CLINICAL SCIENCE

Assessment of symptoms of urinary incontinence in women with polycystic ovary syndrome

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OBJECTIVES: The pelvic floor muscles are sensitive to androgens, and due to hyperandrogenism, women with polycystic ovary syndrome can have increased mass in these muscles compared to controls. The aim of this study is to compare reports of urine leakage and quality of life between women with and without polycystic ovary syndrome.

METHODS: One hundred thirteen 18- to 40-year-old nulliparous women with polycystic ovary syndrome or without the disease (controls) were recruited at the University Hospital of School Medicine of São Paulo University at Ribeirão Preto City, Brazil. The subjects were not taking any hormonal medication, had not undergone previous pelvic surgery and did not exercise their pelvic floor muscles. The women were divided into the following four groups: I- polycystic ovary syndrome with normal body mass index (n = 18), II- polycystic ovary syndrome with body mass index $\geq$25 (n = 32), III- controls with normal body mass index (n = 29), and IV- controls with Body Mass Index $\geq$25 (n = 34). Quality of life was evaluated using the SF-36 questionnaire, and the subjects with urinary complaints also completed the International Consultation on Incontinence Questionnaire Short Form to evaluate the severity of their urinary incontinence.

RESULTS: The replies to the International Consultation on Incontinence Questionnaire Short Form revealed a significant difference in urinary function between groups, with 24% of the subjects in group IV reporting urinary incontinence. The mean scores for the SF-36 questionnaire revealed that group II had the lowest quality of life.

CONCLUSIONS: The control obese group (IV) reported a higher prevalence of urinary incontinence. There was no difference in the reported frequency of urine loss between the polycystic ovary syndrome and control groups with normal body mass index or between the polycystic ovary syndrome and control groups with body mass index $\geq$25.

KEYWORDS: PCOS; Androgens; Pelvic floor muscle; Urinary incontinence; Quality of life.

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INTRODUCTION

Polycystic ovary syndrome (PCOS) is one of the most common endocrine disorders in women of reproductive age, affecting an average of seven percent of all women of reproductive age. PCOS is associated with clinical and biochemical hyperandrogenism, menstrual irregularities, and acne.[1,2]

It is commonly known that the use androgens and anabolic steroids increases muscle mass and strength. Because of the characteristics of obesity and hyperandrogenism in PCOS, it is plausible that women with PCOS may have an increased muscle mass relative to controls. Anthropometric characteristics, including excess fat mass, percent body fat, and body fat androgen distribution, have been well documented in PCOS.[3] However, only a limited amount of information is available regarding the possible connection between PCOS and increased muscle mass in general.[3]

The association between obesity and PCOS was first described by Stein and Leventhal.[4] Obesity among women with PCOS has implications for general health and is also a risk factor for pelvic floor dysfunction.[5,6] Obesity can increase intra-abdominal pressure and thus expose the pelvic support structures and organs to a chronic state of stress, with subsequent pelvic floor muscle fatigue and/or chronic stretch of the pudendal nerve.[7] According to some studies, these structures are important for the maintenance of urinary continence; therefore, obesity represents a risk factor for urinary incontinence (UI).[8-10]

No potential conflict of interest was reported.

Recent studies have shown that androgens may potentially play an important role in changes in the pelvic floor and lower urinary tract, as the muscles in these structures—particularly the levator ani and the urethral sphincter—are sensitive to androgens.[11,12]

Urinary incontinence is a common health problem among women and is highly prevalent in older women; however, according to some studies, urinary incontinence is unexpectedly prevalent among young females as well.[13-15] Hägglund et al[13] investigated the prevalence of urinary incontinence among females with a special focus on younger women, and their principal finding was that urinary incontinence was reported by 23% of nulliparous women, with one-eighth of women below 30 years of age reporting problems with urinary incontinence.

Polycystic ovary syndrome (PCOS) typically manifests during the reproductive period, and no information is available on the prevalence of pelvic floor dysfunction (and urinary incontinence in particular) among women with PCOS.

Because there is a high incidence of obesity among women with PCOS, two counteracting variables might affect the function of the pelvic floor muscles and cause problems related to this function, including UI. These variables are obesity itself as a source of overload on the muscles of the pelvic floor and hyperandrogenism as a factor that is likely to improve the function of the pelvic floor muscles. In light of the paucity of previous studies regarding this topic, the objective of the present investigation was to assess UI rates, symptoms of urine loss and quality of life in obese and non-obese women with PCOS and to compare these findingm to obese and non-obese women without PCOS.

MATERIALS AND METHODS

We conducted an observational cross-sectional controlled study at the University Hospital, Faculty of Medicine of Ribeirão Preto, University of São Paulo (HC-FMRPUSP). The project was approved by the Research Ethics Committee of HC-FMRP (protocol no. HCRP 11165/2007), and each subject provided written informed consent prior to her participation.

The study included a sample of 113 women with PCOS and controls who were seen at this institution; they were divided into the following four groups: group I consisted of 18 women with normal body mass index (BMI) (between 18.5 and 24.9 kg/m^2) and PCOS; group II consisted of 32 overweight or obese women (BMI 25 to 39.9 kg/m^2) with PCOS; group III consisted of 29 women without PCOS and with normal BMI; and group IV consisted of 34 women without PCOS and with BMI $\geq$25 kg/m^2.

Subjects

The diagnosis of PCOS was based on the criteria of the 2003 Rotterdam Consensus,[16] as used by the Department of Endocrine Gynecology, HC-FMRP-USP. The following inclusion criteria were applied: nulliparous women age 18 to 40 years, no previous pelvic surgery or pregnancy, not engaged in training of pelvic floor muscles, and not using any hormonal medicine that could influence the muscle. We also excluded women with an androgen-secreting neoplasm, pituitary adenoma, adrenal hyperplasia, acromegaly or Cushing's syndrome.

Women with PCOS had clinical or biochemical hyperandrogenism, and the control women had normal ovulatory cycles (which ranged from 26 to 33 days).

Evaluation

Each subject completed the International Consultation on Incontinence Questionnaire (ICIQ-SF) to assess her UI symptoms; the questionnaire was validated and translated into Portuguese. Women who reported an involuntary loss of urine one or more times per week over the preceding three months were classified as incontinent.[17]

Each participant also completed a questionnaire to assess her health-related quality of life (SF-36), and the incontinent women additionally completed the International Consultation on Incontinence Questionnaire-Short Form (ICIQ-SF), which is a specific questionnaire that assesses the severity of UI symptoms. The ICIQ-SF consists of six questions on the subject's reports of urinary incontinence during the previous four weeks. Based on the responses to Q3, Q4, and Q5, a score is calculated from the sum of the score for each answer; this score ranges from zero (when there is no report of urine leakage, reflecting no impact on the quality of life) to 21 (highest severity of UI and the maximum impact on the quality of life). Based on the mean scores for Q3, Q4, and Q5, Klovning et al.[18] classified the index of severity of UI and related QOL into the following five levels: slight (1-5), moderate (6-12), severe (13 -18), and highly severe (19-21).

The SF-36 is a widely used and validated instrument that includes the following eight domains: functional capacity, limitation of physical aspects, pain, general health, vitality, social aspects, emotional aspects, and mental health. These eight domains range from 0 (zero) to 100 (one-hundred), where 0 = worst and 100 = best score for each domain.[19]

Statistical Analysis

We analyzed the data using the PROC MEANS and PROC FREQ features of the SAS 9.0 software program. A quantile regression model was used to analyze the quantitative variables[20] to compare the median K values between the various groups of interest. The results were obtained using the STATA software program.

The qualitative variables were analyzed with the Fisher's exact test using the SAS 9.0, PROC FREQ software program.

RESULTS

The mean age (and range) was 24.78 years (18-32) for group I, 28.75 years (18-38) for group II, 31.69 (23-39) years for group III, and 30.61 (21-38) for group IV. Groups II and IV were similar with respect to age ($p = 0.32$), whereas groups I and III were not ($p<0.01$). The groups were similar with respect to skin color ($p = 0.63$).

Table 1 shows the prevalence of UI in the four groups. Group IV had the highest prevalence (24%) of urinary loss and was followed by groups III, II, and then I. The Fisher's exact test revealed a difference between all four of the groups ($p = 0.04$). However, when the groups with similar BMI were examined (Table 2), we found no significant difference between groups I and III ($p = 0.52$) or between groups II and IV ($p = 0.08$).

An analysis of the ICIQ-SF results revealed no statistically significant differences between the groups with regard to the severity of the urinary complaints.

Table 1 - Prevalence of incontinence among the women in the four groups, and the association of the groups with reports of urinary incontinence.

Groups	n	Women with urinary loss (N)	Percentage of women with urinary loss	*p*-value
I- PCOS with normal BMI	18	0	0%	
II- PCOS with BMI ≥25 *kg/m²*	32	2	6%	0.04
III- Control with normal BMI BMI	29	2	7%	
IV- Control with BMI ≥25 *kg/m²*	34	8	24%	

Table 3 summarizes the average values that were obtained for each domain of the SF-36 in each of the various groups. Group II had the lowest averages with regard to functional capacity, limitation of physical aspects, pain, general health, vitality, social aspects, and mental health. A comparison of groups II and IV using the quantile regression model revealed significant differences in the functional capacity ($p<0.02$), general health ($p<0.01$) and social aspects ($p<0.01$) domains.

DISCUSSION

In the present study, we investigated the hypothesis that hyperandrogenism in women with PCOS might act as a protective factor against UI. This hypothesis was based on studies reporting that androgens can play an important role in changes in the pelvic floor and in the lower urinary tract, as the muscles of these structures—in particular, the levator ani and the urethral sphincter—express high number of androgen receptors and are therefore sensitive to androgens.[11,12,21,22] In addition, androgen receptors are present in the smooth muscle of various female urogenital tissues, thereby suggesting the importance of androgens in the lower urinary tract.[23]

In a 2011 study, Mammadov et al[24] verified the effect of testosterone treatment on the urodynamic findings and histopathomorphology of the pelvic floor muscle in female rats with experimental stress-induced urinary incontinence. These authors observed that after testosterone administration, there were increases both in pressure loss in the urodynamics findings and in the muscle's cross-sectional area.

Although the aforementioned hypothesis is plausible, the present study is the first to compare the frequency of reports of urine loss between women with and without PCOS. To help compensate for the effects of BMI, we investigated women with and without PCOS who were divided into groups of BMI that were <25 or ≥25. The two PCOS groups reported UI less frequently than did the control groups. The first analysis revealed a difference between the four groups; however, this difference disappeared when the groups were analyzed according to BMI. The difference between the four groups was due to the fact that the women with BMI ≥25 reported UI more frequently, and this effect was especially true in the group without PCOS. In this respect, these findings agree with previous reports that indicate that being overweight (and obesity in particular) has a negative effect on the structures of the pelvic floor by weakening the muscles and fascia that are important for maintaining continence and by possibly causing neurologic damage and increased intra-abdominal pressure.[7] Thus, obesity is a risk factor for the development of UI.[8-10]

The women in the control group with BMI ≥25 reported the highest prevalence of UI (24% of the women in this group) and presented the highest frequency of urine loss, the highest impact of urine loss on daily life and the highest number of activities that were affected by this loss.

An analysis of the results of the quality of life questionnaire (SF-36) revealed that the PCOS group with BMI ≥25 reported the lowest mean values with regard to functional capacity, limitation of physical aspects, pain, general health status, vitality, social aspects, and mental health. These results may be explained by previous studies that demonstrated that PCOS involves some risk factors for the development of cardiovascular disease, such as insulin resistance, dyslipidemia, diabetes mellitus, systemic arterial hyeon, endothelial dysfunction, central obesity, chronic pro-inflammatory markers, systemic arterial hypertension, and poor physical fitness.[5,25,26] A non-dipping blood pressure (BP) pattern can be considered to be an independent predictor of future cardiovascular events. A recent cross-sectional study by Kargili and collaborators[27] was performed to identify any relationship between changes in BP patterns during sleep and PCOS. Their study revealed that a non-dipping BP pattern is highly prevalent among PCOS patients. This condition contributes to the risk of developing cardiovascular disease in women with PCOS and to a subsequent decrease in the quality of life.

These factors, together with the other risk factor, obesity, tend to impair the quality of life of women with PCOS and with a BMI ≥25.[5,28]

According to a review by Spritzer,[29] women with hirsutism—which is highly prevalent among women with PCOS—experience marked psychosocial discomfort that

Table 2 - Comparison of the groups with the same BMI using the Fisher's exact test.

Groups	Urinary complaints				Total n	*p*-value
	No		Yes			
	n	%	n	%		
I- PCOS with normal BMI	18 0% 100%	0	0 0%	0	18	
III- Control with normal BMI	27 93%	93%%	2 7%	7	29	0.52
II- PCOS with BMI ≥25 *kg/m²*	30 94%	94	2 6%	6	32	
IV- Control with BMI ≥25 *kg/m²*	26 76%	76	8 24%	24	34	0.08

Table 3 - Average scores for each SF-36 domain within the different groups.

Domain	Group			
	I	II	III	IV
Functional capacity	95.56	80.65[a]	94.79	90.76[a]
Limitation of physical aspects	91.67	84.68	91.67	85.61
Pain	73.94	66.35	75.88	78.27
General health	72.50	68.77[b]	80.46	82.79[b]
Vitality	64.72	55.65	62.71	66.67
Social aspects	80.56	70.97[b]	84.90	83.33[b]
Emotional aspects	74.04	73.12	72.22	80.81
Mental health	66.22	60.77	65.67	70.18

[a] p-value = 0.02.
[b] p-value $<$ 0.01.
Quantile regression analysis comparing the PCOS group with BMI $\geq$25 to its control with the same BMI.

leads to conflicts that compromise their quality of life; we observed this situation in the present study as well.

The general quality of life that was evaluated in these women might not depend on UI, as several aspects were evaluated, and several studies that did not assess UI also indicated a poorer general quality of life among obese women with PCOS.

The hypothesis that PCOS may serve a protective role against UI is not supported by the present findings. However, some limitations of the present study should be discussed, and the most important of these is the fact that a convenience sample was used that only included nulliparous women. On one hand, this choice controlled the parity variable, which is known to be related to UI; on the other hand, the prevalence of UI among nulliparous women is much lower than among parous women. It should also be noted that, even though a validated instrument was used to assess the report of UI and although all interviews were conducted by one examiner, several studies have indicated that UI tends to be under-reported.[30,31] This effect may explain the seemingly small number of affected patients in this study, and it represents a limitation. Moreover, the stringent inclusion criteria may have also contributed to the small sample size.

It is also important to note that a physical examination was not performed. This omission represents another limitation of this study because a symptom-based diagnosis can underestimate the true presence of urinary incontinence when diagnosed by physical examination.

Despite these limitations, this first report should serve as the basis for future studies with representative stratified samples of nulliparous and multiparous women in which reports of UI can be correlated to androgen levels and PFM to clarify the impact of PCOS on these variables.

A higher percentage of obese women in the control (non-PCOS) group reported UI. There was no difference in the frequency of reports of urine loss between the PCOS group with normal BMI and its control group with normal BMI, nor between the PCOS group with BMI$\geq$25 and its control group with BMI$\geq$25. The quality of life of women with PCOS and BMI$\geq$25 is lower than that of women without PCOS.

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AUTHOR CONTRIBUTIONS

Montezuma T was responsible for the experiments. Antonio FI wrote the manuscript and performed the experiments. Rosa e Silva ACJS, Silva de Sá MF, Ferriani RA contributed to the final version of the manuscript. Ferreira CHJ contributed to the final version of the manuscript, conceived, and designed the experiments.

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