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ORIGINAL RESEARCH

Risk of sarcopenia in community-dwelling older women with complaint of acute low back pain

Risco de sarcopenia em idosas com queixa de dor lombar aguda

Riesgo de sarcopenia en ancianas con queja de dolor lumbar agudo

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ABSTRACT | The risk of sarcopenia was verified in community-dwelling older women with complaints of acute low back pain. The pain index and mobility/balance were compared between patients at risk of sarcopenia and the non-sarcopenic ones. This is a cross-sectional research, subproject of the epidemiological and multicenter study *Back Complaints in the Elders* (BACE). patients were older women with at least one episode of acute low back pain within six weeks prior to data collection. We evaluated the walking speed (4.6 m), grip strength (Jamar dynamometer), pain index (analog pain scale) and mobility/balance (Timed Up and Go test). Risk of sarcopenia was estimated by percentage measure and comparisons by the Independent Samples t Test. A significance level of 5% was adopted. A total of 322 older women participated in this study. The risk of sarcopenia was 54%, i.e., 173 patients (71.8±5.2 years) were at risk of sarcopenia and 149 (46%) were non-sarcopenic (71.5±5.1 years). There was difference for the pain intensity (p=0.02) and the mobility/balance (p=0.01), given that the ones at risk of sarcopenia were in worse conditions. The results showed risk of sarcopenia among older women with acute low back pain. The latter showed higher pain index and worse mobility/balance, suggesting that sarcopenia, if present in older women with this pain, can influence negatively the functionality.

Keywords | Sarcopenia; Low Back Pain; Aged; Mobility Limitation.

RESUMO | Verificou-se o risco de sarcopenia em idosas comunitárias com queixa de dor lombar aguda e comparou-se o índice de dor e mobilidade/equilíbrio entre aquelas em risco de sarcopenia e as não sarcopênicas. Pesquisa transversal, subprojeto do estudo epidemiológico e multicêntrico *Back Complaints in the Elders* (Bace). Participaram idosas com ao menos um episódio de dor lombar aguda no prazo de seis semanas antes da coleta de dados. Avaliou-se a velocidade de marcha (4,6m), a força de preensão palmar (dinamômetro Jamar), o índice de dor (escala analógica de dor) e mobilidade/equilíbrio (*Timed Up and Go test*). O risco de sarcopenia foi estimado por medida percentual e as comparações pelo teste t para amostras independentes; o nível de significância adotado foi de 5%. Participaram deste estudo 322 idosas: o risco de sarcopenia foi de 54%, ou seja, 173 idosas (71,8±5,2 anos) estavam em risco de sarcopenia e 149 (46%) eram não sarcopênicas (71,5±5,1 anos). Houve diferença quanto à intensidade da dor (p=0,02) e à mobilidade/ao equilíbrio (p=0,01), sendo que aquelas em risco de sarcopenia estavam em piores condições. Os resultados demonstraram risco de sarcopenia entre as idosas com dor lombar aguda. Estas apresentavam maior índice de dor e pior mobilidade/equilíbrio, sugerindo que a sarcopenia, se presente em idosas com essa dor, pode influenciar negativamente na funcionalidade.

Descritores | Sarcopenia; Dor Lombar; Idoso; Limitação da Mobilidade.

Study developed in the laboratories from the Graduate Program in Rehabilitation Sciences at the Universidade Federal de Minas Gerais (UFMG), Brazil.

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RESUMEN | Se verificó el riesgo de sarcopenia en ancianas comunitarias con queja de dolor lumbar agudo y se comparó el índice de dolor y movilidad/equilibrio entre aquellas en riesgo de sarcopenia y las no sarcopénicas. Investigación transversal, subproyecto del estudio epidemiológico y multicéntrico *Back Complaints in the Elders* (Bace). Participaron ancianas con al menos un episodio de dolor lumbar agudo hasta seis semanas antes de la recolección de datos. Se evaluó la velocidad de marcha (4,6m), la fuerza de asimiento palmar (dinamómetro Jamar), el índice de dolor (escala analógica de dolor) y movilidad/equilibrio (*Timed Up and Go test*). El riesgo de sarcopenia fue estimado por medida porcentual y las comparaciones por la prueba t para muestras independientes; el nivel de significancia adoptado fue del 5%. El estudio incluyó a 322 ancianas: el riesgo de sarcopenia fue del 54%, o sea, 173 ancianas (71,8 ± 5,2 años) estaban en riesgo de sarcopenia, y 149 (46%) fueron sarcopénicas (71,5 ± 5,1 años). Se observó una diferencia en cuanto a la intensidad del dolor (p=0,02) y a la movilidad/al equilibrio (p=0,01), siendo que aquellas en riesgo de sarcopenia estaban en peores condiciones. Los resultados demostraron el riesgo de sarcopenia entre ancianas con dolor lumbar agudo. Estas presentaban mayor índice de dolor y peor movilidad/equilibrio, sugiriendo que la sarcopenia, si está presente en ancianas con ese dolor, puede influenciar negativamente en la funcionalidad.

Palabras clave | Sarcopenia; Dolor Lumbar; Anciano; Limitación de la Movilidad.

INTRODUCTION

The change of the Brazilian age structure contributed to the modification of the epidemiological profile of the population. The prevalence of infectious and contagious diseases has been transitioning to the chronic and degenerative ones, as musculoskeletal and joint disorders, and the consequent increase of pain[1-3]. Pain is a multidimensional, subjective, unpleasant, and individual and generally recurrent experience. It can be influenced by social, emotional and cultural factors, which contribute to the emergence of disabilities and dependency, causing negative impacts on individuals' functionality and quality of life[4,5].

Low back pain (LBP) is a highly prevalent and disabling symptom throughout the world, being characterized by a tension or stiffness in the region between the last ribs and the inferior gluteal folds, with or without irradiation to lower extremities[4]. Studies estimate that 70 to 80% of the world population have at least one episode of LBP during life, with recurrence in about 30 to 60% of cases[4,6]. In Brazil, LBP is manifested in 63% of the general population, especially in the older people: 57.7% of the population aged 60 years or over reports this condition[6]. Regarding the prevalence by sex, women are the most affected by the LBP, especially the postmenopausal ones, due to the reduction in the estrogen levels, being associated to the decrease of bone and muscle mass. In addition, factors as joint fragility and ergonomic load imposed by housework and repetitive tasks can contribute to the higher prevalence in this populational group[6]. Despite this high prevalence, studies specific to this population are still scarce, even though older people live longer with the functional limitations and the disabilities resulting from this condition[6-8].

Due to its multifactorial character and complexity, LBP can be classified as *specific* when the triggering cause is known and non-specific when there is no defined cause, being the latter the most prevalent, with 90% of cases[4,7]. In addition, LBP can be classified according to the duration of its symptoms: the *acute* is characterized as self-limiting, lasting up to six weeks; the *subacute* lasts between six and twelve weeks; and the *chronic* persists for over than twelve week[4,9].

Another relevant phenomenon in aging is the sarcopenia. According to the European Working Group on Sarcopenia in Older People (EWGSOP), sarcopenia is defined as a syndrome characterized by the progressive and generalized loss of muscle mass and function (muscle strength or performance), even without the presence of diseases[10,11]. Sarcopenia has been related to the decrease in functionality and quality of life and to the increased risk of death[12]. It has multifactorial etiology and several factors associated with its genesis are indicated, as the loss of motoneurons, the increase in plasma levels of pro-inflammatory cytokines and sedentarism[10-12]. These associations suggest interrelation with the loss of balance and overlapping of the catabolism in relation to the muscle anabolism[10,12].

The loss of muscle fibers resulting from sarcopenia occurs in a generalized manner, compromising the muscles responsible for stabilization and maintenance of posture, as well as the multifidus, the paravertebral, the deep postural muscles and the transverse ones of the abdomen[13-17]. Thus, an imbalance can occur in the normal biomechanical functioning of the spinal cord, causing dysfunctions and compensations that can trigger pain processes in the area of the lumbar spine[15-17]. Similarly, the LBP can lead to muscular inhibition due to the decrease of the efferent stimuli to the compromised muscles, thus being able to contribute to the emergence of sarcopenia[15-17]. In this case, both the pain process and the sarcopenia can lead to the decrease in the physical activity level – essential process for the stimulation of muscle synthesis – of the older person, culminating in a progression cycle of sarcopenia and pain by inactivity. In addition, this framework can contribute to the reduction of the older person's functionality and quality of life[15-17].

Therefore, considering the relevance of sarcopenia and LBP on older people's health, the high financial costs for public health and the need for greater understanding of these two conditions, the objectives of this study were (1) to verify the risk of sarcopenia, according to the EWGSOP algorithm, in older women complaining of non-specific acute LBP and (2) to compare the pain intensity and mobility/balance between older women with non-specific acute LBP, classified as "non-sarcopenic" and "at risk of sarcopenia".

METHODOLOGY

This is a cross-sectional and observational study that assessed 322 community-dwelling older women in Belo Horizonte. This research is a subproject of the epidemiological, multicenter and longitudinal study between Brazil, Netherlands and Australia, named Back Complaints in the Elders (BACE). The BACE-Brazil study was approved by the Research Ethics Committee of the Universidade Federal de Minas Gerais (UFMG), Brazil, protocol no. ETIC 0100.0.203.000-11. Patients were selected through active search in different hospitals and Reference Centers of Older People in the metropolitan area of the city. Those eligible for the study answered a questionnaire for sociodemographic data collection and were assessed according to the protocol of the main study. The researchers involved received previous training and followed the standardization required for data collection with the instruments.

Sample

Inclusion criteria were: community-dwelling older women, aged 65 years or over, referred for assessment by health services, and with a new episode of non-specific acute LBP. The acute LBP was defined as an acute pain episode occurred within six weeks prior to data collection in the area between the last ribs and the gluteal line. The patient could not have looked for care and/or treatment due to pain, and could not have had any determined cause[18]. These criteria are in accordance with the BACE study[19]. The older women were informed about the objectives, risks and benefits of the research, and those who agreed to participate signed an informed consent form (ICF) approved by the Research Ethics Committee of UFMG.

Exclusion criteria were: patients with severe visual, hearing and/or motor impairment, which prevented the performance of the tests, and cognitive alterations detected by the mini-mental state examination[20]. Similarly, these criteria followed the ones determined in BACE. For this analysis, patients younger than 65 years, without data related to the walking speed (WS) and grip strength (GS), and men were excluded.

Instruments and measurements

Identification of older women at risk of sarcopenia

To identify older women at risk of sarcopenia (OWRS), the EWGSOP algorithm was used (Figure 1). It is based on the measurement of the WS and the GS. For these tests, the data collection was carried out after a familiarization.

Initially, the WS test was conducted in 4.6 meters[10,21]. This test consisted of walking in regular speed a distance of 8.6 meters. The period walked was clocked and the two initial and final meters were not considered because they correspond to the times of acceleration and deceleration in the walk, respectively. The test was conducted with the usual footwear. The use of walking aids or orthesis was allowed. For analysis, the speed in meters per second (m/s) was used[21]. The cut-off point was 0.8 m/s[10]. Patients were instructed to remain standing with both feet behind the starting line and began the walk soon after a specific verbal command. This test was applied twice, with one-minute interval between repetitions, and the mean of the two tests was used for analyses. The WS test has good reliability and has been indicated as a predictor of several health conditions in older people, including the fragility and the sarcopenia[10,21].

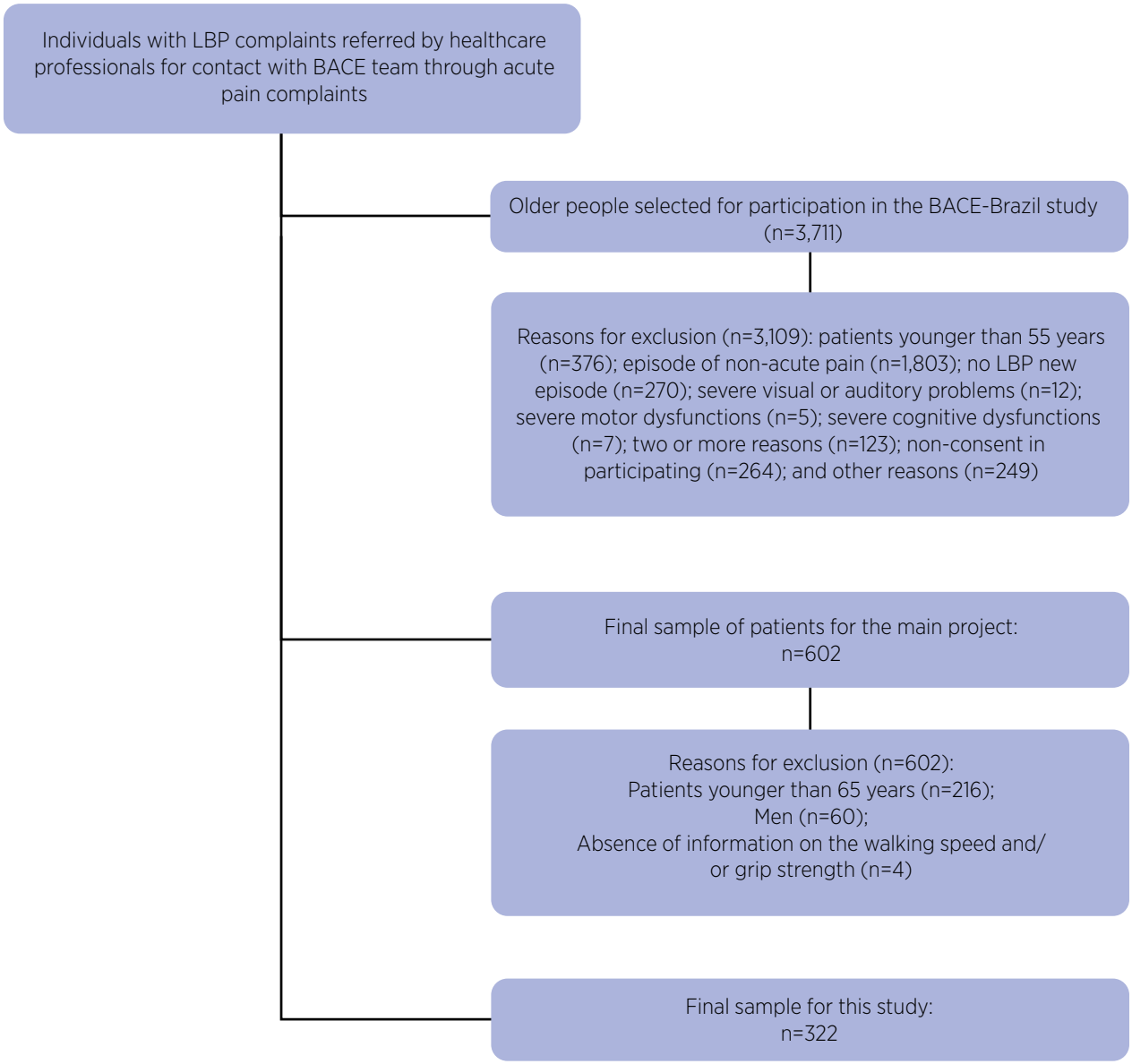

Figure 1. Flowchart showing the selection of the sample

The GS was measured through the Jamar dynamometer (Sh5001 model from Saehan Corporation), which provides a valid, rapid, direct and isometric reading of the grip strength[22]. This instrument features excellent reliability (CI=0.98) and validity[22]. Thus, this measurement was conducted by the dominant hand (the one used to sign the name). The patients remained seated on a chair with backrest, with erect spine, feet on the ground and the hip and knees bent at 90°; the shoulder was in adduction and neutral rotation, with the arm positioned next to the body, the elbow flexed at 90° and the wrist was neutral, without the armrest in the chair. At the examiner's sign, the patient performed the maximum of GS for six seconds[22]. There was encouragement through claps and the word "Come on!". Three measures were conducted, with an interval of one minute between them, and the mean was used for analysis. The cut-off point considered was 20 kg/f[10].

For classification of non-sarcopenic (NSOW) and OWRS older women, the following criteria was used: those with WS below 0.8 m/s were directly classified as "at risk of sarcopenia". The patients who obtained WS above 0.8 m/s performed the GS measurement. Those who had mean measurement below the cut-off point for GS (20 kg/f) were also classified as "at risk of sarcopenia". Older women above the cut-off point were classified as NSOW (Figure 2)[10].

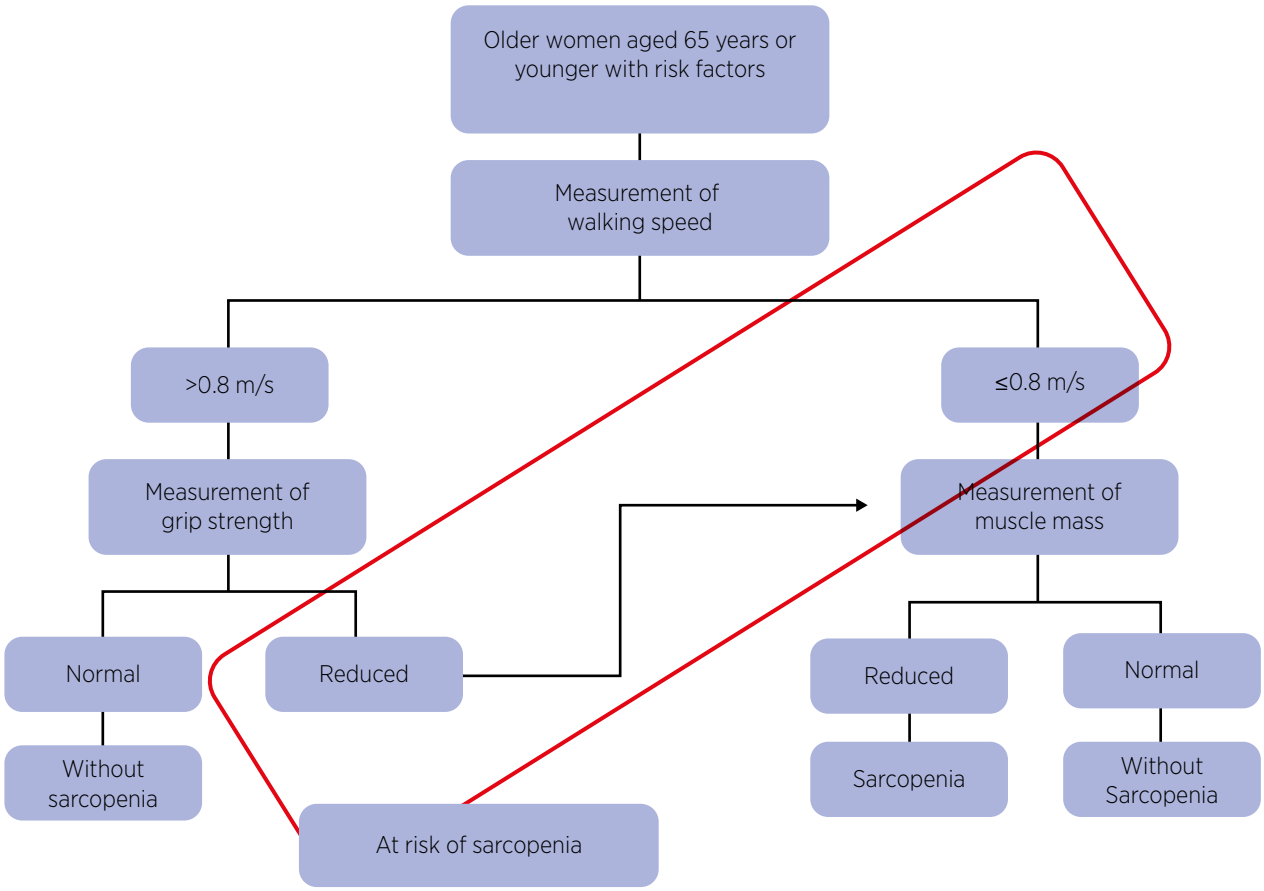

Figure 2. Algorithm for identification of "non-sarcopenic" and "at risk of sarcopenia" older women, according to the EWGSOP

Pain characterization

The LBP characterization was conducted by the visual analogue scale (VAS) for pain. This scale ranges from 0 to 10, in which 0 means "no pain" and 10 means "worst pain", i.e., extreme pain[23]. Previous studies showed excellent reliability of this measure (CI=0.90)[23]. The pain level felt in the preceding week was taken as reference.

Assessment of mobility/balance

The Timed Up and Go test (TUG) was used for assessment of mobility/balance. In TUG, the patient is asked to stand up from a standardized chair, without using the arms for help, to walk for three meters ahead, at the usual walking speed, to turn and return to sit again. The time taken to perform the task was timed, starting the moment the torso left the backrest of the chair and turned off when the torso touched it again[24]. This is a validated test, widely used in Geriatrics and features good reliability (CI=0.90). Two measurements were conducted: the first was a training (familiarization), with one-minute rest between this and the other measurement.

Characterization of the sample

To characterize the patients, the standardized questionnaire was used, which was created for the main (BACE)[19] and for this study. In addition to the mean age, depressive symptoms were analyzed through the Center for Epidemiological Studies-Depression (CES-D)[25], the physical activity level through the Active Australia Questionnaire (AAQ)[26] and functional performance through the Roland Morris Disability Questionnaire (RMDQ)[27].

Statistical analysis

The calculation of the sample has been published in previous studies[18,19]. The characterization of the sample was conducted by descriptive statistics. Measures of central tendency (mean and standard deviation) were used for continuous variables and measures of absolute (n) and relative (%) frequency were used for categorical variables. To verify the risk of sarcopenic and non-sarcopenic older women, percentage measures were used, after

stratification according to the algorithm proposed by the EWGSOP[10]. Normality hypothesis tests of data distribution were performed for all outcome variables through the Kolmogorov-Smirnov test. Comparisons between groups occurred through the Independent Samples t Test. Analyses were conducted by the program Statistical Package for the Social Sciences (IBM SPSS Data Collection), version 17.0, with a significance level of 5%.

RESULTS

The older women participating in this study totaled 322, with mean age of 71.7 (5.2) years. A flowchart showing the characteristics of the sample is illustrated in Figure 1. Most patients (35.6%) reported being a widow, with a mean of 6.8 (4.7) years of education, and pain mean in the week preceding the tests of 4.75 (3.14) points in VAS. A total of 173 (54%) older women were classified as "at risk of sarcopenia" and 149 (46%) were classified as "non-sarcopenic". The NSOW had a mean age of 71.5 (±5.1) years, body mass index of 28.6 (±4.4) kg/m^2 and height of 154.9 (±6.0) meters. The OWRS had a mean age of 71.8 (±5.2) years, body mass index of 29.6 (±5.9) kg/m^2 and height of 153.0 (±6.1) meters. There were no differences between the groups for the depressive symptoms, physical activity level and functional performance ($p>0.05$).

Regarding the clinical variables used in this study, the mean pain in the OWRS group was higher; similarly, they had a worse time in the WS, in the performance in the TUG and in the GS mean (Table 1). When comparing the OWRS and NSOW groups, there was a difference for the pain intensity and mobility/balance (Table 1), indicating that the OWRS were in worse conditions ($p<0.01$).

Table 1. Characteristics of groups and value of the difference in comparisons between "non-sarcopenic" and "at risk of sarcopenia" older women

Variable	OWRS	NSOW	P-value	Error	CI
Walking speed (seconds), mean (SD)	0.9 (0.2)	1.1 (0.2)	0.01*	0.02	-0.24 – -0.14
Grip strength (kg/f), mean (SD)	18.0 (4.5)	24.0 (3.5)	0.01*	0.34	-6.88 – -5.12
Pain (VAS score), mean (SD)	5.1 (3.2)	4.4 (3.0)	0.02*	0.24	0.07 – 1.44
TUG (seconds), mean (SD)	12.8 (4.6)	10.6 (2.6)	0.01*	0.35	1.41 – 3.06

OWRS: older women at risk of sarcopenia; NSOW: non-sarcopenic older women; CI: confidence interval; SD: standard deviation; VAS: visual analog scale; TUG: Timed Up and Go test; *: significant difference.

DISCUSSION

This study aimed at verifying the risk of sarcopenia in older women with acute LBP complaint and comparing the pain intensity and mobility/balance between NSOW and OWRS. The results showed that there was a higher percentage of OWRS (54%) and that they had worse mobility/balance and higher pain intensity when compared to the NSOW.

Sarcopenia has been indicated as a syndrome characterized by the loss of muscle strength and function in aging, and can be related to several adverse events of health[10,11]. The algorithm proposed by EWGSOP allows the early identification of risk of sarcopenia in large populations of older people.[10] Therefore, older people identified at risk must be referred to examinations of body composition for the diagnostic confirmation, its gravity and consequent prevention. This study showed that most of older patients were at risk of sarcopenia and that healthcare professionals should explore better the condition in this population. This is an important indicative for basic health services, aiming at preventing health aggravations.

In addition, the current literature is scarce on studies that associate sarcopenia to the LBP and its functional outcomes. A recent study assessed the risk of sarcopenia in 155 community-dwelling older women with acute LBP and found a ratio of 52.26% OWRS, given that these had major disabilities and greater severity and intensity of the acute LBP, in addition to differences related to the inflammatory mediators[16]. The findings of our study corroborate these results. To our knowledge, these are the only studies that approached the relationship between acute LBP and sarcopenia, demonstrating, though initially, a possible relationship that may impact functionality. On the other hand, it is

suggested that pain can contribute somehow to muscle impairment[16]. In the context of pain, Scott et al.[28], after assessing 709 older people and conducting a follow-up of 2.6 years, concluded that knee and hip pain could be predictive factors for muscle strength loss. Therefore, this could also occur in relation to the LBP, contributing to an aggravation of muscle loss and functionality.

In this case, the statement could be based on the occurrence of reduction of type 2 muscle fibers, something that occurs in sarcopenia, compromising the muscular endurance and the fatigue threshold of postural muscles[29]. Considering the mechanism of muscle stabilization, studies evidence that – when there is reduction of muscle fibers and reduction in the cross-sectional area of the stabilization muscles and consequent inability to support the demand imposed – other muscles tend to compensate its function. These compensations would cause a postural imbalance with nonphysiological biomechanical responses that would trigger a painful process[14-17]. This would justify the results found in our study, which showed that the OWRS had higher pain intensity.

In addition, studies have shown that the loss of muscle strength and function seem to precede the loss of muscle mass[30]. On the other hand, the loss of muscle mass, in isolation, might not be enough to trigger dysfunctions[30,31]. This lack of linearity reinforces the complexity of sarcopenia. In particular, the results of our study showed that most older women with acute LBP were at risk of sarcopenia and had worse performance in the mobility/balance test, confirming the possibility of an impairment of the musculature, whether in strength or function of muscles, which may be occurring even before the reduction in muscle mass. These changes could contribute and be associated with some biomechanical dysfunctions that would aggravate the LBP, especially those related to the stabilization mechanisms of the spine[16,30,31]. However, this is a topic to be examined in future studies, with a suitable methodological design for such.

On the other hand, the higher pain intensity in OWRS could also be a factor for greater inhibition of the neural stimuli triggered by the motor neurons to the postural muscles[16]. Thus, the older women would become more and more inactive, which would cause greater loss of muscle mass, strength and function, establishing a cycle[16,32]. However, despite the clinical relevance of our results, we cannot establish a causal relationship due to the methodological design of this study, which becomes a limitation, being necessary future investigations.

Patients with acute LBP at risk of sarcopenia also had worse performance on the mobility/balance test. Leveille et al. evaluated 1,002 older women and found that those with high intensity of LBP (7 to 10 in VAS) had higher limitation in functional activities, as walking, sitting down and getting up from the chair, as well as reduction in the knee extension strength and hip flexion when compared with older women with moderate and low LBP[33]. In this case, one might think that the patients' pain could have been a limiting factor in the mobility/balance, as well as the possibility of muscle influence, due to the absence of adequate response to muscle strength. It is worth mentioning that the decreased functionality due to pain is a complex and multifactorial process, to which must be considered several other aspects[16,33] – to be investigated in future studies.

This study has limitations to be considered. It assessed the risk of sarcopenia, but did not evaluate the body composition for confirmation of diagnosis. However, we highlight the relevance of the EWGSOP algorithm for being a quick and low-cost measure, ideal for initial tracking of sarcopenia, mainly in contexts of large populations, as in primary health care, the largest clinical applicability. In addition, LBP is a subjective, multidimensional and complex condition, in which several aspects must be considered as the individual, the cultural, the social and the educational ones. Thus, we emphasize the relevance in performing longitudinal studies to evaluate the progression of LBP, sarcopenia and its functional impacts. Similarly, sarcopenia can be a predictor of frailty in older people, as well as presence of pain. To have not analyzed the frailty syndrome in this population could also have been a limitation, indicating caution in data interpretation. However, this is a theme to be explored in the future.

CONCLUSION

Most older women with acute low back pain were at risk of sarcopenia, in addition to having higher pain indexes and worse performance on the mobility/balance test. These results suggest that the sarcopenia can be related to a worse prognosis for functionality and pain for older women with LBP.

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