Probable sarcopenia and obesity in women with urinary incontinence in the climacteric period

Provável sarcopenia e obesidade em mulheres com incontinência urinária no climatério

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Abstract

Introduction: Sarcopenia and obesity are associated with several health conditions. Few studies, however, have analyzed the presence of these conditions in climacteric women with incontinence, and the association between these conditions and the severity of urinary incontinence (UI) is not clear. **Objective:** To analyze probable sarcopenia, sarcopenia, and obesity in climacteric women with different UI severities, and the association between sarcopenia and UI severity. **Methods:** This was a cross-sectional study in a public maternity hospital in Northeast Brazil, with women aged ≥ 40 years. Sociodemographic issues, urogynecological history, UI severity (Incontinence Severity Index - ISI), grip strength, and anthropometric measures (waist circumference and body mass index - BMI) were evaluated. Means, standard deviations, absolute and relative frequencies, T test, and Fisher exact test were used (significance at 5%). **Results:** The sample comprised 177 women, with a mean age of 56.3 (± 9.7) years. Regarding UI, 69 (39.0%) women presented mixed UI, and 53.1% presented moderate UI severity. Only 18.1% women had normal BMIs, and 46.8% had general obesity and 80.3% had abdominal obesity. Probable sarcopenia (low strength) was observed in 35 (20%) women, and sarcopenia, in 3.4%. Women with severe/very severe UI presented lower grip strengths ($p = 0.02$) and higher BMIs ($p = 0.04$). Sarcopenia was associated with greater UI severity ($p = 0.005$). **Conclusion:** Probable sarcopenia and higher BMI were observed in women with greater UI severities, and sarcopenia was associated with greater UI severity. Preventive measures are needed in such conditions to avoid future complications.

Keywords: Climacteric. Obesity. Sarcopenia. Urinary incontinence. Women.

Resumo

Introdução: *Sarcopenia e obesidade têm relação com diversas condições de saúde. Poucos estudos, entretanto, têm analisado a presença destas condições em mulheres incontinentes no climatério, e não está claro se existe associação destas com a gravidade da incontinência urinária (IU).* ***Objetivo:*** *Analisar provável sarcopenia, sarcopenia e obesidade em mulheres com diferentes gravidades de IU na fase do climatério e a associação da sarcopenia com a gravidade da IU.* ***Métodos:*** *Estudo transversal realizado em maternidade pública do nordeste do Brasil, em mulheres com IU a partir de 40 anos. Foram avaliadas questões sociodemográficas, histórico uroginecológico, gravidade da IU (*Incontinence Severity Index - *ISI), força de preensão e medidas antropométricas (circunferência abdominal e índice de massa corporal - IMC). Foram analisadas médias e desvios-padrão, frequências absolutas e relativas, teste T e exato de Fisher (significância de 5%).* ***Resultados:*** *Amostra de 177 mulheres com média de 56,3 (± 9,7) anos. Sobre a IU, 69 (39,0%) mulheres apresentavam IU mista e 53,1% gravidade moderada. Apenas 18,1% apresentavam IMC normal, 46,8% obesidade geral e 80,3% obesidade abdominal. Provável sarcopenia (baixa força) foi observada em 35 (20%) mulheres e sarcopenia em 3,4%. Mulheres com IU grave ou muito grave apresentaram menor força de preensão (p = 0,02) e maior IMC (p = 0,04). A sarcopenia foi associada à maior gravidade de IU (p = 0,005).* ***Conclusão:*** *Observou-se provável sarcopenia e maior IMC em mulheres com maior gravidade de IU e associação da sarcopenia com a maior gravidade de IU. São necessárias medidas preventivas quanto a tais condições, evitando futuras complicações.*

Palavras-chave: *Climatério. Obesidade. Sarcopenia. Incontinência urinária. Mulher.*

Introduction

The physiological aging process is accompanied by several changes, including changes in body composition.[1] In the female aging process, the climacteric period corresponds to the physiological transition process from the reproductive phase to the non-reproductive phase of a woman's life.[2] In this period, the deficiency in estrogen levels due to menopause, can accelerate the effect of aging on tissues, including muscle, which can have consequences on the function of the pelvic floor muscles.[3]

Loss of muscle strength, when associated with loss of muscle mass, results in a condition called sarcopenia.[4] The European Working Group on Sarcopenia in Older People (EWGSOP) recognizes this condition as a progressive and generalized muscle disease, which can present in a severe form when also associated with a loss of physical performance.[5]

Currently, muscle strength predicts adverse outcomes more accurately and is considered the most reliable measure of muscle function. Thus, the EWGSOP, in its new definition, considers probable sarcopenia when low muscle strength is detected, using this measurement as the main parameter of sarcopenia.[5]

Sarcopenia can cause serious health effects, including changes in mobility and risk of falls and fractures, which can lead to activity limitations, functional disability, impairment in the quality of life, and mortality.[5,6] Despite being associated with aging, sarcopenia can develop from the fourth decade of life.[5] The loss of muscle mass is 20% greater in women than that in men, and in the female population, this loss is significantly greater from the fifth decade of life as compared to that in the fourth decade.[7]

In addition, during the menopausal transition period, women have a greater tendency to gain weight, which is associated with increases in the body mass index (BMI) and waist circumference.[8] The abnormal or excessive accumulation of fat is defined by the World Health Organization (WHO) as obesity, which is considered a global health problem due to the increase in its prevalence in recent decades and its association with multiple comorbidities.[9]

Obesity accelerates the aging process, which can lead to changes in muscle phenotype, quantity, and quality.[10] Thus, contractile performance and force production may change, compromising skeletal muscle function,[10] in addition to resulting in increased intra-abdominal pressure, urethral and vascular structural damage in the pelvic floor, and consequently, muscle dysfunction.[11]

Changes in body composition, such as sarcopenia and obesity, seems to be associated with numerous health conditions.[6,10] Among these, urinary incontinence (UI) is one of the most prevalent conditions in middle-aged and older women. UI can negatively affect quality of life, leading to physical, functional, and psychological limitations in the affected population.[12]

The International Continence Society (ICS) defines UI as any complaint of involuntary loss of urine,[13]

and classifies it into three main types: stress urinary incontinence (SUI), urge incontinence (UUI), and mixed (MUI).[14] Estimates indicate that more than 200 million people worldwide are affected by this health condition.[15] Among middle-aged and post-menopausal woman, the prevalence range is 44% to 57%.[12]

Musculoskeletal conditions were found to be associated with UI complaints, and UI is associated with advanced age, high BMI, lower strength, and lower gait speed in older women.[16] However, although there are studies that address UI in Brazil, few have analyzed the presence of sarcopenia and obesity in women with incontinence in the climacteric phase, and no studies have analyzed possible associations with the severity of UI.

Considering that UI can develop due to the decrease in strength of the pelvic floor muscles and the overload imposed on these muscles; given the high prevalence of this condition in women, especially middle-aged and older women; and, knowing its impact on quality of life and functionality of these women, the objectives of this study were to analyze probable sarcopenia, sarcopenia, and obesity in women in the climacteric phase with UI of different severities and, secondarily, to analyze the association of sarcopenia with the severity of UI.

Methods

Type and place of study

This cross-sectional study was carried out in the physiotherapy service of the urogynecology outpatient clinic of the Maternity School Assis Chateaubriand (MEAC), a public maternity hospital in Ceará, Northeastern Brazil. The MEAC is a reference maternity hospital for the whole of Ceará, and the physiotherapy service of the urogynecology outpatient clinic is one of the few in the state that offers free and specialized care for women with UI.

Subjects and sample selection

This study employed a non-probabilistic sample, for convenience. Participants were recruited consecutively when they arrived for physical therapy evaluation at the MEAC urogynecology outpatient clinic. Women evaluated from July 2017 to July 2019 who met the inclusion criteria were considered for this study.

Inclusion and exclusion criteria

To participate in the study, the women needed to have entered the outpatient physiotherapy service in the cited period and be over 40 years old and diagnosed with UI. In addition, they could not have neurological and/or degenerative diseases, such as Parkinson's, stroke, fracture in the dominant upper limb or any other condition that compromised the measurement of grip strength and completion of the questionnaires, as identified by the researchers in the first contact or were self-reported by the participant. The abandonment or impossibility, of any nature, while performing any of the procedures of the research protocol were considered as exclusion criteria.

Data collection and instruments used

Prior to data collection, the interviewers were trained and their performance of the procedures were supervised. The research project was submitted to the MEAC Research Ethics Committee (CAAE: 69965617.0.0000.5050), and data collection was initiated after approval was received. Women were included consecutively as they entered the urogynecological physiotherapy service at the maternity hospital.

In the first contact, protocols and research objectives were clarified, after which they were asked to sign the Free and Informed Consent Term (FICT). After consent, information was collected through a structured questionnaire, assessment of anthropometric measurements, grip strength test, and UI severity questionnaire. All the variables are described hereafter.

Socioeconomic and demographic variables

As for marital status, women were categorized as "with partnership" and "without partnership." In relation to ethnicity/race, they were classified as white, brown, and black. Regarding education, they were classified as illiterate, completed elementary school, completed high school, and higher education or more. Women were categorized into two groups on the basis of whether they were engaged performing income-generating activities.

Urogynecological and obstetric history

Variables including type of UI and number of pregnancies and deliveries were considered. Regarding

the types of UI, women were categorized into SUI, UUI, and MUI. Number of pregnancies was also considered for analysis.

Regarding menopausal transition, women were asked about the presence or absence of menstrual cycles, as well as the time of absence of these. Thus, they were categorized into three periods: pre-menopausal (regular menstrual cycles, which may be shorter, but without delays); peri-menopausal (change in cycle interval greater than seven days from the observation of the last menstrual cycle, up to one year of amenorrhea); and, post-menopausal (women who have had their last period more than one year ago), following the STRAW – Stages of Reproductive Aging Workshop classification.[17]

Severity of urinary incontinence

UI severity was evaluated using the Incontinence Severity Index (ISI) questionnaire. The ISI is a brief, validated instrument that facilitates the assessment and classification of UI severity.[18] Furthermore, it has good reliability (Cronbach's α coefficient = 0.93 and intra-class correlation coefficient = 0.96) and satisfactory construct validity ($r = 0.72$, $p < 0.01$).[18] Composed of two questions, frequency and amount of urinary leakage, the final score is obtained by multiplying the frequency scores by the amount of urinary leakage, allowing its classification into mild, moderate, severe, and very severe.[18] For the analysis of the present study, severity was categorized as mild to moderate and severe or very severe.

Physical exercises

Regarding the performance of physical exercise, the women were asked about the performance, type of activity, and frequency and duration per week. In the present study, women were considered to be physically active when they regularly exercised for at least 150 minutes/week.[19]

Anthropometric measurements - Classification of general and abdominal obesity

A digital scale (Líder® brand, model P-150 C) and a stadiometer were used to measure weight (kg) and height (m), respectively, which were later used to calculate the BMI (kg/m^2). The BMI values were classified into the following categories according to the International Classification of general obesity of the WHO: 18.50 to 24.99 (normal weight); 25.00 to 29.99 (overweight); 30.00 to 34.99 (obese I); and, ≥ 35.00 (obese II and III).[20]

For the measurement of waist circumference, a tape measure "Fiberglass" was used with divisions of 1 mm and the measurement followed the procedures suggested by the document *Waist circumference and waist-hip ratio: report of a WHO expert consultation*.[21] The participant was positioned with feet together and arms over the trunk and was instructed to relax. The measurement was taken above the iliac crests and below the ribs, at the end of a normal expiration. Women with waist circumferences ≥ 88 cm were considered to have abdominal obesity, as proposed by the Brazilian obesity guidelines defined by the Brazilian Association for the Study of Obesity and Metabolic Syndrome.[22]

Waist circumference can provide an estimate of increased abdominal fat, even in the absence of a change in BMI, thereby avoiding some classifications errors.[1] These errors can occur because the BMI does not differentiate between lean mass and fat mass, and even persons with BMI classified as normal can have high percentages of fat mass.[1]

Grip strength

To assess handgrip strength, a calibrated SAEHAN® - SH 5001 hydraulic dynamometer was used, which provided a record of muscle strength in kilograms-force (kgf). The measurement was performed as recommended by the American Society of Hand Therapists,[23] with the volunteer in a sitting position, with the shoulder adducted and in neutral rotation, elbow positioned at 90° of flexion, and the forearm and wrist in neutral positions.

In this position, after demonstration by the evaluator, maximum contractions were requested to be sustained for five seconds, with an interval of one minute between measurements. The dominant limb was considered for the evaluation. The arithmetic mean of the three consecutive measurements was considered for the analysis.[23] Women were classified as having low grip strength (probable sarcopenia) when they presented values below the 20th percentile (≤ 13.0 kgf) of the sample.[4]

Skeletal muscle mass (SMM)

Muscle mass prediction was obtained from the (SMM) prediction equation proposed by Lee et al.[24] (in a sample of adults between 20 and 81 years old), which had as reference the magnetic resonance and the following final equation: SMM (kg) = (0.244 * MC) + (7.8 * EST) + (6.6 * sex) – (0.098 * age) + (ethnicity – 3.3), where EST = height (m); MC = body mass (kg); sex: 1 = men and 0 = women; ethnicity: 1.2 = Asians; 1.4 = Afro-descendants, blacks and browns; 0 = Caucasian, white.[24]

This equation was validated in Brazil and, according to Rech et al.,[25] the estimated SMM did not differ statistically from that obtained by DEXA (Dual-Energy X-ray Absorptiometry) and showed a high correlation, both in men ($r = 0.90$; $p < 0.05$) and women ($r = 0.86$; $p < 0.05$). In addition, agreement was observed between the methods (Kappa = 0.743; $p < 0.001$), with high sensitivity (86%) and specificity (89%), demonstrating that there was no difference between the prevalence values of sarcopenia measured by DEXA and the equation of Lee et al.[24,25]

After the value was obtained by the SMM prediction equation, the skeletal muscle mass index (SMI) was calculated, considering that SMI = SMM [skeletal muscle mass (kg)/height (m)²]. Women were classified as having low muscle mass when they presented SMI values below the 20th percentile (≤ 7.88 kg/m²) of the studied sample.[4]

Classification of probable sarcopenia and sarcopenia

According to the new European sarcopenia consensus established by the EWGSOP, sarcopenia is likely when low muscle strength is detected, and the association with low muscle mass confirms the diagnosis. Sarcopenia is considered severe when it is associated with low muscle strength, muscle mass, and physical perfomance.[5] In this study, the presence of probable sarcopenia was considered when the women had reduced grip strengths, (≤ 13 kgf) and sarcopenia was considered in the presence of reduced grip strength (≤ 13 kgf) associated with low muscle mass as assessed by the SMI (≤ 7.88 kg/m²).[5]

Data analysis

For statistical analysis, SPSS software, version 20.0 (SPSS, Chicago, IL, USA) was used. Data normality was verified using the Shapiro–Wilk test. The descriptive analysis of the sample was presented using means and standard deviations for quantitative variables and absolute and relative frequencies for categorical variables.

Student T test was used to compare body composition and grip strength variables between the UI severity groups. Finally, for the analysis of the association between the independent categorical variables (sarcopenia and obesity) and the dependent variable (UI severity), Fisher exact test was used. For all tests, a statistical significance level of 5% was considered.

Results

The sample comprised 177 women. Regarding sociodemographic data, it was observed that the mean age of the women was 56.31 (± 9.75) years. By age group, 61.6% were < 60 years old. As for education, 50.3% had completed elementary school, and only 9.1% had received higher education or more. Most women reported partnership (n = 100; 56.5%). Only 68 (38.4%) reported engaging in income-generating activities. As for the number of pregnancies and deliveries, averages of 3.77 (± 2.92) and 3.06 (± 2.42) were observed, respectively.

Notably, only 32 (18.1%) women had normal BMIs, and 83 (46.8%) were classified within the obesity categories. The mean BMI was 30.07 (± 5.42). The mean waist circumference was 96.83 (± 12.26), and 80.3% had abdominal obesity. Other variables and categories are described in Table 1.

Regarding the type of UI, 39% of the women had MUI. Regarding the severity of UI, 4% were classified as mild; 53.1%, moderate; 27.7%, severe; and 15.2%, very severe. This variable was recategorized into two groups for association analysis (mild to moderate and severe to very severe). These values and the other types of urinary incontinence are described in Table 2.

The mean grip strength among the women evaluated was 18.08 (± 5.61) kgf. Table 3 shows the MME and IMME means, as well as the number of women with low muscle mass, low muscle strength (probable sarcopenia), and low mass plus low muscle strength (sarcopenia: 3.4%).

On comparing the values of grip strength and body composition variables between the different groups of UI severity, statistically significant differences were

observed for grip strength (p = 0.02) and BMI (p = 0.04). Women with severe or very severe UI had lower mean grip strengths and higher mean BMIs (Table 4).

Secondarily, on analyzing the association of sarcopenia with UI severity (ISI), a significant statistical difference (p = 0.005) was observed, showing that sarcopenia (deficit in muscle strength and mass) was present in women with severe or very severe UI (Table 5).

Table 1 - Sample characteristics (n = 177)

Variables	n	%
Age group		
< 60 years	109	61.6
> 60 years	68	38.4
Color		
White	37	21.0
Brown	124	70.5
Black	5	8.5
Education*		
Illiterate	7	4.0
Up to complete elementary school	88	50.3
Up to high school	64	36.6
Higher education or more	16	9.1
Partnership		
With partner	100	56.5
Without partner	77	43.5
Income-generating activities		
Yes	68	38.5
No	109	61.6
Menopausal Status		
Pre-menopause	32	18.1
Perimenopause	26	14.7
Post-menopause	119	67.2
Regular exercise*		
Yes	16	21.3
No	59	78.7
Body mass index (kg/m²)		
Normal weight	32	18.1
Overweight	62	35.0
Obese I	50	28.2
Obese II & III	33	18.6
Abdominal circumference (cm)		
≥ 88 cm	139	80.3
< 88 cm	34	19.7

Note: *n valid = schooling (n = 175) and regular exercise (n = 75).

Table 2 - Type and severity of urinary incontinence (UI) according to the ISI questionnaire

Variables	n (177)	%
Type of IU		
UUI (urgent)	46	26.0
SUI (stress)	62	35.0
MUI (mixed)	69	39.0
ISI classification		
Mild to moderate	101	57.1
Severe to very severe	76	42.9

Note: ISI = Incontinence Severity Index.

Table 3 - Skeletal muscle mass (SMM), skeletal muscle mass index (SMI), grip strength, and sarcopenia in women with urinary incontinence

Variables	Average	SD
SMM (kg)	21.53	3.50
SMI (kg/m²)	9.14	1.37
Grip strength (kgf)	18.08	5.61
SMI (kg/m²)*	n	%
Below the 20th percentile	36	20.5
Above the 20th percentile	140	79.5
Probable sarcopenia (kgf)*	n	%
Force below the 20th percentile	35	20.0
Force above the 20th percentile	140	80.0
Sarcopenia*	n	%
Yes	6	3.4
No	168	96.4

Note: SD = standard deviation. *n valid = SMI (n = 176), probable sarcopenia (n = 175), and sarcopenia (n = 174).

Discussion

The main objective of this study was to verify probable sarcopenia, sarcopenia, and obesity, and the existence of an association between sarcopenia and the severity of UI in women with UI in the climacteric phase. Women with severe or very severe UI had lower mean grip strengths (probable sarcopenia) and higher mean BMIs. There were also high frequencies of general and abdominal obesity, as well as an association of sarcopenia (deficit in strength and muscle mass) with a greater severity of UI.

Table 4 - Comparison of grip strength, SMM, SMI, waist circumference, and BMI between different UI severity groups

Variables	ISI classification	n	Average	SD	p-value [a]
Grip strength	Mild to moderate	101	18.91	6.08	0.02
	Severe or very severe	74	16.95	4.72	
SMM	Mild to moderate	100	21.38	3.55	0.49
	Severe or very severe	76	21.74	3.43	
SMI	Mild to moderate	100	9.03	1.31	0.26
	Severe or very severe	76	9.27	1.44	
Waist circumference	Mild to moderate	99	95.34	11.53	0.06
	Severe or very severe	74	98.83	12.99	
BMI	Mild to moderate	101	29.38	4.99	0.04
	Severe or very severe	76	31.00	5.84	

Note: SMM = skeletal muscle mass; SMI = skeletal muscle mass index; BMI = body mass index; UI = urinary incontinence; ISI = Incontinence Severity Index questionnaire. [a]Student t test.

Table 5 - Analysis of the association between sarcopenia and severity of urinary incontinence

Sarcopenia	ISI classification		Total (n = 174)	p-value[a]
	Mild to moderate n (%)	**Severe or very severe** n (%)		
Yes	0 (0)	6 (100)	6 (100)	0.005
No	100 (59.5)	68 (40.5)	168 (100)	

Note: ISI = Incontinence Severity Index questionnaire. [a]Fisher exact test.

Low grip strength, considered as probable sarcopenia, is associated with several health problems, such as falls, fractures, increased functional limitations, and poor quality of life.[5] Grip strength is a simple and inexpensive non-invasive marker of muscle strength, considered a key component in the diagnosis of sarcopenia.[5]

In the present study, 35 women had low muscle strength, that is, probable sarcopenia. When the grip strength values were compared between the different groups of UI severity, a statistically significant difference was observed (p = 0.02). The average grip strength was 18.0 kgf. A study proposed reference values of handgrip strength for individuals aged 18–85 years and considering an average of 25.1 kgf in the dominant limb for women aged 55–59 years.[26] The consensus on sarcopenia has a cut-off point of 16 kgf.[5]

Compared with the sample of the present study, a low average value of grip strength was observed in women with an average of 56 years. Therefore, these data serve as a warning for the adoption of preventive measures in order to prevent sarcopenia in the future, in addition to other complications associated with strength deficit. Preventive measures such as adequate nutrition and regular exercise seem to delay or reverse sarcopenia.[5]

Further, sarcopenia was found in 3.4% of the sample. A similar value, i.e. < 3% was observed by Abe et al.,[27] while evaluating women under 60 years of age, similar to the present study sample. On the other hand, Simsek et al.[28] observed the presence of sarcopenia in 5.2% while evaluating 909 older people aged over 65 years, of which 582 were women.

In a systematic review, a prevalence of 1 to 29% of sarcopenia was observed in studies with a mean age ranged from 59.2 to 85.8 years; 14 to 29% in those living in long-term care institutions, and 10% in those in acute hospital care.[29] According to Cruz-Jentoft et al.,[29] the prevalence of sarcopenia varied widely in the literature, which is probably justified by the different populations and regions studied, as well as the different methods used for its assessment.

The pathophysiological mechanisms responsible for the development of sarcopenia are multiple and complex; they include physical inactivity, pathologies, physiological changes related to aging, and inadequate nutrition, among others.[4] Thus, considering that sarcopenia is a multifactorial condition, it is noteworthy that in the present study, analyses were not performed for adjusting for possible confounding factors which allow for bias in the results.

Given this context and considering that the mean age of this sample was 56.3 years, the presence of insufficient strength and muscle mass in some women should be noted. Thus, this population may evolve with limitations in its functionality over time, not only related to the structure and function of the body, but also to its activities and social participation.

Regarding general obesity, the frequency observed was 46.8% as per the obesity categories defined by BMI, whereas abdominal obesity was 82.1%. Among women with incontinence, Baykuş and Yenal[15] observed a similar obesity frequency of 47.7%, as assessed by BMI. The number of obese people is increasing worldwide; in 2016, the WHO reported that approximately 13% of adults worldwide were obese.[30] In addition, studies show that this prevalence is higher in the female population as compared to the male population.[8] The menopausal transition period may contribute to this difference, as this period is associated with increased body weight and changes in body composition, usually in the form of abdominal adiposity and decreased lean muscle mass.[8,31]

BMI is a measure often used in research and clinical settings. Waist circumference, however, becomes more relevant, as it considers the distribution of fat, and this parameter is an independent predictive factor for mortality.[8] In a study carried out in middle-aged women (mean 49.9 ± 5.5 years) in the Northeast, the authors observed abdominal obesity in 67.4% of those evaluated,[32] a proportion slightly lower than that observed in the present study (80.3%), which was performed only in women with UI. Park and Lee[11] observed that women with incontinence (mean 55.4 ± 13.3 years) had significantly higher values of BMI ($p < 001$) and waist circumference ($p < 001$) as compared to women without incontinence. These findings indicate that women with UI may have higher BMI and waist circumference values.

In the study by Park and Baek,[33] non-obese women (< 25 kg/m^2) with abdominal obesity (waist circumference ≥ 80 cm) had a higher chance of UI, followed by obese women (BMI ≥ 25 kg/m^2) with abdominal obesity, which indicates that abdominal obesity may have a greater impact on UI than general obesity.

Abdominal obesity can lead to several metabolic consequences such as dyslipidemia, hypertension, and cardiovascular disease. The cardiovascular disease is the leading cause of death in postmenopausal women.[31] Therefore, it is necessary to reflect on these values and direct attention to the control of body composition in middle-aged women, in order to take preventive measures to reduce future complications. In the present study, we observed a high frequency of obesity and a higher mean BMI in women with severe or very severe UI and a trend towards a higher mean waist circumference in these women. In this way, body weight reduction is encouraged, as it is positively related to the improvement of incontinence symptoms.[33]

Urinary incontinence is considered a relevant health problem in the world, as it can lead to physical, emotional, psychosocial, sexual, and hygienic impairment, among others, in addition to high health expenditures for the public health system.[15] In the present study, the majority of the population (39.0%) had mixed UI. Similar results were seen in the study carried out by Juliato et al.[14] with 749 middle-aged Brazilian women (mean 52.5 ± 4.4 years), where a greater percentage of MUI was observed (40.2%). Although the literature shows that the most common type is SUI, MUI is more prevalent in older women and it affects this population more severely.[34]

Regarding the severity of UI, more than 40% of the sample was classified as severe to very severe. In addition, when analyzing the association of sarcopenia with UI severity (ISI), there was a statistically significant difference ($p = 0.005$), showing that sarcopenia (deficit in muscle strength and mass) is present in women with UI severity classified as severe or very severe. There is no evidence in the literature to date about this association, although studies have observed a relationship between lower muscle strength and lower physical performance and UI.[16,35]

Some limitations of this research are recognized, such as the assessment of muscle mass through the prediction equation using anthropometric measurements, although it is validated in relation to the gold standard, i.e., magnetic resonance,[25] as well as the method of filling out the questionnaire through self-reporting; however, it is noteworthy that they are validated and widely used

questionnaires in research. Furthermore, considering that the study sample was selected by convenience, selection bias could have occurred.

A future longitudinal study is suggested, in which the cause-and-effect relationship between sarcopenia and UI severity can be analyzed, which cannot be observed in cross-sectional studies. Studies considering women with and without UI should also be conducted to analyze sarcopenia and the limitations that this condition can bring related to activities and social participation.

Finally, considering that the average age of the women was less than 60 years, there was a considerable number of women with probable sarcopenia (low muscle strength) and a higher frequency of sarcopenia compared to previous studies in the literature. In addition, there were also high percentages of women with general and abdominal obesity in this population. Thus, understanding the repercussions that sarcopenia and obesity can cause, the importance of implementing preventive strategies aiming at reducing complications related to these conditions is emphasized. It is also noteworthy that sarcopenia was associated with a greater severity of UI, reinforcing the importance of preventing and recovering from this condition, with the aim of contributing to reducing the severity of UI.

Conclusion

In this study, the presence of probable sarcopenia (low muscle strength) and sarcopenia was observed in climacteric women with UI, along with high frequencies of general and abdominal obesity. In addition, sarcopenia was associated with greater severity of UI. Thus, knowing the limitations that these conditions can cause, preventive measures that promote an increase in muscle mass and strength and reductions in body weight and waist circumference, in addition to the practice of physical exercise and adequate nutrition are required, as sarcopenia and obesity are reversible conditions. Thus, such measures can also contribute to reducing the severity of UI, thereby preventing future complications.

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Authors' contributions

RLCAS and MAM were responsible for data analysis and interpretation and, together with SLN, for writing the manuscript; SVOP and SLN reviewed the manuscript. All authors were responsible for the study design and approval of the final version.

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