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# *Body composition does not interfere with urinary incontinence in adult women with grade III obesity*

## Composição corporal não interfere na incontinência urinária em mulheres adultas com obesidade grau III

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***Abstract***
***Objective:*** *to compare the body composition of adult women affected by grade III obesity with and without urinary incontinence.* ***Methodology:*** *we evaluated women with grade III obesity from the bariatric surgery preparation outpatient service of a University Hospital. In addition to clinical data collection, abdominal circumference measurement and body composition evaluation by tetrapolar bioelectrical impedance testing were performed. The International Consultation on Incontinence Questionnaire – Short Form (ICIQ –SF) was used to evaluate the presence of urinary incontinence in the patients. A subgroup analysis was conducted, comparing means between the groups: with urinary incontinence (UI) x without urinary incontinence (WUI) and Control X UI. The control group comprised women with normal BMI and no urinary incontinence.* ***Results:*** *fifty-six women with grade III obesity were evaluated. The mean age of the sample was 37(±8.2) years, and the BMI was 43.9 (±7.5) kg/m$^2$. The body composition variables of the group with grade III participants showed significant differences compared to the control group. No statistically significant differences were observed between the UI and WUI subgroups for the outcomes assessed by tetrapolar bioelectrical impedance.* ***Conclusion:*** *no statistically significant differences were observed in comparing body composition between women affected by grade III obesity with and without urinary incontinence. Body composition, when evaluated independently of other aspects, does not seem to influence the occurrence of urinary incontinence in women with grade III obesity.*
***Keywords:*** *Urinary Incontinence; Obesity, Morbid; Electric Impedance; Body Composition; Women's Health.*

**Resumo**
**Objetivo:** *Comparar a composição corporal de mulheres adultas com obesidade grau III com e sem incontinência urinária.* **Metodologia:** *foram avaliadas mulheres com obesidade grau III do serviço ambulatorial de preparo para cirurgia bariátrica pertencente à um Hospital Universitário. Além da coleta de dados clínicos, foi realizada a mensuração da circunferência abdominal e avaliação da composição corporal por meio do exame de impedância bioelétrica tetrapolar. Para avaliar a presença de incontinência urinária nas pacientes foi utilizado o questionário International Consultation of Incontinence Questionnaire - Short Form. Foi realizada uma análise de subgrupo, com comparação das médias entre os grupos Obesas Com Perda de Urina (PU) x Obesas Sem Perda de Urina (SPU); e Controle X SPU. O grupo controle foi composto por mulheres com IMC normal, sem perda urinária.* **Resultados:** *foram avaliadas 56 mulheres com obesidade grau III. A idade média da amostra foi de 37(±8,2) anos e o IMC 43,9 (±7,5) kg/m$^2$. As variáveis de composição corporal do grupo de obesas grau III mostraram diferenças significativas quando comparadas ao grupo controle. Não foram observadas diferenças estatisticamente significativas entre os subgrupos SPU e PU para os desfechos avaliados pela impedância bioelétrica tetrapolar.* **Conclusão***: não foram observadas diferenças estatisticamente significativas na comparação da composição corporal entre mulheres obesas com e sem perda de urina. A composição corporal, quando avaliada de maneira independente de outros aspectos, parece não influenciar na ocorrência de incontinência urinária nas mulheres obesas grau III.*
**Palavras-chave:** *Incontinência Urinária; Obesidade mórbida; Impedância Bioelétrica; Composição Corporal; Saúde da Mulher.*

## *INTRODUCTION*

It is currently estimated that more than 1 billion people worldwide are affected by obesity[1], and this health condition is already considered a chronic disease. Obesity is characterised by excess weight from the accumulation of body fat, identified by a body mass index or BMI equal to or greater than 30 kg/ m$^2$. Respectively, grade III obesity has been gaining space in health discussions due to

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the significant impact of this population on public health[2].

Obesity is associated with the pathophysiology of several health conditions and may also be a risk factor for urinary incontinence[3]. Women with obesity have higher intra-abdominal pressures than non-obese women, and it has been suggested that this chronically elevated pressure may predispose to urinary incontinence by weakening the pelvic floor support structures[4].

Although simple clinical approaches exist for measuring obesity, such as BMI and abdominal circumference, these measures are not specific to identifying body composition, indicating fat-free mass, muscle mass, or nutritional status[5,6]. Thus, BMI should be considered a screening measure, not a diagnostic one[7].

In this sense, bioelectrical impedance (BIA) is a method that stands out for being fast, non-invasive, and relatively inexpensive for assessing body composition. The method uses a low-intensity electric current that passes through the organic tissues and estimates the total body water and the fat-free mass through some components such as resistance (R), reactance (Xc), and phase angle (PA). Thus, BIA represents a powerful tool for body composition analysis, as it presents a strong relationship between total body impedance measurements and total body water. BIA is adequate for assessing body composition in clinical practice, and such recommendation presents a level of evidence A[2,8,9].

Although weight gain associated with increased adiposity represents an increased risk for urinary incontinence, most studies have used only anthropometric measures to evaluate such aspects. Thus, there is room for further investigation of these associations in different population profiles using more accurate measurement instruments[10-12]. Therefore, studies using BIA in the specific population with grade III obesity should be encouraged so that clinical and scientific discussions can be furthered[13-16].

Hence, this study aimed to compare the body composition of adult women with grade III obesity who had and did not have urinary incontinence.

## *METHODOLOGY*

### *Design*

This cross-sectional observational study was conducted in an outpatient bariatric surgery preparation service at the University Hospital in Paraná, Brazil.

### *Population*

Women who were followed up by the outpatient bariatric surgery preparation service were evaluated. This study evaluated all women on the waiting list for bariatric surgery between March 2021 and December 2021. Inclusion criteria were female subjects over 18 years old, with grade III obesity (BMI>40 kg/ m$^2$). Among this sample, women with gynaecological surgical intervention who were in urogynecological rehabilitation or physical therapy for urinary incontinence and in the menopausal phase were excluded.

The findings were presented according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guide and the study was previously submitted to the Research Ethics Committee of the Assis Gurgacz University Center (FAG) under Resolution 466/2012, obtaining approval expressed by the CAAE number: 23421819.7.0000.5219. The patients who agreed to participate in the study signed the Free and Informed Consent Form and were invited to undergo evaluation by the researchers at the outpatient clinic school.

### *Procedures and measurement instruments*

Body composition was assessed employing tetrapolar bioelectrical impedance testing using the Biodynamis® Body Composition Monitor Model 310e, using the protocol validated by Lukaski, Bolonchuk, Hall, Siders[17] (1986) and following the guidelines for interpretation of results proposed by Gallagher et al.[18] (2000). The following variables were measured: Total body water in Kg/L and percentage; Fat-free mass in Kg and percentage; Body fat in Kg and percentage; Basal et al./day; BMI and raw data (resistance, reactance, capacitance, and phase angle). Lean tissues are highly conducive to the electric current due to a large amount of water and electrolytes; that is, they have a low resistance to the passage of electric current. On the other hand, fat, bone, and skin constitute a low-conductivity medium and, therefore, present high resistance.

According to the Brazilian Guideline for the Diagnosis and Treatment of Metabolic Syndrome19 (2005), the midpoint between the lower costal margin and the iliac crest was used to measure abdominal circumference.

To evaluate the presence of urinary incontinence in the patients, the International Consultation on Incontinence Questionnaire - Short Form (ICIQ-SF) was used, originally developed, and validated in English by Avery et al.[20] (2004) and later translated and validated to Portuguese by Tamanini, D'Ancona, Botega, Rodrigues Netto[21] (2003) The ICIQ-SF is a simple questionnaire that evaluates urinary incontinence frequency, severity, and impact. An ICIQ-SF score of zero determines the absence of urinary incontinence. Women with a sum equal to or greater than three were considered incontinent. Thus, the women were divided into two subgroups: with urinary incontinence (UI) and without urinary incontinence (WUI). The WUI subgroup was compared to a control group to identify the main bioimpedance variables presenting possible differences in participants with grade III obesity. The control group comprised women who attended other services at the site, aged between 18 and 50 years, with normal BMI, without urinary loss, and without comorbidities, who accepted to participate in the research.


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***Data analysis***

Numerical variables were tested for normality distribution by the Shapiro-Wilk test and presented as mean and standard deviation if the assumption of normality was accepted. A frequency distribution was performed for the qualitative variables, and they were presented as frequency and percentage. To compare the means of the groups WUI X UI; WUI X Control Group (CG), the t-Test for independent samples was used. All analyses were performed using the SPSS® 22.0 program, and significance was set at 5% (P<0.05).

***RESULTS***

Fifty-six women with grade III obesity with a mean age of 37(±8.2) years were evaluated. The mean BMI was 43.9 (±7.5) kg/m$^2$, classifying them as grade III obesity. Regarding abdominal obesity, a mean abdominal circumference of 123.1 (±12.1) cm was found.

Most of the sample, 32 (57%), were classified as having urine leakage, and 24 (43%) were without. The mean ICIQ-SF score was 11.2 (±5.4).

The UI and WUI subgroups were homogeneous. In the WUI subgroup, the mean age was 36 (±8.0) years, and in the UI subgroup, it was 37 (±8.5) years (p>0.05); the BMI was 44.7 (±8.0) kg/m$^2$ in the WUI subgroup and 43.3(±6.9) kg/m2 in the with urine leakage (p>0.05).

The mean age of the control group (CG) was 34.8 (±2.4) years, the BMI was 22.2 (±1.8) kg/m$^2$, and the mean abdominal circumference was 70.3 (±3.7) cm.

Specifically, there was no statistically significant difference in abdominal circumference between the subgroups with obesity. The value in the WUI subgroup was 122.9(±11.0) cm and 124.0 (±13.0) cm in the UI (p>0.05).

No statistically significant differences were observed between the WUI and UI subgroups for the outcomes evaluated by Tetrapolar Bioimpedance. However, when comparing the CG to the WUI group, statistically significant differences were found in all variables (p<0.001) except for the phase angle and the percentage of water (Table 1).

**Table 1-** *Mean values of the bioimpedance parameters evaluated for each subgroup.*

| Variables Bioimpedance | Values WUI (Mean; DP) n=24 | Values UI (Mean; DP) n=32 | p Value (WUI x UI) | Values CG (Mean; DP) N=30 | p Value (WUI x CG) |
|---|---|---|---|---|---|
| Phase A (Degrees) | 7.39 (±1.5) | 7.02 (±0.6) | 0.285 | 8.48 (±10.1) | 0.566 |
| Resistance (Ohms) | 465.7 (±73.0) | 453.2 (±40.8) | 0.446 | 608.9 (±57.8) | 0.001 |
| Reactance (Ohms) | 59.31 (±13.0) | 57.1 (±6.3) | 0.396 | 70.6 (±9.37) | 0.001 |
| Capacitance | 870.9 (±185.5) | 851.7 (±130.0) | 0.667 | 603.4 (±78.8) | 0.001 |
| BMR (calories) | 1985.6 (±284.5) | 1992.0 (±222.9) | 0.928 | 1392.1 (±150.9) | 0.001 |
| LM (Kg) | 63.6 (±9.1) | 62.5 (±8.6) | 0.642 | 41.8 (±10.8) | 0.001 |
| FM (Kg) | 53.5 (±14.1) | 52.7 (±13.0) | 0.818 | 18.0(±8.2) | 0.001 |
| TOTAL WATER (l) | 46.4 (±7.1) | 45.8 (±6.6) | 0.733 | 32.28 (±2.9) | 0.001 |
| WATER % | 73.3 (±3.5) | 70.2 (±9.9) | 0.111 | 72.3(±1.9) | 0.193 |

*Subtitle: A (angle), BMR (basal metabolic rate), LM (lean mass), FM (fat mass).*

Source: own authority

***DISCUSSION***

The findings showed no significant difference in any body composition variable when comparing women affected by grade III obesity with and without urinary incontinence. The data indicates that the body composition variables do not influence this condition directly.

The hypothesis suggested by the findings is that other factors should be considered as possible variables of influence on urinary incontinence in women with grade III obesity, such as age, race/ethnicity, socioeconomic status, clinical comorbidities, levels of physical activity, and number of deliveries[13]. Considering the homogeneity of the sample regarding these factors mentioned above, the body composition variables, when evaluated in isolation, do not present interference in urinary incontinence.

The data from the present study diverges from other studies that evaluated eutrophic versus individuals with obesity and that point to body mass index, abdominal fat, and total body weight as risk factors for urinary incontinence. However, the Aune, Mahamat-Saleh, Norat, Riboli[13] (2019) meta-analysis that identified these risk factors included data from populations with Body Mass Indices distinct from the present study's sample, thus suggesting that groups with severely obese people have specific characteristics. Although the degree of obesity (I, II, or III) is not associated with the severity of urinary incontinence[22,23], it is essential to highlight that the population affected by obesity presents distinct characteristics from the overweight and normal BMI groups. Therefore, investigating homogeneous groups with BMI within the obesity category should be encouraged.

The variable abdominal circumference is also an essential aspect of urinary incontinence. Ferreira et al.[24] (2020), in their pioneer study and unique in the literature until then, observed that in adult women, there is an association between the level of visceral fat evaluated by bioimpedance and complaints of urinary loss, being more evident in overweight and women with obesity. Although the study also assessed young women, the sample was composed of women affected by obesity, not specifically in obese grade III, as in the present study. Maserejian et al.[12] (2014) point out that women with more significant gains in waist circumference over time are more likely to develop urinary incontinence. Although conceptually, the literature points out that increased waist circumference may generate a more significant weight load on the abdomen and pelvic floor, thereby increasing pressure on the bladder and facilitating urine leakage[25], the present study found no significant difference when comparing the abdominal circumference of women affected by obesity with and without urinary incontinence. Our findings disagree with others, possibly due to differences in population profile. This study evaluated abdominal circumference in non-elderly women with urinary incontinence and grade III obesity.

The variables for measuring bioelectrical impedance should also be discussed in this population group. Specifically, the phase angle (PA) is used as a prognostic indicator in several diseases and as a predictor of the patient's overall health status. Its use in patients with obesity presents different critical concerns due to the more significant variability of the two measured parameters: resistance (R) and reactance (Xc). These parameters contribute to PA determination[26], with total body water being the main component influencing such parameters[27]. High PA values indicate good health status, while low values should be investigated concerning the patient's clinical picture and history. Phase angle values are influenced by age, gender, ethnicity, and BMI[28,29]. However, in their systematic review, Di Vincenzo et al.[30] (2021) reported that the PA of individuals with obesity presents a wide range of values, with no range considered normal. Body composition and hydration status disparities contribute to this variability in PA values.

Although the means of the phase angle and the water percentage in the control group (CG) and in the group without urinary incontinence (WUI) were higher when compared to the group with urinary incontinence (UI) in the present study, there was no statistically significant difference. However, the absence of a clear normality standard in the literature concerning this variable is an aspect that makes comparisons between groups and the definition of controls difficult. BMI is a weak moderator of PA distribution among individuals with excess adiposity (BMI ≥ 35 kg/m$^2$), indicative of excessive fat accumulation and increased hydration. Fat-free mass, muscle mass, and altered intra- and extracellular fluids are the main factors affecting PA in these patients. Thus, it becomes doubtful to define the PA cut-off in obesity due to the multiple factors contributing to the disease's pathophysiology that directly impact Xc and R values[28].

Most studies aimed at researching UI associations and prevalence have their sample composed of elderly or middle-aged women. Our study shows that UI was prevalent even though the mean age of the women in the sample was less than 40 years. Although the data on the association between age group and female UI is essential for planning clinical rehabilitation strategies and developing prevention policies, the variable behaviour possibly associated with UI in young adult women with grade III obesity still needs further investigation.

Despite the vast literature on BIA in individuals with obesity, this study is the only one to date investigating this profile in young women with grade III and urinary incontinence. In this sense, the findings have important clinical and public health implications due to the growing obesity epidemic worldwide.

Some limitations can be identified, such as evaluating body composition in individuals with various comorbidities and clinical histories. The lack of control of these variables may hinder the extrapolation of data for samples with different characteristics. However, the originality of this study should be highlighted, as should the data's contribution to the discussions in this health area.

No statistically significant differences were observed when comparing body composition between the subgroups of women affected by grade III obesity with and without incontinence. A high prevalence of urinary incontinence was observed in the population group included in the study, even though the sample was composed of young adult women. The findings suggest that body composition, when assessed independently of other aspects, does not seem to influence the occurrence of urinary incontinence in women with grade III obesity.

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