelvic floor dysfunction (PFD) refers to a group of disorders that is connected to abnormal functioning of the pelvic floor structures. This abnormality in the function results from impaired coordination of the pelvic floor musculature, increased muscular activity, named as hypertonicity, or, on the contrary, decreased activity (i.e., hypotonicity) [1].

The PFD problems resulting from the pelvic floor muscles' hypotonicity involve urine and/or fecal incontinence, as well as pelvic organ prolapse [2]. The prevalence of PFD is estimated to be between 23 to 49 % of women wide world [3], with a possible increase in its incidence by 2050, according to Walker et al. Though, pelvic floor diseases often go unnoticed, either because they are socially stigmatized or due to the lack of access to the resources. As a result, the true scope of the problem remains unknown, especially among women of poor nations [4].

Several causes were proposed for the weakness of the pelvic floor structures. A long-term consequence of obesity, metabolic syndrome [5], mechanical injuries and ischemia [6], aging, and age-related hormonal changes [7] are among those causes. Moreover, inflammation could affect collagen fibers that may eventually cause pelvic floor muscles (PFMs) structure alternation [5].

One of the conditions that can greatly affect the structure and function of PFMs is polycystic ovarian syndrome (PCOS), a common endocrinal disorder that largely affects women in their reproductive age, with a prevalence reaching 5% to 15% [8]. According to the Rotterdam criteria, PCOS can be diagnosed with the presence of two out of the following three criteria: (1) oligomenorrhea/anovulation, (2) clinical /biochemical hyperandrogenism, and (3) polycystic ovaries [9]. PCOS is known to have a long-term negative impact on endocrine, metabolic, and cardiovascular health, as well as quality of life [10]. Whether PCOS can negatively or positively affect pelvic floor structures remains elusive. Being a disease of hyperandrogenemia [11], some studies have found a positive effect of PCOS on PFM thickness due to the presence of androgenic receptors abundantly within pelvic floor structure. That makes PFMs sensitively respond to the hormonal changes [12]. On the other hand, PCOS is closely related to a persistent low-grad inflammation that gradually affect the collagen fibers, thus, increases the liability of pelvic floor structure to injury [5]. Nevertheless, another research by Antônio et al has found no difference in PFM strength between PCOS women and those who did not have the syndrome [13]. Contradicting findings necessitated further research regarding the effect of PCOS on PFMs, in form of causing PFD. Yet, no study was conducted to explore the prevalence of PFD in Egyptian women having PCOS. Therefore, this study aimed to investigate the extent by which PFD was prevalent among Egyptian women confirmedly diagnosed by PCOS.

Materials and methods

Study design and ethical approval

This study was designed as an observational, case–control study to assess the presence of PFD in women with PCOS, compared to a control group that included women free of the condition. The study was approved by the Ethics Committee of the faculty of physical therapy, Cairo university (No: P.T.REC/012/003686). All the participants were provided by a full explanation of the study aims and rationale as well as a declaration about the questionnaire used for collecting the data, to gain their confidence and co-operation. They were assured of their rights to withdraw from the study any time and their data

confidentiality. Following that, an informed consent form was signed from each woman before joining the study. The research study was conducted from January to July 2022.

Participants and study settings

Non-probability, convenience sampling technique was used to initially recruit 380 women for the case and the control group, form the women's health outpatient clinic of Kasr El-Ainy university hospital, Giza. The recruitment process was done by directly interviewing women. They were, then, screened according to the eligibility criteria.

The women were included in the case group when their age ranged from 20 to 35 years, with a body mass index (BMI) range of 20 to 30 kg/m^2. They had PCOS, diagnosed by the gynecologist, according to Rotterdam diagnostic criteria [9]. The women in the control group were included when they had matched age and BMI, nulliparous, having normal ovulatory menstrual cycles (i.e., inter-cycle interval of 26 to 33 days), with no signs or symptoms of PCOS or hyperandrogenism. The exclusion criteria included pregnant, multiparous, and postmenopausal women, an avulsion of the levator ani muscles, and receiving hormonal treatment within three months of the study beginning.

The demographics of all women in both groups, involving age, weight, height, and BMI were obtained. Additionally, past, present and menstrual history were taken and recorded in a sheet for data collection.

Assessment of the PFD presence in both groups

The main study outcome, represented by PFD presence, was evaluated using the pelvic floor distress inventory-20 (PFDI-20). The PFDI-20 is an instrument that was originally developed and validated by Barber et al [14]. It is one of the well-known condition-specific questionnaires used to assess PFD and quality of life in women. The PFDI-20 consists of three scales to measure three different aspects of the PFD; (1) the Urinary Distress Inventory, (2) the Pelvic Organ Prolapse Distress Inventory, and (3) the Colorectal-Anal Distress Inventory. Each scale of the PFDI-20 is scored from 0 (least distress) to 100 (greatest distress). The sum of the scores of these 3 scales serves as the overall summary score of the PFDI-20 that ranges from 0 to 300 [14]. The questionnaire was administered in the form of a personal interview by an independent single examiner, who was not aware of the participants' allocation.

Statistical analysis:

Sample size calculation was performed using G*POWER statistical software (version 3.1.9.2; Franz Faul, Universitȁt Kiel, Germany), based on a pervious study by Thais et al [15], and revealed that the appropriate sample size for this study was N= 380, which gave observed power equal to 0.8. Calculations were made using α=0. 05 and an effect size of 0.29.

Statistical analysis was performed by using IBM SPSS Statistical Software, version 24. Continuous variables were represented using mean and standard deviation (SD). Unpaired t test was chosen to detect any statistical significance between the two groups.

Results

Overall, 380 women were primarily selected and explored for eligibility. A total of 368 women met the inclusion criteria, accepted to participate in the study and were included during the five-month enrolment. Regarding general characteristic of the participants, as presented in Table 1, there were no statistically significant differences in the mean values of general characteristics

between women in the PCOS and the control groups ($p<0.05$).

Table 1. General characteristics of Women in both groups.

Variable	Mean ± SD		P-value
	PCOS group (n=184)	Control group (n=184)	
Age (years)	28.76±5.33	28.48±4.87	0.69
Height (cm^2)	165.5±15	168.4±17	0.4
Weight (kg)	70.2±6.1	73,4±5.8	0.2
BMI (kg/m^2)	27±6.1	25.9±5.8	0.2

SD, standard deviation; PCOS, polycystic ovary syndrome; P-value, significant difference at $P < 0.05$.

For the PFDI-20, as presented in Table 2, the mean scores ± SD of pelvic organ prolapse distress inventory-6, colorectal-anal distress inventory-8, and urinary distress inventory-6 scales, as well as the total PFDI-20 scores were 7.51±5.34, 5.33±4.12 13.41±12.77, and 26.25 ± 22.23, respectively for the PCOS group, and 8.08 ± 12.10, 2.82 ± 5.94, 5.95 ± 11.67, and 17.11 ± 26.50, respectively for the control group. The unpaired t test results between groups have shown that there were statistically significant differences in the mean scores of the group for both, the urinary distress inventory-6 (P=0.001*) and the PFDI-20 total score (P=0.002*). Whereas analysis has indicated no statistically significant difference between the PCOS and the control group in neither the colorectal-anal distress inventory-8 (P=0. 2), nor the pelvic organ prolapse distress inventory- 6 (P=0. 07).

Table 2. Comparison of scale scores and total scores of PFDI between both groups.

Variable	Mean ± SD		P-value
	PCOS group (n=184)	Control group (n=184)	
Pelvic organ prolapse distress inventory- 6	7.51±5.34	8.08±12.10	0.07
Colorectal-Anal distress inventory- 8	5.33±4.12	2.82±5.94	0.2
Urinary distress inventory-6	13.41±12.77	5.95±11.67	0.001*
PFDI-20 (total score)	26.25 ± 22.23	17.11 ± 26.50	0.002*

SD, standard deviation; PCOS, polycystic ovary syndrome; *, significant difference at $P < 0.05$.

Discussion

The current study aimed at investigating the presence of PFD among PCOS women, compared to women without the condition. The results of the present study confirmed the hypothesis that hyperandrogenic women with PCOS had a significantly higher prevalence of PFD than the control group. More specifically, the women of the PCOS group had reported urinary incontinence more than the women of the control group did, while no statistically significant differences were noticed between both groups regarding the reporting of fecal incontinence nor pelvic organ prolapse. These findings could be explained on the basis that PFMs contain collagen that could be greatly altered under the effect of the persistent state of low-grade inflammation that is concomitant with PCOS [5].

The findings of the current study confirmed that there no statistically significant difference in reporting pelvic organ prolapse among the women of both

groups, based on the scores of pelvic organ prolapse distress inventory- 6 scale. These findings were not congruent with those of the study done by Taghavi et al, who found that pelvic organ prolapse was more common in women with PCOS, particularly those with a hyperandrogenic phenotype, menstrual cycle abnormality, and polycystic ovary ultrasonography [16].

Though the level of hyperandrogenism in PCOS that would be protective against PFD was unknown, a study by Montezuma et al claimed that PCOS might act as a protective factor against PFD due to the high number of androgen receptors in these structures [15]. That claim was supported by Micussi et al, who stated that women with PCOS had lower PFD than the general population, and surprisingly, reported a higher prevalence of urinary incontinence in the obese women of the control group compared to the PCOS group [17]. The findings of both studies were contradictory to the results of the present study, as there was a higher reporting in the urinary incontinence between the PCOS compared to the control group. Also, PCOS group had higher PFD, according to their higher scores of the PFDI-20, compared to the control group.

A different claim was reported by Antonio et al, who have shown no difference in the PFMs strength between PCOS women and those of the control group [13]. Likewise, another study has indicated no significant difference in the frequency of reporting urine loss between the PCOS and control groups with normal BMI and BMI>25 [18]. On contrary, this study showed that the women in PCOS group had higher scores in the urinary distress inventory-6 domain of PFDI-20, compared to the non-PCOS group (control) of a matched BMI.

The present study is the first to explore the prevalence of PFD among a large sample of women having PCOS. The study employed a valid and reliable instrument to test the hypothesis. Also, the assessor was blinded to the women's allocation, which provided more accurate and unbiased evaluation.

Though this study provides objective findings with statistically significant differences, it has some limitations. The PFDI-20 was administered in its original language by the examiner, as the questionnaire has not been translated into Arabic yet while for more accurate results, an Arabic translated version could be used. Further research is needed to investigate the prevalence of each PFD condition alone in women having PCOS. Also, more prospective studies on large sample are required to explore the effects of PCOS on PFMs.

Conclusion

The findings of this study proved an increased incidence of PFD, especially, urinary incontinence, in women with PCOS. This supports the role of PCOS in the development of PFD.

Abbreviations:

PFD: Pelvic floor dysfunction.

PFMs: Pelvic floor muscles.

PCOS: Polycystic ovarian syndrome.

BMI: Body mass index.

SD: Stander deviation.

PFDI-20: Pelvic floor distress inventory-20.

Declarations

Ethics approval and consent to participate: The study was approved by the Ethics Committee of the faculty of physical therapy, Cairo university (No: P.T.REC/012/003686). All the participants were provided by a full explanation of the study aims and rationale as well as a declaration about the questionnaire used for collecting the data, to gain their

confidence and co-operation. They were assured of their rights to withdraw from the study any time and their data confidentiality. Following that, an informed consent form was signed from each woman before joining the study.

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