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ORIGINAL RESEARCH

Evaluation of pelvic-floor muscle function and urinary incontinence in college women: a cross-sectional study

Avaliação da função dos músculos do assoalho pélvico e incontinência urinária em universitárias: um estudo transversal

Evaluación de la función de los músculos del suelo pélvico y la incontinencia urinaria en universitarias: un estudio transversal

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ABSTRACT | This study evaluated the function and pressure of contraction of the Pelvic Floor Muscles (PFM) and the prevalence of Urinary Incontinence (UI) in university students. A cross-sectional study was conducted with nulliparous university students between 18 and 35 years old, who had already had sexual intercourse and never underwent physical therapy treatment for Pelvic Floor Muscle Disorders (PFMD). All volunteers underwent anamnesis, answered the International Consultation on incontinence questionnaire short form (ICIQ-SF) and the incontinence severity index questionnaire (ISI-Q), and had their PFM function and manometry evaluated. The Shapiro-Wilk test was used and the sample values are expressed in medians, interquartile ranges, absolute and relative frequencies. A total of 35 women were evaluated, 65.72% of whom had normal muscle tone, but only 5.71% performed adequate contraction of the PFM, with low medians for all stages of PERFECT and in the manometry of the PFM. The prevalence of UI was 57.14%, with Urgent Urinary Incontinence (UUI) being the most prevalent complaint (50%) and having moderate severity (55%). This study allowed to identify deficits in the role of PFM and high rates of UI in College Women, demonstrating the importance of making this public aware of this PFMD.

Keywords | Women's Health; Diaphragm of the Pelvis; Pelvic Floor Disorders.

RESUMO | O objetivo deste estudo foi avaliar a função e pressão de contração dos Músculos do Assoalho Pélvico (MAP) e a prevalência de Incontinência Urinária (IU) em universitárias. Realizou-se um estudo transversal, com universitárias entre 18 e 35 anos, nulíparas, que já tiveram relação sexual e que nunca realizaram tratamento fisioterapêutico para Disfunções dos Músculos do Assoalho Pélvico (DMAP). Todas as voluntárias realizaram a anamnese, responderam aos questionários *international consultation on incontinence questionnaire short form* (ICIQ-SF) e *incontinence severity index questionaire* (ISI-Q), e realizaram avaliação da função e manometria dos MAP. Foi utilizado o teste de Shapiro-Wilk e os valores da amostra são expressos em medianas, intervalos interquartílicos, frequências absolutas e relativas. Foram avaliadas 35 mulheres, das quais 65,72% apresentaram tônus normal, mas apenas 5,71% realizavam a contração adequada dos MAP, com medianas baixas para todas as etapas do *PERFECT* e na manometria dos MAP. A prevalência de IU foi 57,14%, sendo a Incontinência Urinária de Urgência (IUU) a queixa mais prevalente (50%) e com severidade moderada (55%). Este estudo permitiu identificar déficit na função dos MAP e altos índices de IU em universitárias, demostrando a importância de conscientizar esse público sobre essa DMAP.

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Descritores | Saúde da Mulher; Diafragma da Pelve; Distúrbios do Assoalho Pélvico.

RESUMEN | El objetivo de este estudio fue evaluar la función y presión de contracción de los músculos del suelo pélvico (MSP) y la prevalencia de incontinencia urinaria (IU) en estudiantes universitarias. Se realizó un estudio transversal, con estudiantes universitarias entre 18 y 35 años, nulíparas, que ya habían tenido relaciones sexuales y que nunca se sometieron a tratamiento fisioterapéutico para las disfunciones musculares del suelo pélvico (DMSP). Todas las voluntarias realizaron anamnesis, respondieron al cuestionario de consulta internacional sobre incontinencia – formulario corto (ICIQ-SF) y al cuestionario de índice de severidad de la incontinencia (ISI-Q), y realizaron la evaluación de la función y la manometría de los MSP. Se utilizó la prueba de Shapiro-Wilk, y los valores muestrales se expresan en medianas, rangos intercuartílicos, frecuencias absolutas y relativas. Se evaluaron a 35 mujeres, de las cuales el 65,72% tenía tono normal, pero solo el 5,71% realizó la adecuada contracción de los MSP, con medianas bajas para todos los estadios de *PERFECT* y en la manometría de los MSP. La prevalencia de IU fue del 57,14%, siendo la incontinencia urinaria urgente (IUU) la queja más prevalente (50%) y de gravedad moderada (55%). Este estudio permitió identificar déficits en el papel de los MSP y altas tasas de IU en estudiantes universitarias, demostrando la importancia de concienciar a este público sobre el DMSP.

Palabras clave | Salud de la Mujer; Diafragma de la Pélvis; Trastornos del Suelo Pélvico.

INTRODUCTION

Deficit in the function of the Pelvic Floor Muscles (PFM) can compromise their action and result in involuntary urination, called by the International Continence Society as Urinary Incontinence (UI)[1]. UI affects about 200 million people and is associated with physical and psychological morbidity and high social costs[2].

Several risk factors are related to UI in women, such as advanced age, pregnancy, obesity, estrogen deficiency, hysterectomy, among others[3], with a prevalence of UI of 25–45% in any age group[3]. In young women, this value is around 1–42.20%[4], but they still neglect UI, believing that it only occurs in elderly, pregnant and postpartum women[4].

There are few studies with university students related to UI[5-7], and none carried out the PFM assessment, attributing urinary symptoms only to voiding habits, behavior, and associated risk factors. PFM assessments are fundamental for Pelvic Floor Muscle Training (PFMT), a first-line treatment for UI[8], and contribute to women's knowledge about their own body[9], fostering the importance of knowledge and PFMT regardless of age, with the objective of assisting in the prevention and treatment of UI. Given the above, this study evaluated the function and pressure of contraction of PFM in university students, and the prevalence, type and severity of UI in this public.

The alternative hypothesis of the present study is that university students, even when not presenting the main risk factors related to UI[3], may complain of urinary loss and impair the function and pressure of PFM contraction.

METHODOLOGY

This is a cross-sectional observational analytical study, carried out at the School of Health Sciences of Trairí, a campus of the Federal University of Rio Grande do Norte (UFRN), in the period from 08/2019 to 03/2020, following the STROBE guidelines[10] and the volunteers signed an informed consent form.

The study participants were university students aged between 18 and 24 years, nulliparous, who had already had sexual intercourse and never underwent physical therapy treatment for Pelvic Floor Muscle Disorders (PFMD). Use of hormone replacement therapy, pelvic organ surgery, urogynecological infection, latex allergy, pelvic organ prolapse greater than grade II, obesity (Body Mass Index (BMI)[11] and cognitive and neurological disorders were exclusion criteria.

Sociodemographic and socioeconomic data, gynecological and urological history, anthropometric measurements with a stadiometer scale (WELMY, model 104A) were collected, and BMI was calculated according to the formula: BMI[11]. The international consultation on incontinence questionnaire short form (ICIQ-SF)[12,13] was applied to identify the presence and type of UI when there was a *score* ≥1[12], and the incontinence severity index questionnaire (ISI-Q) was used to assess the severity of UI[14,15] with severity classified as mild 1-2, moderate 3-6, severe 8-9 and very severe 10-12[15].

During the PFM evaluation, the participants were positioned in dorsal decubitus, with flexion

and abduction of the hips and knees at 45º, and were instructed not to perform synergistic muscle contraction (glutes, abdomen and hip adductors), the Valsalva maneuver[16] was performed as well as the PERFECT scheme to assess strength (P – *Power*), time of sustained contractions (E – *Endurance*), Repetitions (R – *Repetitions*) and fast contractions (F – *Fast*), using the modified Oxford scale to classify the *Power*[17] step. If they used the synergistic muscles during these contractions, the volunteers were classified as having inadequate PFM coordination. For PFM manometry, a manometer (Perina 996-2 Quark Medical; Piracicaba, São Paulo, Brazil) with a 0-60 cmH_2O graduation was used, with a probe coated with a non-lubricated male condom, covered with a water-based gel. The volunteer would then perform 3 maximum contractions with an interval of 20," and the average would be analyzed[18]. To minimize the sources of bias, the evaluations were carried out by a woman evaluator, trained and with 5 years of experience in this type of evaluation.

The sample was a convenience sampling and the data were stored and analyzed using GraphPAD version 8. The Shapiro-Wilk test was applied, which allowed to identify a non-parametric distribution, with values of median, interquartile range, absolute and relative frequency. The sample size considered the age range of the population of female university students included in the study, with a sample error of 10% and a confidence level of 90%, obtaining 42 female students as N.

RESULTS

A total of 35 university students were evaluated, with a sampling power of 83.33%. These women had a median age of 22.00 (20.00 – 2.00) years, BMI of 23.30 (21.20 – 24.90) kg/m^2, and most were of mixed race (57.14%). The volunteers reported menarche with a median of 12.00 (11.00–13.00) years, 97.14% were single and 94.29% were sexually active and used some kind of contraceptive (71.43%) (Table 1).

With regard to the PFM evaluation, the students presented normal muscle tone (65.72%) and inadequate PFM coordination (94.29%), with contractions associated with the gluteus (76.47%), abdomen (58.82%), hip adductors (52.94%) and/or apnea (14.70%). In *PERFECT*, the median *Power* was 3.00 (2.00-4.00), *Endurance* 4.56 (3.30-8.00), *Repetition* 3.00 (3.00-5.00) and *Fast* 07.00 (5.00-10.00), while the PFM manometry had a median of 12.00 (8.30-40.00) cmH_2O.

Table 1. Sample description (n=35)

Characteristic	n	%
Age [median (IQ)]	22.00 (20.00–22.00)	
BMI [median (IQ)]	23.30 (21.20–24.90)	
Race		
White	11	31.43
Black	4	11.43
Mixed race	20	57.14
Years of schooling [median (IQ)]	16.50 (14.50–17.00)	
Monthly household income		
≤1 monthly minimum wage	11	31.43
1 to 3 minimum wages	19	54.28
> 3 minimum wages	4	11.43
Chose not to answer	1	2.86
Marital status		
Single	34	97.14
Has a partner	1	2.86
Menarche [median (IQ)]	12.00 (11.00–13.00)	
Sexually active in the last month		
Yes	33	94.29
No	2	5.71
Uses contraceptive		
Yes	25	71.43
No	10	28.57
Voiding Complaint		
Urinary Continence	15	42.86
Urinary Incontinence	20	57.14

IQ: interquartile range; BMI: Body Mass Index. *Minimum wage values for 2019 (998 BRL).

Table 2. Assessment of the Pelvic Floor Muscles of all volunteers (n=35)

Characteristic	n	%
Tone		
Normal	23	65.72
Hypertonia	10	28.57
Hypotonia	2	5.71
Coordination		
Adequate	2	5.71
Inadequate	33	94.29
Gluteus AC	26	76.47
Abdomen AC	20	58.82
Hip adductors AC	18	52.94
Apnea	5	14.70
PERFECT [median (IQ)]		
Power	03.00 (02.00–04.00)	
Endurance	04.56 (03.30–08.00)	
Repetition	03.00 (03.00–05.00)	
Fast	07.00 (05.00–10.00)	
Manometry [median (IQ)]	12.00 (08.30–40.00)	

AC: associated contraction; IQ: interquartile range.

Table 3. Urinary data and pelvic floor muscle assessment of urinary incontinents (n=20)

Characteristic	n	%
UI	20	57.14
ICIQ-SF Total [median (IQ)]	07.00 (05.00–09.00)	
UI Type		
UUI	10	50.00
SUI	5	25.00
MUI	5	25.00
ISI-Q Total [median (IQ)]	03.50 (02.00–06.00)	
Mild UI	7	35.00
Moderate UI	11	55.00
Severe UI	2	10.00
Tone		
Normal	12	60.00
Hypertonia	6	30.00
Hypotonia	2	10.00
Coordination		
Adequate	1	5.00
Inadequate	19	95.00
Gluteus AC	14	70.00
Abdomen AC	11	55.00
Hip adductors AC	8	40.00
Apnea	2	10.00
PERFECT [median (IQ)]		
Power	02.50 (02.00–03.00)	
Endurance	04.00 (02.07–09.50)	
Repetition	03.00 (02.25–04.75)	
Fast	05.50 (03.25–10.00)	
Manometry [median (IQ)]	10.35 (06.10–34.68)	

ICIQ-SF: *International Consultation on Incontinence Questionnaire – Short Form*; IQ: interquartile range; UI: Urinary Incontinence; UUI: Urgent Urinary Incontinence; SUI: Stress Urinary Incontinence; MUI: Mixed Urinary Incontinence; ISI-Q: *Incontinence Severity Index Questionnaire*; AC: Associated contraction.

Among the incontinent university students (57.14%), 50% reported Urgent Urinary Incontinence (UUI) and moderate severity UI (55%), with normal muscle tone (60%) and inadequate coordination of the PFM (95%) with contraction of the gluteus (70%) and abdomen (55%). The *Power* of incontinents was 2.50 (2.00–3.00), *Endurance* was 4.00 (2.07–9.50), *Repetition* was 3.00 (2.25–4.75) and *Fast* was 5.50 (3.25–10.00), with a manometry of 10.35 (06.10–34.68) cmH_2O (Table 3).

DISCUSSION

In this study, 57.14% of university students reported UI, and of these 95% had inadequate coordination of PFM. A study by Vieira et al. (2020)[19] found that women who have impaired coordination of these muscles are 93% more likely to have UI. Furthermore, about 30-45% of urinary incontinents have difficulty contracting the PFM[20], demonstrating the importance of assessment, health education and knowledge of the body itself in order to know how to correctly contract this muscle group, regardless of the woman's age. In Brazil, a study[21] concluded that 46.70% of adults with UI correctly contract their PFM, a value higher than that found in this research (5%). Fitz et al.[21] performed a review of medical records of women who underwent PFMT for UI, while in the present study the PFM of university students that never underwent PFMT.

Regarding PERFECT, Power results were similar to the study[22], with 25 nulliparous women without complaints of PFMD, divided into two groups for intervention with PFMT, which obtained a *Power* of 2.50 (±1.10) and 2.20 (±0.80) before training, and similar to what was found in a study[21] with 139 urinary incontinents with low values for all stages of *PERFECT*. As for the PFM manometry, a study[23] carried out with 40 nulliparous women without symptoms of pelvic disease resulted in 8.83 cmH_2O, similar to the values of this research.

These data demonstrate that both young continents and Brazilian urinary incontinents have weak and low PFM manometry values. A possible explanation for this is the lack of knowledge about PFM, as shown by a study[24] in which only 6.30% of women knew what the pelvic floor is and 15.20% knew its location. A systematic review[9] found a low to moderate level of knowledge about PFMD.

With regard to UI, a study[7] with 1397 university students found a UI of 18.40%, lower than that observed in this research (57.14%). Ural et al.[7] evaluated women from different departments, while our sample as a convenience sampling and as such might have attracted individuals who already had some sort of voiding complaint, which might explain the discrepancy between prevalences.

Among the types of UI, most volunteers had UUI, which studies[5,6] report to be related to the behavioral habits of this specific audience, such as excessive consumption of substances that irritate the bladder (caffeine and alcohol) and bad urinary habits such as premature voiding or delaying urination. This indicates that, in addition to PFM deficits, they also have inadequate habits that favor the emergence of voiding complaints. As for severity, UI was moderate in 55% of cases, a value close to a study[25] with 96 nulliparous non-athletes (46.20%).

According to the results of this study, the deficit in PFM function has been present since youth and that perhaps with aging and the emergence of more risk factors, it may culminate in the worsening of UI and the appearance of other PFMD[4-6]. Therefore, young women should receive guidance on the function and anatomy

of the pelvic floor, and it is important to perform PFM assessment with a specialized professional in order to identify, prevent and enable early treatment of PFM in this population.

As this study was carried out with a small convenience sample, generalization is limited, and further studies are needed to address the assessment of PFM function and pressure, the knowledge in relation to PFMD, and the behavioral and voiding habits of this population, in order to identify potential UI risk factors early, as well as a possible cause for the difficulty of adequate PFM contraction in this population.

CONCLUSION

Continent and incontinent university students showed inadequate coordination, low values of PFM function and pressure of contraction, high prevalence of UI (57.14%), especially UUI (50%), with moderate severity (55%). The present study brings an alert and encouragement for all young adult women to know their bodies and be empowered over it, better understanding what happens in the function and dysfunction of these intimate muscles and preventing future complications.

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