DOI: 10.1590/1809-2950/e23013624en

ORIGINAL RESEARCH

Urinary incontinence and quality of life in women with severe obesity: an observational study

Incontinência urinária e qualidade de vida em mulheres com obesidade mórbida: um estudo observacional

Incontinencia urinaria y calidad de vida en mujeres con obesidad mórbida: un estudio observacional

Lizyana Vieira[1], Renato Almeida[2]

ABSTRACT | The primary objective of this study was to determine the prevalence of urinary incontinence (UI) in women with severe obesity. Other objectives included assessing the quality of life among women with obesity with UI and comparing levels of pelvic floor muscle strength and lumbar disability between women with and without UI. A cross-sectional observational study was conducted involving 56 women with class III obesity. The International Consultation of Incontinence Questionnaire-Short Form was used to detect the presence of UI, and the King's Health Questionnaire was used to assess the quality of life of those considered incontinent. Pelvic floor muscle strength was evaluated using the PERFECT scale, while lumbar disability was verified using the Oswestry Disability Index. The results indicated that UI was prevalent in the studied population, with a rate of 57.1% (n=32). The sample showed low quality of life scores in the domains of "General Health Perception" (51.5 ± 22.8) and "Impact of Incontinence" (51.0 ± 36.8). There were no statistically significant differences in pelvic floor muscle strength levels and lumbar disability between the groups with or without UI. However, there was a statistically significant difference in the incidence of vaginal childbirth in the subgroup with UI (62.5%) compared to the subgroup without UI (25%) (p=0.005). Overall, UI was prevalent in most of the studied population, and the sample showed poor quality of life. Furthermore, vaginal childbirth was found to influence the occurrence of UI.

Keywords | Women's Health; Urinary Incontinence; Obesity, Morbid; Quality of Life.

RESUMO | O principal objetivo deste estudo foi determinar a prevalência de incontinência urinária (IU) em mulheres com obesidade mórbida. Os objetivos secundários incluíram a avaliação da qualidade de vida das mulheres obesas com IU, bem como a comparação dos níveis de força muscular do assoalho pélvico e a incapacidade lombar entre mulheres com e sem IU. Foi conduzido um estudo observacional transversal no qual 56 mulheres com obesidade grau 3 foram avaliadas. O *International Consultation of Incontinence Questionnaire-Short Form* foi utilizado para detectar a presença de IU, e o *King's Health Questionnaire* para avaliar a qualidade de vida daquelas que foram consideradas incontinentes. Para a avaliação da força muscular do assoalho pélvico, foi utilizada a escala PERFECT e a incapacidade lombar foi verificada por meio do *Oswestry Disability Index.* A IU foi prevalente na população estudada em 57,1% (n=32), e a amostra revelou baixos níveis de qualidade de vida nos domínios de "percepção geral de saúde" 51,5 (±22,8) e "impacto da incontinência" 51 (±36,8). Não houve diferença estatisticamente significativa nos desfechos de níveis de força muscular do assoalho pélvico e incapacidade lombar entre os grupos com ou sem incontinência. Todavia, houve diferença estatisticamente significativa entre a incidência de partos vaginais no subgrupo com incontinência (62,5%) quando comparado ao subgrupo sem incontinência urinária (25%) (p=0,005). A IU foi prevalente na maioria da população estudada e a amostra revelou baixos níveis

This study was carried out at the Centro Universitário Augusto Motta, (UNISUAM). Rio de Janeiro (RJ), Brazil.
[1]Centro Universitário Augusto Motta (UNISUAM), Student at the Graduation Program in Rehabilitation in Health Sciences , Rio de Janeiro, (RJ). Brazil. E-mail: lizyana@gmail.com. ORCID: 0000-0003-3881-896X.
[2]Centro Universitário Augusto Motta (UNISUAM), Professor at the Graduation Program in Rehabilitation in Health Sciences, Rio de Janeiro, (RJ). Brazil E-mail: renatofisio@gmail.com. ORCID: 0000-0003-2148-334X.

Corresponding address: Lizyana Vieira. Centro Universitário Augusto Motta (UNISUAM), Rio de Janeiro, Brazil. ORCID: 0000-0003-3881-896X.Avenida Paris 84, Rio de Janeiro – Zip Code: 21041-020500, RJ, Brazil. E-mail: lizyana@gmail.com – Financing source: nothing to delcare – Conflict of interests: nothing to declare – Presentation: Oct. 16th, 2023 – Accepted fo Publciation: Apr. 15th, 2024 – This article is part of the Doctoral degree dissertation in Sciences of Rehabilitation at the Centro Universitário Augusto Motta (UNISUAM), Rio de Janeiro, Brazil.

de qualidade de vida. Neste estudo, o parto vaginal influenciou a ocorrência de IU.
Descritores | Saúde da Mulher; Incontinência Urinária, Obesidade Mórbida; Qualidade de vida.

RESUMEN | Este estudio tuvo el objetivo principal de determinar la prevalencia de incontinencia urinaria (IU) en mujeres con obesidad mórbida. Los objetivos secundarios incluyeron evaluar la calidad de vida de mujeres obesas con IU, así como comparar los niveles de fuerza muscular del suelo pélvico y la discapacidad lumbar entre mujeres con y sin IU. Se realizó un estudio observacional transversal en el que se evaluaron 56 mujeres con obesidad de grado 3. Se utilizó el *International Consultation of Incontinence Questionnaire-Short Form* para detectar la presencia de IU, y el *King's Health Questionnaire* para evaluar la calidad de vida de las mujeres que se consideraron incontinentes. Para evaluar la fuerza muscular del suelo pélvico, se utilizó la escala PERFECT y se verificó la discapacidad lumbar mediante el *Oswestry Disability Index*. La IU fue prevalente en la población estudiada en el 57,1% (n=32), y la muestra reveló bajos niveles de calidad de vida en los dominios de "percepción general de salud" 51,5 (±22,8) e "impacto de la incontinencia" 51 (±36,8). No hubo diferencia estadísticamente significativa en los resultados de niveles de fuerza muscular del suelo pélvico y discapacidad lumbar entre los grupos con o sin incontinencia. Sin embargo, hubo diferencia estadísticamente significativa entre la incidencia de partos vaginales en el subgrupo con incontinencia (el 62,5%) en comparación con el subgrupo sin incontinencia urinaria (el 25%) (p=0,005). La IU fue prevalente en la mayoría de la población estudiada y la muestra reveló bajos niveles de calidad de vida. En este estudio, el parto vaginal influyó la incidencia de IU.
Palabras clave | Salud de la Mujer; Incontinencia Urinaria, Obesidad Mórbida, Calidad de Vida

INTRODUCTION

The World Health Organization (WHO) classifies obesity as a disease and is currently considered one of the most prevalent global public health issues due to its significant increase and severe consequences[1,2]. In Brazil, the prevalence of this chronic condition has risen by 72% over the past 13 years, increasing from 11.8% of the population in 2006 to 20.3% in 2019[3].

Among the obesity-associated comorbidities, urinary incontinence (UI) in women stands out with a high prevalence, affecting from 60% to 70% of this population, particularly as stress urinary incontinence (SUI)[4-6]. The literature indicates that an increase of five units in the body mass index (BMI) is associated with a 20% to 70% rise in the prevalence of UI[7,8]. Obesity contributes to increased intra-abdominal pressure, weakening pelvic muscles and nerves. Prolonged strain on the pelvic musculature, nerve supply, and supporting structures may weaken pelvic floor muscle, negatively impacting the function of pelvic organs and facilitating the occurrence of UI[6-9].

Regarding the correlation between the degree of obesity and the severity of UI, conflicting results are reported in the literature. A randomized clinical trial involving 650 patients with UI showed a positive association between BMI and the severity of UI, with higher BMIs linked to more severe UI. Conversely, another study, which analyzed 1,155 questionnaires completed by women stratified by age and BMI, found no relationship between the severity of urinary symptoms and the degree of obesity. Nonetheless, a higher prevalence of SUI has been observed in women with class III obesity compared to those with lower classes of obesity[10,11].

UI often leads to social isolation and psychosocial frustration, affecting women in a unique and complex manner[12]. Obesity is also linked to functional disability, chronic low back pain, and lower quality of life[13]. Currently, individuals with obesity and sedentary behavior represent the group with the highest risk of developing low back pain[14]. Large epidemiological studies have shown an association between low back pain and UI, with the presence of one condition seemingly predisposing the development of the other, although the exact mechanism remains unclear[15].

Therefore, the diagnosis and treatment of UI are particularly important in women with severe obesity, as these measures contribute to improving their quality of life[10,16].

Although the clinical repercussions of obesity are well-documented, particularly in women with severe obesity, there remains a gap in the literature regarding the prevalence of UI, the main dimensions of quality of life affected, and the associated musculoskeletal disorders in this population. The primary objective of this study

was to determine the prevalence of UI in women with severe obesity. The secondary objectives were to evaluate the quality of life of women with obesity and UI and to compare pelvic floor muscle strength and lumbar disability levels between women with and without urinary incontinence.

METHODOLOGY

Study design and population

This cross-sectional observational study evaluated women under follow-up in the outpatient service for bariatric surgery preparation at a university hospital. All women on the waiting list for bariatric surgery from March 2021 to December 2021 were included in the assessment. The inclusion criteria were females aged from 18 to 60 years. Exclusion criteria included women who had undergone gynecological surgeries, those undergoing urogynecological rehabilitation, or those who had received physical therapy for urinary incontinence or menopause.

Procedures and measurement instruments

Sociodemographic and clinical variables were initially collected to characterize the sample, including age, weight, height, abdominal circumference, number of pregnancies, mode of delivery, miscarriages, smoking and alcohol consumption habits, and diagnoses of anxiety, depression, and other comorbidities. Anxiety and depression were defined based on participants' self-reports and the use of specific medications prescribed by their physicians.

The International Consultation of Incontinence Questionnaire – Short Form (ICIQ-SF), translated into and validated for Portuguese by Tamanini et al.[17], was administered to assess the presence of UI. The ICIQ-SF is a simple questionnaire composed of questions that evaluate the frequency, severity, and impact of UI. A score of zero determines the absence of UI, while women with a score ≥3 were considered incontinent.

For participants who reported UI and had ICIQ-SF scores consistent with the self-report, the King's Health Questionnaire (KHQ) was used. This instrument specifically measures the impact of UI on quality of life and has been translated into and validated ofr Portuguese[18,19]. The KHQ consists of 20 questions related to nine domains of UI: general health perception; incontinence impact; role limitations ; physical limitations; social limitations; personal relationships; emotions; sleep/energy; and severity measures. Each domain is scored from zero to 100, with zero representing no symptoms and 100 representing the maximum impact on quality of life.

The physical evaluation of the pelvic floor muscles was performed on all participants, whether they had incontinence or not. Via digital palpation, the PERFECT scheme, developed and validated by Laycock and Jerwood[20], was applied. This acronym stands for different aspects of pelvic muscle function: "P" assesses the power of the maximum voluntary contraction (MVC) of the pelvic floor muscles, graded according to the modified Oxford scale; "E" represents endurance, measured by the time the MVC is sustained before a 35% or greater reduction in contraction; "R" stands for repetitions, referring to the number of times the sustained contraction can be performed with proper duration; and "F" stands for fast contractions, assessing the number of short-duration MVCs that can be performed after a rest period. The evaluation was conducted by a single physical therapist with eight years of clinical experience in pelvic physical therapy. The participant was positioned supine on a table, with the lower limbs abducted and hips and knees flexed. A first contraction was requested to ensure correct muscle contraction technique and to familiarize the participant, while avoiding the Valsalva maneuver, hip abduction, and the use of accessory muscles.

Finally, the Oswestry Disability Index (ODI), validated for Portuguese by Vigatto et al.[21], was employed to quantify lumbar disability in all participants. The final ODI scores are presented as percentages and classified into five categories: minimal disability (0–20%), moderate disability (21–40%), severe disability (41–60%), crippled (61–80%), and bedridden individuals (81–100%).

Data analysis

For the statistical analysis, the data were tested using the Shapiro-Wilk normality test. Since the data showed a normal distribution, they were presented as mean and standard deviation or as frequency and percentage. A subgroup analysis of the ICIQ-SF

questionnaire was performed, considering the following comparisons: (1) urinary incontinence (UI) subgroup – participants with scores above three points on the ICIQ-SF, and (2) non-urinary incontinence (NUI) subgroup – individuals with scores below three points on the ICIQ-SF. To compare the means between the NUI and UI groups, an independent samples *t*-test was applied. Associations between categorical variables were analyzed using the Chi-square test. The SPSS® version 22.0 program was used for the analysis, and a 5% significance level was set ($p<0.05$).

RESULTS

A total of 56 women with a mean age of 37 (±8.2) years were evaluated. Mean BMI was 43.9 (±7.5) kg/m², with all participants classified as having class 3 obesity. Regar5ding abdominal obesity, the mean abdominal circumference was 123.1 (±12.1) cm. After applying the ICIQ-SF questionnaire, more than half patients (57.1%; n=32) were classified as having urinary incontinence (UI subgroup), while 42.9% (n=24) were considered without urinary incontinence (NUI subgroup).

Table 1. Score values of King's Health Questionnaire (n=32) for the urinary incontinence subgroup.

Domain	Mean (±SD)
General health perception	51.5 (±22.8)
Incontinence impact	51.0 (±36.8)
Role limitations	36.4 (±35.0)
Physical limitations	39.5 (±35.3)
Social limitations	14.7 (±17.8)
Personal relationships	14.5 (±24.2)
Emotional aspects	29.8 (±35.0)
Sleep/energy	27.0 (±29.2)
Severity measures	41.8 (±25.8)

SD: standard deviation.

The UI subgroup was also evaluated regarding quality of life, with scores for the dimensions "general health perception" and " incontinence impact" being 51.5 (±22.8) and 51.0 (±36.8), respectively, indicating impairment in these areas. Table shows the mean values related to the impact on quality of life across different dimensions of the KHQ. Following the division of the groups, and for comparison purposes, the UI and NUI subgroups were considered homogeneous. No statistically significant difference was observed when comparing the mean pelvic floor muscle strength (PERFECT scale) and lumbar disability (ODI) between groups (Table 2).

Table 2. Comparison of secondary outcomes between the urinary incontinence and no urinary incontinence subgroups.

Parameter	Mean UI values (±SD) n=32	Mean NUI values (±SD) n=24	MD (95% CI)	p-value
Age (years)			−1.3 (−5.7; 3.2)	0.64
BMI (kg/m2)			−1.4 (−2.7; 5.5)	0.29
Abdominal circumference (cm)	37 (±8.0)	36 (±8.7)	−0.3 (−6.9; 6.3)	0.24
Lumbar disability (ODI)	43.3 (±7.1)	44.7 (±8.0)	−4.2 (−11.7: 3.3)	0.67
PERFECT	2.03 (±0.8)	2.08 (±0.9)	−0.05 (−0.4; 0.5)	
Power	1.75 (±1.5)	2.04 (±1.4)	−0.29 (−0.5: 1.1)	0.83
Endurance	1.31 (±1.1)	1.33 (±1.2)	−0.02 (−0.6; 0.6)	0.84
Repetitions	1.90 (±1.5)	1.95 (±1.5)	−0.05 (−0.7; 0.9)	0.58
Fast contractions				0.73

UI: subgroup with urinary incontinence; NUI: subgroup with no urinary incontinence; SD: standard deviation; MD: mean difference; CI: confidence interval. BMI: body mass index; ODI: Oswestry Disability Index.

Regarding the analysis of clinical variables, a statistically significant difference was observed for the variable vaginal delivery in the urinary incontinence subgroup (62.5%) compared to the NUI subgroup (25%) (p=0.005) (Table 3).

Table 3. Comparison of clinical variables between UI and NUI subgroups.

Parameter	UI group		NUI group		p-value
	YES N (%)	NO N (%)	YES N (%)	NO N (%)	
Births	28 (87.5)	4 (12.5%)	16 (66.7%)	8 (33.3%)	0.060
Miscarriages	5 (15.6%)	27 (84.4%)	8 (33.3%)	16 (66.7%)	0.120
Vaginal childbirth	20 (62.5%)	12 (37.5%)	6 (25.0%)	18 (75.0%)	0.005*
C-section	19 (59.4%)	13 (40.6%)	14 (58.3%)	10 (41.7%)	0.938
Systemic arterial hypertension	18 (56.3%)	14 (43.8%)	9 (37.5%)	15 (62.5%)	0.165
Diabetes mellitus	6 (18.8%)	26 (81.3%)	2 (8.3%)	22 (91.7%)	0.270
Digestive complaints	3 (9.4%)	29 (90.6%)	2 (8.3%)	22 (91.7%)	0.892
Respiratory complaints	1 (3.1%)	31 (96.6%)	4 (16.7%)	20 (83.3%)	0.079

(continues)

Table 3. Continuation

Parameter	UI group		NUI group		p-value
	YES N (%)	NO N (%)	YES N (%)	NO N (%)	
Musculoskeletal pains	10 (31.3%)	22 (68.8%)	9 (37.5%)	15 (62.5%)	0.625
Alcoholism	13 (40.6%)	19 (59.4%)	12 (50.0%)	12 (50.0%)	0.485
Smoking habit	6 (18.8%)	26 (81.3%)	6 (25%)	18 75%)	0.573
Anxiety	14 (43.8%)	18 (56.3%)	15 (62.5%)	9 37.5%)	0.165
Depression	7 (21.9%)	25 (78.1%)	10 (41.7%)	14 58.3%)	0.111

UI: subgroup with urinary incontinence; NUI: subgroup with no urinary incontinence. * statistical difference.

DISCUSSION

For the primary outcome, this study demonstrates a prevalence of 57.1% of UI in women with severe obesity. Notably, UI was prevalent even though the mean age of the women in the sample was under 40 years. Similar data were observed in other studies such as that by Gerten et al.[22], in which prevalence of urinary incontinence ranged from 46% to 67% , while Castro et al.[23] observed that the prevalence could reach 70.8% in their sample composed of women undergoing preoperative bariatric surgery procedures.

Lamerton et al.[5], in their review and meta-analysis, found that patients with overweight and obesity had an increased risk of UI at this stage of life. As more women become overweight or obese at younger ages, it is likely that the incidence of urinary incontinence will increase as they reach middle age.

Richter et al.[11] compared scores of SUI intensity and its impact on women with normal BMI, as well as on those with overweight and obesity, finding that women with obesity had more episodes of urinary leakage, more symptom-related distress, and poorer quality of life.

Chen et al.[24] reported that among female adults in the United States, an increase in BMI and trunk fat percentage is strongly linked to both higher prevalence and greater severity of UI. While prior studies have shown that central obesity increases the risk of UI in older women[25,26], the findings of this study suggest that body composition measures—such as BMI and abdominal circumference—do not significantly influence UI levels. This is evidenced by the lack of differences between these variables in women with and without UI. One possible explanation for this divergence may be the younger average age of the sample, along with other uncontrolled confounding factors, such as estrogen deficiency, that could have influenced the outcomes[27].

For the secondary outcomes, the impact of UI on women's quality of life was most evident in the domains of "general health perception" and "incontinence impact." These findings align with previous research such as that by Nygaard et al.[28], who investigated UI prevalence in women awaiting bariatric surgery and explored associated risk factors. They found that UI detrimentally affects the quality of life in this population, with the most affected domains, as measured by the KHQ instrument, being "incontinence impact," "severity measures," and "general health perception." Similarly, Pazzianotto-Forti et al.[29] studied women with severe obesity and found that despite a lower UI prevalence in their sample, quality of life was still significantly impaired, especially in the domains "incontinence impact" and "general health perception."

Our study also yielded findings regarding the influence of vaginal childbirth on the occurrence of UI, which contrasts with previous research. Chan et al.[30] concluded that childbirth is a key factor in pelvic floor dysfunction, incontinence, and pelvic organ prolapse, with the effects more pronounced with further childbirths and vaginal childbirth. This is thought to result from neuromuscular impacts during and after childbirth, as well as perineal trauma[31]. Pomian et al.[32] further observed that UI prevalence is strongly associated with more childbirths, particularly in younger women aged 20 to 34, while this association nearly disappears in women over the age of 65.

The role of pelvic floor muscle integrity in maintaining continence is well established, as these muscles are crucial for urethral support[6]. Research has shown that women with UI often exhibit weaker pelvic floor muscles regarding strength, endurance, and coordination, as well as altered electromyographic activity[33]. However, in this study, no significant differences in pelvic floor muscle dysfunction were noted between the UI and NUI subgroups, which contradicts existing literature. Given the overall obesity of the sample, it was expected that women with UI would exhibit more pelvic floor frailty, but this was not observed.

Additionally, no significant differences were found regarding lumbar disability between the groups. This finding contrasts with an epidemiological study from Japan, which identified age over 40, obesity, vaginal childbirth, and lumbar pain as risk factors for UI[34].

The limitations of this study stem from the multifactorial nature of UI, making it difficult to isolate obesity as the sole contributing factor. Furthermore, while

patient-centered measurement tools are practical, they may introduce some degree of subjectivity or error.

Despite these limitations, the findings contribute to the ongoing discussion regarding the impact of severe obesity on women's health, including quality of life and pelvic floor function. Future studies with larger sample sizes may provide more conclusive results, as this study identified a notable prevalence of UI even in a relatively young sample.

CONCLUSION

Urinary incontinence was prevalent among most of the studied population, with the sample exhibiting low quality of life scores in the domains of "general health perception" and "incontinence impact." No statistically significant differences were found in pelvic floor muscle strength or lumbar disability between the groups with UI and SUI. Additionally, this study indicated that vaginal childbirth influenced the occurrence of urinary incontinence.

REFERENCES

1. Melendez-Araújo MS, Matos Arruda SL, Oliveira Kelly E, Carvalho KM. Preoperative nutritional interventions in morbid obesity: impact on body weight, energy intake, and eating quality. Obes Surg. 2012;22(12):1848-54. doi: 10.1007/s11695-012-0737-6.
2. Fuselier A, Hanberry J, Margaret Lovin J, Gomelsky A. Obesity and Stress Urinary Incontinence: Impact on Pathophysiology and Treatment. Curr Urol Rep. 2018;19(1):10. doi: 10.1007/s11934-018-0762-7.
3. Ministério da Saúde. Secretaria de Vigilância em Saúde, Departamento de Análise em Saúde e Vigilância de Doenças não Transmissíveis. Vigitel Brasil 2019: Vigilância de Fatores de Risco e Proteção para Doenças Crônicas por Inquérito Telefônico. Brasília, DF: Ministério da Saúde, 2020.
4. Yang X, Wang X, Gao Z, Li L, Lin H, Wang H, et al. The Anatomical Pathogenesis of Stress Urinary Incontinence in Women. Medicina (Kaunas). 2022;59(1):5. doi: 10.3390/medicina59010005.
5. Lamerton TJ, Torquati L, Brown WJ. Overweight and obesity as major, modifiable risk factors for urinary incontinence in young to mid-aged women: a systematic review and meta-analysis. Obes Rev. 2018;19(12):1735-45. doi: 10.1111/obr.12756.
6. Abrams P, Cardozo L, Wagg A, Wein A, editors. Incontinence 6th Edition ICI-ICS. Bristol, UK: International Continence Society, 2017.
7. El-Hefnawy AS, Wadie BS. Severe stress urinary incontinence: Objective analysis of risk factors. Maturitas. 2011;68(4):374-7. doi: 10.1016/j.maturitas.2011.01.005.
8. Subak LL, Richter HE, Hunskaar S. Obesity and urinary incontinence: epidemiology and clinical research update. J Urol. 2009;182(6 Suppl): S2-7. doi: 10.1016/j.juro.2009.08.071.
9. Wasserberg N, Haney M, Petrone P, Ritter M, Emami C, Rosca J, et al. Morbid obesity adversely impacts pelvic floor function in females seeking attention for weight loss surgery. Dis Colon Rectum. 2007;50(12):2096-103. doi: 10.1007/s10350-007-9058-6.
10. Whitcomb EL, Horgan S, Donohue MC, Lukacz ES. Impact of surgically induced weight loss on pelvic floor disorders. Int Urogynecol J. 2012;23(8):1111-6. doi: 10.1007/s00192-012-1756-5.
11. Richter HE, Kenton K, Huang L, Nygaard I, Kraus S, Whitcomb E, et al. The impact of obesity on urinary incontinence symptoms, severity, urodynamic characteristics and quality of life. J Urol. 2010;183(2):622-8. doi: 10.1016/j.juro.2009.09.083.
12. Can Z, Şahin S. The prevalence of urinary incontinence in obese women and its effect on quality of life. Health Care Women Int. 2022;43(1-3):207-18. doi: 10.1080/07399332.2021.1958329–218.
13. Malta DC, Oliveira MM, Andrade SSCA, Caiaffa WT, Souza MFM, Bernal RTI. Factors associated with chronic back pain in adults in Brazil. Rev Saude Publica. 2017;51(Suppl 1):9s. doi: 10.1590/S1518-8787.2017051000052.
14. Shiri R, Solovieva S, Husgafvel-Pursiainen K, Telama R, Yang X, Viikari J, et al. The role of obesity and physical activity in non-specific and radiating low back pain: the Young Finns study. Semin Arthritis Rheum. 2013;42(6):640-50. doi: 10.1016/j.semarthrit.2012.09.002.
15. Welk B, Baverstock R. Is there a link between back pain and urinary symptoms?. Neurourol Urodyn. 2020;39(2):523-32. doi: 10.1002/nau.24269.
16. McDermott CD, Terry CL, Mattar SG, Hale DS. Female pelvic floor symptoms before and after bariatric surgery. Obes Surg. 2012;22(8):1244-50. doi: 10.1007/s11695-012-0592-5.
17. Tamanini JTN, Dambros M, D'Ancona CAL, Palma PCR, Rodrigues NN. Validation of the "International Consultation on Incontinence Questionnaire – Short Form" (ICIQ-SF) for Portuguese. Rev Saude Publica. 2004;38(3):438-44. doi: 10.1590/S0034-89102004000300015.
18. Tamanini JTN, D'Ancona CAL, Botega NJ, Netto Jr NR. Validação do "King's Health Questionnaire" para o português em mulheres com incontinência urinária. *Rev Saude Publica.* 2003;37(2):203-11. doi: 10.1590/S0034-89102003000200007.
19. Fonseca ESM, Camargo ALM, Castro RA, Sartori MGF, Fonseca MCM, Lima GR, et al. Validação do questionário de qualidade de vida (King's Health Questionnaire) em mulheres brasileiras com incontinência urinária. *Rev Bras Ginecol Obstet.* 2005;27(5):235-42. doi: 10.1590/S0100-72032005000500002.
20. Laycock J, Jerwood D. Pelvic Floor Muscle Assessment: The PERFECT Scheme. Physiotherapy. 2001;87(12):631-42. doi: 10.1016/S0031-9406(05)61108-X.
21. Vigatto R, Alexandre NMC, Correa Filho HR. Development of a Brazilian Portuguese version of the Oswestry Disability Index: cross-cultural adaptation, reliability, and validity. Spine (Phila Pa 1976). 2007;32(4):481-6. doi: 10.1097/01.brs.0000255075.11496.47.
22. Gerten KA, Richter HE, Burgio KL, Wheeler TL, Goode PS, Redden DT. Impact of urinary incontinence in morbidly obese women versus women seeking urogynecologic care. Urology. 2007;70(6):1082-5. doi: 10.1016/j.urology.2007.07.058.
23. Castro LA, Sobottka W, Baretta G, Freitas ACT. Efeitos da cirurgia bariátrica na função do assoalho pélvico. ABCD Arq Bras Cir Dig. 2012;25(4):263-8. doi: 10.1590/S0102-67202012000400010.

24. Chen J, Peng L, Xiang L, Li B, Shen H, Luo D. Association between body mass index, trunk and total body fat percentage with urinary incontinence in adult US population. Int Urogynecol J. 2023;34(5):1075-82. doi: 10.1007/s00192-022-05317-z.

25. Hunskaar S. A systematic review of overweight and obesity as risk factors and targets for clinical intervention for urinary incontinence in women. Neurourol Urodyn. 2008;27(8):749-57. doi: 10.1002/nau.20635.

26. Krause MP, Albert SM, Elsangedy HM, Krinski K, Goss FL, Silva SG. Urinary incontinence and waist circumference in older women. Age Ageing. 2010;39(1):69-73. doi: 10.1093/ageing/afp208.

27. Doumouchtsis SK, Loganathan J, Pergialiotis V. The role of obesity on urinary incontinence and anal incontinence in women: a review. BJOG. 2022;129(1):162-70. doi: 10.1111/1471-0528.16848.

28. Nygaard CC, Schreiner L, Morsch TP, Saadi RP, Figueiredo MF, Padoin AV. Urinary Incontinence and Quality of Life in Female Patients with Obesity. Rev Bras Ginecol Obstet. 2018;40(9):534-9. doi: 10.1055/s-0038-1670626.

29. Pazzianotto-Forti EM, Brigatto P, Baltieri L, Souza Júnior JE, Guirro ECO, Kasawara KT. Quality of life in obese women with symptoms of urinary incontinence. Fisioter Mov. 2019;32:e003211. doi: 10.1590/1980-5918.032.AO11.

30. Chan SSC, Cheung RYK, Yiu KW, Lee LL, Chung TKH. Prevalence of urinary and fecal incontinence in Chinese women during and after their first pregnancy. Int Urogynecol J. 2013;24(9):1473-9. doi: 10.1007/s00192-012-2004-8.

31. LaCross A, Groff M, Smaldone A. Obstetric anal sphincter injury and anal incontinence following vaginal birth: a systematic review and meta-analysis. J Midwifery Womens Health. 2015;60(1):37-47. doi: 10.1111/jmwh.12283.

32. Pomian A, Lisik W, Kosieradzki M, Barcz E. Obesity and Pelvic Floor Disorders: A Review of the Literature. Med Sci Monit. 2016;22:1880-6. doi: 10.12659/msm.896331.

33. Devreese A, Staes F, De Weerdt W, Feys H, Assche AV, Penninckx F, et al. Clinical evaluation of pelvic floor muscle function in continent and incontinent women. Neurourol Urodyn. 2004;23(3):190-7. doi: 10.1002/nau.20018.

34. Onishi A, Shibata A. Prevalence and sociodemographic correlates of urinary incontinence in Japanese women: A web-based cross-sectional study. Womens Health (Lond). 2023;19:17455057231207754. doi: 10.1177/17455057231207754..